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Suite of bench mark tests for the shallow water wave model SWAN

SWAN Cycle 2, Version 40.01 and updates

WL | Delft Hydraulics

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01

Implementation Document
and
User Manual

Implementation document and user manual of the

Suite of bench mark tests for the shallow water wave model

SWAN Cycle 2 (version 40.01 and updates)

WL | DELFT HYDRAULICS

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By:

WL | DELFT HYDRAULICS
Marine and Coastal Infrastructure
P.O. Box 177
2600 MH Delft
The Netherlands

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List of Symbols

Roman letters

c_g	group velocity
d	water depth
E	wave energy
E_{tot}	total wave energy
E^*	non-dimensional wave energy
f	frequency
f_m	mean frequency
f_m^*	non-dimensional mean frequency
f_p	peak frequency
f_p^*	non-dimensional peak frequency
f_{low}, f_{min}	lowest discrete frequency in SWAN in Hz
g	acceleration of gravity
H_s	significant wave height (defined as $H_s=4\sqrt{m_0}$)
H_i	incident significant wave height
t	time
T_{m01}	mean wave period
T_p	peak period
U_{10}	wind speed at 10 m height
U_*	friction velocity
x,y	x-, y- co-ordinate
X	fetch
X^*	non-dimensional fetch

Greek symbols

σ	radian frequency
σ_θ	standard deviation in directional-space
σ_σ	standard deviation in frequency-space
σ_{PM}	Pierson-Moskowitz frequency for fully developed spectra
σ_{low}	lowest discrete frequency in SWAN in radians
σ_{high}	highest discrete frequency in SWAN in radians
γ_o	peak enhancement factor
θ	mean wave direction (Cartesian convention)
θ_w	mean wind direction (Cartesian convention)
θ_o, θ_i	incident mean wave direction (Cartesian convention) at up-wave boundary
$\Delta x, \Delta y$	increment in x- and y-direction, respectively
$\Delta f, \Delta\theta$	increment in frequency- and directional-space, respectively

I Introduction

I.I General

The numerical wave model SWAN is presently considered as the new standard for nearshore wave modelling and coastal protection studies. Since the model has been released under public domain, many institutes, universities and consultancy companies apply the SWAN model in their projects. The model was developed at Delft University of Technology, Delft (the Netherlands), and which is also the focal point for improvements and further enhancements (see e.g. Booij et al., 1999).

The reliability of model results of SWAN in practical applications depends on how well the model has performed in (prescribed) validation and verification test cases (which may comprise idealised, laboratory and field cases). The general purpose of the model validation is to investigate and optimise the performance of the numerical schemes and of the representation of various physical processes of generation and dissipation of SWAN. Wave propagation and transformation are therefore considered in idealised cases (with and without currents). Model results can be compared with analytical solutions from linear wave theory and with field or laboratory observations. In such cases, model coefficients can be tuned to achieve the best agreement between the model results and observations. The verification of the SWAN model consists of the application in field situations with an increasing complexity in two-dimensional bathymetry and added presence of wind and currents. Here model results are compared with field observations.

The model validation and verification is presently mainly being carried out by Delft University of Technology (the Netherlands). They have many test cases (a number of these tests are described in e.g. Booij et al., 1999 and Ris et al., 1999) that are used to:

1. Verify the proper implementation of the formulations for the physical processes that are implemented in SWAN.
2. Determine the numerical accuracy and robustness of the SWAN model.
3. Verify the input and output commands of SWAN.
4. Validate and verify the performance of the SWAN model in idealised, laboratory and field cases (with added winds and currents).

Although all test cases are frequently used by Delft University of Technology, they are not well accessible to other SWAN users, because the input- and data-files (e.g. data of observations) are very limited documented and structured (with respect to the file names and the directory structure). Moreover, the pre- and post-processing tools that are required, are only limited documented.

In order to make the test cases accessible for all SWAN users, the Dutch Ministry of Public Works and Coastal Management (RIKZ, the Netherlands) commissioned WL | DELFT HYDRAULICS to develop 'a suite of bench mark tests for SWAN'.

1.2 Objectives of the study

The purpose of the present study is to make a large number of test cases accessible for all SWAN users by establishing bench mark tests for SWAN. The bench mark tests should be organised and structured in such a way that users can run the bench mark tests in many cases and compare model results with analytical solutions (according to linear theory) or with laboratory or field observations. It should also be possible to compare the model result of a new release or adapted version of 40.01 (i.e. SWAN CYCLE 2, version 40.01+) with that of the previous release of the SWAN model (i.e. SWAN CYCLE 2, version 40.01, which has been released mid-1999).

The most common way to evaluate the performance of SWAN is to present the model results in plots (which can easily be interpreted by a user). To that end, model results in terms of integral wave parameters and one-dimensional wave spectra are plotted in a prescribed format and compared with analytical solutions or observations. In addition to this, the performance of the model is also analysed by means of a statistical analysis. To limit the required actions of the SWAN users as much as possible, the set-up of the SWAN bench mark tests should be such that also this post-processing part is carried out automatically. The latter is a point of concern since the format of the output of one- (and two-) dimensional wave spectra of SWAN version 40.01 is such that some post-processing is required.

Most of the (present) SWAN users apply the SWAN model on an IBM-compatible computer or a Unix-machine. The structure and files of the bench mark tests that have been developed in this study are such that the bench mark tests are suitable for use on an IBM-compatible computer and on a Unix-machine.

1.3 Outline of the document

The outline of this document is as follows. In Chapter 2 the structure the bench mark tests for SWAN is presented and discussed. In Chapter 3 a description is given of how to implement the bench mark tests for SWAN on your computer system. The performance of the SWAN model in terms of statistical parameters is described in Chapter 4.

2 Structure of bench mark tests of SWAN

2.1 Introduction

Since it is the intention that many SWAN users will use the bench mark tests for SWAN, it is important to have a structure (i.e. with respect to directories, file names, pre- and post-processing programs, etc.) that:

1. Can easily be downloaded from the SWAN homepage;
2. Can be installed on a computer system with only little effort;
3. Is robust and simple to use (i.e. batch file oriented, plots are to be automatically produced);
4. Requires almost no maintenance (after having been installed on your computer);
5. New cases can easily be added to the bench mark tests;
6. Is platform independent (i.e. it should at perform well on both an IBM-compatible computer and a Unix machine).

The structure of the present bench mark tests of SWAN have been developed such that it satisfies these objectives. In the following sections the selection of the file names and names of the test cases, the directory structure and the pre- and post-processing's programs have been described.

2.2 Selection of file names and test cases

2.2.1 File names and extensions

The bench mark tests contain many files (input, output and additional files). With respect to the maintenance of the bench mark tests it has been decided to use as much as possible the same convention of names of input and output file extensions (for SWAN and the other pre- and post-processing's programs) as used by Delft University of Technology. To this end the following extensions have been used for the SWAN **input** files:

*.SWN	SWAN input file
*.BOT	data file with bottom depth
*.LEV	data file with water levels
*.CUR	data file with current velocities
*.WND	data file with wind velocities
*.BND	data file with 1d- or 2d- wave spectra (to be used as input spectrum at upwave boundaries)
*.NST	data file of nested computations (to be used as input for the nested computation)

The convention of the extension of the SWAN **output** files that has been used, is the following:

*.PRT	PRINT file with information regarding the computation
*.PLT	standard output file in HPGL-format of SWAN
*.TAB	data file obtained using the TABLE option (unheaded table format output)
*.TBL	data file obtained using the TABLE option (headed table format output)
*.BLK	data file obtained using the BLOCK option (block format output)
*.SP1	data of one-dimensional wave spectra at a location
*.SP2	data of two-dimensional wave spectra at a location
*.SPC	data of one- or two-dimensional wave spectra which need to be converted

To enable users to carry out the post-processing automatically, a number of post-processing programs are present that convert output data of SWAN into a different format (or the data is for instance scaled with wind speed to obtain dimensionless parameters). These programs require generally an input file with some information. The input files for the post-processing programs can be recognised by the use of the extension *.INP.

The graphical post-processing procedure is also carried out automatically (using the OPGRAPH.EXE program, developed at Delft University of Technology, the Netherlands). This OPGRAPH.EXE program requires an input file (in which the commands that generate the plot are listed) and data in a prescribed format. The extension of the input file of the program is:

*.OPG	OPGRAPH input file (with information of the graphical representation of the plot).

The name of the output file of the graphical post-processing program always starts with the following three characters:

PLFxxx	standard HPGL output file of for test case 'xxx'

As described in the introduction (see Section 1), three different types of test cases have been distinguished, i.e.:

1. **Academic situations**. These academic situations represent idealised situations in which model results can be compared with solutions of linear wave theory (e.g. depth- and current induced shoaling and refraction).
2. **Laboratory situations**. These situations refer to laboratory experiments (e.g. flume or basin) where specific physical processes were the subject of interest. In these situations detailed observations are often available. The laboratory test cases are generally used to validate the SWAN model (e.g. triad wave-wave formulations).
3. **Field situations.** Which comprise generally complex field cases (with added winds and currents) where observations are available. These cases are used to verify the SWAN model.

The names of the test cases have been chosen 8 characters long starting with the index 'A', 'L' or 'F' for the academic, the laboratory and the field cases, respectively. The next two characters (characters 2 and 3) of the file name represent the head and sub serial number of the test case considered. The last 5 characters have been reserved for a brief indication of the (physical) test case. For instance, test case A23SHO01 is the third case of the second academic test case (i.e., case 'A23') in which (depth-induced) shoaling is tested. L11WAV02 is the second run (i.e '02') of the first laboratory test in which (depth-induced) breaking is tested. The directory structure of the bench mark tests largely follows these identification names of the test cases.

2.2.2 Test cases (and names) for the bench mark tests

The names of the files and the directories of all the test cases have been selected such that they are unique (in their kind) and that users of the bench mark tests can easily determine to which test case is referred.

With respect to test cases which represent idealised situations, and for most of which a comparison can be made with solutions according to linear wave theory, the following test cases - indicated with index **A** - have been added to the bench mark tests:

Case	Purpose of test:
A11REFRA	Depth-induced refraction and shoaling
A12REFRA	Depth-induced refraction and shoaling but computational grid 10° rotated
A21SHOAL	Depth-induced shoaling (with a $\cos^2$-directional distribution)
A22SHOAL	Depth-induced shoaling (with a $\cos^{500}$-directional distribution)
A23SHOAL	Depth-induced shoaling (with a $\cos^{500}$-directional distribution with SWAN-1D)
A31CURFO	Current-induced shoaling (following current)
A32CUROP	Current-induced shoaling (opposing current)
A33CURSL	Current-induced refraction and shoaling (slanting current, incident wave direction 120°)
A34CURSL	Current-induced refraction and shoaling (slanting current, incident wave direction 60°)
A35CURBL	Current-induced blocking (wave blocking using implicit scheme in frequency space)
A41WAVFR	Bottom friction formulations
A51CURVI	Depth-induced shoaling on three different curvi-linear grids
A52CURVI	Depth-induced refraction and shoaling on three different curvi-linear grids
A53CURVI	2D-wave-induced set-up module on three different curvi-linear grids
A61OBSTA	Wave propagation through obstacles

Table 2.1 Listing of all directories of the bench mark tests that are related to academic test cases.

A number of laboratory test cases are available to validate the SWAN model. The following laboratory cases - indicated with index **L** - have been added to the bench mark tests:

Case	Purpose of test:
L11WAVBR	Depth-induced breaking, mildly and violent breaking case (experiment of Battjes and Janssen, 1978)
L21TRIAD	Triad wave-wave interactions (experiment of Beji and Battjes, 1993)
L31SETUP	Wave-induced set-up (experiment of Boers, 1996)
L41CURBL	Current-induced wave blocking (experiment of Lai et al., 1989)
L51HISWA	Wave propagation and transformation over a submerged bar (the HISWA-basin; Dingemans et al., 1989)
L61BARRI	Barrier Island: wave propagation and transformation using a regular and two different curvi-linear grids (Holthuijsen et al., 1993)

Table 2.2 Listing of all directories of the bench mark tests that are related to laboratory test cases.

The following realistic field cases - indicated with index **F** - have been added to the bench mark tests in order to verify wave propagation and wave transformation in the SWAN model:

Case	Purpose of test:
F11GRSHW	Depth-limited wave growth using *third-generation* formulations and U_{10} = 10 m/s (SWAN results are compared with data of Young and Verhagen, 1996; Holthuijsen, 1980 and Bretschneider, 1973)
F12GRSHW	As case **F11GRSHW** but with U_{10} = 20 m/s
F13GRSHW	As case **F11GRSHW** but with U_{10} = 30 m/s
F21GRDPW	Fetch-limited deep water wave growth using *third-generation* formulations and U_{10} = 10 m/s (SWAN results are compared with data of Wilson, 1965; Pierson-Moskowitz, 1964 and Kahma and Calkoen, 1992)
F22GRDPW	As case **F21GRDPW** but with U_{10} = 20 m/s
F23GRDPW	As case **F21GRDPW** but with U_{10} = 30 m/s
F24GRDPW	Fetch-limited deep water wave growth using *second-generation* formulations and U_{10} = 10 m/s (SWAN results are compared with data of Wilson, 1965; Pierson-Moskowitz, 1964 and Kahma and Calkoen, 1992)
F25GRDPW	As case **F24GRDPW** but with U_{10} = 20 m/s
F26GRDPW	As case **F24GRDPW** but with U_{10} = 30 m/s
F27GRDPW	Model convergence in case of fetch-limited wave growth in deep water
F31HARIN	Wave propagation and transformation in the Haringvliet estuary, the Netherlands (Andorka Gal, 1995)
F41LAKGR	Wave growth in shallow lake of Lake George, Australia (Young and Verhagen, 1996a and 1996b)
F51FRIES	Wave propagation and transformation in the tidal inlet of the Friesche Zeegat, the Netherlands (Dunsbergen, 1995a and 1995b)
F61WESTR	Wave propagation and transformation in the Westerschelde estuary, the Netherlands (Andorka Gal and Roelse, 1997)
F62WESTR	Wave propagation and transformation on curvi-linear grids in the Westerschelde estuary, the Netherlands (Andorka Gal and Roelse, 1997)
F71MEDSE	Non-stationary wave computations in the Mediterranean Sea ('Gorbush storm': Komen et al., 1994: Holthuijsen et al., 1996)

F81NORDE	Wave propagation and transformation in the Norderneyer Seegat, Germany (Niemeyer and Kaiser, 1997)
F91PETTE	Wave propagation and transformation at the shallow foreshore next to the Petten Sea Defence, Petten, The Netherlands (Andorka Gal et al., 1998)

Table 2.3 Listing of all directories of the bench mark tests that are related to field cases.

2.3 Pre- and (graphical) post-processing programs

A number of pre- and post-processing programs are available in order to be able to fully automatically perform the bench mark tests.

The **pre-processing** programs consist of the program CONVBND.EXE only. This program converts the format of the one- and two-dimensional wave spectra that is being used for input wave spectra and up-wave boundaries of an early release of SWAN (i.e. version 30.75) into that of SWAN version 40.01 (and updates). The reason that this conversion of 1d- and 2d spectra is required is that the format of the spectral files of version 40.01 has been changed compared to that of the early version 30.75.

Generally, two type of **post-processing** programs can be distinguished, i.e., post-processing programs that are related to *data* conversion (i.e. converting the output data of SWAN in a specific format) and to the *graphical* post-processing tools to make the plots.

The following post-processing programs are available with respect to *data conversion*:

CONVDP.EXE — This program converts wave data (as computed by SWAN version 40.01 and updates) into dimensionless data by using the friction velocity U_* (according to Wu, 1982). The program is used for the tests cases that are related to fetch-limited (deep water) wave growth (cases F21 to F26);

CONVSH.EXE — This program converts wave data (as computed by SWAN version 40.01 and updates) into dimensionless data by using the wind speed U_{10}. This program is activated for the test case that is related to depth-limited wave growth (case F11);

CONVRT1D.EXE — This program converts the format of the one-dimensional wave spectra (as computed by SWAN version 40.01 and updates) into a format that is appropriate for the graphical post-processing's program (see below). This program is activated in all test cases in which wave spectra are presented;

The following post-processing programs are available for the purpose of the graphical presentation of the model results:

OPGRAPH.EXE — The purpose of this program is to make graphs of 1d functions (see OPGRAPH manual of Delft University of Technology, the Netherlands). It has the great advantage in contrast with other post-processing programs such as spreadsheets that it can be run in batch (i.e. without interference by a user) and that it is platform independent (since it is a FORTRAN77 program). The program produces HPGL plots which can easily be visualised or printed by a HPGL view- and plot program such as PRINTGL;

PRINTGL.EXE — With the program PRINTGL.EXE it is possible to visualise and plot the HPGL-files that have been made by the OPGRAPH program. It is noted that this program can only be used on an IBM-compatible computer (not on Unix).

Although the PRINTGL.EXE is shareware, a user of the PRINTGL.EXE program should be aware of the following conditions with respect to its use:

```
PrintGL/D (c) Copyright Ravitz Software Inc. 1990,1993

  PrintGL/D is distributed as shareware.  If you use
  PrintGL/D  beyond  evaluation  you must purchase a
  registered copy for $50 from  Ravitz Software Inc.
  See "License and Registration" in  PRINTGL.DOC for
  more information.
                           Ravitz Software Inc.
                           P.O. Box 25068
                           Lexington, KY  40524-5068
                           USA
```

2.4 General directory structure of bench mark tests

In this section the directory structure that has been developed for the bench mark tests for SWAN, is described. The complete directory structure consist of only three levels:

1. Main directory of the bench mark tests (level I);
2. Directories in which the most common data is stored (level II);
3. Sub-directories with data and input files for the bench mark tests (level III).

The main directory is called **TESTBANK**, which corresponds to directory level I (it is noted that the name of this (and only this) main directory may be chosen arbitrarily). This main directory **TESTBANK** contains a number of subdirectories, which are indicated with level II (see Table 2.4). These subdirectories at level II contain all the files that are required to automatically carry out the pre-processing, the SWAN computations (with SWAN version 40.01 and updates) and the post-processing. Generally, four type of subdirectories can be distinguished at the second subdirectory level:

1. subdirectories who's name starts with the following characters: **SWAN** contain files that are directly related to SWAN (i.e., SWAN executable, central directories in which all model results of SWAN are stored);
2. subdirectory **PROGS** contains all the additional executables that are required to automatically carry out all the pre- and post-processing procedures;
3. the subdirectories **SYS_PC** and **SYS_UNIX** (for use on an IBM-compatible computer or a Unix system, respectively) contain all the batch files with which the computations and postprocessing procedures of the bench mark tests can be executed;

4. the subdirectories with the names starting with '**A**', '**L**' and '**F**' contain all the subdirectories and files for the three different type of test cases, i.e.: the academic situations, the laboratory situations and the (complex) field situations, respectively.

The subdirectories at the third level (level III) of the main directories **SWANPREC**, **SWANCOMP** and **PROGS** contain only source code (and subsequent makefile for Unix applications) of related programs. The subdirectories **BATDIR** and **BINDIR** contain the batch files (with extension *.BAT) which should copied by a user to a so called BAT- or BIN-directory on PC or UNIX, respectively. Within all these *.BAT files a number of lines may need to be adapted (depending on your path-structure; see for more information Section 3.4). The directories with the names starting with '**A**', '**L**' and '**F**' contain each four subdirectories, i.e.:

1. **PRECOMP**
2. **COMPUTED**
3. **DATA**
4. **PLOTS**

in which all the files for a particular test case have been stored. A complete overview of the directory structure at the levels II and III are given in Table 2.4.

The directory structure of the bench mark tests for SWAN is the following:

Level II	Level III	Description of contents of subdirectory
\SWANDOCS		Documents related to the bench mark tests for SWAN
\SWANPRT	\COMPUTED	Directory in which all ***print*** files (*.PRT) of SWANCOMP are stored
	\PRECOMP	Directory in which all ***print*** files (*.PRT) of SWANPREC are stored
\SWANPLOTS		Central directory in which all PLF* files are stored
	\COMPUTED	Directory in which all ***plot*** files (*.PLT) of files SWANCOMP are stored
	\PRECOMP	Directory in which all ***plot*** files (*.PLT) of files SWANPREC are stored
\SWANERR	\COMPUTED	Directory with all ***error*** files (*.ERF and *.ERP) files of SWANCOMP
	\PRECOMP	Directory with all ***error*** files (*.ERF and *.ERP) files of SWANPREC
	\PLOTS	Directory in which all ***error*** files (*OPG.ERF) files of OPGRAPGH are stored
\SWANPREC		Directory with ***executable*** **SWANPREC.EXE** of SWAN version 40.01
	\PROG	Directory with the ***source code*** of SWAN version 40.01
	\DOCS	Directory with the manual of SWAN version 40.01
\SWANCOMP		Directory with ***executable*** **SWANCOMP.EXE** of SWAN version 40.01+
	\PROG	Directory with the ***source code*** of SWAN version 40.01+
	\DOCS	Directory with the manual of SWAN version 40.01+
\PROGS		Directory with executables of all additional programs
	\CONVDP	Source code of program **CONVDP.EXE**
	\CONVSH	Source code of program **CONVSH.EXE**
	\CONVRT1D	Source code of program **CONVRT1D.EXE**
	\OPGRAPH	Source code of program **OPGRAPH.EXE**
	\CONVBND	Source code of program **CONVBND.EXE**
	\PRINTGL	Executable **PRINTGL.EXE** of the HPGL-viewer for PC-use
\SYS_PC		Central directory from which the batch files to perform SWAN computations and generate plots can be executed for PC-applications
	\BATDIR	Batch files which should be adapted for personal use and which should be copied to the directory C:/BAT
\SYS_UNIX		Central directory from which the batch files to perform SWAN computations and generate plots can be executed for UNIX-applications
	\BINDIR	Batch files which should be adapted for personal use and which should be copied to the directory BIN on Unix
\A11xxxxx		Test cases in idealised situations
	\PRECOMP	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANPREC.EXE**
	\COMPUTED	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANCOMP.EXE**
	\DATA	Data of solutions according to linear wave theory
	\PLOTS	Input files (*.OPG) for **OPGRAPH.EXE** and plots files (PLF*)
\L11xxxxx		Laboratory cases
	\PRECOMP	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANPREC.EXE**
	\COMPUTED	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANCOMP.EXE**
	\DATA	Data of laboratory observations
	\PLOTS	Input files (*.OPG) for the program **OPGRAPH.EXE** and plots files (PLF*)
\F11xxxxx		Field cases
	\PRECOMP	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANPREC.EXE**
	\COMPUTED	All SWAN input files (*.SWN, *.LEV, *.BOT, *.CUR) for **SWANCOMP.EXE**
	\DATA	Data of field observations
	\PLOTS	Input files (*.OPG) for **OPGRAPH.EXE** and plot files (PLF*)

Table 2.4 Listing of directory structure of the bench mark tests for SWAN.

3 How to install and activate the bench mark tests on a computer system

3.1 Introduction

The complete bench mark tests for SWAN are available on the SWAN home page (http://swan.ct.tudelft.nl) and can be downloaded from this home page. In this Chapter the procedure for installation the bench mark tests on your computer system (IBM-compatible computer or Unix system) is described.

3.2 Computer dependent commands

When installing the bench mark tests on your computer it should be realised that a number of frequently used commands in the files differ with respect to the computer system that is used (i.e. an IBM-compatible computer or a Unix machine). To avoid any difficulties when installing or modifying the bench mark tests, the following differences should be a point of concern:

- Under a Unix system a distinction is made between lower case and upper case characters. In order to avoid any difficulties with system dependent commands with respect to characters, all the present file and directory names are all in lower case characters. It is therefore strongly recommended that all new file names (after e.g. compilation and renaming) and directory names are in lower case characters.
- To indicate that a comment line is present in a batch file on an IBM-compatible computer, a user should start this line with: '**REM** .....' whereas on a Unix system the user should use the command: '#.....'.
- The command line on an IBM-compatible computer uses a '\' whereas on a Unix system a '/' is used. The files of the bench mark tests and the additional (FORTRAN77) programs are such that after initialisation of all files on a particular computer system (i.e. an IBM-compatible or a Unix system) the difference between the command line '\' and '/' is automatically taken care of.
- Ensure that on an IBM-type computer all 'read only' file attributes are cleared (or removed) to avoid problems with the opening, writing and closing of (data) files;
- Ensure that on a Unix machine the status of all executables and batch-files (*.BAT files in the directory /BIN; see below) are changed by using the Unix-command: **CHMOD +X**.

3.3 Downloading the bench mark tests

The complete set of bench mark tests of SWAN can be downloaded from the SWAN home page. To download the files, a FTP program (i.e. *file transfer protocol* program) should be used to transfer the complete directory structure as listed in Table 2.4 to your computer system. It is recommended to download the complete bench mark tests, but a user may chose to download only the (complete) directories of the academic, the laboratory or the field cases (see Table 2.1, 2.2 and 2.3, respectively). The data should be transferred using the ASCII-transfer option. In order to minimise the required changes to make the bench mark tests operational on your computer, it is advised to store the directory TESTBANK on the C-drive if you are using an IBM-compatible type computer (i.e. **C:\TESTBANK**) or your local host-directory if you are using a Unix system (i.e. **/USER/TESTBANK**). If all files are located in an other directory than described here above, a number of changes have to be made in several files (see Section 3.4).

3.4 Preparing the bench mark tests: path- and file names

Depending on your computer system, the following procedures are required after having downloaded all directories and files for an IBM-compatible computer and a Unix machine, respectively:

On an IBM-compatible computer

1. Ensure that there exist a directory **C:\BAT** on your computer and that this directory is added to your path according to: **PATH=%PATH%;C:\BAT;**
2. If you have installed the TESTBANK in a directory different than that described in Section 3.3, you have to change the path names in all the *.BAT files in the directory **TESTBANK\SYS_PC\BAT_DIRECTORY**. To this end, change the present path name '**C:\TESTBANK**' that is included in the *.BAT files into the name of the location of the path in which you have installed your TESTBANK directory. The modifications concern the files:
   - CONVDP.BAT
   - CONRT1D.BAT
   - CONVSH.BAT
   - OPG.BAT
   - PRHP.BAT (note that this file is *not* available for Unix type machines)
   - VUHP.BAT (note that this file is *not* available for Unix type machines)
   - SWANCOMP.BAT
   - SWANPREC.BAT

   The file CLEAR.BAT does not need to be changed.
3. Copy subsequently all the (modified) *.BAT files to the directory **C:\BAT** on your computer.
4. In order to perform computations with SWAN and with the pre- and postprocessing programs, it is required to compile (and link) a number of programs. The programs (to be compiled and linked) should be stored - with a specific file name - in prescribed directories. The compilation procedures are restricted to the following directories and programs:
   - Directory **TESTBANK\SWANCOMP\PROG**: compile and link - following the implementation document of SWAN, all relevant SWAN files of the most recent version 40.01+ and ensure that the executable is named: **SWANCOMP.EXE**. Note that a minimum pool size of 15.000.000 is required (corresponding to 60 Mb internal memory) and that it is assumed that a user is aware of the modifications that have to be made in the computer dependent files of SWAN (reference is made to

the implementation document of SWAN). The executable **SWANCOMP.EXE** should be copied to the directory **TESTBANK\SWANCOMP**

- Directory **TESTBANK\SWANPREC\PROG**: compile and link - following the implementation document of SWAN, all relevant SWAN files of the previous version (i.e. version 40.01) and ensure that the executable is named: **SWANPREC.EXE**. Note that a minimum pool size of 15.000.000 is required (corresponding to 60 Mb internal memory) and that it is assumed that a user is aware of the modifications that have to made in the computer dependent files of SWAN (reference is made to the implementation document of SWAN). This executable **SWANPREC.EXE** should be copied to the directory **TESTBANK\SWANPREC**
- Directory **TESTBANK\PROGS**: compile and link all programs listed in the directories and ensure that all the executable (with a name as listed here below) are stored in the directory **TESTBANK\PROGS**:

n°	Directory	Name of executable	Remarks
1	CONVBND	CONVBND.EXE	
2	CONVDP	CONVDP.EXE	
3	CONVSH	CONVSH.EXE	
4	CONVRT1D	CONVRT1D.EXE	
5	OPGRAPH	OPGRAPH.EXE	Change DIRCH2='/' into DIRCH2='\' on line 96 and 137 in the file OCPIDS.F for PC-application (see also readme.txt file)
6	PRINTGL	PRINTGL.EXE	Only executable is available

Note that the source code of the file PRINTGL.EXE in the directory PRINTGL is not available but only the executable. This executable should also be present in the directory **TESTBANK\PROGS**. Moreover, note that the files in the directories CONVRT1D and OPGRAPGH contain more than one *.FOR file.

End of modifications for IBM-compatible computers!

On a Unix system

1. Ensure that there exist a directory: **/BIN**
2. If you have installed the TESTBANK in a directory different than that as described in Section 3.3, you have to change the path in all the files in the directory **TESTBANK/SYS_UNIX/BIN_DIRECTORY**. Change the present path name **/U/RIS/TESTBANK** that is included in all the files (in the BIN_DIRECTORY) into the name of the location of the path in which you have installed your testbank directory. The modifications concern the files:
   - CONVDP.BAT
   - CONRT1D.BAT
   - CONVSH.BAT
   - OPG.BAT
   - SWANCOMP (note: no extension of .BAT !)
   - SWANPREC (note: no extension of .BAT !)

   The file CLEAR.BAT does not need to be changed.
   Ensure that the status of all the files in the directory **SYS_UNIX/BIN_DIRECTORY** is changed by using Unix-command: '**CHMOD +X *.***'. Copy subsequently all the (modified) files to the directory **/BIN**.

3. In order to perform computations with SWAN and with the pre- and postprocessing programs, it is required to compile (and link) a number of programs. The programs should be stored - with a specific file name - in given directories. The compilation procedures are restricted to the following directories and programs:
   - Directory **TESTBANK/SWANCOMP/PROG**: compile and link - following the implementation document of SWAN, all relevant SWAN files of the most recent version 40.01+ and ensure that the executable is named: **SWANCOMP.EXE**. Note that a minimum pool size of 15.000.000 is required (corresponding to 60 Mb internal memory) and that it is assumed that a user is aware of the modifications that have to made in the computer dependent files of SWAN (reference is made to the implementation document of SWAN). The executable **SWANCOMP.EXE** should be copied to the directory **TESTBANK/SWANCOMP.**
   - Directory **TESTBANK/SWANPREC/PROG**: compile and link - following the implementation document of SWAN, all relevant SWAN files of the previous version (i.e. version 40.01) and ensure that the executable is named: **SWANPREC.EXE**. Note that a minimum pool size of 15.000.000 is required (corresponding to 60 Mb internal memory) and that it is assumed that a user is aware of the modifications that have to made in the computer dependent files of SWAN (reference is made to the implementation document of SWAN). This executable **SWANPREC.EXE** should be copied to the directory **TESTBANK/SWANPREC.**
   - Directory **TESTBANK/PROGS**: compile and link all programs listed in the directories and ensure that all the executable (with a name as listed here below) are stored in the directory **TESTBANK/PROGS.**

n°	Directory	Name of executable	Remarks
1	CONVBND	CONVBND.EXE	
2	CONVDP	CONVDP.EXE	
3	CONVSH	CONVSH.EXE	
4	CONVRT1D	CONVRT1D.EXE	
5	OPGRAPH	OPGRAPH.EXE	Change DIRCH2='\' into DIRCH2='/' on line 96 and 137 in the file OCPIDS.F for UNIX application (see also readme.txt file)
6	PRINTGL	PRINTGL.EXE	This executable is for a dos-environment and cannot be used on a Unix machine !

   Note that the files in the directories CONVRT1D and OPGRAPGH contain more than one *.FOR file. Ensure that the status of all the executables in the directory **TESTBANK\PROGS** is changed by using the Unix-command: **CHMOD +X *.EXE**

End of modifications for Unix machines!

3.5 Testing the modifications (with respect to the path- and file names)

The modifications as described in Section 3.4 are required in order to install the bench mark tests on your computer. In order to verify whether the installation procedure (compiling different programs, copying files to prescribed directories etc.) has successfully been completed and that from any directory the executables can be activated, it is advised to carry out the following testing procedures:

On an IBM-compatible computer

Change to the directory L41CUR01. Then change subsequently to the following directories and carry out the following scripts:

1. Change to directory COMPUTED and execute: SWANCOMP L41CUR01. Now the present version 40.01+ of SWAN should be activated to compute the specified case. To test the post-processing program CONVRT1D.EXE execute: CONVRT1D L41CUR01. An output file with the extension L41CUR01.SP1 should be produced
2. Change to directory PRECOMPUTED and execute: SWANPREC L41CUR01. Now version 40.01 of SWAN should be activated to compute the specified case. To test the post-processing program CONVRT1D.EXE execute: CONVRT1D L41CUR01. An output file with the extension L41CUR01.SP1 should be produced
3. Change to directory PLOTS and execute: OPG L41CUR1A and OPG L41CUR1B. Two output files with the file names: PLFL41A and PLFL41B should have been produced (by the program OPGRAPH.EXE). On an IBM-compatible computer these PLF-files can be visualised by executing: VUHP PLFL41A and VUHP PLFL41B or printed by PRHP PLFL41A and PRHP PLFL41B (check the destination of the printer port in the file PRHP.BAT)

In addition to these tests, it is recommended to also check whether the programs CONVSH.EXE and CONVDP.EXE can be activated. To this end execute: CONVSH and CONVDP and check if the program responds (it should show '*.INP FILE NOT FOUND').

On a Unix system

Change to the directory L41CUR01. Then change subsequently to the following directories and carry out the following scripts:

1. Change to directory COMPUTED and execute: SWANCOMP L41CUR01. Now the present version 40.01+ of SWAN should be activated to compute the specified case. To test the post-processing program CONVRT1D.EXE execute: CONVRT1D.BAT L41CUR01. An output file with the extension L41CUR01.SP1 should be produced
2. Change to directory PRECOMPUTED and execute: SWANPREC L41CUR01. Now version 40.01 of SWAN should be activated to compute the specified case. To test the post-processing program CONVRT1D.EXE execute: CONVRT1D.BAT L41CUR01. An output file with the extension L41CUR01.SP1 should be produced
3. Change to directory PLOTS and execute: OPG.BAT L41CUR1A and OPG.BAT L41CUR1B. Two output files with the file names: PLFL41A and PLFL41B should have been produced (by the program OPGRAPH.EXE). As described in Section 3.4, the HPGL-files (PLFL41A and PLFL41B) cannot be visualised on a Unix machine since the HPGL-viewer of the bench mark test (i.e. file PRINTGL.EXE) is only for a DOS-environment. To visualise the plots, a user should transfer all the plot files (PLF* and *.PLT) of the directory SWAN plots from the Unix machine to a local IBM-type computer. Then on the IBM-compatible computer the HPGL-plot files can be visualised by executing: VUHP PLFL41A and VUHP PLFL41B.

In addition to these tests, it is recommended to also check whether the programs CONVSH.EXE and CONVDP.EXE can be activated. To this end execute: CONVSH.BAT and CONVDP.BAT and check if the program responds (it should show '*.INP FILE NOT FOUND').

It is noted that when the plots, that have been generated by the program OPGRAPH.EXE, are visualised on your computer with the program PRINTGL.EXE that all lines, symbols, text etc., are represented in:

a) black, if the data concerns the pre-computed option (version 40.01);
b) blue, if the data concerns the computed option (version 40.01+);
c) red, if the data concerns observations (laboratory and field) or analytical solutions.

If the installation procedure has successfully been tested, the bench mark tests can be used for validating and verifying purposes of SWAN.

3.6 Activating the bench mark tests

The bench mark tests can be activated in different manners. Generally, the execution of all the files is controlled by a limited number of batch files that are stored in the directory **TESTBANK\SYS_PC** (if an IBM-compatible system is used) or **TESTBANK/SYS_UNIX** (if a Unix machine is used). The names of the batch files have been chosen such that they simply represent the action that will be undertaken:

Batch files to perform computations with the new version of SWAN (e.g. version 40.01+):

RUNCOMPA.BAT	compute all **academic** test cases with the present SWAN version
RUNCOMPL.BAT	compute all **laboratory** test cases with the present SWAN version
RUNCOMPF.BAT	compute all **field** test cases with the present SWAN version
RUNCOMPALL.BAT	activate in sequence the three batch files: RUNCOMPA.BAT, RUNCOMPL.BAT and RUNCOMPF.BAT

Batch files to perform computations with version 40.01 of SWAN

RUNPRECA.BAT	compute all **academic** test cases with the previous SWAN version.
RUNPRECL.BAT	compute all **laboratory** test cases with the previous SWAN version
RUNPRECF.BAT	compute all **field** test cases with the previous SWAN version
RUNPRECALL.BAT	activate in sequence the three batch files: RUNPRECA.BAT, RUNPRECL.BAT and RUNPRECF.BAT

By activating one of the above batch files, all the output generated by SWAN is copied to prescribed directories such that a user will have a general view of the model results. This concerns the following files:

- *.PRT print files generated by SWAN are copied to the directory SWANPRT
- *.PLT plot files generated by SWAN are copied to the directory SWANPLOTS
- *.ERP and *.ERF files generated by SWAN are copied to the directory SWANERR

If all computations have been carried out successfully and the output data of the computations with the 'precomputed' and 'computed' version of SWAN have been stored in the directories COMPUTED and PRECOMP, the post-processing part of the bench mark tests can be activated. This can be achieved by executing:

PLOTA.BAT	generate output plots (i.e. plot files with name PLF*) for all **academic** test cases and copy all the files to the directory SWANPLOTS. All the *.PLT plot files generated by SWAN are also copied to the directory SWANPLOTS;
PLOTL.BAT	generate output plots (i.e. plot files with name PLF*) for all **laboratory** test cases and copy all the files to the directory SWANPLOTS. All the *.PLT plot files generated by SWAN are also copied to the directory SWANPLOTS;
PLOTF.BAT	generate output plots (i.e. plot files with name PLF*) for all **field** test cases and copy all the files to the directory SWANPLOTS. All the *.PLT plot files generated by SWAN are also copied to the directory SWANPLOTS;
PLOTALL.BAT	activate in sequence the three batch files: PLOTA.BAT, PLOTL.BAT and PLOTF.BAT.

By copying all relevant files of all the test cases to central directories, i.e. copying the:

1. **PLF*** and ***.PLT** files to the **SWANPLOTS** directory;
2. ***.PRT** files to the **SWANPRT** directory;
3. ***.ERF** and ***.ERP**-files to the **SWANERR** directory,

a user can easily check the model results of all the test cases. This can be achieved by considering the size of the *.PRT files in the directory SWANPRT, the presence of *.ERF or *.ERP files in the directory SWANERR or by visualisation of all the plot files that have been generated. On an IBM-type computer the HPGL plots can be viewed by using **VUHP PLF*** or printed to a local printer by executing: **PRHP PLF***.

4 Statistical analysis on data of bench mark tests SWAN

4.1 Introduction

In the bench mark tests the model performance of SWAN, i.e. how well does the SWAN model simulate the observed wave evolution, can be presented graphically for a number of academic, field and laboratory cases. If, however, the user wants to know in what respect adaptations of SWAN (physics and/or numerics) result in an improvement of the overall model performance, statistical parameters are needed. To this end, a post-processing program which statistically analyses the results of the computations has been added to the bench mark tests. The post-processing program expresses the performance of SWAN in statistical parameters for a number of integral wave parameters. The statistical parameters enable the user to determine the predictive performance of SWAN (based on integral wave parameters) for each test case and to compare the performance of e.g. an official SWAN release with a research version.

4.2 Approach

To implement the statistical analysis to the bench mark tests the following activities were carried out:

- the structure of the benchmark tests has been adapted to create an extra directory in which the statistical analysis can be carried out. In this manner a user has the possibility not to include the statistical analysis in the bench mark tests;
- the SWAN input files of the selected cases have been slightly modified to obtain the required output;
- procedures (scripts and batch files) have been written to copy required data, carry out data transformations and run the statistical analysis;
- a program has been developed which reads the measured and computed data and computes various statistical parameters.

The program carrying out the statistical analysis, which has been named STATIS, can be run in two modes, default and non default. The default mode enables the user to determine the model performance of SWAN based on the wave parameters directly derived from the SWAN computation, with a limited number of statistical parameters.

As RIKZ has defined a number of other parameters for the wave period which are more suitable for use in design formulae in case of double-peaked and broad spectra, a 'non default' mode has also been implemented. Using this non default mode, the performance of SWAN is evaluated for more integral wave parameters and with more statistical parameters.

The program STATIS has been designed in such a way that the results are presented for each SWAN computation (run) for each case separately next to the overall model performance for each case and the overall performance for a case type (field, laboratory or academic). To allow some freedom in the way the combined performance is determined, a weight factor can be defined for each run. The user can change the weighing factor of each case and can even decide to skip a run or case in the computation of the overall statistical parameters.

At the start of this project it was agreed to implement the statistical analysis for the field and laboratory cases shown in Table 4.1 below. The number of cases can easily be enlarged (see Section 4.5).

field cases	laboratory cases
f31harin	l21triad
f41lakgr	l31setup
f51fries	l41curbl
f61westr	l51hiswa
f81norde	
f91pette	

Table 4.1 Cases for which the statistical analysis has been implemented

4.3 Implementation

4.3.1 Directory structure

The directory which has been added to the bench mark tests directory structure in order to perform the statistical analysis has been called SWANSTAT. This directory is subdivided in a number of subdirectories (as shown below) in which the data required for the statistical analysis is stored.

Level II	Level III	Description of contents of subdirectory
\SWANSTAT		Directory in which the statistical analysis is carried out.
	\COMPUTED	Directory in which the ***output*** (*.TBL, *.SP1 and *.PAR) files of SWAN 40.01+ are stored
	\PRECOMP	Directory in which the ***output*** (*.TBL, *.SP1 and *.PAR) files of SWAN 40.01 are stored
	\DATA	Directory in which observed data files (*.OBS and *.DAT) files are stored
	\PERFSTAT	Directory in which the results of the statistical analysis are stored
	\SCATTER	Directory in which the results and *OPG files for the scatter plots are stored

The programs which are needed for the statistical analysis are added to the PROGS directory in the subdirectory STATIS and INTPAR. This is shown below.

\PROGS		Directory with executables of all additional programs
	\STATIS	Source code of program STATIS.EXE, F61WESDF.EXE and F61WESND.EXE
	\INTPAR	Source code of programs INTPAR.EXE

The function of the different programs will be discussed in Section 4.3.3. The statistical computation will be carried out in the PERFSTAT directory.

4.3.2 Modification SWAN input files

To allow the statistical evaluation of the model results standardised output of the SWAN computations is required. The SWAN input files for the selected cases were adapted with two output requests. Both are generated for the stations for which observations are available. In the first the integral wave parameters are requested using the standard TABLE command of SWAN. This output is listed in a table in the file with the extension '*tbl*'. The second request concerns a one dimensional energy spectrum and this spectrum is saved with the extension '*sp1*'.

4.3.3 Procedures

Script / batch file

To carry out all required actions a script / batch file named *runstatall.bat* has been prepared which carries out all required actions for the statistical analysis. These are:

- start the auxiliary program INTPAR (see below) to compute integral wave parameters from the one-dimensional spectra from the SWAN computations,
- combine data of overall and nested models into one data file (Westerschelde case only, see below),
- start the program STATIS to carry out the statistical analysis.

Auxiliary programs

Apart from the main program carrying out the statistical analysis, two additional programs were developed to make it possible to run the statistical analysis. The first program is used to edit the one-dimensional spectra and the second is used to combine (pre)computed data from an overall and a nested model. Both programs are described below.

A program called INTPAR has been made to adapt the one-dimensional spectra from SWAN to the required format for the statistical analysis. The program converts one-dimensional spectra into the integral wave parameters and has been based on an earlier developed program (Van Vledder, personal communication 1999).

The integral wave parameters from the measurements were derived from the observed spectra (**.obs*) in a similar way. The default wave parameters are derived directly from the measured spectra. Prior to deriving the non-default parameters a smoothing algorithm was applied 4 times on the measured spectra, to reduce 'grassiness' of the spectra, thus avoiding false peaks. Additional information with respect to the definitions of non-default spectral period measures and the smoothing procedure can be found in Appendix B.

A program called F61WES* has been developed specifically for the Westerschelde case. The program combines the computed integral wave parameters of the coarse and the fine (nested) model in one file. In cases where the output locations are within the coarse grid and the fine grid, the program uses the values of the fine grid only. This combined file is used in the statistical analysis. The program has been written in such a way that it can easily be adapted if a new case with nested models is added to the bench mark tests.

File names and data flow

For the statistical analysis quite a few files are required with model results, observed data and steering information for the statistical analysis. Which (input)files are needed in the program STATIS depends also on the required mode of the computation. Figure 4.1 shown below gives an overview of the various input and output files of the statistical analysis. Each column in the figure indicates one of the subdirectories of the SWANSTAT directory.

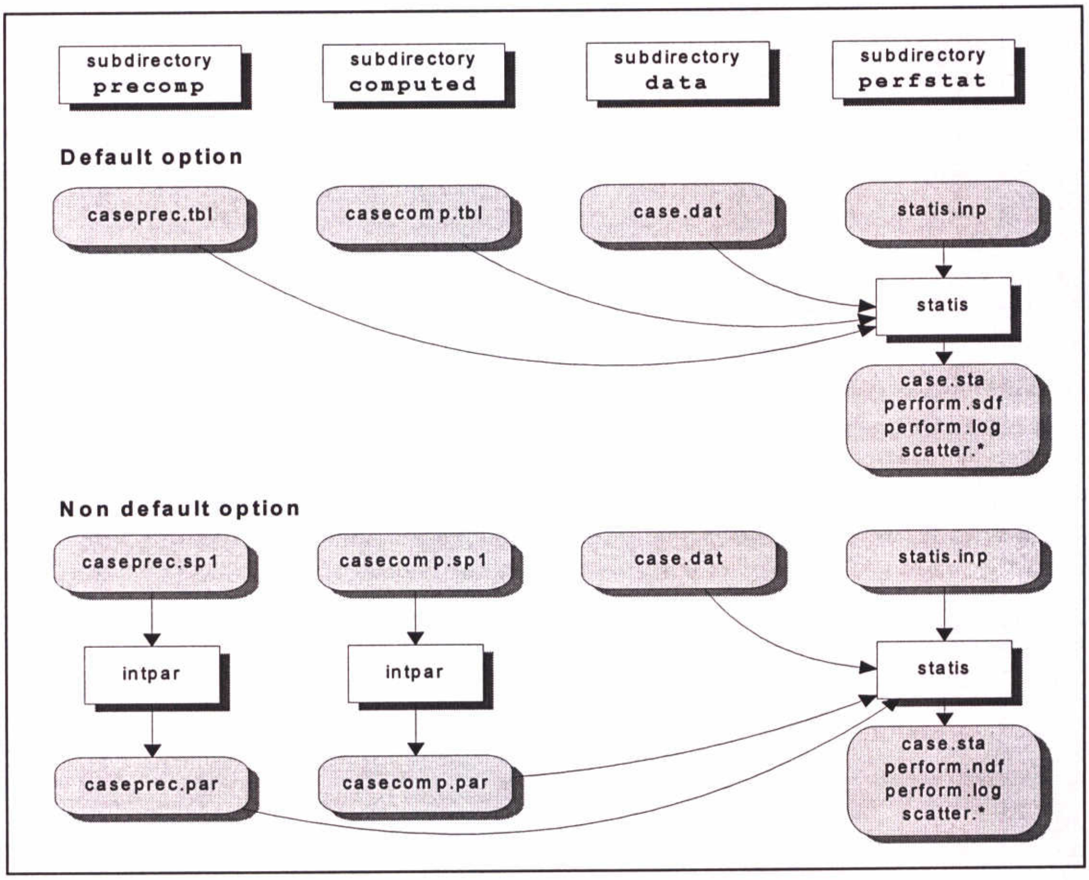

Figure 4.1 Chart showing data flow for the statistical analysis of the bench mark tests

The input files with the results of the model computations are the *.*tbl* files with the integral wave parameters as computed directly by SWAN and the *.*sp1* files with spectral data as created while running the bench mark tests. These files are copied by the script from the 'case' directories of the bench mark tests into the PRECOMP and COMPUTED subdirectories of the statistical analysis. For the non default analysis the integral parameters are computed from the spectral data using the program INTPAR. The results are saved in the *.*par* files.

The observed spectra have been analysed with a program similar to INTPAR to obtain the integral parameters. This evaluation is needed only once when the run is added in the statistical analysis. This has been carried out for all cases selected for the present study and the resulting integral wave parameters are stored in the *.*dat* files.

4.3.4 The program STATIS

The program STATIS computes the model performance indices of SWAN. Therefore the program reads observed and both the precomputed and the computed integral wave parameters and determines a number of statistical parameters describing the agreement of observed and computed values. Since observed wave directions are available at a few stations only, the model results for the mean wave direction are not statistically analysed here. The imposed values of the wave parameters at the model boundary are obviously not included in the analysis.

The program STATIS is steered with an input file called *statis.inp*. This file contains the data that are needed for the statistical analysis, i.e. the required names and weighing factors of the cases which have to be analysed.

The results of the statistical analysis are stored for each run separately in the directory PERFSTAT as *'casename.sta'*. The file *perform.sdf* (for the default mode or *perform.ndf* for the for the non default mode) contains the statistical parameters for all separate runs, but also the (weighted) average values for each case and for each type of cases (laboratory and field cases). Furthermore the program STATIS always creates the diagnostic file *perform.log* containing messages on the progress of the statistical post processing.

As described before, two options are implemented in the program STATIS to determine the model performance of a SWAN version. The statistical analysis which is carried out on the integral wave parameters generated directly from the SWAN computation is the default analysis. If the non default option is chosen the statistical parameters will be determined for various additional period definitions, derived from the spectral data.

The statistical parameters will be computed for the following integral wave parameters:

	1	2	3	4	5	6	7	8	9	10	11	12	13
Default	Hs	T_p	T_{m01}	T_{m02}	fspr								
Non-default	Hs	T_p	T_{m01}	T_{m02}	fspr	T_{m-4-3}	T_{m-3-2}	T_{m-2-1}	T_{m-10}	T_{peq}	T_{pb}	T_{pbeq}	T_{pm}

For the statistical parameters a distinction between the default and non default option has been made as well:

	1	2	3	4	5	6	7	8	9	10	11	12
Default	bias	mae	rms	sci	mpi	opi						
Non-default	bias	mae	rms	sci	mpi	opi	std	d1	d2	corr	rega	regb

The definition and use of the statistical parameters which are mentioned in the table are described in Appendix A of this document. The definitions of the non-default spectral period measures are given in Appendix B.

In addition to the statistical parameters that are generated by the program STATIS, output in tems of integral wave parameters (of model results and observations) is also automatically stored in files. The format of the file is such that it can easily be used for the generation of scatter plots for all cases, all laboratory cases, all field cases or for each case separately. The following files are generated by STATIS:

1. SCATTER.ALL data of all cases
2. SCATTER.LAB data of all laboratory cases
3. SCATTER.FLD data of all field cases
4. SCATTER.CASE data of each case

In the present bench mark suite, scatter plots for a number of integral wave parameters are generated for all cases (i.e. laboratory and field cases), all laboratory cases and all field cases.

4.4 Running the statistical analysis

Carrying out the statistical analysis requires at maximum two actions from the user:

1. the input file for the statistical analysis '*statis.inp*' (subdirectory PERFSTAT) may be adjusted if required; the mode can be set in the first line (this must be either 'default' or 'non default') and the cases to be included in the analysis can be modified. Furthermore it is possible to adjust the weighing factor of each case in this file.
2. Next the statistical analysis can be activated with the batch file *runstatall.bat*. This batch file activates the following actions:
   - b) Spectral data derived from the SWAN computations are converted with the program INTPAR into integral wave parameters.
   - c) The data of overall and nested models is combined into one datafile (Westerschelde case only !).
   - d) The statistical analysis is carried out using the program STATIS.

If changes in the set-up of the statistical analysis are not required, modification of the file *statis.inp* is not necessary, so that after computing all bench mark tests the command *runstatall.bat* suffices to carry out the statistical analysis.

4.5 Adding cases

In the future it will take only little effort to add new cases for the statistical analysis. Only a few actions are required:

- the SWAN input files have to be extended with the standard output requests
- the observed (spectral) data have to be analysed to derive the integral wave parameters and the resulting **.dat* file has to be stored in the SWANSTAT\DATA directory;
- the batch file which controls the statistical analysis must be adjusted;
- the cases must be included in the input file *statis.inp* for STATIS.

If the new case consists of nested computations, modification of the auxiliary program F61WES will be necessary.

4.6 Example of application

4.6.1 Introduction

The statistical analysis is more clearly described with an example. In the following the use is shown based on the Haringvliet field case (f31harin). In Section 4.6.2 the results of this field case are statistically analysed in the default mode. Section 4.6.3 deals with the non-default mode of the STATIS program. Table 4.2 gives an overview of the input files required in the default and the non default mode.

input from	default input		non default input	
computed	*.tbl	Box 2	*.spl. *.par	Box 6
precomputed	*.tbl		*.spl, *.par	Box 7
data	*.dat	Box 3	*.dat	
perfstat	*.inp	Box 1	*.inp	

Table 4.2 Input files required for the statistical analysis and the box where an example is given

4.6.2 Default option

The input file *statis.inp* which is the main input file steering the statistical analysis is shown in Box 1.

```
default
f31har01 f31har01 f31har01 1.00
f31har02 f31har02 f31har02 1.00
f31har03 f31har03 f31har03 1.00
f31har04 f31har04 f31har04 1.00
```

Box 1 Example of input file *statis.inp* for statistical analysis. The first and second column represent the file name of the data of the precomp and computed version. The third colum is the name of the file with the data of the observations. Note that the names of the files do no have to be identical.

The first line indicates that the program STATIS will be run in the default mode. The next lines each contain the names of the three input files for each test that must be included in the analysis and the relative weight. The three names refer to the input files in respectively the precomputed, the computed and the data directory. The weight factor is used in the determination of the average statistical parameters.

In this (default) case the statistical analysis will be carried out with the integral wave parameter directly derived from the SWAN computation. Therefore the analysis needs the input files listed in *statis.inp* with the extension '*.tbl*' for the first two columns. One of these files is shown in Box 2.

Run:F31 Table:buoy

Hsig [m]	Tpeak [sec]	Tm01 [sec]	Tm02 [sec]	FSpr [ ]
3.189	8.14	6.67	6.29	0.5438
2.962	8.14	6.08	5.18	0.5610
2.417	8.14	5.74	5.06	0.3544
2.365	8.14	5.68	5.00	0.3361
0.577	2.85	2.02	1.68	0.3459
1.107	8.14	3.36	2.73	0.1539
1.236	8.14	3.89	3.12	0.2280
0.771	3.14	2.48	2.08	0.3873

Box 2 Example of SWAN output file with basic wave parameters used in the default statistical analysis

The name of the corresponding file with measured data consists of the text in the third column of the input file with the extension '*.dat*'. This file is shown below in Box 3.

Computed integral wave parameters for file :f31har01.obs

nr	Hs	Tp	Tm01	Tm02	Fspr	Tm-4-3	Tm-3-2	Tm-2-1	Tm-10	Tpeq	Tpb	Tpbeq	Tpm
1	3.193	8.333	6.700	6.350	0.503	15.724	8.997	7.774	7.242	8.333	7.983	7.983	7.983
2	2.609	7.692	6.310	5.794	0.474	15.713	9.051	7.684	7.018	7.692	7.826	7.826	7.826
3	2.436	8.333	6.170	5.368	0.494	17.666	9.210	7.767	7.048	7.963	7.984	7.658	7.984
4	2.721	8.333	6.244	5.524	0.506	16.925	9.202	7.833	7.116	8.136	8.042	7.853	8.042
5	0.885	4.545	3.254	2.626	0.241	22.573	10.961	6.892	4.708	6.257	5.102	6.416	6.416
6	1.499	7.692	5.427	4.800	0.322	21.159	10.970	8.084	6.628	7.231	7.552	7.170	7.552
7	1.499	7.692	5.427	4.800	0.322	21.159	10.970	8.084	6.628	7.231	7.552	7.170	7.552
8	0.756	3.226	2.928	2.595	0.446	25.650	8.628	4.668	3.516	4.710	3.190	4.690	4.690

Box 3 Example of file with wave parameters computed from observed 1-D spectra.

The program STATIS compares the values of the integral wave parameters of the SWAN computations with the values of the observations. This results in a number of integral wave parameters, which are saved in a file for each case. The name of this file consists of the text in the third column of *statis.inp* with the extension '*.sta*'. This file is shown below in Box 4.

```
Computed statistical parameters for case: f31har01
Total number of observation stations                  :  8
Number of stations at which observations are available  :  8
Number of stations at which precomputed data is available:  8
Number of stations at which computed data is available  :  8
```

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.137	-0.139	-0.118	-0.118	-0.931	-0.930	-0.951	-0.951	-0.059	-0.063
mae	0.245	0.244	0.502	0.502	0.931	0.930	0.951	0.951	0.121	0.117
rms	0.287	0.285	0.713	0.713	1.131	1.128	1.136	1.135	0.127	0.124
sci	0.162	0.161	0.105	0.105	0.221	0.221	0.252	0.252	0.317	0.309
mpi	0.822	0.823	0.708	0.708	0.454	0.455	0.490	0.491	0.096	0.119
opi	0.090	0.089	0.088	0.088	0.170	0.169	0.181	0.180	0.234	0.228

Box 4 Example of output of default statistical analysis for single test

In the file *perform.sdf* all results are collected and at the end of this file mean values of the computations carried out for the Haringvliet are presented. In case of more field or laboratory cases a mean for these is also computed and stored in the file *perform.sdf.* The tables with mean values (of each experiment and of all field cases) are presented in Box 5.

```
Mean of all f31har cases (total number:  4)
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
 SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
------------------------------------------------------------------------------------
 bias   0.130   0.128  -0.026  -0.026  -0.563  -0.563  -0.620  -0.621  -0.040  -0.042
 mae    0.246   0.244   0.755   0.755   0.628   0.631   0.637   0.640   0.110   0.109
 rms    0.315   0.311   1.090   1.090   0.786   0.788   0.813   0.815   0.123   0.122
 sci    0.172   0.169   0.143   0.143   0.154   0.154   0.181   0.181   0.331   0.329
 mpi    0.817   0.820  -0.702  -0.702   0.626   0.626   0.642   0.641   0.286   0.291
 opi    0.093   0.092   0.129   0.129   0.117   0.117   0.128   0.129   0.229   0.228

 Mean of all field cases         (total number: 38)
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
 SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
------------------------------------------------------------------------------------
 bias   0.047   0.066   0.301   0.309  -0.381  -0.366  -0.568  -0.556  -0.020  -0.016
 mae    0.204   0.223   1.036   0.998   0.520   0.505   0.658   0.645   0.097   0.091
 rms    0.235   0.257   1.245   1.192   0.599   0.590   0.718   0.710   0.114   0.107
 sci    0.199   0.216   0.209   0.199   0.153   0.151   0.201   0.199   0.309   0.293
 mpi    0.789   0.781   0.282   0.301  -0.208  -0.206   0.340   0.345  -0.030   0.026
 opi    0.080   0.087   0.150   0.141   0.107   0.109   0.143   0.141   0.334   0.306
```

Box 5 Example of output for default statistical analysis averaged over one case and all (selected) field cases

4.6.3 Non default option

If the program STATIS is run in non default mode only the first line of the input file *files.inp* differs from Box 1. Instead of default non default is written.

Non default indicates that the SWAN computation will be statistically analysed for a number of additional integral wave parameters derived from the spectral SWAN data. The file names of these spectral data are again based on the names listed in the input file but have the extension '*.sp1*'. An example is given in Box 6.

0.0521	0.2952E-01	0.2488E-01	0.2049E-01	0.1975E-01	0.1701E-03	0.2698E-02	0.4604E-02	0.1284E-03
0.0573	0.1710E-01	0.1437E-01	0.1174E-01	0.1131E-01	0.9778E-04	0.1548E-02	0.2638E-02	0.7485E-04
0.0630	0.1835E-01	0.1538E-01	0.1244E-01	0.1198E-01	0.1038E-03	0.1640E-02	0.2788E-02	0.8074E-04
0.0693	0.2624E-01	0.2192E-01	0.1753E-01	0.1686E-01	0.1464E-03	0.2309E-02	0.3913E-02	0.1164E-03
0.0763	0.5607E-01	0.4688E-01	0.3695E-01	0.3552E-01	0.3079E-03	0.4853E-02	0.8195E-02	0.2504E-03
0.0839	0.1287E+00	0.1109E+00	0.8585E-01	0.8250E-01	0.6945E-03	0.1099E-01	0.1852E-01	0.5796E-03
0.0923	0.4600E+00	0.4071E+00	0.3093E+00	0.2967E+00	0.2427E-02	0.3860E-01	0.6466E-01	0.2097E-02
0.1015	0.2229E+01	0.1872E+01	0.1373E+01	0.1310E+01	0.1019E-01	0.1636E+00	0.2734E+00	0.9446E-02
0.1117	0.8882E+01	0.7405E+01	0.4359E+01	0.4093E+01	0.2309E-01	0.3805E+00	0.6314E+00	0.2282E-01
0.1228	0.1466E+02	0.1203E+02	0.6285E+01	0.5867E+01	0.3430E-01	0.5531E+00	0.9312E+00	0.3757E-01
0.1351	0.7422E+01	0.6106E+01	0.3427E+01	0.3214E+01	0.1937E-01	0.3062E+00	0.4940E+00	0.2168E-01
0.1486	0.4876E+01	0.3882E+01	0.2196E+01	0.2075E+01	0.1307E-01	0.2032E+00	0.3235E+00	0.1534E-01
0.1635	0.2739E+01	0.2008E+01	0.1120E+01	0.1068E+01	0.7762E-02	0.1208E+00	0.1898E+00	0.1007E-01
0.1799	0.1986E+01	0.1592E+01	0.8516E+00	0.8164E+00	0.6100E-02	0.9360E-01	0.1468E+00	0.9386E-02
0.1978	0.1866E+01	0.1290E+01	0.6805E+00	0.6552E+00	0.6407E-02	0.9432E-01	0.1447E+00	0.1237E-01
0.2176	0.9063E+00	0.9173E+00	0.1146E+01	0.1144E+01	0.1371E-01	0.2063E+00	0.3186E+00	0.3624E-01
0.2394	0.5112E+00	0.7360E+00	0.1829E+01	0.1814E+01	0.2302E-01	0.3528E+00	0.5486E+00	0.9605E-01
0.2633	0.4637E+00	0.4933E+00	0.7142E+00	0.7208E+00	0.1558E-01	0.2132E+00	0.2828E+00	0.1323E+00
0.2897	0.2762E+00	0.3405E+00	0.3387E+00	0.3431E+00	0.1338E-01	0.1415E+00	0.1896E+00	0.1557E+00
0.3186	0.1922E+00	0.2179E+00	0.1386E+00	0.1382E+00	0.2712E-01	0.1885E+00	0.1686E+00	0.1692E+00
0.3505	0.1019E+00	0.1757E+00	0.8220E-01	0.8090E-01	0.7780E-01	0.1587E+00	0.8655E-01	0.1356E+00
0.3855	0.7206E-01	0.1240E+00	0.4828E-01	0.4696E-01	0.4915E-01	0.8710E-01	0.8323E-01	0.9046E-01
0.4241	0.3254E-01	0.8170E-01	0.3276E-01	0.3097E-01	0.5320E-01	0.1129E+00	0.9946E-01	0.5919E-01
0.4665	0.2457E-01	0.5718E-01	0.2239E-01	0.2101E-01	0.5827E-01	0.9871E-01	0.4438E-01	0.4373E-01
0.5132	0.4693E-02	0.3803E-01	0.1514E-01	0.1429E-01	0.4158E-01	0.3642E-01	0.3472E-01	0.3363E-01
0.5645	0.7557E-03	0.2790E-01	0.1047E-01	0.1004E-01	0.2681E-01	0.2331E-01	0.2117E-01	0.2686E-01
0.6209	0.8410E-03	0.1816E-01	0.7413E-02	0.7225E-02	0.1542E-01	0.1562E-01	0.1502E-01	0.1863E-01
0.6830	0.5700E-03	0.1192E-01	0.5345E-02	0.5322E-02	0.1153E-01	0.1188E-01	0.1093E-01	0.1261E-01
0.7513	0.2671E-03	0.8082E-02	0.3831E-02	0.3885E-02	0.8420E-02	0.8203E-02	0.7540E-02	0.8585E-02
0.8264	0.1403E-03	0.5314E-02	0.2677E-02	0.2731E-02	0.6459E-02	0.5684E-02	0.5028E-02	0.5774E-02
0.9091	0.1227E-03	0.3597E-02	0.1825E-02	0.1863E-02	0.4264E-02	0.3644E-02	0.3250E-02	0.3961E-02
1.0000	0.7515E-04	0.2304E-02	0.1222E-02	0.1248E-02	0.2827E-02	0.2362E-02	0.2189E-02	0.2565E-02

Box 6 Example of file F31HAR01.SP1 with spectral data from SWAN computation

The spectral data are converted into integral wave parameters with the program INTPAR and the result is stored in the a file with the same name but the extension '*.par*' (see Box 7).

```
Computed integral wave parameters for file :f31har01.spl
 nr    Hs     Tp     Tm01   Tm02   Fspr   Tm-4-3 Tm-3-2 Tm-2-1 Tm-10  Tpeq   Tpb    Tpbeq  Tpm
  1  3.188  8.143  6.669  6.293  0.544  8.175  7.909  7.599  7.203  8.143  8.046  8.046  8.046
  2  2.961  8.143  6.081  5.178  0.562  8.182  7.890  7.520  6.978  8.143  8.068  8.068  8.068
  3  2.416  8.143  5.735  5.059  0.355  8.164  7.754  7.243  6.585  7.560  8.074  7.512  8.074
  4  2.365  8.143  5.682  5.004  0.337  8.156  7.733  7.209  6.538  7.533  8.070  7.482  8.070
  5  0.577  2.853  2.020  1.676  0.306  6.892  5.251  3.677  2.652  4.446  2.373  4.333  4.333
  6  1.107  8.143  3.357  2.727  0.152  7.817  6.960  5.828  4.548  6.311  8.069  6.215  8.069
  7  1.235  8.143  3.895  3.119  0.235  7.979  7.265  6.325  5.166  6.772  8.106  6.743  8.106
  8  0.771  3.139  2.483  2.085  0.404  5.594  4.453  3.620  3.024  4.154  3.230  4.149  4.149
```

Box 7 Example of output file of the program INTPAR with wave parameters computed from the spectra

The input of observed data is obviously the same as in the default option and with the described input the program STATIS can be run. The model performance is expressed with a few more statistical parameters than in the default mode. An example is given in Box 8. This figure shows the file in which results are stored per case. In the file *perform.ndf* all results are presented including the means as described in the default mode.

```
Computed statistical parameters for case: f31har01
Total number of observation stations              :  8
Number of stations at which observations are available   :  8
Number of stations at which precomputed data is available:  8
Number of stations at which computed data is available   :  8
           Hs              Tp              Tm01            Tm02            fspr            Tm-4-3
           [m]             [s]             [s]             [s]             [-]             [s]
 SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
---------------------------------------------------------------------------------------------------
 bias  -0.137  -0.139  -0.115  -0.115  -0.931  -0.930  -0.951  -0.951  -0.061  -0.065 -12.614 -12.580
 mae    0.245   0.244   0.502   0.502   0.931   0.930   0.951   0.951   0.112   0.109  12.614  12.580
 rms    0.287   0.285   0.712   0.712   1.131   1.128   1.135   1.136   0.121   0.118  13.266  13.222
 sci    0.162   0.161   0.105   0.105   0.221   0.221   0.252   0.252   0.301   0.295   0.659   0.657
 mpi    0.822   0.823   0.708   0.708   0.454   0.455   0.490   0.490   0.143   0.158  -1.424  -1.416
 opi    0.090   0.089   0.087   0.087   0.169   0.169   0.180   0.180   0.222   0.218   1.623   1.617
 std    0.272   0.269   0.759   0.759   0.693   0.691   0.671   0.670   0.112   0.107   4.440   4.396
 d1     0.840   0.841   0.865   0.865   0.657   0.656   0.625   0.624   0.441   0.464   0.186   0.186
 d2     0.968   0.969   0.971   0.971   0.862   0.862   0.840   0.839   0.689   0.709   0.281   0.282
 corr   0.961   0.961   0.966   0.966   0.912   0.911   0.896   0.895   0.557   0.601  -0.874  -0.874
 rega  -0.316  -0.307  -1.405  -1.405  -1.275  -1.237  -0.996  -0.966   0.062   0.036  12.593  12.390
 regb   1.101   1.095   1.190   1.190   1.067   1.060   1.010   1.003   0.694   0.749  -0.253  -0.241

      Tm-3-2          Tm-2-1          Tm-10           Tpeq            Tpb             Tpbeq           Tpm
       [s]             [s]             [s]             [s]             [s]             [s]             [s]
  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-----------------------------------------------------------------------------------------------------------------
  -3.133  -3.098  -1.392  -1.370  -1.033  -1.024  -0.637  -0.614  -0.178  -0.180  -0.638  -0.612  -0.194  -0.170
   3.133   3.098   1.392   1.370   1.033   1.024   0.766   0.743   0.602   0.600   0.708   0.681   0.608   0.579
   3.552   3.494   1.745   1.703   1.295   1.281   0.918   0.876   1.076   1.075   0.973   0.921   0.923   0.868
   0.360   0.355   0.239   0.234   0.212   0.210   0.131   0.125   0.159   0.159   0.140   0.132   0.129   0.121
  -1.728  -1.683  -0.416  -0.382   0.255   0.263   0.463   0.487   0.494   0.495   0.330   0.366   0.340   0.380
   0.449   0.442   0.230   0.224   0.180   0.178   0.113   0.108   0.134   0.134   0.121   0.115   0.115   0.108
   1.809   1.746   1.136   1.093   0.843   0.830   0.714   0.675   1.147   1.145   0.794   0.744   0.974   0.919
   0.233   0.235   0.400   0.404   0.616   0.617   0.641   0.648   0.831   0.832   0.657   0.666   0.750   0.759
   0.333   0.339   0.679   0.687   0.832   0.834   0.878   0.886   0.929   0.929   0.856   0.867   0.894   0.904
  -0.046  -0.027   0.745   0.751   0.884   0.884   0.910   0.914   0.917   0.917   0.889   0.897   0.902   0.909
   7.331   7.107  -1.653  -1.501  -1.704  -1.617  -2.164  -1.985  -1.990  -1.984  -2.528  -2.348  -3.232  -3.040
  -0.062  -0.035   1.036   1.018   1.110   1.097   1.217   1.195   1.268   1.267   1.271   1.249   1.425   1.401
```

Box 8 Example of output of non-default statistical analysis (note that the lower text block is in reality printed on the same lines as the first block)

If the non default mode is chosen than also the file *perform.rws* is generated. This file contains part of the data of the file *perform.ndf* only and has been added to the bench mark suite on request of RIKZ. An example of this file is presented in Box 9.

```
Computed statistical parameters for case: f31har01
 Total number of observation stations                 :  8
 Number of stations at which observations are available  :  8
 Number of stations at which precomputed data is available:  8
 Number of stations at which computed data is available  :  8
            Hs              Tpm             Tpb             Tpbeq           Tm02
            [m]             [s]             [s]             [s]             [s]
 SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------------
 bias  -0.137  -0.139  -0.194  -0.170  -0.178  -0.180  -0.638  -0.612  -0.951  -0.951
 std    0.272   0.269   0.974   0.919   1.147   1.145   0.794   0.744   0.671   0.670
 rms    0.287   0.285   0.923   0.868   1.076   1.075   0.973   0.921   1.135   1.136
 sci    0.162   0.161   0.129   0.121   0.159   0.159   0.140   0.132   0.252   0.252
```

Box 9 Example of output of non-default statistical analysis as listed in the file *perform.rws*.

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Appendix A Definition of statistical parameters

The statistical analysis which has been added to the bench mark tests determines the model performance of SWAN with a number of statistical parameters. In this appendix these parameters will be discussed briefly. The statistical parameters are subdivided into five types of error measures, these are prediction errors, average errors, relative errors, indices of agreement and the correlation and regression coefficients. For detailed information regarding these statistical parameters reference is made to for instance WL | Delft Hydraulics (1993).

Prediction error

The prediction error can be characterised with the first and second moment, similar to the moments of a time series. These moments are known as *BIAS* and *spread*, in formula:

$$BIAS = \frac{1}{N}\sum_{i=1}^{N}(y_i - x_i) = \overline{y} - \overline{x} \tag{A1}$$

$$STD^2 = \frac{1}{N-1}\sum_{i=1}^{N}(y_i - x_i - BIAS)^2 \tag{A2}$$

in which N is the number of the observed (and computed) values (not including the imposed values at the up-wave boundaries), x_i is the observed value at location i and y_i is the value computed by the SWAN model at location i.

$\overline{x}$ is the mean value of the observations given by:

$$\overline{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{A3}$$

$\overline{y}$ is the mean value of the predictions given by:

$$\overline{y} = \frac{1}{N}\sum_{i=1}^{N} y_i \tag{A4}$$

Average error

Two measures for the average error are considered important. These are the mean absolute error (*MAE*) and the root mean square error (*RMSE*).The mean absolute error is given by:

$$MAE = \frac{1}{N}\sum_{i=1}^{N}\left|y_i - x_i\right| \tag{A5}$$

and the root mean square error is defined as:

$$RMSE = \left\{\frac{1}{N}\sum_{i=1}^{N}\left(x_i - y_i\right)^2\right\}^{1/2} \tag{A6}$$

Relative error

For many applications absolute measures of errors are less relevant than relative measures. In the statistical post processing program three straightforward relative measures of errors are used i.e. the Scatter Index, the Model Performance Index and the Operational Performance Index.

The Scatter Index is defined as the root mean square error normalized with the mean of the observed wave parameters and is given by:

$$SCI = \frac{RMSE}{\left|\bar{x}\right|} \tag{A7}$$

The Model Performance Index indicates the degree to which the model reproduces the changes of the waves and is defined as in the equation below:

$$MPI = 1 - \frac{RMSE}{RMS_{changes}} \tag{A8}$$

The definition of the $RMS_{changes}$ is identical to that of $RMSE$ except that all computed y_i values are replaced by the observed incident value x_{inc}. This Model Performance Index is a suitable measure to determine the model performance in situations where wave conditions in the inner region of the model are significantly different from the (imposed) wave conditions at the up-wave boundary (e.g. the Haringvliet case, where the significant wave at station 5 is only 25% of that at the up-wave boundary). The advantage of the Model Performance Index over the Scatter Index is that it uses the observed changes in the waves to judge the quality of the computed changes. The Scatter Index uses the waves themselves for this judgement.
The Operational Performance Index (*OPI*) is defined as the $RMSE$ normalized with the value of the wave parameters at the up-wave boundary:

$$OPI = \frac{RMSE}{x_{inc}} \tag{A9}$$

This *OPI* seems to be a convenient measure to express the model performance for operational users (e.g., marine companies) who may prefer to express the error in terms of the input to the model.

Indices of agreement

Another set of relative error measures has been introduced by Wilmott (1981, 1984 and 1985). They are based on the ratio of the actual and potential prediction error. Wilmott argued that if the observations are error free, then so will be their mean $\bar{x}$ so that the maximum potential difference between an observation x_i and prediction y_i is given by $|y_i - \bar{x}| + |x_i - \bar{x}|$. Based on the potential difference linear and quadratic measures have been constructed indicating the amount of similarity between observations and model predictions. The linear measure is indicated with d_1 and is defined as 1 minus the ratio of actual prediction error and the linearly weighted potential prediction error:

$$d_1 = 1 - \frac{\sum_{i=1}^{N} |y_i - x_i|}{\sum_{i=1}^{N} \left[|y_i - \bar{x}| + |x_i - \bar{x}| \right]} \tag{A10}$$

d_1 is called the index of linear agreement. In a similar way the quadratic index of agreement d_2 is defined:

$$d_2 = 1 - \frac{\sum_{i=1}^{N} |y_i - x_i|^2}{\sum_{i=1}^{N} \left[|y_i - \bar{x}| + |x_i - \bar{x}| \right]^2} \tag{A11}$$

Correlation and regression coefficients

A commonly used parameter to quantify agreement between two variables is the coefficient of linear correlation. The coefficient of linear correlation is defined as the ratio of their covariance and the product of their individual standard deviations. If the correlation coefficient is 1, x and y will be perfectly correlated. The correlation coefficient is defined with:

$$corr = \frac{\sum_{i=1}^{N} (x_i - \bar{x})(y_i - \bar{y})}{\left\{ \sum_{i=1}^{N} (x_i - \bar{x})^2 \right\}^{1/2} \left\{ \sum_{i=1}^{N} (y_i - \bar{y})^2 \right\}^{1/2}} \tag{A12}$$

The analysis of a perfect model which predicts the observed values exactly produces a scatter diagram in which all data points lie on a line making an angle of 45° with the horizontal axis (assuming the same scale for measurements and model results). However, perfect models are an utopia and the model predictions will deviate from this line. As an first aproximation, the relation between measurements and model results is indicated with a linear regression line. This line gives a relation between x and y ($y = a + bx$). The coefficients for the intercept a and slope b are estimated . The computation of the regression coefficients is based on the minimization of the chi-square merit function:

$$\chi^2(a,b) = \sum_{i=1}^{N} (y_i - a - bx_i)^2 \tag{A13}$$

The regression coefficients a and b are computed as:

$$a = \frac{\sum {x_i}^2 \sum y_i - \sum x_i \sum x_i y_i}{N \sum {x_i}^2 - \left(\sum x_i\right)^2} \tag{A14}$$

$$b = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})} \tag{A15}$$

Appendix B Definition of non-default spectral period measures

For application in the non-default mode of the testbank a number of additional spectral parameters are computed, such as extra mean period measures, peak period measures and equivalent period measures. To increase the robustness of the computation of some of these parameters for measured spectra a smoothing technique is used. This appendix contains the definitions of these parameters and the smoothing algorithm that is applied. Background information about these parameters and the smoothing algorithm are given in Alkyon (1999).

Mean period measures

In default mode of the testbank the mean period measures T_{m01} and T_{m02} are computed. These measures are based on the frequency moments m_i of a wave spectrum:

$$m_i = \int f^i E(f)\, df \tag{B1}$$

In the non-default mode of the testbank also the following mean period measures are used:

$$T_{m-4,-3} = \frac{m_{-4}}{m_{-3}} \tag{B2}$$

$$T_{m-3,-2} = \frac{m_{-3}}{m_{-2}} \tag{B3}$$

$$T_{m-2,-1} = \frac{m_{-2}}{m_{-1}} \tag{B4}$$

$$T_{m-1,0} = \frac{m_{-1}}{m_0} \tag{B5}$$

The block peak period T_{pb}

The block peak period T_{pb} is defined as the mean period T_{m-10} in an interval around the peak period T_p. The limits of the frequency interval are determined as the frequencies where on the lower and higher frequency (f_1 and f_2) flank around the spectral peak where the energy density has a downward crossing with the level of 40% of the energy density level at the spectral peak. The equation for the computation of the block peak period is:

$$T_{pb} = \frac{\int_{f_1}^{f_2} \frac{1}{f} E(f)\,df}{\int_{f_1}^{f_2} E(f)\,df} \tag{B6}$$

It is noted that the block peak period T_{pb} is a similar measure as the dominant peak period T_{pd} as described in IAHR (1989).

Equivalent period measures for double peaked spectra

In the case of a double peaked spectrum the peak periods T_{p1} and T_{p2} and the block peak periods T_{pb1} and T_{pb2} are computed for each sub-spectrum. Based on these peak period measures an equivalent peak period T_{peq} and an equivalent block peak period T_{pbeq} are computed by a weighting with the total amount of energy per sub spectrum and the fourth power of the (block) peak in each sub-spectrum:

$$T_{peq} = \sqrt[4]{T_{p1}^4 \frac{m_0^{(1)}}{m_0} + T_{p2}^4 \frac{m_0^{(2)}}{m_0}} \tag{B7}$$

and

$$T_{pbeq} = \sqrt[4]{T_{pb1}^4 \frac{m_0^{(1)}}{m_0} + T_{pb2}^4 \frac{m_0^{(2)}}{m_0}} \tag{B8}$$

in which m_0 is the total variance of the double peaked spectrum, and $m_0^{(1)}$ and $m_0^{(2)}$ are total wave variance in each sub-spectrum.

Peak period T_{pm}

For double peaked spectra, both the block peak period T_{pb} (based on the highest peak) and the equivalent block peak period T_{pbeq} are computed. Based on these two estimates the characteristic peak period T_{pm} is computed as:

$$T_{pm} = \max\left(T_{pb}, T_{pbeq}\right) \tag{B9}$$

Smoothing of measured spectra

Measured spectra often show a 'grassy' behaviour with multiple local maxima. The grassiness of such a spectra is reduced by applying an energy conserving smoothing mechanism. This smoothing enhances the reliability of the energy density in each bin but reduces the frequency resolution. The smoothing procedure works as follows. Consider three subsequent bins of a discrete spectrum $E(f_1)$, $E(f_2)$ and $E(f_3)$, with bandwidths Δf_1, Δf_2

and Δf_3 . First, the mismatch ΔE of total wave variance between the central bin and the surrounding bins is computed as:

$$\Delta E = -\tfrac{1}{4} E(f_1)\Delta f_1 + \tfrac{1}{2} E(f_2)\Delta f_2 - \tfrac{1}{4} E(f_3)\Delta f_3 \tag{B10}$$

Thereafter, the mismatch in wave variance is distributed over the 3 bins in the form of a change of wave variance per bin:

$$\begin{aligned} \Delta E_1 &= \Delta E_1 + \tfrac{1}{8}\Delta E \\ \Delta E_2 &= \Delta E_2 - \tfrac{6}{8}\Delta E \\ \Delta E_3 &= \Delta E_3 + \tfrac{1}{8}\Delta E \end{aligned} \tag{B11}$$

In the last step all changes to the total wave variance are converted to changes in energy density by dividing by the bandwidth of each frequency bin.

The smoothing technique is only applied to measured spectra for a robust estimation of the energy density at the spectral peak in order to determine the integration interval (f_1, f_2) of the block peak period T_{pb}. The computation of the block period itself, is performed on the unsmoothed spectrum. The smoothing technique is also applied for the determination of the splitting frequency of double peaked spectra in order to eliminate false peaks.

02

Description of the Suite of Bench Mark Tests

Description of the

Suite of bench mark tests for the shallow water wave model

SWAN Cycle 2 (version 40.01 and updates)

WL | DELFT HYDRAULICS

Version	: 2.01
Last revision	: 18 April 2000
Date of printing	: 26 April 2000

By:

WL | DELFT HYDRAULICS
Marine and Coastal Infrastructure
P.O. Box 177
2600 MH Delft
The Netherlands

Project title	Suite of bench mark tests for the shallow water wave model SWAN Cycle 2 (version 40.01 and updates)
Project description	Test the performance of the SWAN model in a number of selected academic situations, laboratory and (complex) field cases and compare the model results with analytical solutions and/or observations.
Customer	Dutch Ministry of Public Works and Coastal Management (RIKZ) P.O. Box 20907 2500 EX 's-Gravenhage The Netherlands
Represented by	J.G. de Ronde J.H. Andorka Gal A.T. Kamsteeg
Project leader	dr R.C. Ris (WL | DELFT HYDRAULICS)

It is not necessary to request formal approval for the use of this suite of benchmark tests, provided that in publications, WL | DELFT HYDRAULICS (the Netherlands) is acknowledged. If laboratory or field data are used independently, the original source should be acknowledged and reference should be made to the papers listed (per case).

The following academic, laboratory and field test cases are presently available in the bench mark tests for SWAN:

Academic cases:

Case	Purpose of test:
A11REFRA	Depth-induced refraction and shoaling
A12REFRA	Depth-induced refraction and shoaling but computational grid 10^0 rotated
A21SHOAL	Depth-induced shoaling (with a $\cos^2$-directional distribution)
A22SHOAL	Depth-induced shoaling (with a $\cos^{500}$-directional distribution)
A23SHOAL	Depth-induced shoaling (with a $\cos^{500}$-directional distribution with SWAN-1D)
A31CURFO	Current-induced shoaling (following current)
A32CUROP	Current-induced shoaling (opposing current)
A33CURSL	Current-induced refraction and shoaling (slanting current, incident wave direction 120°)
A34CURSL	Current-induced refraction and shoaling (slanting current, incident wave direction 60°)
A35CURBL	Current-induced blocking (wave blocking using implicit scheme in frequency space)
A41WAVFR	Bottom friction formulations (three different formulations)
A51CURVI	Depth-induced shoaling on three different curvi-linear grids
A52CURVI	Depth-induced refraction and shoaling on three different curvi-linear grids
A53CURVI	2D-wave-induced setup module on three different curvi-linear grids
A61OBSTA	Wave propagation through obstacles

Laboratory cases:

Case	Purpose of test:
L11WAVBR	Depth-induced breaking, mildly and violent cases (experiment of Battjes and Janssen, 1978)
L21TRIAD	Triad wave-wave interactions (experiment of Beji and Battjes 1993)
L31SETUP	Wave-induced setup (experiment of Boers, 1996)
L41CURBL	Current-induced wave blocking (experiment of Lai et al., 1989)
L51HISWA	Wave propagation and transformation over a submerged bar (the HISWA-basin; Dingemans et al., 1989)
L61BARRI	Barrier Island: wave propagation and transformation using regular and two different curvi-linear grids (Komen et al. 1994: Holthuijsen et al., 1993)

Field cases:

Case	Purpose of test:
F11GRSHW	Depth-limited wave growth, U_{10} = 10 m/s (SWAN results are compared with data of Young and Verhagen, 1996; Holthuijsen, 1980 and Bretschneider, 1973)
F12GRSHW	As case **F11GRSHW** but with U_{10} = 20 m/s
F13GRSHW	As case **F11GRSHW** but with U_{10} = 30 m/s
F21GRDPW	Fetch-limited deep water wave growth using *third-generation* formulations and U_{10} = 10 m/s (results are compared with data of Wilson, 1965; Pierson-Moskowitz, 1964 and Kahma and Calkoen, 1992)
F22GRDPW	As case **F21GRDPW** but with U_{10} = 20 m/s
F23GRDPW	As case **F21GRDPW** but with U_{10} = 30 m/s
F24GRDPW	Fetch-limited deep water wave growth using *second-generation* formulations and U_{10} = 10 m/s (SWAN results are compared with data of Wilson, 1965; Pierson-Moskowitz, 1964 and Kahma and Calkoen, 1992)
F25GRDPW	As case **F24GRDPW** but with U_{10} = 20 m/s
F26GRDPW	As case **F24GRDPW** but with U_{10} = 30 m/s

`F27GRDPW`	Model convergence in case of fetch-limited wave growth in deep water
`F31HARIN`	Wave propagation and transformation in the Haringvliet estuary, the Netherlands (Andorka Gal, 1995)
`F41LAKGR`	Wave growth in shallow lake of Lake George, Australia (Young and Verhagen, 1996a, 1996b and 1996c)
`F51FRIES`	Wave propagation and transformation in the tidal inlet of the Friesche Zeegat, the Netherlands (Dunsbergen, 1995a and 1995b)
`F61WESTR`	Wave propagation and transformation in the Westerschelde estuary, the Netherlands (Andorka Gal and Roelse, 1997)
`F62WESTR`	Wave propagation and transformation on curvi-linear grids in the Westerschelde estuary, the Netherlands (Andorka Gal and Roelse, 1997)
`F71MEDSE`	Non-stationary wave computations in the Mediterranean Sea ('Gorbush storm'; Komen et al., 1994; Holthuijsen et al. 1996)
`F81NORDE`	Wave propagation and transformation in the Norderneyer Seegat, Germany (Niemeyer and Kaiser, 1997)
`F91PETTE`	Wave propagation and transformation at the shallow foreshore next to the Petten Sea Defence, Petten, The Netherlands (Andorka Gal et al., 1998)

A11 and A12: Refraction

Purpose

The goal of these tests is to validate depth-induced refraction (i.e. wave propagation in directional space).

Situation

In order to test refraction, an infinitely long plane beach is considered, where depth contours are parallel to the x-axis and to the water line. Monochromatic, long-crested waves are propagating from a water depth of 20 m towards the shore (see Figure 1). The travel distance of the waves perpendicular to the depth contours from the upwave boundary to the water line is 4000 m (slope equal 1:200). Currents and wind are absent.

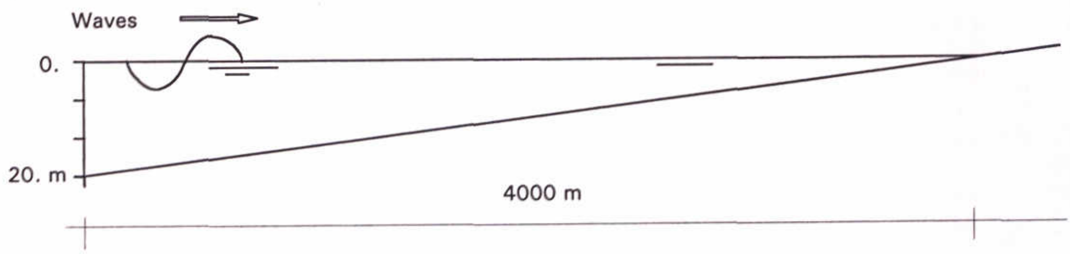

Figure 1 Refraction on a infinitely long plane beach.

Test case description

In test case A11, the 2D-mode of SWAN is activated. The computational grid is oriented in the direction of the beach, so that no action is shifted from one directional quadrant to another due to refraction (see Holthuijsen, 1993). From a uniform up-wave boundary waves propagate at an angle of 120° to the depth contours at the boundary towards the beach. The wave field is characterised by a Gaussian-shaped spectrum and the directional distribution is equal to $\cos^{500}$. To verify whether the exchange between the quadrants due to refraction is properly implemented, computations have been carried out with the computational grid rotated clockwise 10° (test case A12). Output is generated along an output curve (from x = 10 km, y = 0 km, to x = 10 km, y = 4 km).

Analytical solution

The significant wave height along an output curve, perpendicular to the depth contours, can be calculated by (see Mei, 1983):

$$\frac{H^2}{H_i^2} = \frac{c_{g,i}}{c_g} \frac{\cos(\theta_i)}{\cos(\theta)}$$

where the wave direction θ can be calculated with Snell's law:

$$\frac{\sin\theta_i}{c_i} = \frac{\sin\theta}{c}$$

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
A11	2D	0	0	0	20000	4000
A12	2D	0	-1763.2698	10°	20400	4000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	800	40	80°	130°	0.5°	0.05	0.25	40
	816	40	80°	130°	0.5°	0.05	0.25	40

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	off	off	off	off	off	off	on	off	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
A11	side	S	con	par	Gauss 0.01	peak	power	1	10	120°	500
A12	side	S	con	par	Gauss 0.01	peak	power	1	10	120°	500

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
A11	'a11refr.bot'	-	-	-
A12	'a12refr.bot'	-	-	-

Model results

The model results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction (DIR) and the analytical solution of test A11 are shown in Figure A11. For test A12, the same information is given in Figure A12.

References

Holthuijsen, L.H., N. Booij and R.C. Ris, 1993: A spectral wave model for the coastal zone, *Proc. of 2nd Int. Symposium on Ocean Wave Measurement and Analysis,* New Orleans, 630-641

Mei, C.C., 1983: *The applied dynamics of ocean surface waves,* Wiley, New York, 740 p.

Acknowledgements

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A21, A22 and A23: Shoaling

Purpose
The goal of these cases is to test the numerical representation of depth-induced shoaling (i.e. wave propagation in geographical space) in SWAN.

Situation
In order to test shoaling, an infinitely long plane beach is considered, where depth contours are oriented in x-direction, parallel to the water line. Short- (and long-) crested waves are propagating from a water depth of 20 m towards the shore (see Figure 1). The travel distance of the waves perpendicular to the depth contours from the upwave boundary to the water line is 4000 m (slope equal 1:200). Currents and wind are absent.

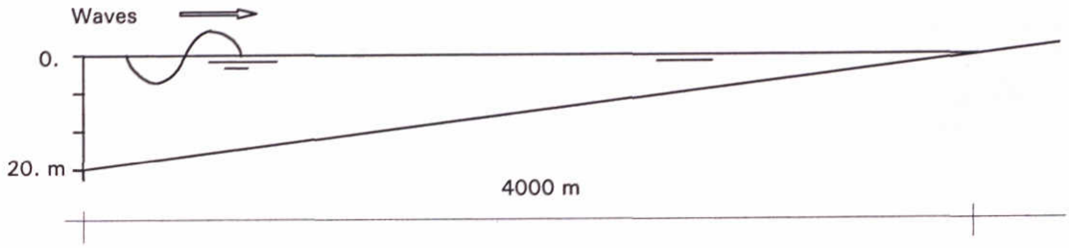

Figure 1 Shoaling on a infinitely long plane beach.

Test case description
In test case A21, the 2D-mode of SWAN is activated. The computational grid is oriented in the direction of the beach. From a uniform up-wave boundary, waves are propagating at an angle of 90° to the upwave boundary depth contours towards the beach. In test case A21, the input is a Jonswap-type spectrum and the width of the energy spectrum is equal to about 30° (which corresponds to a $\cos^2$-distribution). In case A22, the wave field is characterised by a Gaussian-shaped spectrum with a directional distribution of $\cos^{500}$. Output is generated along an output curve (from x = 8000 m, y = 0 m to x = 8000 m, y = 4000 m). Test case A23 is identical to test case A22, but here the computation is performed using the 1D-mode of SWAN. (Note that the grid and the incident wave direction are rotated over 90° with respect to cases A21 and A22.)

Analytical solution
The wave height for a monochromatic wave, perpendicular to the depth contours, can be calculated by (see Mei, 1983):

$$\frac{H^2}{H_i^2} = \frac{c_{g,i}}{c_g}$$

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
A21	2D	0	0	0	16000	4000
A22	2D	0	0	0	16000	4000
A23	1D	0	0	0	4000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
A21	800	40	0°	360°	10°	0.05	0.25	40
A22	800	40	80°	100°	0.25°	0.05	0.25	40
A23	40	0	-10°	10°	0.2°	0.05	0.25	40

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	off	off	off	off	off	off	on	off	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
A21	side	S	con	par	Jonswap	peak	power	1	10	90°	2
A22	side	S	con	par	Gauss 0.01	peak	power	1	10	90°	500
A23	side	W	con	par	Gauss 0.01	peak	power	1	10	0°	500

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
A21	'a21shoa.bot'	-	-	-
A22	'a22shoa.bot'	-	-	-
A23	'a23shoa.bot'	-	-	-

Model results

The model results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction (DIR) and the analytical solution of test A21 are shown in Figure A21. For test A22, the same information is given in Figure A22, and for test A23 in Figure A23. The model results are compared with the analytical long-crested(!) solution according to linear wave theory.

References

Holthuijsen, L.H., N. Booij and R.C. Ris, 1993: A spectral wave model for the coastal zone, *Proc. of 2nd Int. Symposium on Ocean Wave Measurement and Analysis,* New Orleans, 630-641

Mei, C.C., 1983: *The applied dynamics of ocean surface waves,* Wiley, New York, 740 p.

Acknowledgements

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A31, A32, A33/A34: Following, Opposing and Slanting current

Purpose

The goal of these tests is to investigate wave propagation in the presence of currents (current-induced refraction and shoaling).

Situation

Monochromatic, long-crested waves in deep water of constant depth are considered with added currents. The travel distance of the waves along the y-axis is 4000 m (see Figure 1). The considered current conditions are a following current (waves propagating with the current, see Figure 1), an opposing current (waves propagating against the current, as Figure 1 but with reversed current direction) and a slanting current (waves propagating at an angle of a shear-current, see Figure 2). Maximum current velocity is 1 m/s. The following and opposing absolute current velocities increase in the down-wave direction (see Figures 1 and 2). Wind is absent.

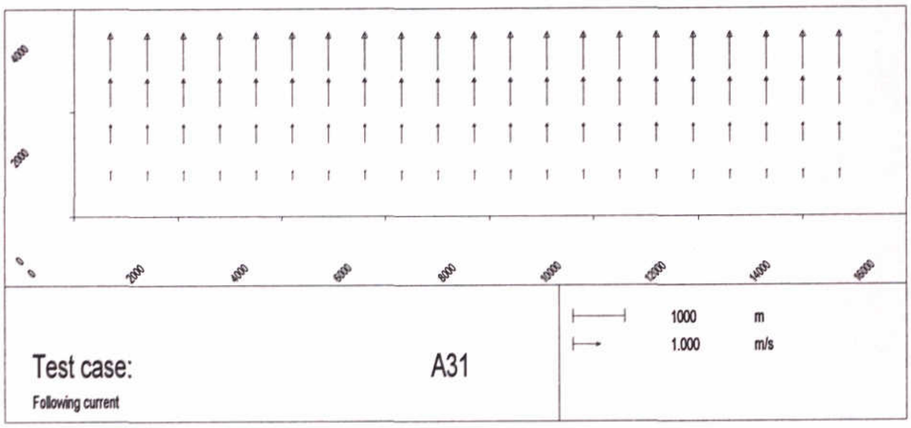

Figure 1 Following current condition.

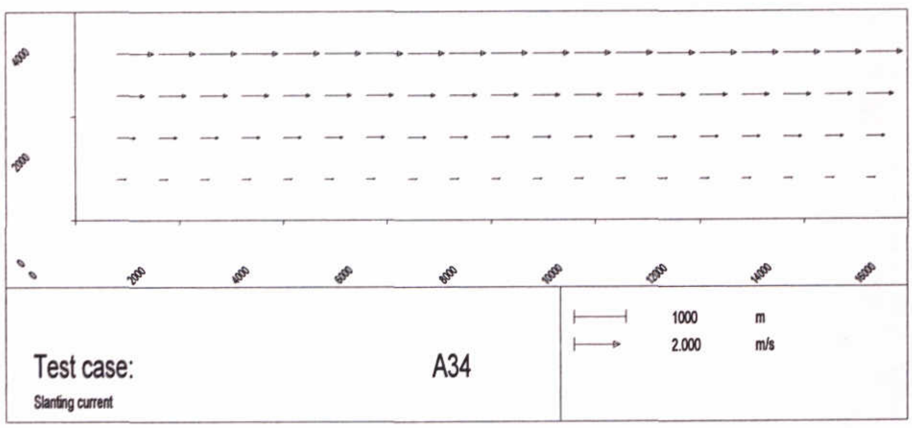

Figure 2 Slanting current condition.

Test case description

The computations for the four current conditions are carried out with the 2D-mode of SWAN. For the following and the opposing current conditions, at the upwave boundary the current and mean incident wave direction are both parallel with the y-axis. To test current-induced refraction, the current direction has been turned over 90° in test cases A33 and A34, so that it is parallel to the x-axis. The incident wave directions are $\theta_0 = 120°$ (test case A33) and $\theta_0 = 60°$ (test case A34). The incident waves are characterised by a Gaussian-shaped spectrum with a directional distribution equal $\cos^{500}$ (long-crested waves). Activated physical processes are: whitecapping, refraction and frequency shift due to currents. Output is generated along an output curve (from x = 8000 m, y = 0 m to x = 8000 m, y = 4000 m).

Analytical solution

For waves travelling parallel with the current direction, the analytical solution for the wave height is (see e.g. Phillips, 1977; Jonsson, 1993):

$$\frac{H^2}{H_0^2} = \frac{c_0^2}{c(c+2U)} \qquad \text{where} \qquad \frac{c}{c_0} = \frac{1}{2} + \frac{1}{2}\left(1 + 4\frac{U}{c_0}\right)^{\frac{1}{2}}$$

For obliquely incident waves on the slanting current, the analytical solutions for the wave direction and the wave height, using Snel's law: $\sin\theta / c$ = constant, are (see e.g., Hedges, 1987; Jonsson, 1993):

$$\begin{cases} \theta = \arccos\left(\dfrac{g k_0 \cos(\theta_0)}{[\omega - U k_0 \cos(\theta_0)]^2} \right) \\ H = H_0 \sqrt{\dfrac{\sin(2\theta_0)}{\sin(2\theta)}} \end{cases}$$

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	0	0	0	16000	4000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
A31	400	40	30°	150°	2°	0.05	0.25	40
A32	400	40	30°	150°	2°	0.05	0.25	40
A33	640	40	60°	140°	1°	0.05	0.25	40
A34	640	40	10°	70°	1°	0.05	0.25	40

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	off	off	off	off	off	on	on	on	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
A31	side	S	con	par	Gauss 0.01	peak	power	1	10	90°	500
A32	side	S	con	par	Gauss 0.01	peak	power	1	10	90°	500
A33	side	S	con	par	Gauss 0.01	peak	power	1	10	120°	500
A34	side	S	con	par	Gauss 0.01	peak	power	1	10	60°	500

	BOTTOM:	WIND:	CURRENT:	WATER LEVEL:
A31	'a31curf.bot'	-	'a31curf.cur'	-
A32	'a32curo.bot'	-	'a32curo.cur'	-
A33	'a33curs.bot'	-	'a33curs.cur'	-
A34	'a34curs.bot'	-	'a34curs.cur'	-

Model results

The computational results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction (DIR) are shown in the Figures A31, A32, A33 and A34. The H_s decreases and increases, as expected, in downwave direction for the following and opposing current, respectively, as is evident from Figures A31 and A32. Due to current-induced refraction, the mean direction changes slightly in test cases A33 and A34. The model results are compared with long-crested(!) analytical solutions (see e.g. Jonsson, 1993; Phillips, 1977; and Hedges, 1987).

References

Phillips, O.M., 1977: The dynamics of the upper ocean, 2nd edition, Cambridge University Press, 336 p.

Jonsson, I.G., 1993: *The Sea,* Ocean Engineering Science, 9, Part A

Hedges, T.S., 1987: Combination of waves and currents: an introduction, *Proc. Instn. Civ. Engrs.*, Part 1, 82,567-585

Acknowledgements

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A35 Blocking current

Purpose

This test is available in order to investigate the robustness of the propagation scheme in frequency space and the model behaviour of SWAN in the situation of a blocking current.

Situation

The considered situation is nearly identical to case A32, but now the current velocity is larger (large enough to block the waves, i.e. where $c_g + u \approx 0$ m/s, see Lai et al., 1989). The maximum current velocity is 2 m/s. The incident waves are characterised by a Jonswap type spectrum and short-crested waves in deep water. The incident waves at the upwave boundary travel 4000 m along the y-axis (see Figure 1). Wind effects are absent.

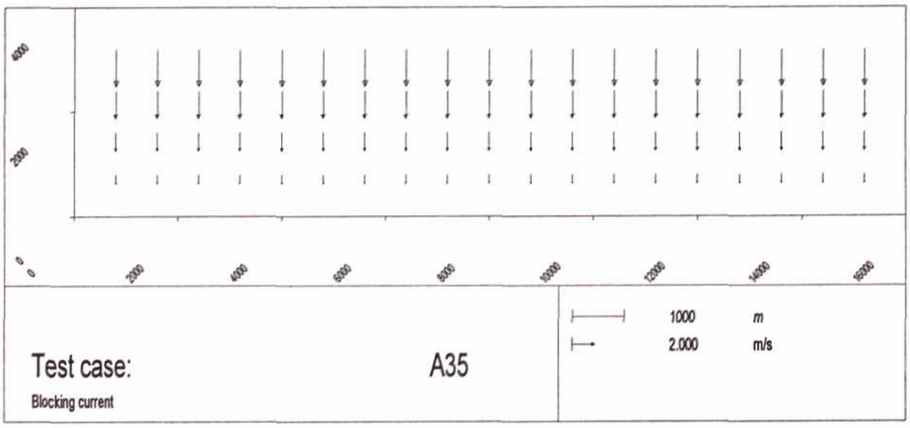

Figure 1 Blocking current condition (for test case A35 and A36).

Test case description

In test case A35, the 2D-mode of SWAN is used. The computational grid is oriented in the direction of the y-axis. The input spectrum is of the Jonswap type and the directional distribution is equal to $\cos^2$. Activated physical processes are whitecapping, refraction and wave propagation in frequency space. In case A35, an implicit scheme is used in frequency space. Output is generated along an output curve (from x = 8 km, y = 0 km, to x = 8 km, y = 4 km).

Analytical solution

An analytical solution is not available.

Model commands

COMPUTATIONAL GRID							
1D/2D	XPC	YPC	ALPC	XLENC	YLENC		
2D	0	0	0	16000	4000		
ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
400	40	0°	360°	10°	0.05	0.25	40

PHYSICS								
GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
3	off	off	off	off	on	on	on	off

BOUNDARY CONDITIONS										
TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
side	S	con	par	Jonswap	peak	power	1	10	90°	2

BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
'a35curb.bot'	-	'a35curb.cur'	-

Model results

The model results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction (DIR) of test A35 are shown in Figure A35.

References

Lai, R.J. et al., 1989: Laboratory studies of wave-current interaction: Kinematics of the strong interaction, *J.Geophys. Res.*, 94, No. C11, 16,201-16,214

Acknowledgements

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A41 Bottom friction

Purpose

The goal of this test is to validate the bottom friction formulations in SWAN.

Situation

In order to test the different bottom friction formulations in SWAN, short-crested waves are considered, propagating from a uniform up-wave boundary at a constant water depth of 3 m. The travel distance of the waves is 4000 m. Wind and currents are absent.

Test case description

In this test case, the 2D-mode of SWAN is activated. The input wave field is characterised by a Pierson-Moskowitz spectrum and a directional distribution of $\cos^2$. In three cases, three different formulations for dissipation by bottom friction effects are tested in SWAN:

case

1: the empirical Jonswap model (Hasselmann et al., 1973);
2: the formulation of Madsen (Madsen et al., 1988);
3: the formulation of Collins (Collins, J.I., 1972).

In addition to the computations, the process of whitecapping is activated. Output is generated along an output curve (from x = 10 km, y = 0 km, to x = 10 km, y = 4 km).

Analytical solution

An analytical solution for wave decay due to bottom friction is not available.

Model commands

	COMPUTATIONAL GRID							
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC		
	2D	0	0	0	20000	4000		
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	400	40	0°	360°	10°	0.05	0.25	40

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
01	3	off	Jonswap	off	off	on	on	off	off
02	3	off	Madsen	off	off	on	on	off	off
03	3	off	Collins	off	off	on	on	off	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
	side	S	con	par	PM	peak	power	1	10	90°	2

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
	'a41wavf.bot'	-	-	-

Model results

The model results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction (DIR) of case A41 cases a, b and c, are shown in Figure A41.

References

Hasselmann et al., 1973: Measurements of wind-wave growth and swell decay during the Joint North Sea Wave Project (JONSWAP), *Dtsch. Hydrogr. Z. Suppl.*, 12, A8

Madsen, O.S. et al., 1988: Spectral wave attenuation by bottom friction: Theory, *Proc. 21st Int. Conf. Coastal Engineering*, ASCE, 492-504

Collins, J.I., 1972: Prediction of shallow water spectra, *J. Geophys. Res.*, 77, No. 15, 2693-2707

Acknowledgements

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A51 Curvilinear grid

Purpose

The goal of this case is to test depth-induced shoaling (wave propagation in geographical space) on curvilinear grids.

Situation

A depth-induced shoaling test case is considered here. Waves propagate at an angle of 90° with the positive x-axis from a uniform up-wave boundary (at a water depth of 9.5 m) towards an infinitely long plane beach (parallel depth contours in x-direction). The travel distance of the waves (perpendicular to the depth contours) to the water line is 2280 m. The bottom is uniformly ascending (slope equal 1:240). Wind and currents are absent.

Test case description

In test case A51 wave propagation is tested using three different curvilinear grids (see Figure 1):

grid 01: an orthogonal curvilinear grid;
grid 02: a horizontally jagged curvilinear grid;
grid 03: a vertically jagged curvilinear grid.

The curvilinear computational grids contain 80 meshes in x-direction, and 10 meshes in y-direction. The 2D-mode of SWAN is activated. The input wave field is of the Jonswap type and the direction distribution of the waves is equal to $\cos^4$. Of all physical processes, only refraction is activated in SWAN. Output is generated along an output curve (from x = 10 km, y = 0 km to x = 10 km, y = 2.4 km).

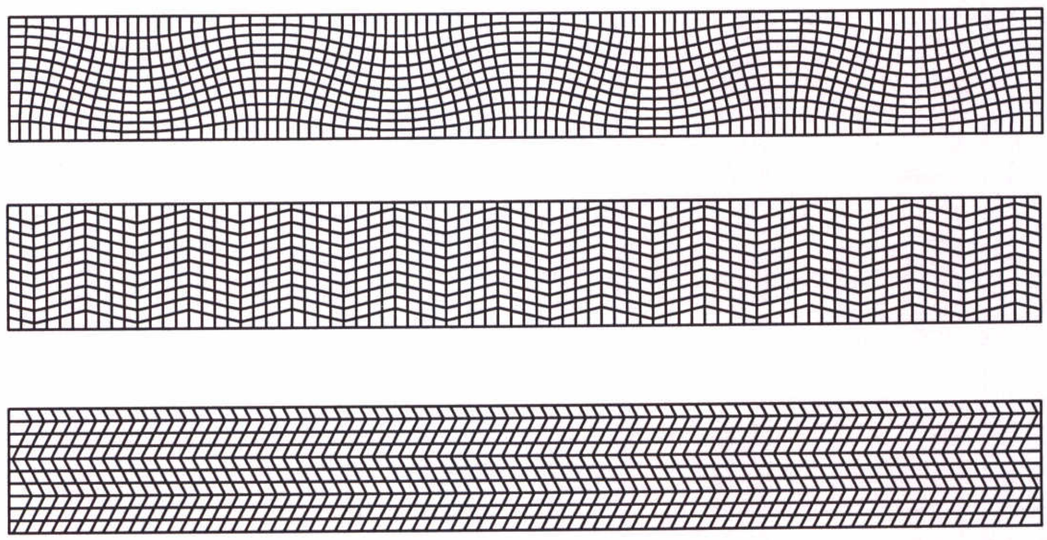

Figure 1 Curvilinear grids: an orthogonal curvilinear grid (top panel); horizontally jagged curvilinear grid (middle panel); vertically jagged curvilinear grid (bottom panel).

Analytical solution

The significant wave height along an output curve, perpendicular to the depth contours, can be calculated by (see Mei, 1983):

$$\frac{H^2}{H_i^2} = \frac{c_{g,i}}{c_g}$$

Model commands

	COMPUTATIONAL GRID			
	1D/2D	Read grid from file:	MXC	MYC
01	2D	'a51crv01.grd'	80	10
02	2D	'a51crv02.grd'	80	10
03	2D	'a51crv03.grd'	80	10

	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	0°	360°	10°	0.07	1.0	24

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	off	off	off	off	off	off	on	off	off

	BOUNDARY CONDITIONS									
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
	side	S	con	par	Jonswap	peak	power	1	7	90°	4

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
	'a51crvi.bot'	-	-	-

Model results

For grid (01), the model results in terms of significant wave height H_s, mean wave period T_{m01} and water depth *d* are shown in Figure A51a. In Figure A51b and A51c, the model results of grid (02) and (03) are shown, respectively. The SWAN results are compared with the solution according to linear wave theory.

References

Holthuijsen, L.H., N. Booij and R.C. Ris, 1993: A spectral wave model for the coastal zone, *Proc. of 2nd Int. Symposium on Ocean Wave Measurement and Analysis,* New Orleans, 630-641

Mei, C.C., 1983: *The applied dynamics of ocean surface waves,* Wiley, New York, 740 p.

Acknowledgements

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A52 Curvilinear grid

Purpose

The goal of this case is to test depth-induced shoaling and refraction on curvilinear grids.

Situation

Depth-induced shoaling and refraction on curvilinear grids are validated by considering waves propagating at an angle of 120° from a uniform up-wave boundary (at a water depth of 9.5 m) towards an infinitely long plane beach (parallel depth contours in x-direction). The travel distance of the waves (perpendicular to the depth contours) to the water line is 2280 m. The bottom is uniformly ascending (slope equal 1:240). Wind and currents are absent.

Test case description

In this test case, the 2D-mode of SWAN is activated. The input wave field is of the Jonswap type and a $\cos^4$-directional distribution of the waves is used. Of all physical processes, only refraction is activated in SWAN. In test A52, the same three different curvilinear computational grids are used as in test case A51 (see Figure 1). The curvilinear computational grids contain 80 meshes in x-direction, and 10 meshes in y-direction. Output is generated along an output curve (from x = 10 km, y = 0 km to x = 10 km, y = 2.4 km).

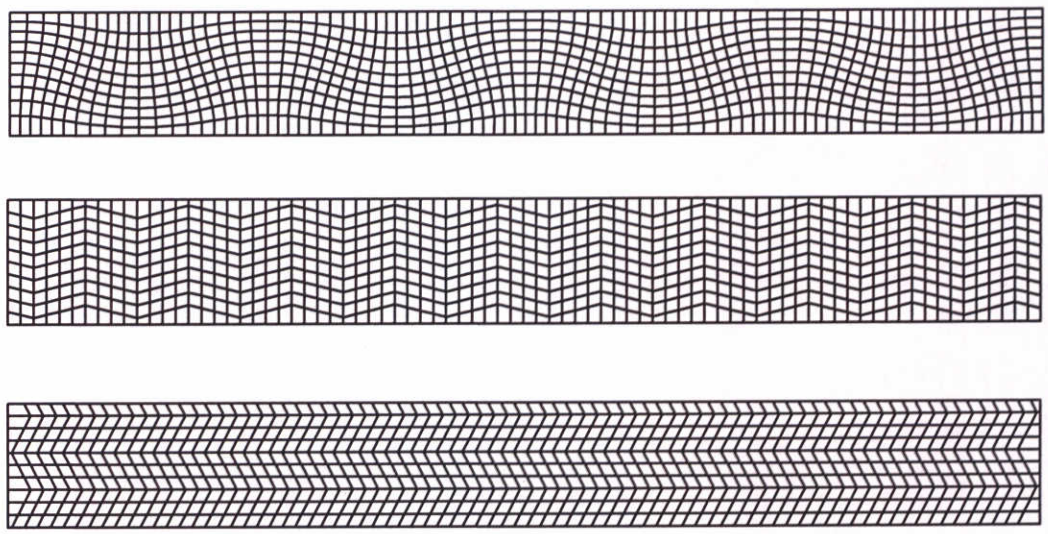

Figure 1 Curvilinear grids: an orthogonal curvilinear grid (top panel); horizontally jagged curvilinear grid (middle panel); vertically jagged curvilinear grid (bottom panel).

Analytical solution

The significant wave height along an output curve, perpendicular to the depth contours, can be calculated by (see Mei, 1983):

$$\frac{H^2}{H_i^2} = \frac{c_{g,i}}{c_g}\frac{\cos(\theta_i)}{\cos(\theta)}$$

where the wave direction θ can be calculated with Snel's law:

$$\frac{\sin\theta_i}{c_i} = \frac{\sin\theta}{c}$$

Model commands

	COMPUTATIONAL GRID			
	1D/2D	Read grid from file:	MXC	MYC
01	2D	'a52crv01.grd'	80	10
02	2D	'a52crv02.grd'	80	10
03	2D	'a52crv03.grd'	80	10

	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	0°	360°	10°	0.07	1.0	24

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	off	off	off	off	off	on	off	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
	side	S	con	par	Jonswap	peak	power	1	7	120°	4

	BOTTOM:	WIND:	CURRENT:	WATER LEVEL:
	'a52crvi.bot'	-	-	-

Model results

The model results in terms of significant wave height H_s, mean wave direction $(DIR)_I$ and water depth d are shown in Figures A52a, A52b and A52c, for curvilinear grids (01), (02) and (03), respectively. The SWAN results are compared with the solution according to linear wave theory.

References

Holthuijsen, L.H., N. Booij and R.C. Ris, 1993: A spectral wave model for the coastal zone, *Proc. of 2nd Int. Symposium on Ocean Wave Measurement and Analysis,* New Orleans, 630-641

Mei, C.C., 1983: *The applied dynamics of ocean surface waves,* Wiley, New York, 740 p.

Acknowledgements

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A53 Curvilinear grid

Purpose

The goal of this case is to test wave propagation on high-resolution curvilinear grids accounting for all relevant processes (e.g. depth-induced breaking and the computation of wave-induced set-up).

Situation

Waves propagate at an angle of 120° from a uniform up-wave boundary (at a water depth of 7.0 m) towards an infinitely long plane beach (parallel depth contours in x-direction). The travel distance of the waves (perpendicular to the depth contours) to the water line is 2100 m. The bottom is uniformly ascending (slope equal 1:300). Due to a gradient in the radiation stresses (mainly induced by depth-induced wave breaking), wave set-up is present. Wind and currents are absent.

Test case description

In this test case, the 2D-mode (including the 2D-setup mode) of SWAN is activated. Wave propagation is tested on three high-resolution curvilinear grids. These grids are identical to those described in test cases A51 and A52 (see Figure 1), but in test A53 the resolutions of the grids have significantly been increased compared to the former two test cases, in order to accurately compute the wave-induced set-up near the coast. The curvilinear computational grids contain 80 meshes in x-direction and 80 meshes in y-direction (whereas the number of grid points in y-direction is equal to 10 for the grids of cases A51 and A52). Activated are depth-induced breaking, whitecapping, refraction and wave-induced set-up. Output is generated along an output curve (from x = 10 km, y = 0 km, to x = 10 km, y = 2.4 km).

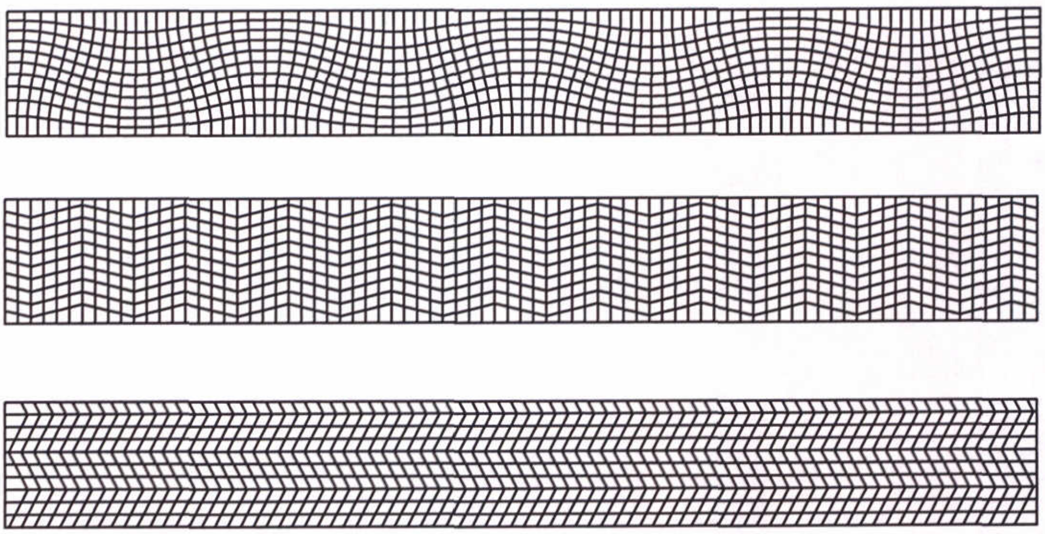

Figure 1 Curvilinear grids: an orthogonal curvilinear grid (top panel); horizontally jagged curvilinear grid (middle panel); vertically jagged curvilinear grid (bottom panel). It is noted that the resolution of the grids in the computations is significantly higher than it is as presented in this figure.

Analytical solution

No analytical solution is available, since source terms are activated.

Model commands

	COMPUTATIONAL GRID			
	1D/2D	Read grid from file:	MXC	MYC
01	2D	'a53crv01.grd'	80	80
02	2D	'a53crv02.grd'	80	80
03	2D	'a53crv03.grd'	80	80

	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	0°	360°	10°	0.07	1.0	28

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	off	off	off	on	on	off	on

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
	side	S	con	par	Jonswap	peak	power	1	7	120°	4

	BOTTOM:	WIND:	CURRENT:	WATER LEVEL:
	'a53crvi.bot'	-	-	-

Model results

For grid (01), the model results in terms of significant wave height H_s, wave-induced set-up η and water depth d are shown in Figure A53a. In Figure A53b, the model results of grid (02) are shown. Figure A53c shows the model results for grid (03).

References

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Acknowledgements

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A61 Obstacles

Purpose
The goal of this test is to validate wave propagation in SWAN in the presence of obstacles.

Situation
Waves propagate from a uniform up-wave boundary over a uniform bottom. The travel distance of the waves (along the x-axis in the positive direction) is 2000 m and the basin is 4000 m wide. An obstacle is situated in the basin. In test case 01, the crest of the obstacle is 0 m above the mean water level and its orientation is almost parallel to the y-axis (see Figure 1, left panel). In this case, the water level is uniformly descending from +2.0 m at the x-axis to -2.0 m at the other side of the basin. In test case 02 the obstacle is situated parallel to the y-axis (see Figure 1, middle panel). One half of the obstacle is completely blocking the waves and the other half of the obstacle has a constant transmission coefficient of 0.4. Wind is blowing in the same direction as the waves, with a velocity U_{10}= 20 m/s. In test case 03, the obstacle consists of two differently orientated sections, with a crest height of 0.5 m above the reference level (see Figure 1, right panel). In all three tests, currents are absent.

Test case description
The 2D-mode of SWAN is activated. The computational grid consists of 20 meshes in the x-, and 40 meshes in the y-direction, and their size is 100 m x 100 m. The incident wave field is characterized by a Jonswap spectrum with a directional distribution equal cos^4. In cases 01 and 02, all physical processes have been de-activated. In case 02, depth-induced wave breaking, quadruplets, whitecapping, refraction and wind have been activated. In test cases 01 and 02 output is generated along a curve crossing the obstacle. In test case 02, output is also generated on a curve behind and parallel to the obstacle. In test case 03 the output domain is a frame containing the area of the obstacle.

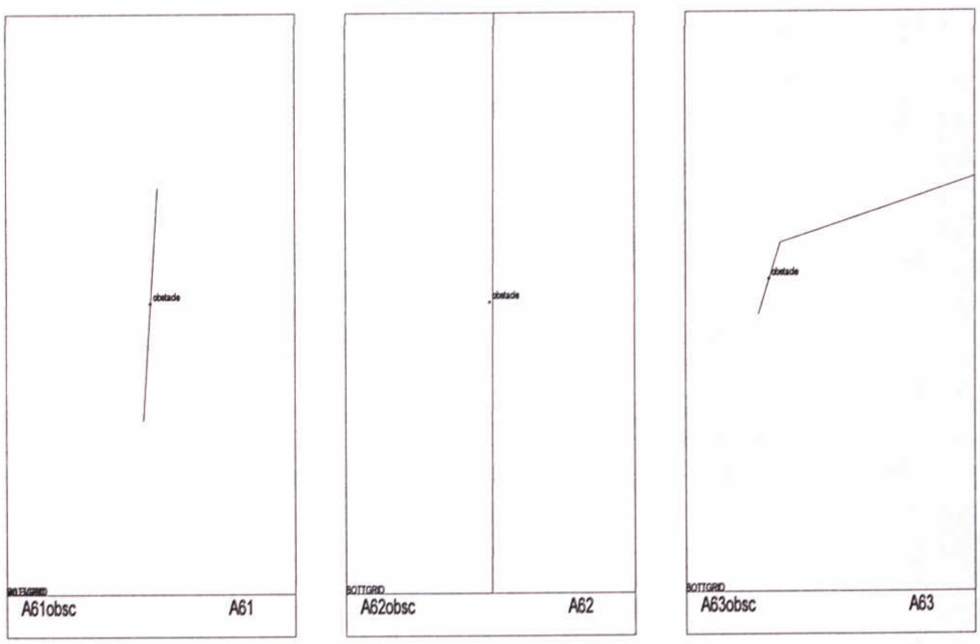

Figure 1 Geometry of obstacles for the three test cases

Analytical solution
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Model commands

	COMPUTATIONAL GRID							
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC		
	2D	-1000	-2000	0	2000	4000		
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	100	100	-80°	80°	8°	0.1	1	24
02	100	100	0°	360°	10°	0.1	1	24
03	100	100	-60°	60°	3.3°	0.1	3	36

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
01	off	off	off	off	off	off	off	off	off
02	3	off	off	off	on	on	on	off	off
03	off	off	off	off	off	off	off	off	off

	BOUNDARY CONDITIONS									
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
01	side	W	con	par	Jonswap	peak	power	1	7	0°	4
02	side	W	con	par	Jonswap	peak	power	2	8	0°	4
03	side	W	con	par	Jonswap	peak	power	1	7	0°	4

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'a61obst.bot'	-		-	'a61obs01.lev'
02	'a61obst.bot'	u_{10}=20 m/s	θ_w=0°		-
03	'a61obst.bot'	-		-	-

Model results

The computational results in terms of significant wave height H_s, mean wave period T_{m01} and mean wave direction *DIR* as a function of the distance along a curve are shown in Figures A61a, A61b and A61c.

References

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L11 Wave breaking

Purpose

The goal of this case is to test the formulation for dissipation by depth-induced wave breaking in SWAN.

Situation

Dissipation by depth-induced wave breaking formulations are tested using the laboratory data of Battjes and Janssen (1978). Random, uni-directional waves (in a flume) propagate towards a bar-trough beach profile, accompanied by depth-induced wave breaking over the bar (see Figure 1). The observed water levels (including wave-induced set-up) have been added. Currents and wind are absent.

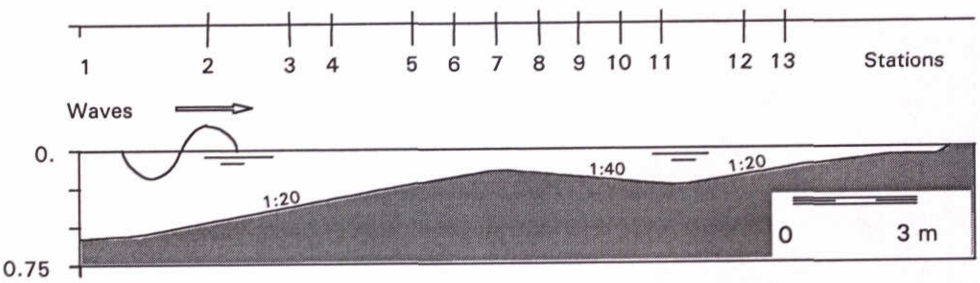

Figure 1 Bathymetry of laboratory experiment of Battjes and Janssen (1978).

Test case description

In this test case, the 1D-mode of SWAN is activated. Test case 01 is a simulation of mildly breaking waves (i.e. run 13 of Battjes and Janssen, 1978). Violently breaking waves (i.e. run 15 of Battjes and Janssen, 1978) are studied in case 02. In both cases, the same bottom file is used, but the difference is made by using different water levels, wave heights and characteristic wave periods. Maximum water depth is 0.762m in test case 01 and 0.615m in test case 02. Input wave fields are of the Jonswap type and the directional distribution is equal to $\cos^{500}$. In these computations, depth-induced wave breaking, bottom friction, whitecapping and refraction are activated. Output is generated along an output curve (from x = 7.4 m, y = 0 m to x = 30.6 m, y = 0 m).

Observations

The observations in terms of significant wave height H_s of Battjes and Janssen (1978) are used to verify the performance of SWAN.

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	1D	7.4	0	0	30	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	0.1	0	-10°	10°	0.5°	0.2485	3.5714	30

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	off	on	on	off	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
01	side	W	con	par	Jonswap	peak	power	0.147	2.012	0	500
02	side	W	con	par	Jonswap	peak	power	0.2022	1.886	0	500

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
01	'111wavb.bot'	-	-	'111wav01.lev'
02	'111wavb.bot'	-	-	'111wav02.lev'

Model results

The model results in terms of significant wave height H_s, fraction of breaking waves Q_b and depth d of cases 01 and 02 are presented in Figures L11a and L11c, respectively. The dissipation term Diss is shown in Figures L11b and L11d. The computed results are compared with the observations by Battjes and Janssen (1978).

References

Battjes, J.A. and J.P.F.M. Janssen., 1978: Energy loss and set-up due to breaking of random waves, *Proc. 16th Int. Conf. Coastal Engineering*, ASCE, 569-587

Acknowledgements

Data courtesy of Delft University of Technology, Delft, the Netherlands.

L21 Triads

Purpose
The goal of this case is to test the formulation for triad wave-wave interactions in SWAN.

Situation
To validate the implemented Lumped Triad Approximation (LTA; Eldeberky, 1996, Eldeberky and Battjes, 1995) the laboratory flume experiment of Beji and Battjes (1993) is used. In their experiment, waves propagate in relatively shallow water over a submerged bar (the still-water depth d varies between 0.4 m in the deep section and 0.1 m above the elevated bottom, see Figure 1). The up- and downwave bottom slopes of the submerged bar are 1:20 and 1:10 respectively. Random uni-directional waves travel across the bar with very little depth-induced wave breaking but with the evolution of a relatively large secondary peak in the spectrum. Currents and wind are absent.

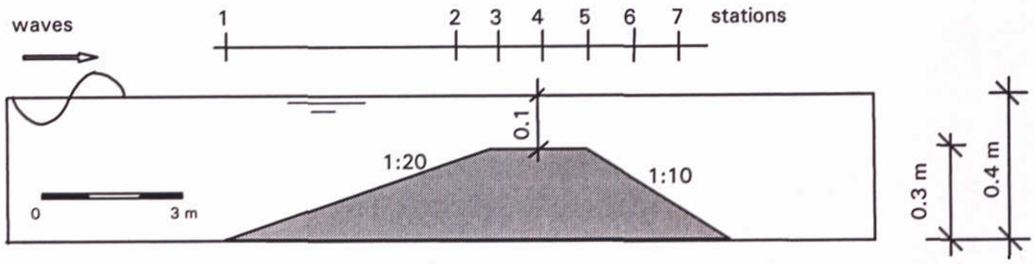

Figure 1 Bathymetry of laboratory experiment of Beji and Battjes (1993).

Test case description
A one-dimensional Jonswap spectrum as observed by Beji and Battjes (1993) is used as upwave boundary condition at station 1. SWAN is used in the 1D-mode. The processes of depth-induced wave breaking, friction, triads, whitecapping and refraction are activated. Output is generated along an output curve (from x = 0 m, y = 0 m to x = 30 m, y = 0 m).

Observations
Observations have been made by Beji and Battjes (1993). For seven different stations (see Figure 1 for locations), the observed energy density spectra are used here.

Model commands

	COMPUTATIONAL GRID								
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC			
	1D	0	0	0	30	0			
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC	
	0.1	0	-10°	10°	0.5°	0.0837	2.5	40	
	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	off	on	on	off	off
	BOUNDARY CONDITIONS								
	TYPE	BOU	C/V	P/R	NAME OF FILE				
01	side	W	con	read boundary from file	'121tri01.bnd'				
	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**					
	'121tria.bot'	-	-	-					

Model results
The model results in terms of significant wave height H_s, mean wave period T_{m01} and depth d of case 01 are presented in Figure L21a. In L21b, the computed energy density spectra $E(f)$ for the seven stations are shown, together with the observations by Beji and Battjes (1993).

References

Beji, S. and J.A. Battjes, 1993: Experimental investigation of wave propagation over a bar, *Coastal Engineering*, 19, 151-162

Eldeberky, Y. and J.A. Battjes, 1995: Parameterization of triad interactions in wave energy models, *Proc. Coastal Dynamics Conf. '95*, Gdansk, Polen, 140-148

Eldeberky, Y., 1996: Nonlinear transformation of wave spectra in the nearshore zone, Ph.D.-dissertation, Delft University of Technology, Department of Civil Engineering, The Netherlands

Acknowledgements

Data courtesy of Delft University of Technology, Delft, the Netherlands.

L31 Set-up

Purpose

The goal of this case is to test wave propagation, dissipation and wave-induced set-up in SWAN.

Situation

To validate wave propagation and transformation in shallow water and the wave-induced set-up module in SWAN, the laboratory flume experiment of Boers (1996) is used (see Figure 1). In his experiment, random, uni-directional waves propagate towards a bar-trough profile. At a large number of locations, wave spectra have been measured. Three different test cases are considered here. Currents and wind are absent.

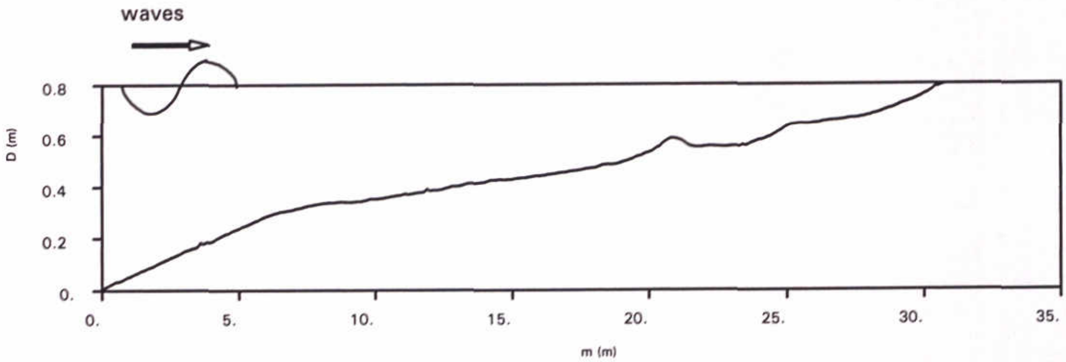

Figure 1 Bathymetry of laboratory experiment of Boers (1996).

Test case description

The 1D-mode of SWAN is used. As wave boundary condition, the observed 1D-spectrum is used in SWAN. The three different tests 01, 02 and 03 use different input spectra. The processes of depth-induced wave breaking, bottom friction, triads, whitecapping, refraction and the computation of wave-induced set-up are activated in SWAN. Output is generated along an output curve (from x = 0 m, y = 0 m to x = 31.3 m, y = 0 m).

Observations

The performance of SWAN is evaluated by using the data of Boers (1996).

Model commands

	COMPUTATIONAL GRID								
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC			
	1D	0	0	90°	31.3	0			
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC	
	0.1	0	82.5°	97.5°	0.5°	0.15	2.	53	
	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	off	on	on	off	on
	BOUNDARY CONDITIONS								
	TYPE	BOU	C/V	P/R	NAME OF FILE				
01	side	S	con	read boundary from file	'l31set01.bnd'				
02	side	S	con	read boundary from file	'l32set02.bnd'				
03	side	S	con	read boundary from file	'l33set03.bnd'				
	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**					
	'l31setu.bot'	-	-	-					

Model results

The model results in terms of water depth d, wave-induced set-up η, significant wave height H_s and wave period T_{m02} of cases 01, 02 and 03 are presented in Figures L31a, L31c and L31e, together with the observations by Boers (1996). In Figures L31b, L31d and L31f, the spectra for the different output locations are shown.

References

Boers, M., 1996: Simulation of a surf zone with a barred beach; Report 1: wave heights and wave breaking. *Communications on hydraulic and geotechnical engineering*. ISSN 0169-6548

Acknowledgements

Data courtesy of M. Boers of Delft University of Technology, Delft, the Netherlands.

L41 Wave blocking

Purpose

The goal of this case is to investigate wave propagation and transformation in the presence of a strong opposing, blocking current.

Situation

To test current-induced wave blocking in SWAN, the experiment of Lai et al. (1989) is used. Here we focus on their violently breaking case only. Random, long-crested waves are sent into a flume (see Figure 1). The opposing current velocity is large enough to block the waves for certain frequencies ($c_g + u < 0$ m/s). Maximum velocity on top of the submerged shoal is 0.22 m/s. Wind is absent.

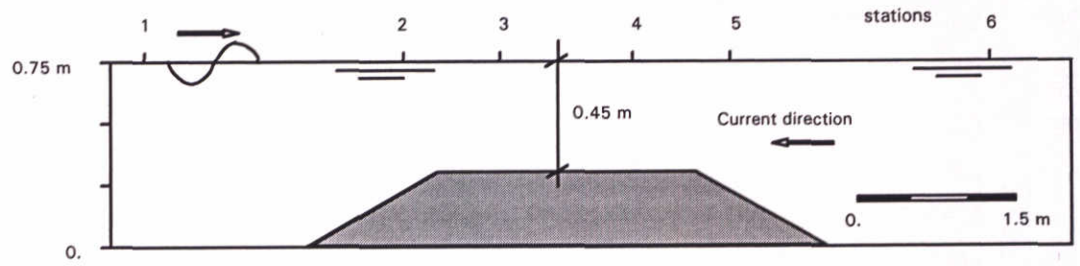

Figure 1 Bathymetry and locations of observation stations of laboratory experiment of Lai et al. (1989).

Test case description

In test case L41, the 2D-mode is activated in SWAN. The computational grid is 40 m long and oriented along the x-axis. The input spectrum in SWAN is as observed by Lai et al., and is read from file. The activated processes are triads, whitecapping, refraction and frequency shift due to currents. Output is generated along an output curve along the crest of the bar (from x = 20 m, y = 0.31 m to x = 20 m, y = 8.23 m).

Observations

The results of SWAN are compared with the observations of Lai et al.(1989).

Model commands

	COMPUTATIONAL GRID								
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC			
	2D	0	0.31	0	40.0	7.92			
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC	
	2	0.02	82.5°	97.5°	0.5°	0.869	5.56	35	
	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	off	on	off	on	on	on	off
	BOUNDARY CONDITIONS								
	TYPE	BOU	C/V	P/R	NAME OF FILE				
01	side	S	con	read boundary from file	'141cur01.bnd'				
	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**					
01	'141curb.bot'	-	'141cur01.cur'	-					

Model results

The model results in terms of significant wave height H_s, mean wave period T_{m01} and water depth d of case 01 are presented in Figure L41a, together with the observations by Lai et al. (1989). In Figure L41b, model results and observed values of the energy density spectra $E(f)$ for 6 different stations are shown.

References

Lai, R.J. et al., 1989: Laboratory studies of wave-current interaction: Kinematics of the strong interaction, *J.Geophys. Res.*, 94, No. C11, 16,201-16,214

Acknowledgements
Data courtesy of S. R. Long of NASA, Wallops Flight Facility (USA).

L51 HISWA basin experiment

Purpose
The goal of this case is to test wave propagation and transformation over a submerged bar in a 2D-laboratory experiment with added currents.

Situation
The dimensions of the basin are 26.4 m × 34.0 m (see Figure 1). A wave maker is located along one of the short ends. Waves propagate over a horizontal bottom, across a submerged breakwater that extends over half the basin width, to a beach at the other end of the basin. The waves travel across the breakwater with a significant loss of energy and the generation of a relatively large high-frequency spectral peak. The breaking waves generate a mean current in the basin (Dingemans et al., 1987).

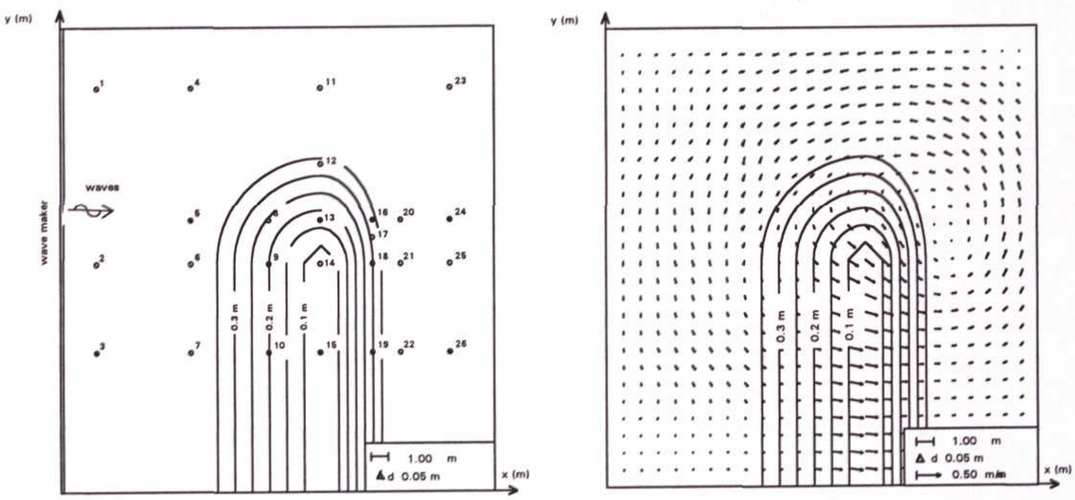

Figure 1 Bathymetry of the HISWA basin experiment (left panel) and wave-induced current pattern as observed by Dingemans et al. (1987) (right panel).

Test case description
From all cases considered by Dingemans et al. (1987), we concentrate on their test case number ME35. In this test case, the 2D-mode is activated in SWAN. The computational grid is oriented perpendicularly to the submerged bar. In the computations, the presence of the fully reflecting side walls in the basin is simulated by extending the basin size 17 m to either side. The spectrum that is generated by the wave maker is a Jonswap spectrum (Hasselmann et al., 1973) with a peak enhancement factor $\gamma_0 = 3.3$. The observed width of the directional energy distribution is about 25° (cf. Kuik et al., 1988). The significant wave height and the peak frequency at the wave maker are 0.1 m and 0.805 Hz, respectively. The observed mean wave direction at site 2 is 1.34° relative to the main axis of the tank (normal to the breakwater). The physical processes of depth-induced wave breaking, bottom friction, triads, whitecapping, refraction and frequency shift due to currents are activated. Output is generated along an output curve (from x = 0 m, y = 0 m to x = 25 m, y = 0 m).

Observations
The model results and the observations of test case ME35 of Dingemans et al. (1987) are considered here.

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	0	-30	0	25	65

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	0.5	0.5	0°	360°	10°	0.317	3.125	24

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	off	on	on	on	off

	BOUNDARY CONDITIONS											
	TYPE	BOU	C/V	P/R	SHAPE	P/ME	DSPR	LEN	HS	PER	PDIR	DD
	side	W	var	par	Jonswap	peak	power	25	.1004	1.241	-5.56	4
								30	.1042	1.241	1.34	4
								40	.1108	1.241	-3.63	4

	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**
01	'l51hisw.bot'	-	'l51his01.cur'	-

Model results

In Figure L51a, the computed energy density spectra $E(f)$ for 8 different locations are shown, together with observed values of Dingemans et al. (1987). Locations 8, 13 and 16 (i.e. stations 32, 33, and 34 in Fig. L51a and Dingemans, 1987) are located along a section across the head of the breakwater and locations 2, 9, 14, 18 and 24 (i.e. stations 30, 12, 13, 14 and 29 in Fig. L51a and Dingemans, 1987) on a section across its main body. The significant wave height H_s, mean wave period T_{m01} and water depth d along an output curve extending over the top of the submerged breakwater are presented in Figure L51b.

References

Dingemans, M.W., 1987. Verification of numerical wave propagation models with laboratory measurements; HISWA verification in the directional wave basin. Delft Hydraulics, Report H228, 400 pp.

Hasselmann et al., 1973: Measurements of wind-wave growth and swell decay during the Joint North Sea Wave Project (JONSWAP), *Dtsch. Hydrogr. Z. Suppl.*, 12, A8

Kuik et al., 1988: A method for the routine analysis of pitch-and-roll buoy wave data, *J. Phys. Oceanogr.*, 18, 1020-1034

Acknowledgements

Data courtesy of WL | DELFT HYDRAULICS, Delft, the Netherlands.

L61 Barrier island

Purpose
The goal of this case is to validate wave propagation (where the waves completely reverse their direction behind the barrier island) and wave-induced set-up on different grids (i.e. 1 regular rectangular grid and 2 curvilinear grids, see Figure 2).

Situation
A barrier island is schematised as a set of straight lines and half circles (see Holthuijsen et al., 1993). The waves propagate from a uniform up-wave boundary (at a water depth of 20 m) towards the island. The depth contours are parallel to the contours of the island and the travel distance of the waves from the up-wave boundary towards the shore is 7000 m (see Figure 1). Currents and wind are absent.

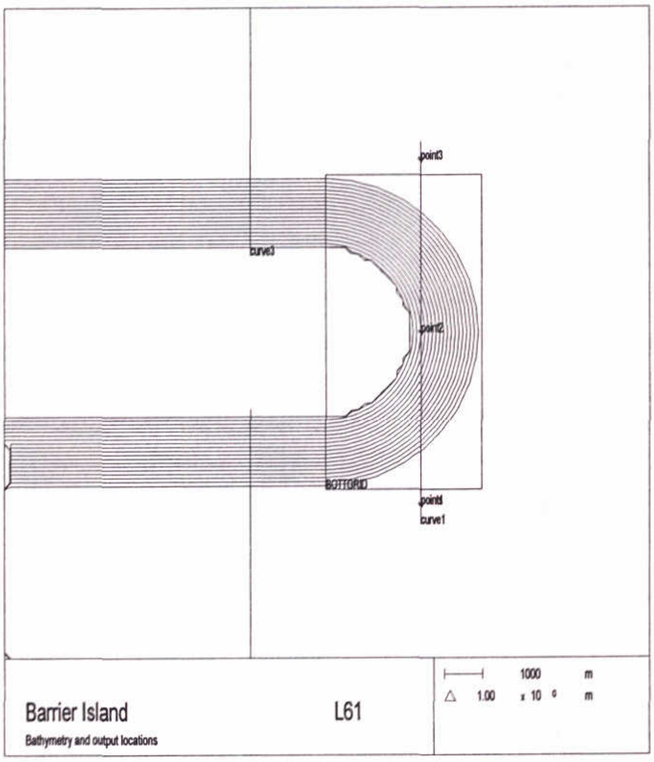

Figure 1 Bathymetry with output locations and output curves of the Barrier Island case.

Test case description
In test case L61, the 2D-mode is activated in SWAN. Test case 01 is based on a regular grid (see Figure 2). Case 02 is performed using a relatively fine curvilinear grid (see Figure 2), where in case 03 a relatively course curvilinear grid is used (see Figure 2). The input spectrum is of the Jonswap type, and the directional distribution is equal to $\cos^4$. Depth-induced wave breaking, bottom friction, triads, quadruplets, whitecapping, refraction and wave-induced set-up are activated during the computations. For dissipation by bottom friction the Jonswap formulation is used. Output is generated along three output curves (from x = 11.5 km, y = 4 km, to x = 11.5 km, y = 14 km; from x = 7 km, y = 0 km to x = 7 km, y = 7 km; and from x = 7 km, y = 11 km to x = 7 km, y = 18 km).

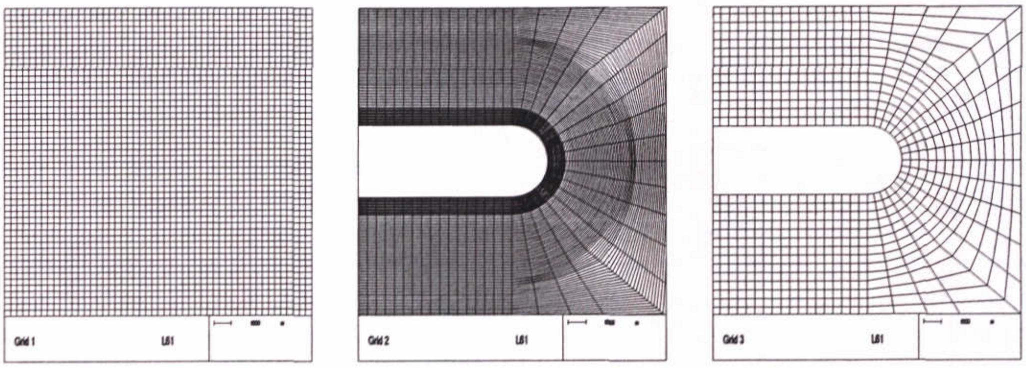

Figure 2 Three different grids to be used in the computations of the barrier island case: (01) regular rectangular grid, (02) high resolution curvilinear grid and (03) curvilinear grid.

Observations

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Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	2D	0	0	0	18000	18000
02	2D	CURVI GRID: 'l61bar02.grd'		MXC: 54		MYC: 100
03	2D	CURVI GRID: 'l61bar03.grd'		MXC: 54		MYC: 14

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	200	200	0°	360°	10°	0.07	1.0	28

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	Jonswap	on	on	on	on	off	on

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
01	side	W+S	con	par	Jonswap	peak	power	2	6	90°	4
02	segm	IJ	con	par	Jonswap	peak	power	2	6	90°	4
03	segm	IJ	con	par	Jonswap	peak	power	2	6	90°	4

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'l61barr.bot'	U_{10}: 0.01 m/s	θ_w: 0°	-	-1.0 m

Model results

The used grids, regular as well as curvilinear are shown in Figure 2. In Figures L61a to L61f, model results are presented in terms of significant wave height H_s, wave-induced set-up η, depth d, mean wave period T_{m01}, mean wave direction and dissipation, for the three grids.

References

Holthuijsen, L.H., N. Booij and R.C. Ris, 1993: A spectral wave model for the coastal zone, *Proc. of 2nd Int. Symposium on Ocean Wave Measurement and Analysis,* New Orleans, 630-641

Acknowledgements

-

F11, F12 and F13: Wave growth in shallow water (GEN3 mode)

Purpose

The goal of this case is to test depth-limited (fully-developed) wave growth in shallow water for different wind speeds, using the stationary mode of SWAN.

Situation

Considered is wind-induced wave growth in water of uniform, finite depth. SWAN computations (with WAM Cycle 3 formulations) have been carried out for three different wind speeds (U_{10} = 10 m/s, 20 m/s and 30 m/s). For each case, the values of the depths have been adapted to the actual wind speed (for U_{10} = 10 m/s the following depths have been considered: d=0.15625, 0.3125, 0.625, 1.25, 2.5, 5, 10, 20, 40, and 80 m; for U_{10} = 20 m/s the following depths have been considered: d= 0.625, 1.250, 2.5, 5.0, 10, 20, 40, 80, 160, and 320 m; for U_{10} = 30 m/s the following depths have been considered: depths d =1.40625, 2.8125, 5.625, 11.25, 22.5, 45, 90, 180, 360, and 720 m). Currents are absent.

Test case description

The test is carried out using the 1D-mode of SWAN. The wave parameters (significant wave height H_s and peak frequency f_p) in these cases have been scaled with the wind speed U_{10}. As the water depth, and thus the wind-induced wave field, changes over the different test cases, the frequency range varies as well. Activated processes are depth-induced wave breaking, friction, triads, quadruplets, whitecapping and refraction. For each case, output is generated along an output curve (co-ordinates depend on the actual fetch).

Observations

The model results using WAM Cycle 3 formulations are compared with the expressions of Bretschneider (1973), Young and Verhagen (1996) and the envelope of observations reviewed by Holthuijsen (1980).

Model commands for U_{10} = 10 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
00	1D	0	0	0	4500	0
01	1D	0	0	0	45 000	0
02	1D	0	0	0	300 000	0
03	1D	0	0	0	300 000	0
04	1D	0	0	0	1 800 000	0
05	1D	0	0	0	15 000 000	0
06	1D	0	0	0	15 000 000	0
07	1D	0	0	0	50 000 000	0
08	1D	0	0	0	50 000 000	0
09	1D	0	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
00	10	0	0°	360°	10°	0.227	3.333	27
01	10	0	0°	360°	10°	0.1538	2.0	27
02	100	0	0°	360°	10°	0.1	1.0	24
03	100	0	0°	360°	10°	0.1	1.0	24
04	600	0	0°	360°	10°	0.065	1.0	29
05	3000	0	0°	360°	10°	0.05	1.0	31
06	3000	0	0°	360°	10°	0.05	1.0	31
07	10 000	0	0°	360°	10°	0.03846	1.0	34
08	10 000	0	0°	360°	10°	0.03846	1.0	34
09	10 000	0	0°	360°	10°	0.03846	1.0	34

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
	-	-	-	-	-

	BOTTOM:	FAC	**WIND:**	**CURRENT:**	**WATER LEVEL:**

00	'fl1grsw.bot'	0.156	U_{10}: 10 m/s	θ_w: 0°	-	-
01	'fl1grsw.bot'	0.313	U_{10}: 10 m/s	θ_w: 0°	-	-
02	'fl1grsw.bot'	0.625	U_{10}: 10 m/s	θ_w: 0°	-	-
03	'fl1grsw.bot'	1.25	U_{10}: 10 m/s	θ_w: 0°	-	-
04	'fl1grsw.bot'	2.5	U_{10}: 10 m/s	θ_w: 0°	-	-
05	'fl1grsw.bot'	5	U_{10}: 10 m/s	θ_w: 0°	-	-
06	'fl1grsw.bot'	10	U_{10}: 10 m/s	θ_w: 0°	-	-
07	'fl1grsw.bot'	20	U_{10}: 10 m/s	θ_w: 0°	-	-
08	'fl1grsw.bot'	40	U_{10}: 10 m/s	θ_w: 0°	-	-
09	'fl1grsw.bot'	80	U_{10}: 10 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 20 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
00	1D	0	0	0	4500	0
01	1D	0	0	0	45 000	0
02	1D	0	0	0	300 000	0
03	1D	0	0	0	300 000	0
04	1D	0	0	0	1 800 000	0
05	1D	0	0	0	15 000 000	0
06	1D	0	0	0	15 000 000	0
07	1D	0	0	0	50 000 000	0
08	1D	0	0	0	50 000 000	0
09	1D	0	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
00	10	0	0°	360°	10°	0.227	3.333	27
01	10	0	0°	360°	10°	0.1538	2.0	27
02	100	0	0°	360°	10°	0.1	1.0	24
03	100	0	0°	360°	10°	0.1	1.0	24
04	600	0	0°	360°	10°	0.065	1.0	29
05	3000	0	0°	360°	10°	0.05	1.0	31
06	3000	0	0°	360°	10°	0.05	1.0	31
07	10 000	0	0°	360°	10°	0.03846	1.0	34
08	10 000	0	0°	360°	10°	0.03846	1.0	34
09	10 000	0	0°	360°	10°	0.03846	1.0	34

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
	-	-	-	-	-

	BOTTOM:	FAC	WIND:		CURRENT:	WATER LEVEL:
00	'fl2grsw.bot'	0.625	U_{10}: 20 m/s	θ_w: 0°	-	-
01	'fl2grsw.bot'	1.25	U_{10}: 20 m/s	θ_w: 0°	-	-
02	'fl2grsw.bot'	2.5	U_{10}: 20 m/s	θ_w: 0°	-	-
03	'fl2grsw.bot'	5	U_{10}: 20 m/s	θ_w: 0°	-	-
04	'fl2grsw.bot'	10	U_{10}: 20 m/s	θ_w: 0°	-	-
05	'fl2grsw.bot'	20	U_{10}: 20 m/s	θ_w: 0°	-	-
06	'fl2grsw.bot'	40	U_{10}: 20 m/s	θ_w: 0°	-	-
07	'fl2grsw.bot'	80	U_{10}: 20 m/s	θ_w: 0°	-	-
08	'fl2grsw.bot'	160	U_{10}: 20 m/s	θ_w: 0°	-	-
09	'fl2grsw.bot'	320	U_{10}: 20 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 30 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
00	1D	0	0	0	6 000	0
01	1D	0	0	0	60 000	0
02	1D	0	0	0	300 000	0
03	1D	0	0	0	10 000 000	0
04	1D	0	0	0	10 000 000	0
05	1D	0	0	0	10 000 000	0
06	1D	0	0	0	50 000 000	0
07	1D	0	0	0	50 000 000	0

08	1D	0	0	0	110 000 000	0
09	1D	0	0	0	110 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
00		0	0°	360°	10°	0.12	3.0	34
01		0	0°	360°	10°	0.08	2.0	34
02		0	0°	360°	10°	0.08	1.0	27
03		0	0°	360°	10°	0.06	1.0	30
04		0	0°	360°	10°	0.03	1.0	34
05		0	0°	360°	10°	0.03	1.0	34
06		0	0°	360°	10°	0.025	1.0	39
07		0	0°	360°	10°	0.02	1.0	41
08		0	0°	360°	10°	0.02	1.0	41
09		0	0°	360°	10°	0.018	1.0	42

PHYSICS

GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
3	on	on	on	on	on	on	off	off

BOUNDARY CONDITIONS

TYPE	BOU	C/V	P/R	NAME OF FILE
-	-	-	-	-

	BOTTOM:	FAC	WIND:		CURRENT:	WATER LEVEL:
00	'fl3grsw.bot'	1.406	U_{10}: 30 m/s	θ_w: 0°	-	-
01	'fl3grsw.bot'	2.813	U_{10}: 30 m/s	θ_w: 0°	-	-
02	'fl3grsw.bot'	5.625	U_{10}: 30 m/s	θ_w: 0°	-	-
03	'fl3grsw.bot'	11.25	U_{10}: 30 m/s	θ_w: 0°	-	-
04	'fl3grsw.bot'	22.5	U_{10}: 30 m/s	θ_w: 0°	-	-
05	'fl3grsw.bot'	45	U_{10}: 30 m/s	θ_w: 0°	-	-
06	'fl3grsw.bot'	90	U_{10}: 30 m/s	θ_w: 0°	-	-
07	'fl3grsw.bot'	180	U_{10}: 30 m/s	θ_w: 0°	-	-
08	'fl3grsw.bot'	360	U_{10}: 30 m/s	θ_w: 0°	-	-
09	'fl3grsw.bot'	720	U_{10}: 30 m/s	θ_w: 0°	-	-

Model results

For comparison, model results in terms of non-dimensional depth, non-dimensional total energy and non-dimensional peak frequency and observations by Young and Verhagen (1996), Holthuijsen (1980) and Bretschneider (1973) are given in Figures F11a, F12a and F13a. Note that the model results have been scaled with the wind speed U_{10} (see page 61 of Ris, 1997). The evolution of the waves for the different water depths in terms of significant wave height H_s as a function of fetch is shown in Figures F11b, F12b and F13b.

References

Bretschneider, C.L., 1973: in Shore Protection Manual, CERC, U.S. Army Corps of Engineers, Techn. Rep. No 4

Young, I.R. and L.A.Verhagen, 1996: The growth of fetch limited waves in water of finite depth. Part II: Spectral evolution, *Coastal Engineering*, 29, 79-99

Holthuijsen, L.H., 1980: Methods of wave prediction, part I and II (Methoden voor golfvoorspelling, deel I en II, in Dutch), Technical Advisory Commission against Inundation (Technische Adviescommissie voor de Waterkeringen, in Dutch), Den Haag, The Netherlands

Ris, R.C., 1997: Spectral modelling of wind waves in coastal areas, Ph.D.-dissertation, Delft University of Technology, Department of Civil Engineering, The Netherlands

Acknowledgements

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F21, F22 and F23: Wave growth in deep water (GEN3 mode)

Purpose

The goal of this case is to test fetch-limited deep water wave growth for 3 different wind speeds using the **third-generation** mode of SWAN.

Situation

Considered is fetch-limited deep water wave growth caused by a constant uniform wind blowing normal off a long and straight coastline. The wind velocities considered are U_{10} = 10, 20 and 30 m/s. Currents are absent.

Test case description

The 1D-, third-generation mode of SWAN is used in this test case. In order to resolve the full range of fetch (from very short fetches (order of 100 m) up to long fetches (50.000 km), the computations are carried out in sequences with different fetches (6 computations). Computation (a) starts without boundary condition; only wave growth over a limited fetch is responsible for the computed wave energy. Computation (b) uses the wave field computed from test case (a) as a boundary condition at one side. Wave generation over fetch (b) generates the boundary condition for computation (c), and so on. The scale of the computations increases going from case (a) to case (f). The frequency range changes from wide to narrow and centres around the lower frequencies. Of the physical processes, only wind, quadruplets and whitecapping are activated in SWAN. For each computation, output is generated along an output curve (co-ordinates depend on the used fetch).

Case F22 and F23 are identical to case F21, except that the frequency range and fetch has been adapted.

Observations

Model results are scaled using the friction velocity U_* (see page 45 of Ris, 1997). The SWAN results are compared with the expressions of Kahma and Calkoen (1992), Wilson (1965) and Pierson-Moskowitz (1964).

Model commands for U_{10} = 10 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.300	4.0	27
02	10	0	0°	360°	10°	0.200	3.0	28
03	100	0	0°	360°	10°	0.120	2.0	30
04	100	0	0°	360°	10°	0.070	1.0	28
05	500	0	0°	360°	10°	0.060	1.0	30
06	10 000	0	0°	360°	10°	0.060	1.0	30

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	off	off	off	on	on	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f21grd02.abs'
03	side	W	con	read boundary from file	'f21grd03.abs'
04	side	W	con	read boundary from file	'f21grd04.abs'
05	side	W	con	read boundary from file	'f21grd05.abs'
06	side	W	con	read boundary from file	'f21grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f21grdp.bot'	U_{10}: 10 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 20 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.250	3.0	26
02	10	0	0°	360°	10°	0.200	2.0	24
03	100	0	0°	360°	10°	0.100	2.0	29
04	100	0	0°	360°	10°	0.050	1.0	31
05	500	0	0°	360°	10°	0.033	1.0	36
06	10 000	0	0°	360°	10°	0.033	1.0	36

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	off	off	off	on	on	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f22grd02.abs'
03	side	W	con	read boundary from file	'f22grd03.abs'
04	side	W	con	read boundary from file	'f22grd04.abs'
05	side	W	con	read boundary from file	'f22grd05.abs'
06	side	W	con	read boundary from file	'f22grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f22grdp.bot'	U_{10}: 20 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 30 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.200	3.0	28
02	10	0	0°	360°	10°	0.100	2.0	31
03	100	0	0°	360°	10°	0.090	1.0	25
04	100	0	0°	360°	10°	0.055	1.0	31
05	500	0	0°	360°	10°	0.033	1.0	36
06	10 000	0	0°	360°	10°	0.025	1.0	38

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	off	off	off	on	on	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f23grd02.abs'
03	side	W	con	read boundary from file	'f23grd03.abs'
04	side	W	con	read boundary from file	'f23grd04.abs'
05	side	W	con	read boundary from file	'f23grd05.abs'
06	side	W	con	read boundary from file	'f23grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f23grdp.bot'	U_{10}: 30 m/s	θ_w: 0°	-	-

Model results

The computed non-dimensional total wave energy and non-dimensional peak frequency both as function of the non-dimensional fetch are given in Figure F21, F22 and F23. Model results using third-generation formulations are given for wind velocities of U_{10} = 10, 20 and 30 m/s. All results are compared with the expressions of Kahma and Calkoen (1992), Pierson-Moskowitz (1964) and Wilson (1965). The computed wave parameters in this test case are scaled with the wind speed U_*.

References

Kahma, K.K. and C.J. Calkoen, 1992: Reconciling discrepancies in the observed growth of wind-generated waves, *J. Phys. Oceanogr.*, 22, 1389-1405

Wilson, B.W., 1965: Numerical prediction of ocean waves in the North Atlantic for December 1959, *Deutsch. Hydrogr. Z.*, 18, No. 3, p. 114-130

Pierson, W.J. and L. Moskowitz, 1964: A proposed spectral form for fully-developed wind seas based on the similarity theory of S.A. Kitaigorodskii, *J. Geophys. Res.*, 69, No. 24, 5181-5190

Acknowledgements

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F24, F25 and F26: Wave growth in deep water (GEN2 mode)

Purpose

The goal of this case is to test fetch-limited deep water wave growth for 3 different wind speeds in the **second-generation** mode of SWAN.

Situation

Considered is fetch-limited deep water wave growth caused by a constant uniform wind blowing normal off a long and straight coastline. The wind velocities considered are U_{10} = 10, 20 and 30 m/s. Currents are absent.

Test case description

The 1D-, second-generation mode of SWAN is used in this test case. In order to resolve the full range of fetch (from very short fetches (order of 100 m) up to long fetches (50.000 km), the computations are carried out in sequences with different fetches (6 computations). Computation (a) starts without boundary condition; only wave growth over a limited fetch is responsible for the computed wave energy. Computation (b) uses the wave field computed from test case (a) as a boundary condition at one side. Wave generation over fetch (b) generates the boundary condition for computation (c), and so on. The scale of the computations increases going from case (a) to case (f). The frequency range changes from wide to narrow and centres around the lower frequencies. For each computation, output is generated along an output curve (co-ordinates depend on the used fetch).

Case F25 and F26 are identical to case F24, except that the frequency range and fetch has been adapted.

Observations

Model results are scaled using the friction velocity U_* (see page 45 of Ris, 1997). The SWAN results are compared with the expressions of Kahma and Calkoen (1992), Wilson (1965) and Pierson-Moskowitz (1964).

Model commands for U_{10} = 10 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.300	4.0	27
02	10	0	0°	360°	10°	0.200	3.0	28
03	100	0	0°	360°	10°	0.120	2.0	30
04	100	0	0°	360°	10°	0.070	1.0	28
05	500	0	0°	360°	10°	0.060	1.0	30
06	10 000	0	0°	360°	10°	0.060	1.0	30

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	2	off	off	off	off	off	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f24grd02.abs'
03	side	W	con	read boundary from file	'f24grd03.abs'
04	side	W	con	read boundary from file	'f24grd04.abs'
05	side	W	con	read boundary from file	'f24grd05.abs'
06	side	W	con	read boundary from file	'f24grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f24grdp.bot'	U_{10}: 10 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 20 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.250	3.0	26
02	10	0	0°	360°	10°	0.200	2.0	24
03	100	0	0°	360°	10°	0.100	2.0	29
04	100	0	0°	360°	10°	0.050	1.0	31
05	500	0	0°	360°	10°	0.033	1.0	36
06	10 000	0	0°	360°	10°	0.033	1.0	36

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	2	off	off	off	off	off	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f25grd02.abs'
03	side	W	con	read boundary from file	'f25grd03.abs'
04	side	W	con	read boundary from file	'f25grd04.abs'
05	side	W	con	read boundary from file	'f25grd05.abs'
06	side	W	con	read boundary from file	'f25grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f25grdp.bot'	U_{10}: 20 m/s	θ_w: 0°	-	-

Model commands for U_{10} = 30 m/s

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
01	1D	0	0	0	100	0
02	1D	90	0	0	1000	0
03	1D	800	0	0	10 200	0
04	1D	10 000	0	0	150 000	0
05	1D	150 000	0	0	750 000	0
06	1D	750 000	0	0	50 000 000	0

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	1	0	0°	360°	10°	0.200	3.0	28
02	10	0	0°	360°	10°	0.100	2.0	31
03	100	0	0°	360°	10°	0.090	1.0	25
04	100	0	0°	360°	10°	0.055	1.0	31
05	500	0	0°	360°	10°	0.033	1.0	36
06	10 000	0	0°	360°	10°	0.025	1.0	38

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	2	off	off	off	off	off	off	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	-	-	-	-	-
02	side	W	con	read boundary from file	'f26grd02.abs'
03	side	W	con	read boundary from file	'f26grd03.abs'
04	side	W	con	read boundary from file	'f26grd04.abs'
05	side	W	con	read boundary from file	'f26grd05.abs'
06	side	W	con	read boundary from file	'f26grd06.abs'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
	'f26grdp.bot'	U_{10}: 30 m/s	θ_w: 0°	-	-

Model results

The computed non-dimensional total wave energy and non-dimensional peak frequency both as function of the non-dimensional fetch are given in Figure F24, F25 and F26. Model results using second-generation formulations are given for wind velocities of U_{10} = 10, 20 and 30 m/s. All results are compared with the expressions of Kahma and Calkoen (1992), Pierson-Moskowitz (1964) and Wilson (1965). The computed wave parameters in this test case are scaled with the wind speed U_*.

References

Kahma, K.K. and C.J. Calkoen, 1992: Reconciling discrepancies in the observed growth of wind-generated waves, *J. Phys. Oceanogr.*, 22, 1389-1405

Wilson, B.W., 1965: Numerical prediction of ocean waves in the North Atlantic for December 1959, *Deutsch. Hydrogr. Z.*, 18, No. 3, p. 114-130

Pierson, W.J. and L. Moskowitz, 1964: A proposed spectral form for fully developed wind seas based on the similarity theory of S.A. Kitaigorodskii, *J. Geophys. Res.*, 69, No. 24, 5181-5190

Acknowledgements

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F27 Wave growth in deep water (model convergence)

Purpose

The goal of this case is to test model convergence in the case of deep water wave growth (along a 25 km fetch) using the **third-generation** mode of SWAN.

Situation

Fetch-limited deep water wave growth is considered for a constant uniform wind blowing normal off a long and straight coastline (see WL | DELFT HYDRAULICS, 1999). Wind velocity U_{10} = 30 m/s. Currents are absent. Full fetch is 25 km.

Test case description

To investigate the model convergence behaviour, computations have been made with SWAN, using different accuracy criteria to terminate the computations. The computations have been carried out using the 1D-, third-generation mode of SWAN. The test case is performed without boundary conditions; only wave growth over a limited fetch is responsible for the computed wave energy. Of all physical processes, wind, quadruplets and whitecapping are activated in SWAN. Output is generated along an output curve (from x = 0 km, y = 0 km to x = 25 km, y = 0 km).

Observations

-

Model commands

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<tr><td></td><td>TYPE</td><td>BOU</td><td>C/V</td><td>P/R</td><td>NAME OF FILE</td></tr>
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</table>

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<tr><td></td><td>'f27grdp.bot'</td><td>U_{10}: 30 m/s</td><td>θ_w: 0°</td><td>-</td><td>-</td></tr>
</table>

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<tr><td></td><td colspan="5">NUMERICAL ACCURACY</td></tr>
<tr><td></td><td>DREL</td><td>DHABS</td><td>DTABS</td><td>NPNTS</td><td>ITERMAX</td></tr>
<tr><td>01</td><td>1.e-5</td><td>1.e-5</td><td>1.e-5</td><td>101</td><td>1</td></tr>
<tr><td>02</td><td>1.e-5</td><td>1.e-5</td><td>1.e-5</td><td>101</td><td>5</td></tr>
<tr><td>03</td><td>1.e-5</td><td>1.e-5</td><td>1.e-5</td><td>101</td><td>15</td></tr>
<tr><td>04</td><td>1.e-5</td><td>1.e-5</td><td>1.e-5</td><td>101</td><td>50</td></tr>
<tr><td>05</td><td>1.e-5</td><td>1.e-5</td><td>1.e-5</td><td>101</td><td>100</td></tr>
</table>

Model results

The computed and the precomputed significant wave height H_s, mean wave period T_{m01} and the directional distribution DSPR for different iteration levels are shown in Figures F27a and F27b, respectively.

References

WL | DELFT HYDRAULICS, 1999: Model convergence of SWAN in the Westerschelde estuary. A study on model convergence using the one-dimensional mode of SWAN, R.C. Ris, report H3496.

Acknowledgements

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F31 Haringvliet estuary (the Netherlands)

Purpose
To test wave propagation and the formulations of the physical processes, in particular that of triads and the regeneration of waves by local wind effects, the SWAN model is applied in the complex field case of the Haringvliet Estuary (the Netherlands).

Situation
The Haringvliet is a relatively shallow branch of the Rhine estuary in the south-west of the Netherlands, separated from this estuary by sluices (see Andorka Gal, 1995). The water depth is 4 to 6 m and the surface area is about 10 km × 10 km (see Figure 1). The bay is partly protected from the southern North Sea by a shoal (called "Hinderplaat") extending half across the bay entrance. The waves approach the estuary from deep water and break over the shoal with a reduction of significant wave height. Deep inside the branch, the local wind regenerates the waves (which is evident as a high-frequency peak in the observed spectra). A constant wind speed U_{10} is considered for each test case. Currents are assumed to be absent. The water level varies from +0.30 m in case (01) to +2.10 m in case (02).

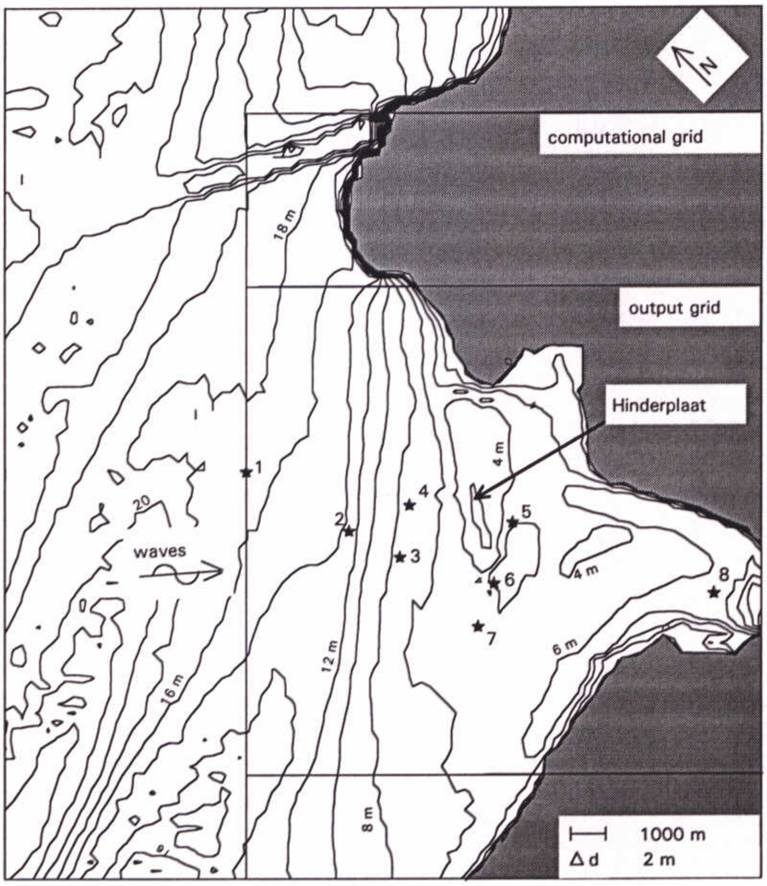


Figure 1 Bathymetry of the Haringvliet estuary (the Netherlands) with the locations of the eight observation stations.

Test case description
In this test case, the 2D-mode of SWAN is activated. SWAN simulations have been performed for four different time levels, selected from the measurement data:

case:

1. 14-10-1982/ 21.00 UTC;
2. 14-10-1982/ 22.00 UTC;
3. 14-10-1982/ 23.00 UTC;
4. 14-10-1982/ 24.00 UTC.

These time levels have been selected because (a) the wind speed and the wind direction were fairly constant, (b) the waves were fairly high (for the observation period of 13 weeks, (c) the water level was sufficiently low to see the generation of a significant secondary peak in the spectra near the shoal, but not so low that the shoal would be dry.

All physical processes are activated in SWAN.

Observations

At 8 locations, wave observations are available (see Andorka Gal, 1995).

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	6960.2	0	0	14789.8	22000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	150	250	0°	360°	10°	0.0521	1.0	31

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	side	W	con	read boundary from file	'f31har01.bnd'
02	side	W	con	read boundary from file	'f31har02.bnd'
03	side	W	con	read boundary from file	'f31har03.bnd'
04	side	W	con	read boundary from file	'f31har04.bnd'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f31hari.bot'	U_{10}: 12 m/s	θ_w: 8.8°	-	+0.30 m
02	'f31hari.bot'	U_{10}: 17 m/s	θ_w: 8.8°	-	+0.90 m
03	'f31hari.bot'	U_{10}: 14 m/s	θ_w: 8.8°	-	+1.70 m
04	'f31hari.bot'	U_{10}: 15 m/s	θ_w: 8.8°	-	+2.10 m

Model results

In the Figures F31a, F31b, F31c, and F31e, the model results (in terms of energy density spectra *E(f)*) and the observations for eight stations of Andorka Gal (1995) are shown for the four time levels. The model results in terms of integral wave parameters (the significant wave height H_s and the mean wave period T_{m01}) for the different stations at 23.00 UTC, computed in case 03, are given in Figure F31d.

References

Andorka Gal, J.H., 1995: Verification set Haringvliet -October 14, 1982- October 15, 1982-, Rep. -95.112x, Ministry of Transport, Public Works and Water Management, Den Haag, The Netherlands

Dingemans, M.W., 1983: Verification of numerical wave propagation models with field measurements; CREDIZ verification Haringvliet, Rep. W488, Part 1b, Delft Hydraulics, Delft, The Netherlands

Acknowledgements

Data courtesy of J.H. Andorka Gal and J.G. de Ronde of the Dutch Ministry of Public Works and Coastal Management (RIKZ), Den Haag, the Netherlands.

F41 Lake George (Australia)

Purpose

In this test, the performance of SWAN is studied in a nearly idealised depth-limited wave growth situation of Lake George, near Canberra, Australia.

Situation

Lake George is a fairly shallow lake with a nearly flat bottom (depth about 2 m, see Young and Verhagen, 1996a, 1996b and 1996c). It is approximately 20 km long and 10 km wide (see Figure 1). The bottom is rather smooth (bottom ripples are practically absent) and the bottom material consists of fine clay. The water level varies with the season. Currents are absent. For the first three test cases, wind conditions have been adapted according to the procedure proposed by Taylor and Lee (1984).
Conditions were considered to be nearly ideal, as the wind speed and direction were relatively constant during the 30 minutes sampling period and the wind direction stayed within 20° of the alignment of the wave gauge array (stations 1 to 6 only).

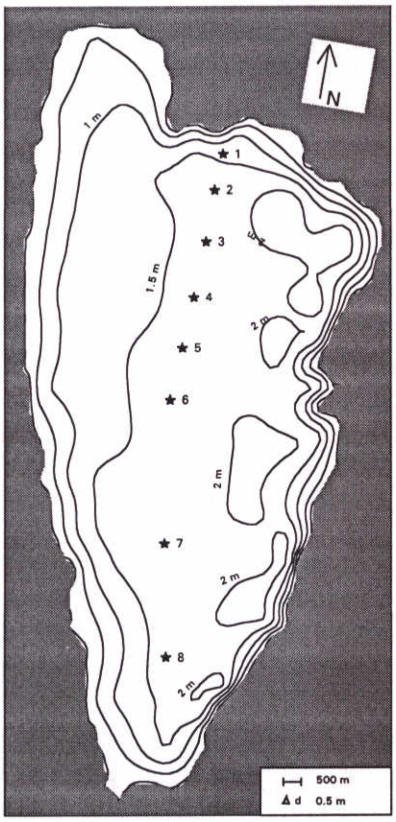


Figure 1 Bathymetry of Lake George (Australia) with the locations of the eight observation stations.

Test case description

To test the performance of the SWAN model, the 2-dimensional mode is used. A series of eight wave gauges were situated along the north-south axis of the lake. At station 6, the wind velocity U_{10} and the directional wave spectrum were measured. The wave measurements were carried out during the period from April 1992 till October 1993. From the extensive data set nine typical examples, all with wind speeds from northerly directions, were selected for the computations:

case:

1. 10-02-1993 / 22.00 hrs;
2. 03-10-1993 / 17.00 hrs;
3. 21-11-1992 / 16.00 hrs;

4. 12-05-1992 / 12.00 hrs;
5. 01-06-1992 / 22.00 hrs;
6. 31-10-1992 / 02.00 hrs;
7. 09-11-1992 / 09.00 hrs;
8. 03-10-1993 / 15.00 hrs;
9. 03-10-1993 / 16.00 hrs.

The incident wave field at the up-wave boundary is described by the observed frequency spectrum at station 1. To account for seasonal variations in the water level, for the test cases 01 to 09, the water depth was increased with respectively +0.10 m, +0.30 m, +0.27 m, +0.19 m, +0.28 m, +0.27 m, +0.29 m, +0.28 m and +0.19 m over the entire lake. The physical processes of depth-induced wave breaking, bottom friction, triads, quadruplets and wind are activated in SWAN.

Observations

The SWAN model results in terms of significant wave height H_s, peak period T_p and spectral wave energy $E(f)$ are compared with the observations of Young and Verhagen (1996a, 1996b and 1996c).

Model commands

	COMPUTATIONAL GRID							
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC		
	2D	1667	1667	0	11340	17907		
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
01	210	175	0°	360°	10°	0.166	2.0	26
02	210	175	0°	360°	10°	0.125	1.0	22
03	210	175	0°	360°	10°	0.125	1.0	22
04	210	175	0°	360°	10°	0.125	1.0	22
05	210	175	0°	360°	10°	0.125	1.0	22
06	210	175	0°	360°	10°	0.125	1.0	22
07	210	175	0°	360°	10°	0.166	2.0	26
08	210	175	0°	360°	10°	0.125	1.0	22
09	210	175	0°	360°	10°	0.125	1.0	22

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	side	N	con	read boundary from file	'f41lak01.bnd'
02	side	N	con	read boundary from file	'f41lak02.bnd'
03	side	N	con	read boundary from file	'f41lak03.bnd'
04	side	N	con	read boundary from file	'f41lak04.bnd'
05	side	N	con	read boundary from file	'f41lak05.bnd'
06	side	N	con	read boundary from file	'f41lak06.bnd'
07	side	N	con	read boundary from file	'f41lak07.bnd'
08	side	N	con	read boundary from file	'f41lak08.bnd'
09	side	N	con	read boundary from file	'f41lak09.bnd'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f41lakg.bot'	'f41lak01.wnd'		-	+0.10 m
02	'f41lakg.bot'	'f41lak02.wnd'		-	+0.30 m
03	'f41lakg.bot'	'f41lak03.wnd'		-	+0.27 m
04	'f41lakg.bot'	U_{10}: 9.1 m/s	θ_w: 286°	-	+0.19 m
05	'f41lakg.bot'	U_{10}: 7.0 m/s	θ_w: 288°	-	+0.28 m
06	'f41lakg.bot'	U_{10}: 8.3 m/s	θ_w: 287°	-	+0.27 m
07	'f41lakg.bot'	U_{10}: 4.0 m/s	θ_w: 284°	-	+0.29 m
08	'f41lakg.bot'	U_{10}: 7.3 m/s	θ_w: 288°	-	+0.28 m
09	'f41lakg.bot'	U_{10}: 8.8 m/s	θ_w: 287°	-	+0.19 m

Model results

In the Figures, the model results in terms of energy density spectra $E(f)$ and the observations for the different stations of Young and Verhagen for different wind speeds conditions are shown. For each wind speed, the computed and observed values for H_s and for T_p are given in a succeeding Figure b.

References

Young, I.R. and L.A. Verhagen, 1996a: The growth of fetch limited waves in water of finite depth. Part I: Total energy and peak frequency, *Coastal Engineering*, 29, 47-78

Young, I.R. and L.A. Verhagen, 1996b: The growth of fetch limited waves in water of finite depth. Part II: Spectral Evolution, Coastal Engineering, 29, 79-99

Young, I.R. and L.A. Verhagen, 1996c: The growth of fetch limited waves in water of finite depth. Part III: DIrectional spectra, Coastal Engineering, 29, 101-121

Taylor, P.A. and R.J. Lee, 1984: Simple guidelines for estimating wind speed variations due to small-scale topographic features, *Climatol. Bull.*, 18, 3-32

Acknowledgements

Data courtesy of I.R. Young, University of New South Wales, Canberra, Australia.

F51 Friesche Zeegat (tidal inlet in the Netherlands)

Purpose

In this test, the performance of SWAN is verified in the complex field situation of the Friesche Zeegat (the Netherlands) with tidal currents added.

Situation

The Friesche Zeegat is located between the islands of Ameland and Schiermonnikoog in the north of the Netherlands. The bathymetry, sized 15 × 25 km, is rather complex, with a water depth varying from about 2 m over the shoals at high tide to about 15 m in the tidal channels (see Figure 1). As the waves penetrate through the tidal gap, they refract out of the channels, across the shoals of the tidal flat. Behind the barrier islands, the waves completely reverse their direction due to refraction. There, they are regenerated by the local wind. It appears that the offshore waves (at least for the case considered here) hardly penetrate into the interior region because of the strong filtering effect of the shallow banks in the middle of the tidal gap. The current velocities and water levels used in the computations have been obtained with the WAQUA circulation model (Les, 1996). The wind velocity and direction have been recorded at the observation station 'Huibertgat', located north of Schiermonnikoog.

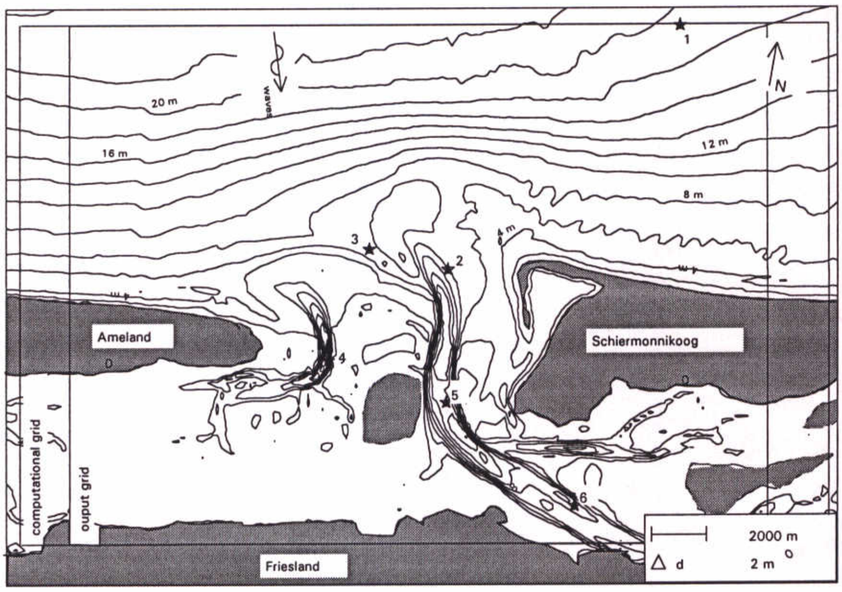


Figure 1 Bathymetry of the Friesche Zeegat (the Netherlands) with the locations of the observation stations: (1) SON, (2) NWG, (3) OWG, (4) PIG, (5) ENG and (6) RHO.

Test case description

The geographical situation of the Friesche Zeegat has been chosen, because observations are available of conditions with tidal currents (maximum speed of about 1 m/s), that have been computed with a fair degree of detail. For this verification, observations have been selected from the extensive data set:

case:

1. 09-10-1992 / 05:00 UTC flood current;
2. 09-10-1992 / 09:00 UTC high water;
3. 09-10-1992 / 11:00 UTC ebb current.

These times have been chosen, because (a) at these times, relatively high waves were observed (significant wave height about 3 m), generated by a storm in the northern North Sea, (b) during the period of these observations the wind speed was nearly constant, (c) the frequency spectrum was unimodal and (d) both tidal currents and water levels were measured.

In the SWAN computation, all physical processes except wave-induced set-up have been taken into account.

Observations

Observations are available for all observation stations (see e.g. Dunsbergen, 1995b).

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	185305	599939	10	31000	18800

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	250	200	0°	360°	10°	0.05209	1.0	24

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	on	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	side	N	con	read boundary from file	'f51fri01.bnd'
02	side	N	con	read boundary from file	'f51fri02.bnd'
03	side	N	con	read boundary from file	'f51fri03.bnd'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f51frie.bot'	U_{10}: 11.5 m/s	θ_w: 310°	'f51fri01.cur'	'f51fri01.lev'
02	'f51frie.bot'	U_{10}: 10 m/s	θ_w: 280°	'f51fri02.cur'	'f51fri02.lev'
03	'f51frie.bot'	U_{10}: 11.5 m/s	θ_w: 290°	'f51fri03.cur'	'f51fri03.lev'

Model results

In Figure F51a, the SWAN model results in terms of energy density spectra $E(f)$ and the observations for the different stations by Dunsbergen (1995b) for the situation of a flood current are shown. For the same flood current, the computed and observed values for H_s and for T_{m01} are given in Figure F51b. For high water, this information is shown in Figures F51c and F51d. Figures F51e and F51f respectively show energy density spectra and integral wave parameters for the situation of an ebb current.

References

Dunsbergen, D.W., 1995b: Verification set Friesche Zeegat -October 1, 1992- November 17, 1992-, Rep. RIKZ-95.035, Ministry of Transport, Public works and Water Management, Den Haag, The Netherlands

Les, B.A.J., 1996: Flow computations in the Friesche Zeegat (Stromingsberekeningen in het Friesche Zeegat, in Dutch) M.Sc.-thesis, Delft University of Technology, Department of Civil Engineering, The Netherlands

Acknowledgements

Data courtesy of D.W. Dunsbergen, J.H. Andorka Gal and J.G. de Ronde of the Dutch Ministry of Public Works and Coastal Management (RIKZ), Den Haag, the Netherlands.

F61 Westerschelde estuary (the Netherlands)

Purpose

The goal of this case is to test the performance of SWAN in the complex field situation of the Westerschelde (the Netherlands), in the presence of currents and wind, using nested computational grids.

Situation

The Westerschelde is an estuary of approximately 60 × 10 km^2 in the south-west of the Netherlands (see Andorka Gal and Roelse, 1997). The bathymetry varies significantly in two dimensions (see Figures 1 and 2). At its entrance, a multi-peaked wave spectrum is present, as swell is penetrating from deep water into the shallow part of the estuary and a local wind sea is generated in the inner area. Currents and wind are present. A storm event that occurred on December 20, 1991 is considered. The current velocities and water levels used in the computations have been obtained with the WAQUA circulation model (computations performed by the Dutch Ministry of Public Works and Coastal Management, RIKZ, 1999).

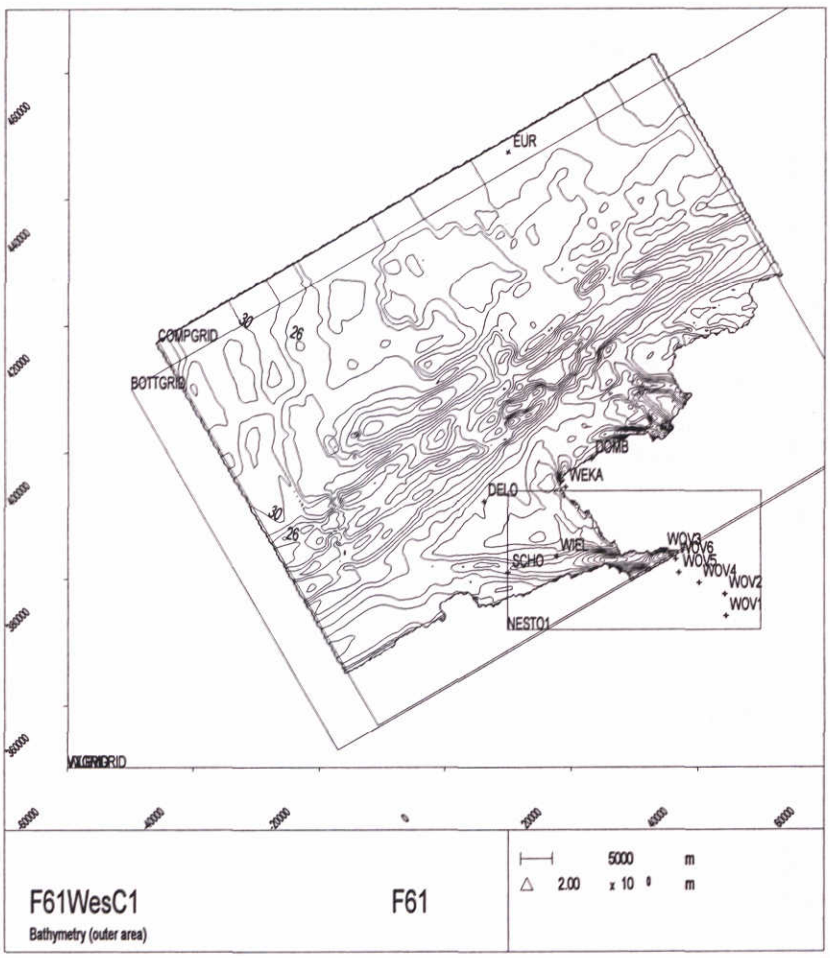


Figure 1 Bathymetry and computational grid of the outer region and the inner region of the Westerschelde (the Netherlands) with the locations of the observation stations.

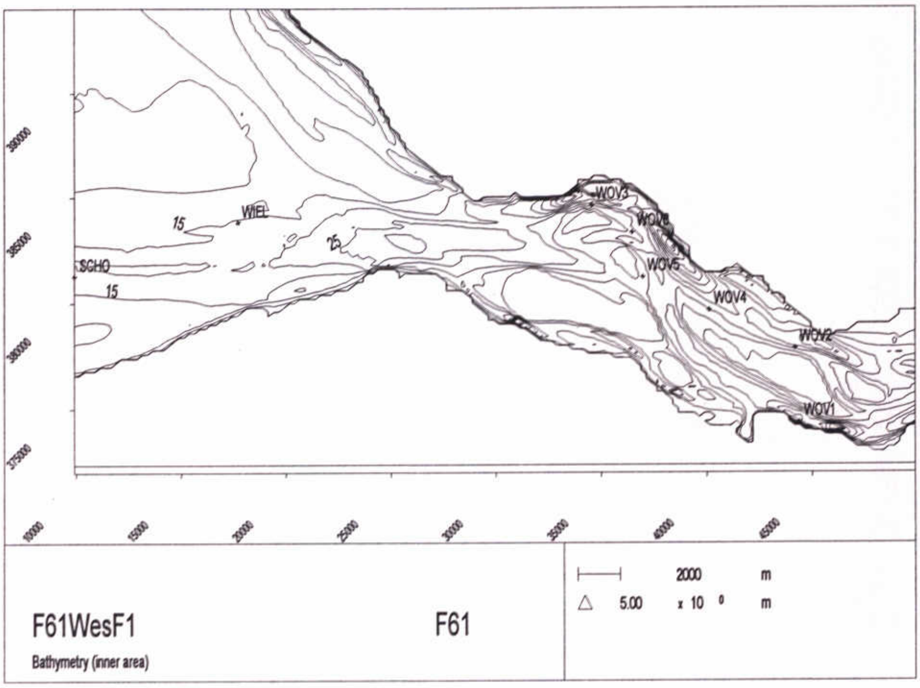


Figure 2 Bathymetry and computational grid of the inner region of the Westerschelde (the Netherlands) with the locations of the observation stations.

Test case description

In this test case, the 2D-mode of SWAN is activated. The Westerschelde has been divided into an outer region (course computational grid) and an inner region (high-resolution grid) (see Figure 1). On the same nested grid, twelve computations have been made, using twelve different boundary conditions. From the available observations, the following twelve time levels have been selected:

case:

1. 20-12-1991 / 12.00 hrs MWL = about 1.78 m +NAP;
2. 20-12-1991 / 15.00 hrs MWL = about 1.46 m +NAP;
3. 20-12-1991 / 18.00 hrs MWL = about 0.45 m +NAP;
4. 20-12-1991 / 21.00 hrs MWL = about 0.63 m +NAP;
5. 25-01-1990 / 18.00 hrs MWL = about 0.00 m +NAP;
6. 25-01-1990 / 19.00 hrs MWL = about 0.07 m +NAP;
7. 25-01-1990 / 20.00 hrs MWL = about 0.23 m +NAP;
8. 25-01-1990 / 21.00 hrs MWL = about 0.37 m +NAP;
9. 25-01-1990 / 22.00 hrs MWL = about 0.47 m +NAP;
10. 25-01-1990 / 23.00 hrs MWL = about 0.75 m +NAP;
11. 13-03-1992 / 09.30 hrs MWL = about 1.16 m +NAP;
12. 13-03-1992 / 10.30 hrs MWL = about 0.89 m +NAP.

All physical processes (except wave-induced setup) have been activated. In the computations, the wind velocity U_{10} varies. Generally, in the outer region the wind speed is slightly higher than in the inner region (which is in agreement with the observations). The boundary for the computations on the nested grid are obtained from the results of the computations on the course grid. Output is generated at 12 different locations (see Figures 1 and 2).

Observations

At a number of twelve locations, observations are available during the storm event (from the Dutch Ministry of Public Works and Coastal Management RIKZ, 1999).

Model commands (outer region)

	COMPUTATIONAL GRID							
	SET	1D/2D	XPC	YPC	ALPC	XLENC	YLENC	
	nautical	2D	-45669	417500	300	70000	90000	
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	500	1000	0°	360°	15°	0.05	0.8	29

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	on	off

	BOUNDARY CONDITIONS											
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	LEN	HS	PER	DIR	DD
01	side	NW	con	par	Jonswap	peak	degrees	-	4.15	8.38	277	39
01	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.15	8.38	277	39
01								58000	4.15	8.38	277	39
02	side	NW	con	par	Jonswap	peak	degrees	-	3.63	7.98	280	42
02	side	NE/SE	var	par	Jonswap	peak	degrees	0	3.63	7.98	280	42
02								58000	3.63	7.98	280	42
03	side	NW	con	par	Jonswap	peak	degrees	-	4.84	8.91	291	37
03	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.84	8.91	291	37
03								58000	4.84	8.91	291	37
04	side	NW	con	par	Jonswap	peak	degrees	-	4.45	9.18	292	36
04	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.45	9.18	292	36
04								58000	4.45	9.18	292	36
05	side	NW	con	par	Jonswap	peak	degrees	-	6.63	10.64	240	29
05	side	NE/SE	var	par	Jonswap	peak	degrees	0	6.63	10.64	240	29
05								58000	6.63	10.64	240	29
06	side	NW	con	par	Jonswap	peak	degrees	-	6.17	10.37	249	31
06	side	NE/SE	var	par	Jonswap	peak	degrees	0	6.17	10.37	249	31
06								58000	6.17	10.37	249	31
07	side	NW	con	par	Jonswap	peak	degrees	-	5.55	9.98	250	36
07	side	NE/SE	var	par	Jonswap	peak	degrees	0	5.55	9.98	250	36
07								58000	5.55	9.98	250	36
08	side	NW	con	par	Jonswap	peak	degrees	-	5.47	10.24	252	30
08	side	NE/SE	var	par	Jonswap	peak	degrees	0	5.47	10.24	252	30
08								58000	5.47	10.24	252	30
09	side	NW	con	par	Jonswap	peak	degrees	-	4.94	9.58	252	32
09	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.94	9.58	252	32
09								58000	4.94	9.58	252	32
10	side	NW	con	par	Jonswap	peak	degrees	-	4.65	9.31	250	35
10	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.65	9.31	250	35
10								58000	4.65	9.31	250	35
11	side	NW	con	par	Jonswap	peak	degrees	-	3.42	7.58	247	43
11	side	NE/SE	var	par	Jonswap	peak	degrees	0	3.42	7.58	247	43
11								58000	3.42	7.58	247	43
12	side	NW	con	par	Jonswap	peak	degrees	-	3.30	7.71	246	44
12	side	NE/SE	var	par	Jonswap	peak	degrees	0	3.30	7.71	246	44
12								58000	3.30	7.71	246	44

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f61wesc.bot'	U_{10}: 17.5 m/s	θ_w: 270°	'f61wes01.cur'	'f61wes01.lev'
02	'f61wesc.bot'	U_{10}: 18. m/s	θ_w: 280°	'f61wes02.cur'	'f61wes02.lev'
03	'f61wesc.bot'	U_{10}: 18.5 m/s	θ_w: 290°	'f61wes03.cur'	'f61wes03.lev'
04	'f61wesc.bot'	U_{10}: 16 m/s	θ_w: 290°	'f61wes04.cur'	'f61wes04.lev'
05	'f61wesc.bot'	U_{10}: 27 m/s	θ_w: 230°	'f61wes05.cur'	'f61wes05.lev'
06	'f61wesc.bot'	U_{10}: 28 m/s	θ_w: 240°	'f61wes06.cur'	'f61wes06.lev'
07	'f61wesc.bot'	U_{10}: 24 m/s	θ_w: 240°	'f61wes07.cur'	'f61wes07.lev'
08	'f61wesc.bot'	U_{10}: 21 m/s	θ_w: 250°	'f61wes08.cur'	'f61wes08.lev'
09	'f61wesc.bot'	U_{10}: 22 m/s	θ_w: 240°	'f61wes09.cur'	'f61wes09.lev'
10	'f61wesc.bot'	U_{10}: 19.5 m/s	θ_w: 240°	'f61wes10.cur'	'f61wes10.lev'
11	'f61wesc.bot'	U_{10}: 15.5 m/s	θ_w: 245°	'f61wes11.cur'	'f61wes11.lev'
12	'f61wesc.bot'	U_{10}: 15.8 m/s	θ_w: 250°	'f61wes12.cur'	'f61wes12.lev'

Model commands (inner region)

COMPUTATIONAL GRID

1D/2D	XPC	YPC	ALPC	XLENC	YLENC
2D	10000	372000	0	40000	22000

ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
250	200	0°	360°	15°	0.05	0.8	29

PHYSICS

GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
3	on	on	on	on	on	on	on	off

	BOUNDARY CONDITIONS
01	'f61wsf01.nst'
02	'f61wsf02.nst'
03	'f61wsf03.nst'
04	'f61wsf04.nst'
05	'f61wsf05.nst'
06	'f61wsf06.nst'
07	'f61wsf07.nst'
08	'f61wsf08.nst'
09	'f61wsf09.nst'
10	'f61wsf10.nst'
11	'f61wsf11.nst'
12	'f61wsf12.nst'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f61wesf.bot'	U_{10}: 14.5 m/s	θ_w: 280°	'f61wes01.cur'	'f61wes01.lev'
02	'f61wesf.bot'	U_{10}: 16 m/s	θ_w: 290°	'f61wes02.cur'	'f61wes02.lev'
03	'f61wesf.bot'	U_{10}: 14 m/s	θ_w: 290°	'f61wes03.cur'	'f61wes03.lev'
04	'f61wesf.bot'	U_{10}: 13.5 m/s	θ_w: 290°	'f61wes04.cur'	'f61wes04.lev'
05	'f61wesf.bot'	U_{10}: 24.5 m/s	θ_w: 240°	'f61wes05.cur'	'f61wes05.lev'
06	'f61wesf.bot'	U_{10}: 23 m/s	θ_w: 240°	'f61wes06.cur'	'f61wes06.lev'
07	'f61wesf.bot'	U_{10}: 22 m/s	θ_w: 240°	'f61wes07.cur'	'f61wes07.lev'
08	'f61wesf.bot'	U_{10}: 19.5 m/s	θ_w: 250°	'f61wes08.cur'	'f61wes08.lev'
09	'f61wesf.bot'	U_{10}: 19.5 m/s	θ_w: 250°	'f61wes09.cur'	'f61wes09.lev'
10	'f61wesf.bot'	U_{10}: 19 m/s	θ_w: 250°	'f61wes10.cur'	'f61wes10.lev'
11	'f61wesf.bot'	U_{10}: 18.8 m/s	θ_w: 250°	'f61wes11.cur'	'f61wes11.lev'
12	'f61wesf.bot'	U_{10}: 18.3 m/s	θ_w: 250°	'f61wes12.cur'	'f61wes12.lev'

Model results

Model results in terms of energy density spectra *E(f)* and observations for the different stations for case a are shown in Figure F61a (outer region) and F61b (inner region). For the other cases, the same information is shown in Figures F61c through F61x.

References

Kamsteeg, A.T., J.H. Andorka Gal, J.G. de Ronde and J.C.M. de Jong, 1998:"Wave boundary conditions on the Westerschelde, given a 1/4000 wind velocity" (in Dutch: "Golfrandvoorwaarden op de Westerschelde gegeven een 1/4000 windsnelheid"), RIKZ report no. 98.018, Ministry of Transport, Public Works and Water Management, Den Haag, The Netherlands

Andorka Gal, J.H. and P. Roelse, 1997: Wave modelling in the Westerschelde estuary and wave conditions along the sea defences (Westerschelde golfmodellering en golfrandvoorwaarden voor de dijkvakken, in Dutch), Rep. RIKZ/AB-96.868x, Ministry of Transport, Public Works and Water Management, Den Haag, The Netherlands

Acknowledgements

Data courtesy of J.G. de Ronde and J.H. Andorka Gal of the Dutch Ministry of Public Works and Coastal Management (RIKZ), Den Haag, the Netherlands.

F62 Westerschelde estuary (the Netherlands)

Purpose

The goal of this case is to test the performance of SWAN in the complex field situation of the Westerschelde (the Netherlands), in the presence of currents and wind, using a curvilinear grid.

Situation

The Westerschelde Estuary is an estuary of approximately 60 × 10 km^2 in the south-west of the Netherlands (see Kamsteeg et al., 1998). The bathymetry varies significantly in two dimensions (Figure 1). Since in this test case wave propagation and transformation on curvi-linear grids is considered, the incident wave and wind conditions have been chosen arbitrarily. At the entrance of the Westerschelde Estuary, swell is penetrating from deep water into the branch. In the inner area of the Westerschelde estuary, a local sea is generated by a relatively strong wind.

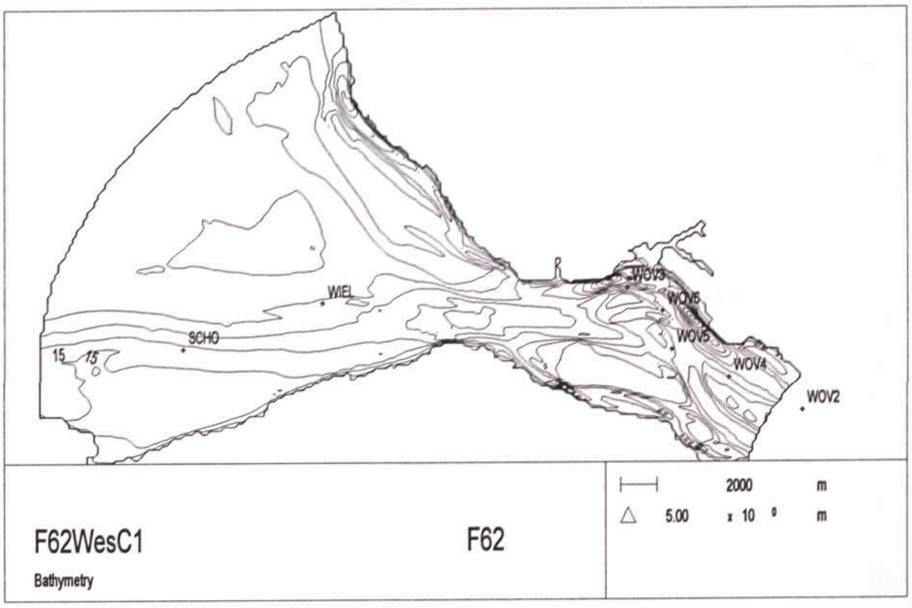


Figure 1 Bathymetry of the Westerschelde (the Netherlands) on a curvi-linear grid

Test case description

In this test case, the 2D-mode of SWAN is activated. A computation is performed, using a curvilinear computational grid, consisting of 178 meshes in x- and 504 meshes in y-direction (see Figure 2). As the up-wave boundary condition, only the low-frequent peak of the input spectrum is specified. This is a Jonswap spectrum with a significant wave height of 3.5 m, a peak period of 12 seconds and a directional distribution of $\cos^6$. All physical processes are activated. Output is generated at a number of locations (from x=14.5 km, y=388.064 km to x=39 km, y=381.499 km)

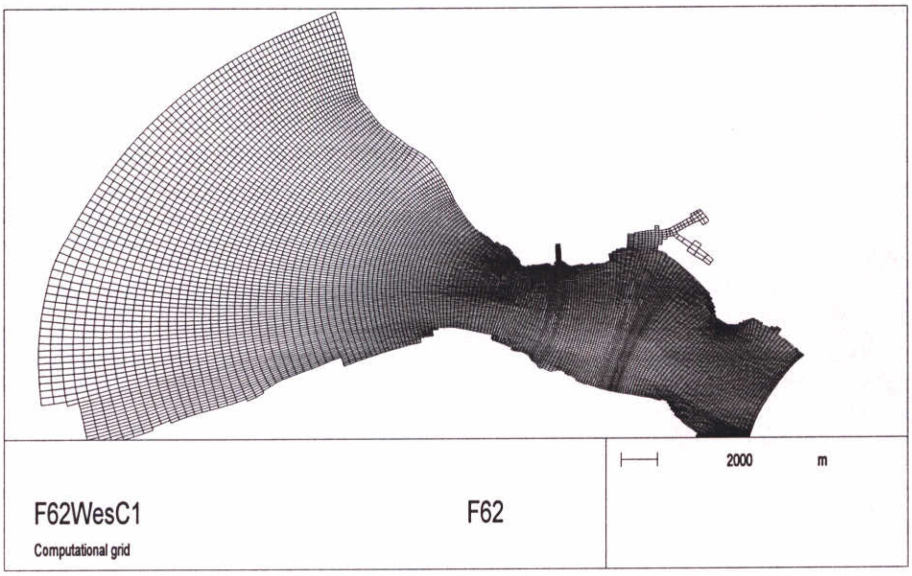


Figure 2 Curvi-linear grid for SWAN in the Westerschelde region.

Observations

-

Model commands

	COMPUTATIONAL GRID										
	1D/2D	CURVI GRID	MXC	MYC							
	2D	'f62wes01.grd'	178	504							
	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC					
	0°	360°	20°	0.05	0.8	20					
	PHYSICS										
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP		
	3	on	on	on	on	on	off	off	off		
	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	HS	PER	PDIR	DD
	side	W	con	par	Jonswap	peak	power	3.5	12	325	6
	BOTTOM:	**WIND:**		**CURRENT:**	**WATER LEVEL:**						
	'f62west.bot'	U_{10}=20m/s	θ_w=280°	-	+ 4 m						

Model results

To test wave propagation and transformation on a curvi-linear grid, in Figure F62a, SWAN model results in terms of energy density spectra *E(f)* at different stations are shown and mutually compared.

References

Kamsteeg, A.T., J.H. Andorka Gal, J.G. de ronde and J.C.M. de Jong, 1998:"Wave boundary conditions on the Westerschelde, given a 1/4000 wind velocity" (in Dutch: "Golfrandvoorwaarden op de Westerschelde gegeven een 1/4000 windsnelheid"), RIKZ report no. 98.018

Acknowledgements

Data courtesy of J.G. de Ronde and J.H. Andorka Gal of the Dutch Ministry of Public Works and Coastal Management (RIKZ), Den Haag, the Netherlands.

F71 Mediterranean Sea

Purpose

In this test, the performance of the non-stationary mode of SWAN is verified in the Mediterranean Sea (Europe).

Situation

The Mediterranean Sea can be characterised as a closed, relatively deep basin (water depths larger than 1000 m). Its size in x-direction is taken 3696 km and in y-direction it is 1792 km (see Figure 1). Due to this size, computations must be made using a non-stationary mode of SWAN. Together with the Mediterranean climate, this makes it suitable for deep water wave growth studies. Waves are mainly determined by the presence of wind; it is assumed that ocean swell is absent. Also currents are assumed to be absent.

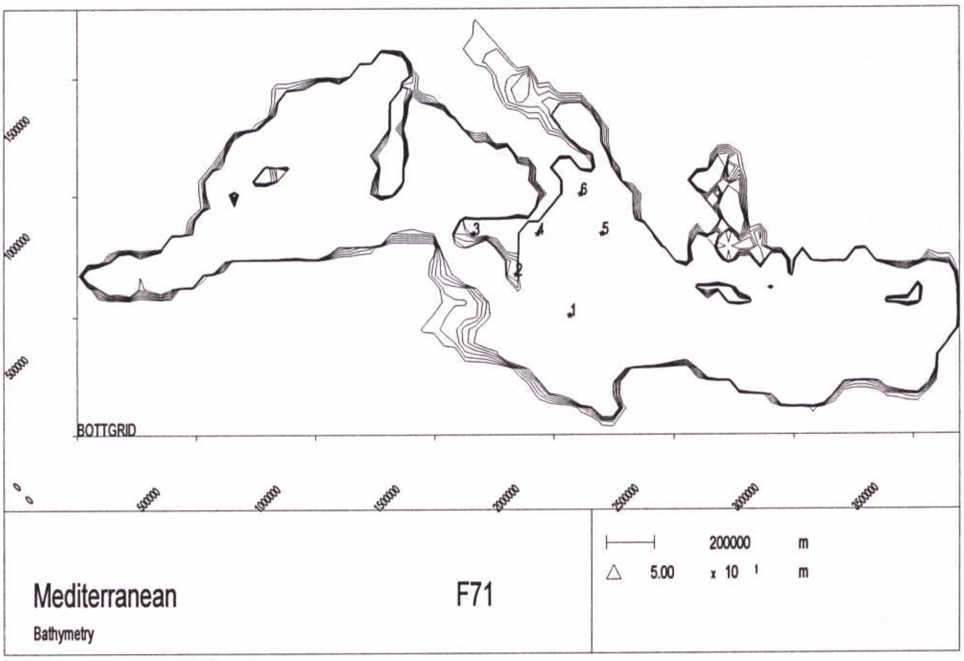


Figure 1 Bathymetry of the Mediterranean Sea (Europe) with the locations of the observation stations: (1) Sirte, (2) Malta, (3) Mazara, (4) Catania, (5) Jonio, (6) Crotonio.

Test case description

In this test case, the 2D-dynamic, third-generation mode of SWAN is activated. Dynamic wind information is put into the SWAN model on the same grid points. As the area is a closed system, initial boundary conditions for the non-stationary wave computations consist of a zero energy wave field. Thus, the dynamic wave growth effects are isolated from other influences. Apart from the processes of depth-induced wave breaking, quadruplets and whitecapping (default in the third-generation mode), no other physical processes are activated in SWAN.

Observations

Observations in terms of integral wave parameters (H_s and T_{m01}) are available at a limited number of locations only (i.e. Mazara, Catania and Crotone).

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D dynamic	0	0	0	3696000	1792000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	44000	56000	0°	360°	10°	0.04	1.0	30

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	off	off	on	on	off	off	off

	BOUNDARY CONDITIONS
	-

	BOTTOM:	WIND:	CURRENT:	WATER LEVEL:
	'f71meds.bot'	'f71med01.wnd' nonstat	-	-

Model results

For six locations, called Sirte, Malta, Mazara, Catania, Jonio and Crotone, model results are shown in Figures F71a (H_s as a function of time) and F71b (T_{m01} as a function of time). In the same figures, observations of 3 stations and results of WAM computations are given for comparison (both ECMWF LAM-wind and GM-wind).

References

Komen, G.J. et al., 1994: *Dynamics and Modelling of Ocean Waves*, Cambridge University Press, 532 p.

Holthuijsen, L.H., N. Booij and L. Bertotti, 1996: The propagation of wind errors through ocean wave hindcasts, *J. of Offshore Mech. and Arctic Eng.*, 118, 184-189

Acknowledgements

Data courtesy of L. Cavaleri from Instituto per lo Studio della Grandi Masse, Venice, Italy. Wind fields courtesy of European Centre for Medium-Range Weather Forecasts (ECMWF), England.

F81 Norderneyer Seegat (tidal inlet in Germany)

Purpose

In this test, the performance of SWAN is verified in the complex field situation of the Norderneyer Seegat (Germany).

Situation

The Norderneyer Seegat is a tidal inlet situated between the barrier islands of Norderney and Juist (East-Frisian Islands in the north of Germany). The region behind the inlet is an inter-tidal area with shoals and channels over a distance of 7.5 km to the main land. The bathymetry for the 20 km x 25 km area is shown in Figure 1. The main channel (Norderneyer Riffgat, with a maximum depth of 16 m) penetrates deep around the head of Norderney to the east. Two smaller channels bifurcate from the Norderneyer Seegat to the south and south-west. North of the inlet lies a sandbank on which most waves coming from the North Sea break. Due to wind effects, in the inlet and behind the islands a local wind sea is generated.

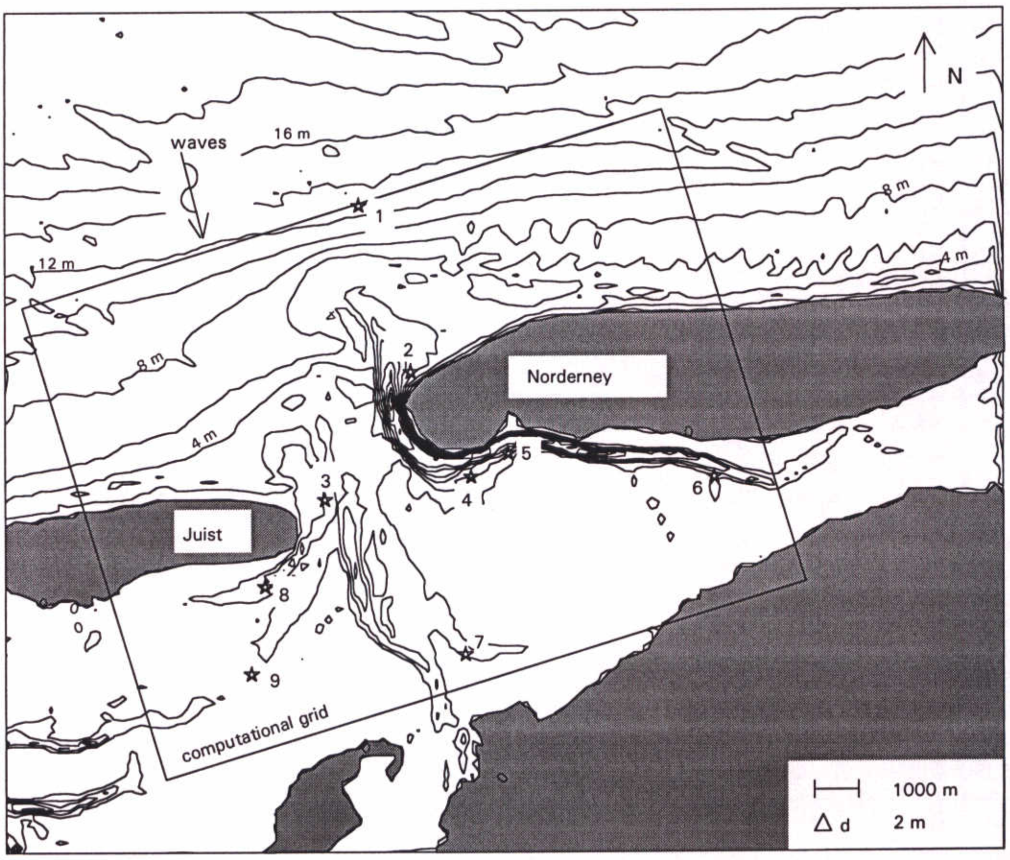


Figure 1 Bathymetry of the Norderneyer Seegat (Germany) with the locations of the nine observation stations.

Test case description

The geographical situation of the Norderneyer Seegat has been chosen, because wave observations are available at a high and low water situation (practically no tidal currents are present). For this verification, four typical high and low water situations have been selected:

case:

1. 17-11-1995 / 3.58 UTC a high tide case;
2. 16-11-1995 / 21.58 UTC a low tide case;
3. 19-11-1995 / 7.59 UTC a high tide case;
4. 16-11-1995 / 4.58 UTC a high tide case.

In the SWAN computation, all physical processes except wave-induced set-up have been taken into account.

Observations

Observations are available for all time levels.

Model commands

COMPUTATIONAL GRID

1D/2D	XPC	YPC	ALPC	XLENC	YLENC
2D	66389	55613	287	11130	15200

ΔX	ΔY	DIR1	DIR2	$\Delta\theta$	FLOW	FHIGH	MSC
100	100	0°	360°	10°	0.04545	1.0	32

PHYSICS

GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
3	on	on	on	on	on	on	on	off

BOUNDARY CONDITIONS

	TYPE	BOU	C/V	P/R	NAME OF FILE
01	side	N	con	read boundary from file	'f81nor01.bnd'
02	side	N	con	read boundary from file	'f81nor02.bnd'
03	side	N	con	read boundary from file	'f81nor03.bnd'
04	side	N	con	read boundary from file	'f81nor04.bnd'

	BOTTOM:	WIND:		CURRENT:	WATER LEVEL:
01	'f81nord.bot'	U_{10}: 8 m/s	θ_w: 292°	-	MSL +1.42 m
02	'f81nord.bot'	U_{10}: 13 m/s	θ_w: 315°	-	MSL -0.07 m
03	'f81nord.bot'	U_{10}: 11.5 m/s	θ_w: 290°	-	MSL +1.75 m
04	'f81nord.bot'	U_{10}: 5 m/s	θ_w: 70°	-	MSL +1.11 m

Model results

In Figure F81a, the SWAN model results in terms of energy density spectra *E(f)* and the observations for the different stations for the first case (high tide) are shown. For the same case, the computed and observed values for H_s and for T_{m01} are given in Figure F81b. For the second case (low tide), this information is shown in Figures F81c and F81d. Figures F81e and F81f respectively show energy density spectra and integral wave parameters for the third case (high tide), and F81g and F81h for the fourth (high tide).

References

Niemeyer, H. D. and R. Kaiser, 1997: Variationen im lokalen Seegangsklimas infolge morphologischer Anderungen im Riffbogen. Berichte der Forschungsstelle Kuste, Band 41, 107-117, Norderney.

Acknowledgements

Data courtesy of H. Niemeyer and R. Kaiser of the State Coastal Research Station at Norderney, Germany.

F91 Petten (shallow foreshore in the Netherlands)

Purpose

In this test, the performance of SWAN is verified in the complex field situation of the shallow foreshore next to the Petten See Defence (the Netherlands).

Situation

At the Petten area, the bottom profile is dominated by the presence of a long system of shoals (see Figure 1). Shortcrested waves approach the shore almost perpendicularly. Currents are asssumed to be absent. The water level varies from 1.60 m in case (e) to 2.18 m in case (c). The wind direction and speed are as observed.

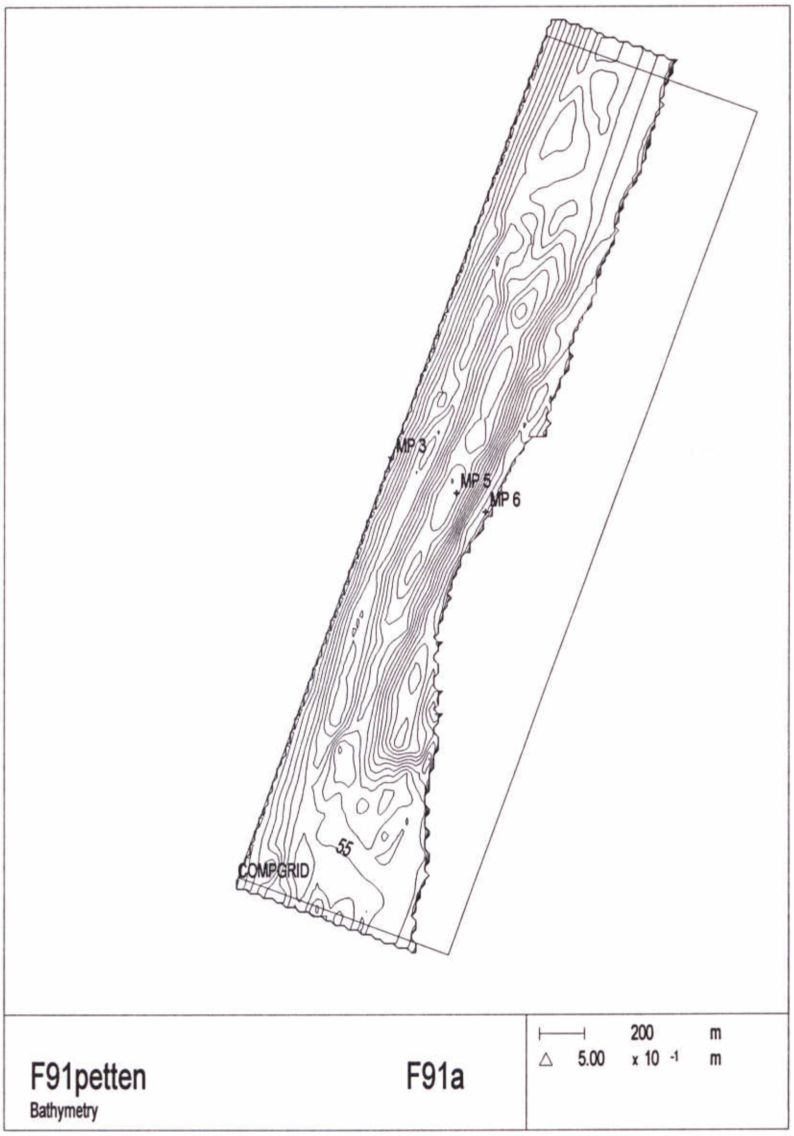


Figure 1 Bathymetry of Petten with the locations of the three observation stations.

Test case description

In this test case, the 2D-mode of SWAN is activated. From the measurement data, six different time levels have been selected for the cases:

case:
1. 01-01-1995/ 15.40 UTC;
2. 01-01-1995/ 17.00 UTC;
3. 02-01-1995/ 04.00 UTC;
4. 02-01-1995/ 05.40 UTC;
5. 02-01-1995/ 16.20 UTC;
6. 10-01-1995/ 11.00 UTC.

For each case, the wind speed U_{10} is assumed to be constant over the area considered. All physical processes are activated in SWAN except wave-induced setup.

Observations

Observations are available at three observation stations, MP3, MP5 and MP6.

Model commands

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	104546	530111	-20	1000	4000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	10	100	0°	360°	10°	0.04	0.5	27

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	off	off

	BOUNDARY CONDITIONS				
	TYPE	BOU	C/V	P/R	NAME OF FILE
01	side	W	con	read boundary from file	'f91pet01.bnd'
02	side	W	con	read boundary from file	'f91pet02.bnd'
03	side	W	con	read boundary from file	'f91pet03.bnd'
04	side	W	con	read boundary from file	'f91pet04.bnd'
05	side	W	con	read boundary from file	'f91pet05.bnd'
06	side	W	con	read boundary from file	'f91pet06.bnd'

	BOTTOM:	**WIND:**		**CURRENT:**	**WATER LEVEL:**
01	'f91pett.bot'	U_{10}: 17.3 m/s	θ_w: 293°	-	+2.10 m
02	'f91pett.bot'	U_{10}: 19.1 m/s	θ_w: 283°	-	+2.01 m
03	'f91pett.bot'	U_{10}: 17.3 m/s	θ_w: 316°	-	+2.18 m
04	'f91pett.bot'	U_{10}: 18.5 m/s	θ_w: 314°	-	+1.64 m
05	'f91pett.bot'	U_{10}: 11.5 m/s	θ_w: 350°	-	+1.60 m
06	'f91pett.bot'	U_{10}: 13.6 m/s	θ_w: 274°	-	+2.00 m

Model results

In the Figures F91a, F91c, F91e, F91g, F91i and F91k, the model results for the six time levels are shown in terms of energy density spectra *E(f)* and the observations for the three stations. The model results for the different stations in terms of integral wave parameters (water depth *D*, significant wave height H_s and mean wave period T_{m01}) are given in Figures F91b, F91d, F91f, F91h, F91j and F91l.

References

Andorka Gal, J.H., L.H. Holthuijsen, J.C.M. de Jong and A.T.M.M. Kieftenburg, 1998, Wave transformation near a quasi-1D coast, 26th Int. Conf. Coastal Engng., Copenhagen,150-160

Acknowledgements

Data courtesy of J.H. Andorka Gal and J.G. de Ronde of the Dutch Ministry of Public Works and Coastal Management (RIKZ), Den Haag, the Netherlands.

03

Figures

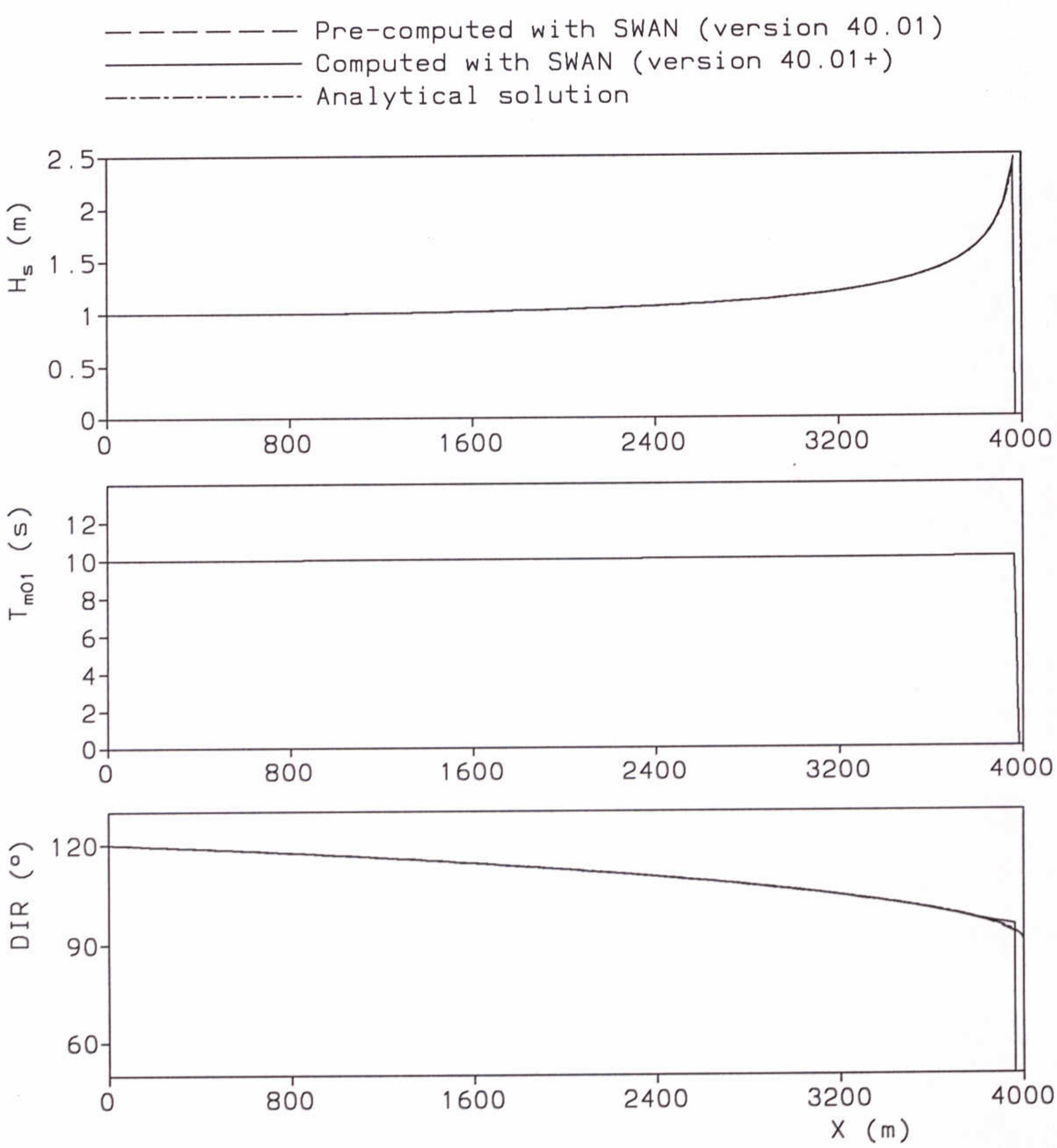
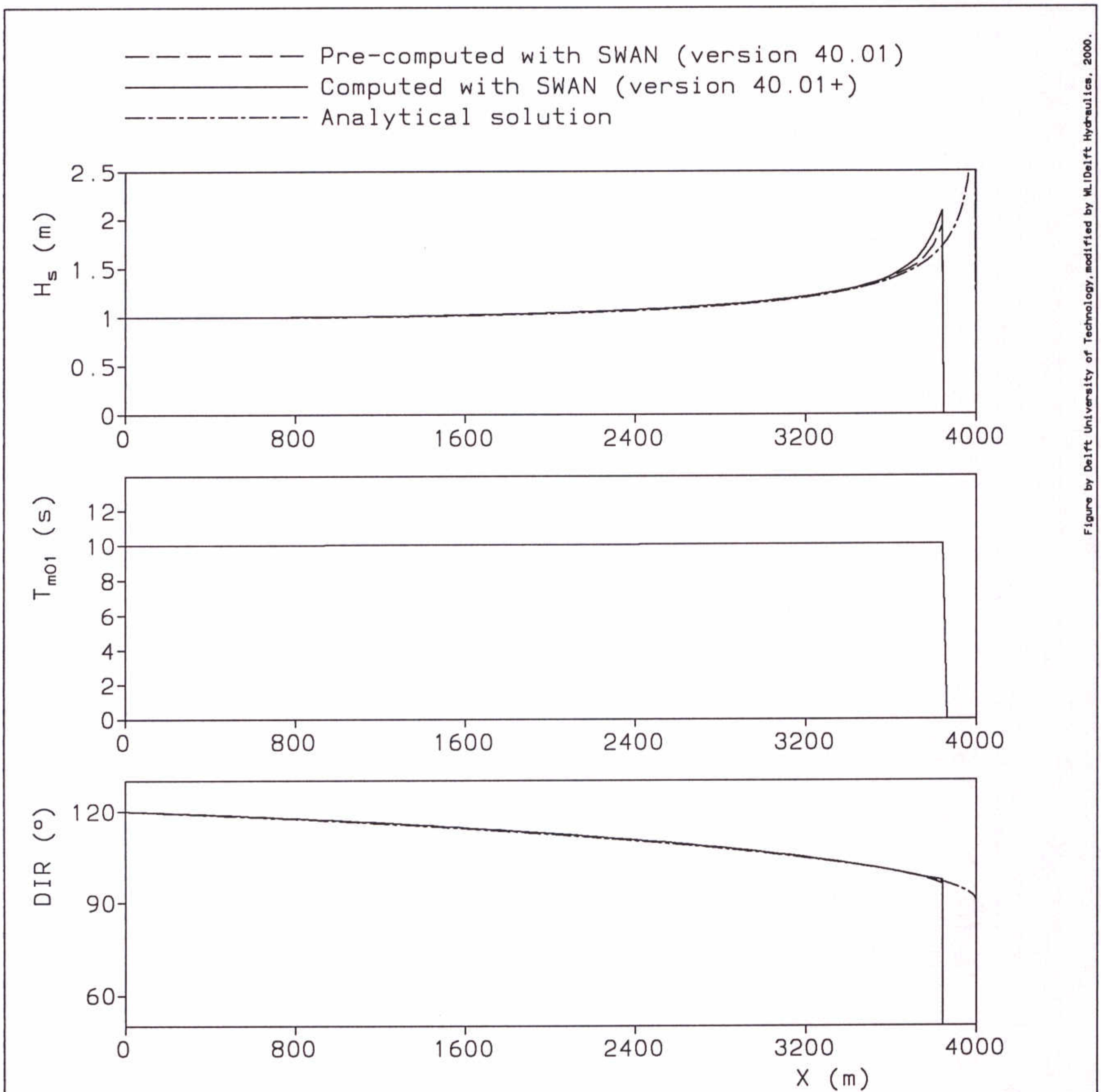


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A11ref01 A11

Depth refraction on plane beach



A12ref01 A12

As A11: grid 10 deg rotated

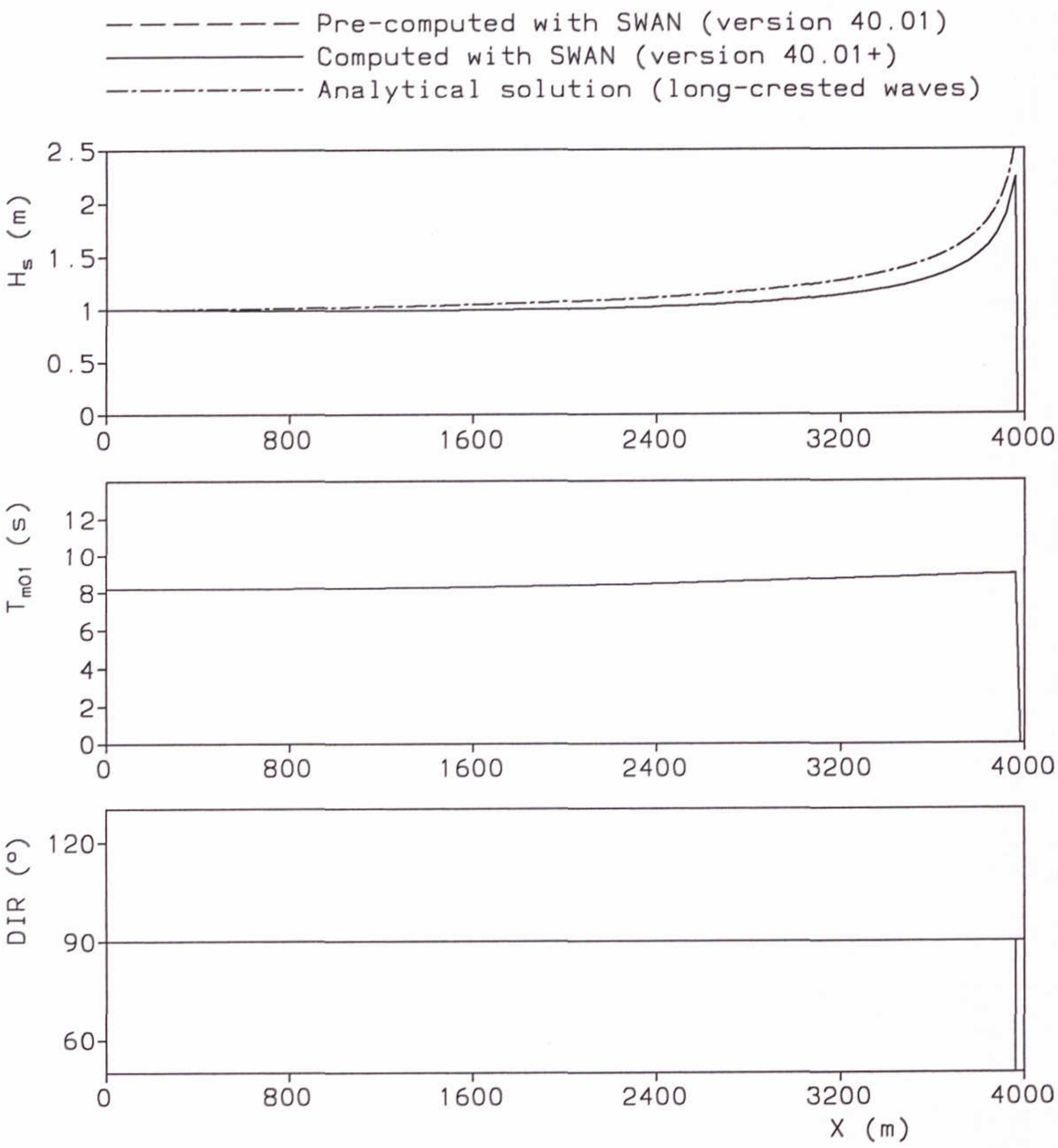
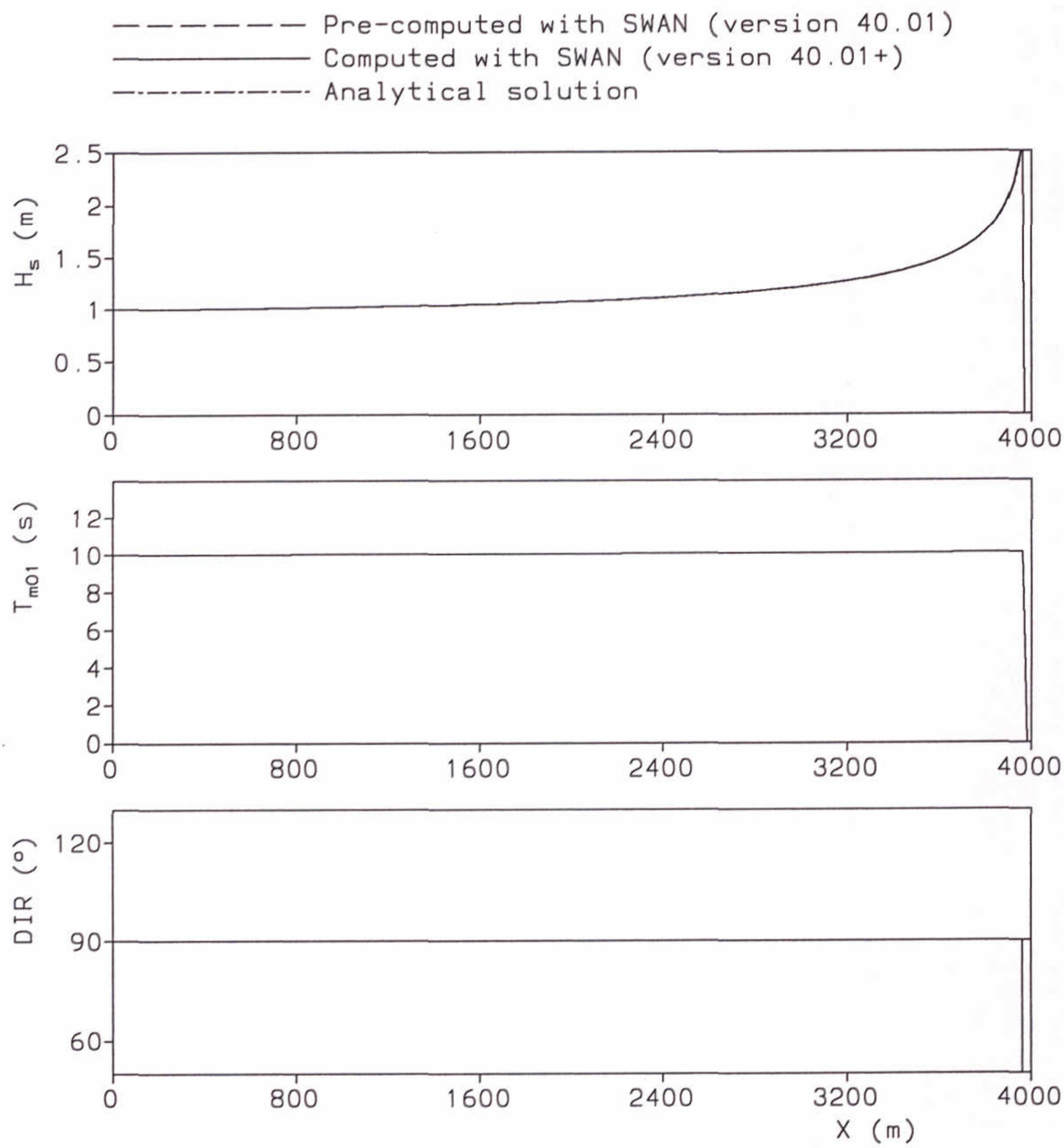


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

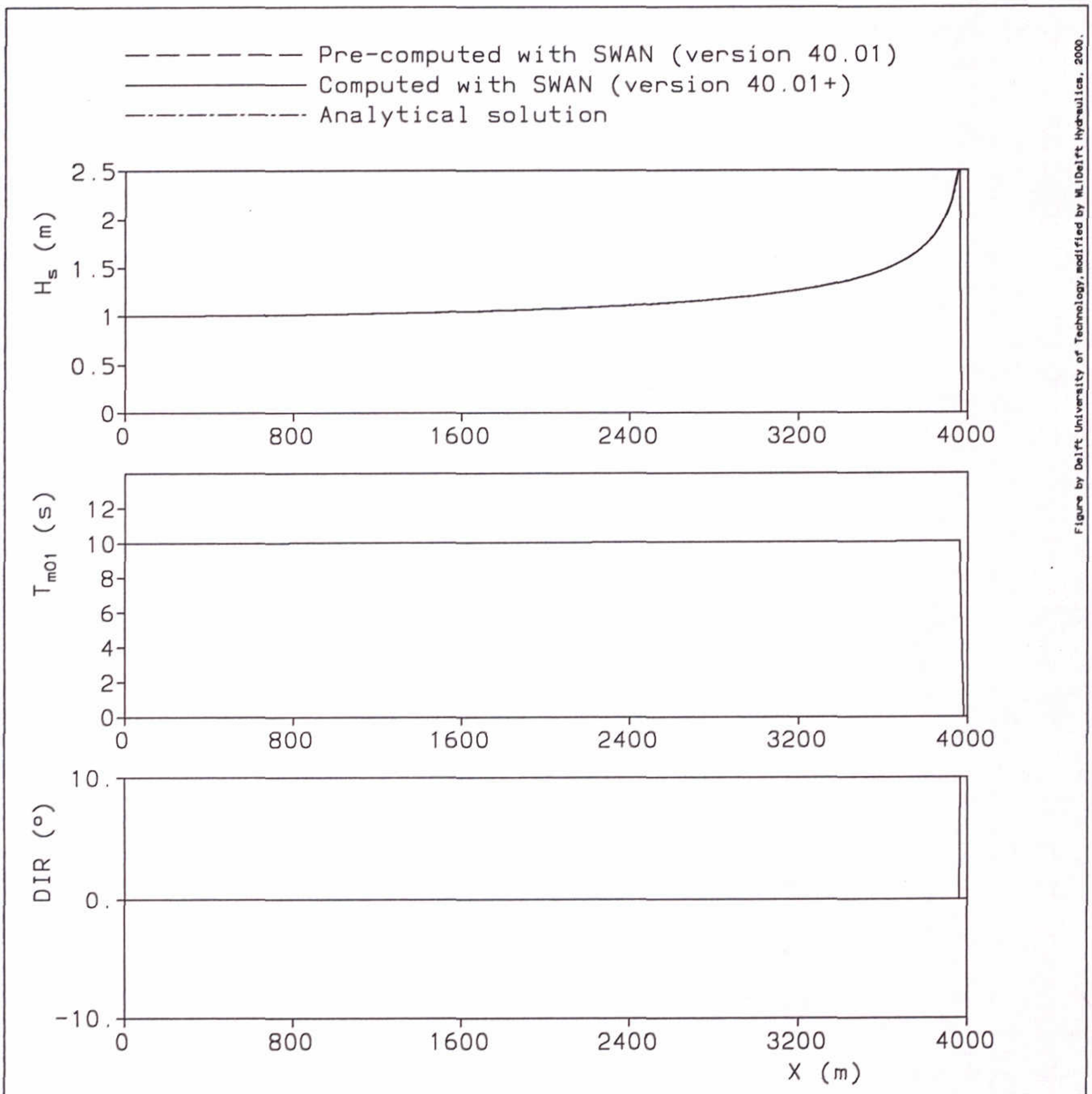
A21sho01 A21

Shoaling with cos^2-distribution



A22sho01 A22

As A21: but cos^500-distribution



A23sho01 A23

As A21: but cos^500 dist., SWAN-1D

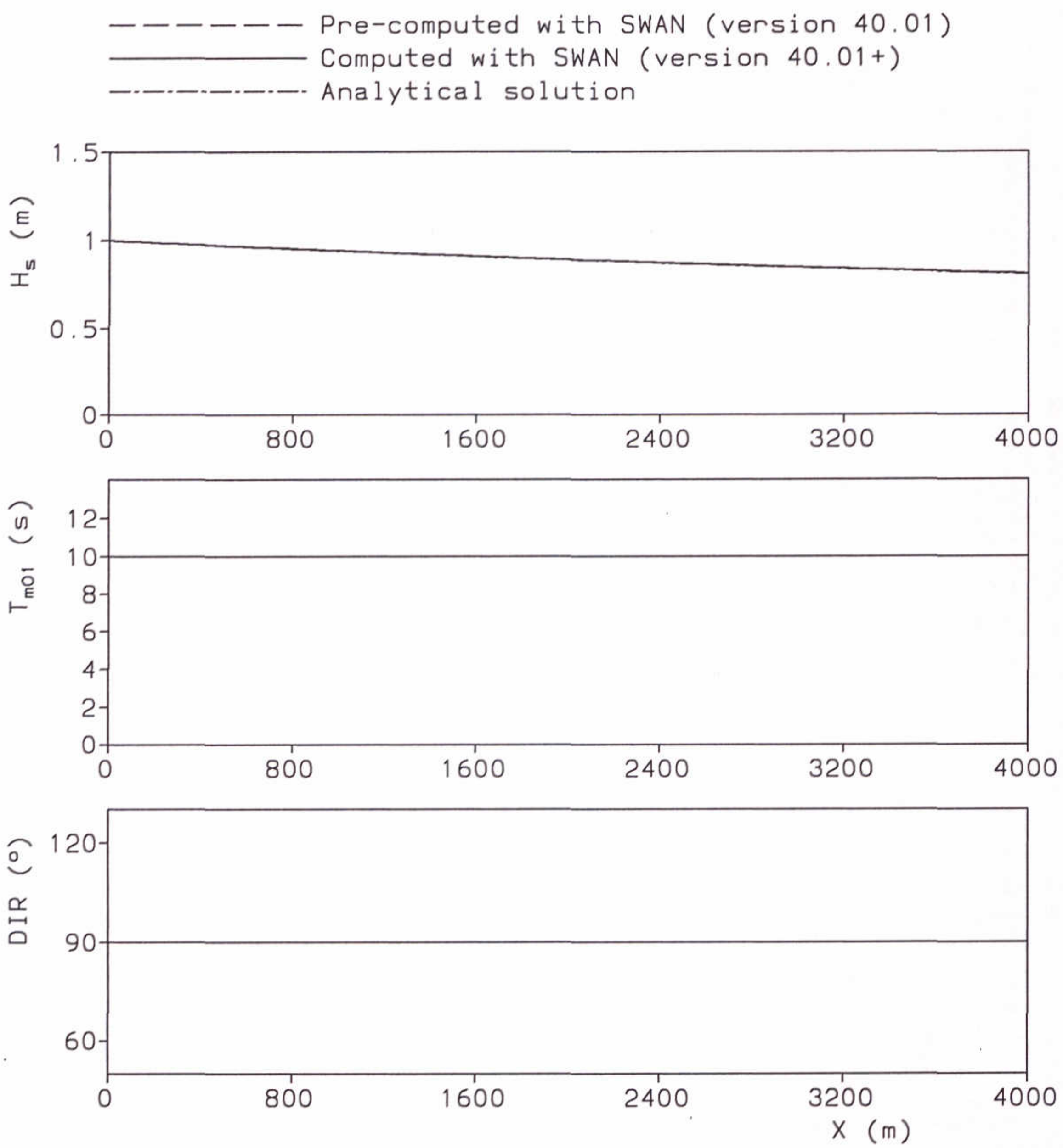


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A31cur01 A31

Following current

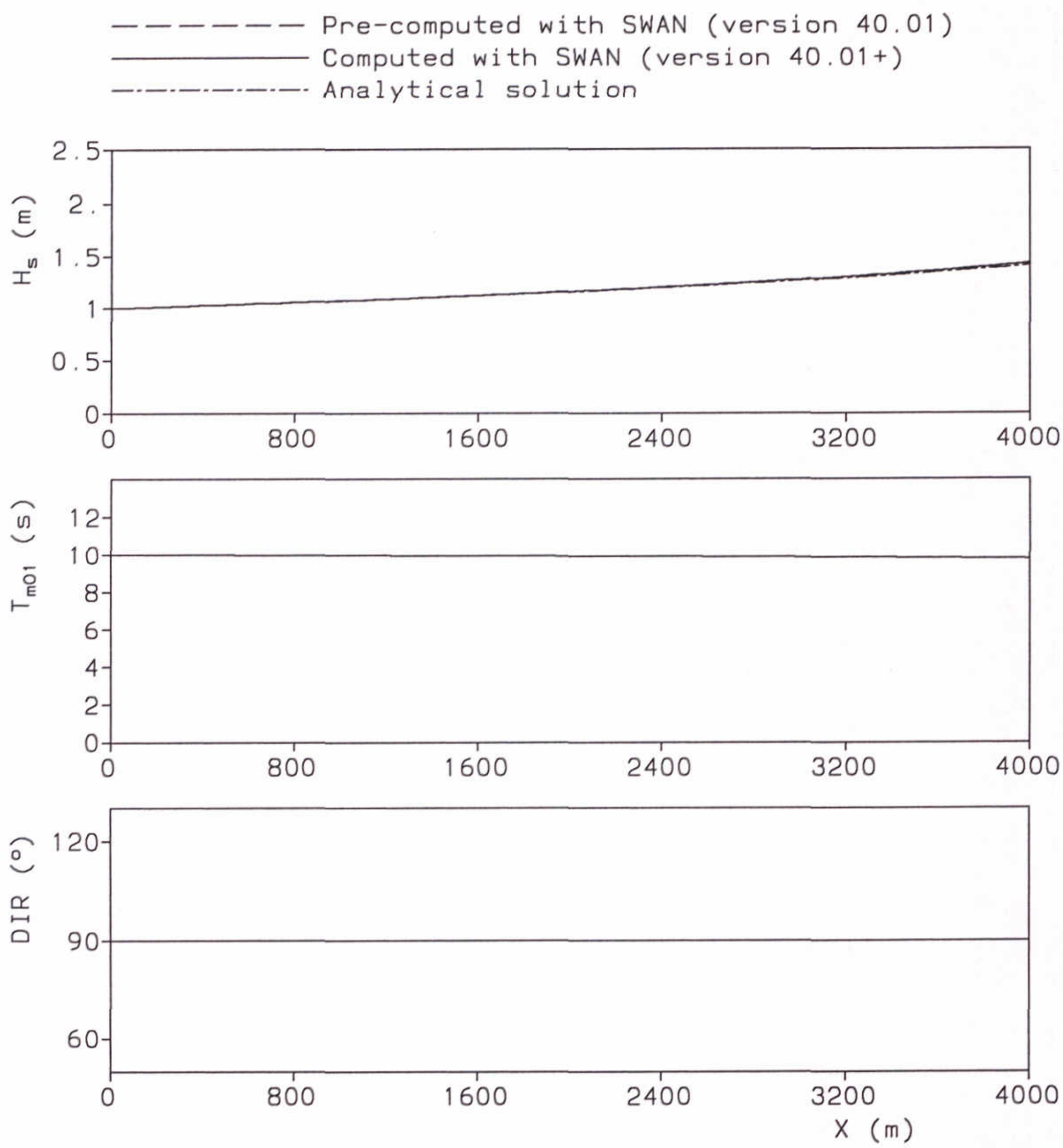


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A32cur01 A32

Opposing current

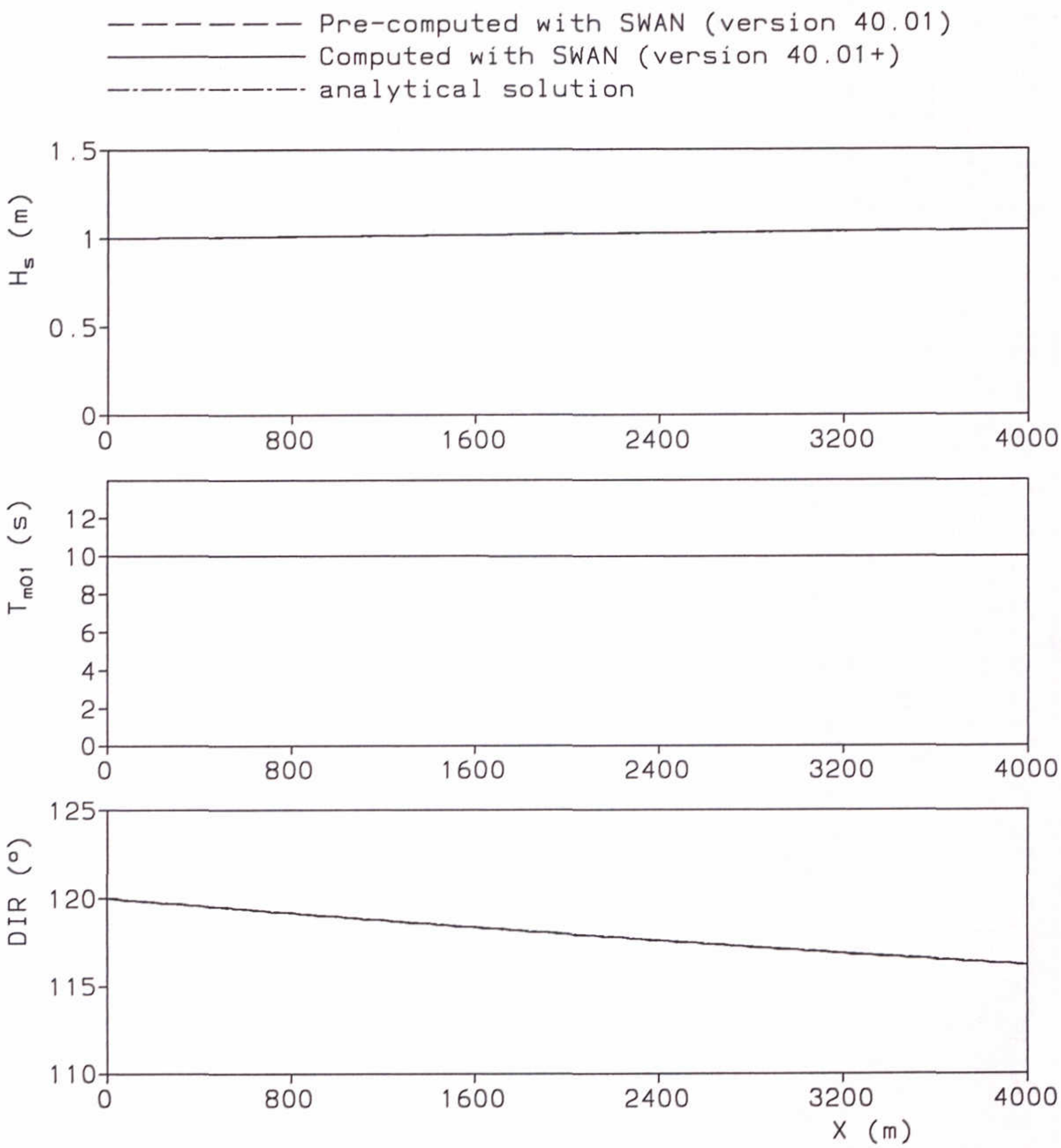


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A33cur01 A33

Slanting current (DIR(waves) = 120o)

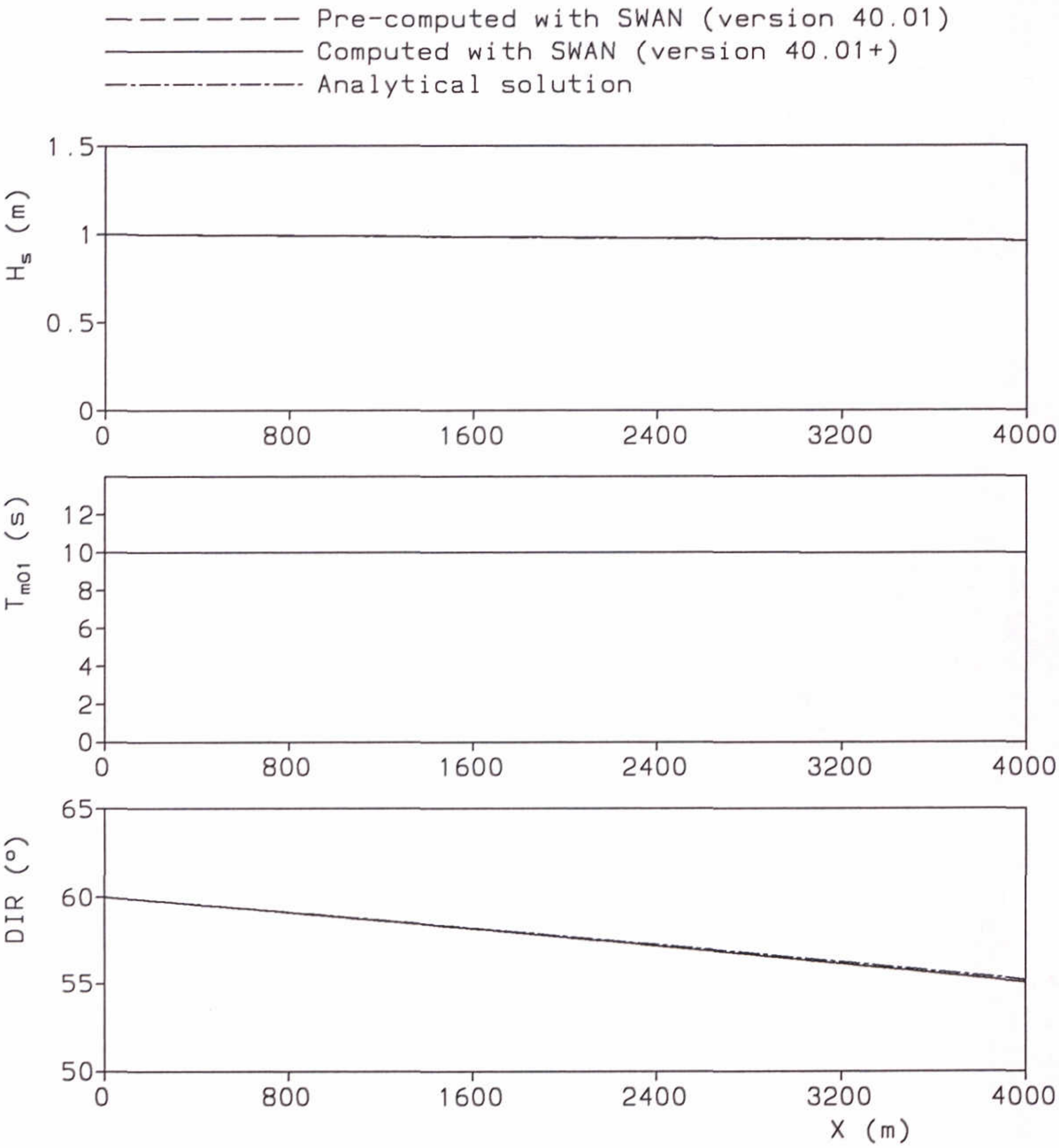
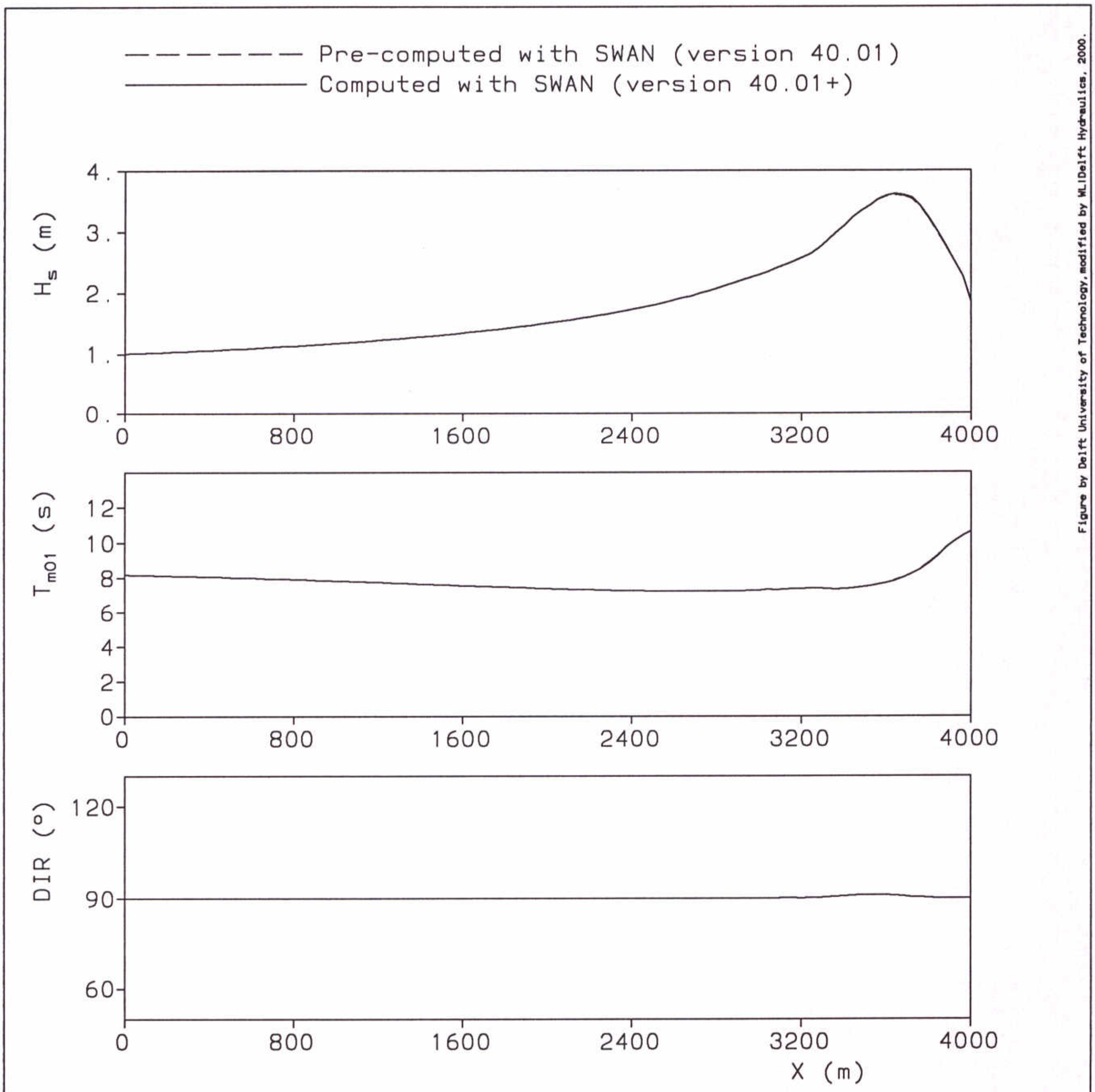


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A34cur01 A34

Slanting current (DIR(waves) = 60o)



A35cur01 A35

Blocking current: implicit scheme

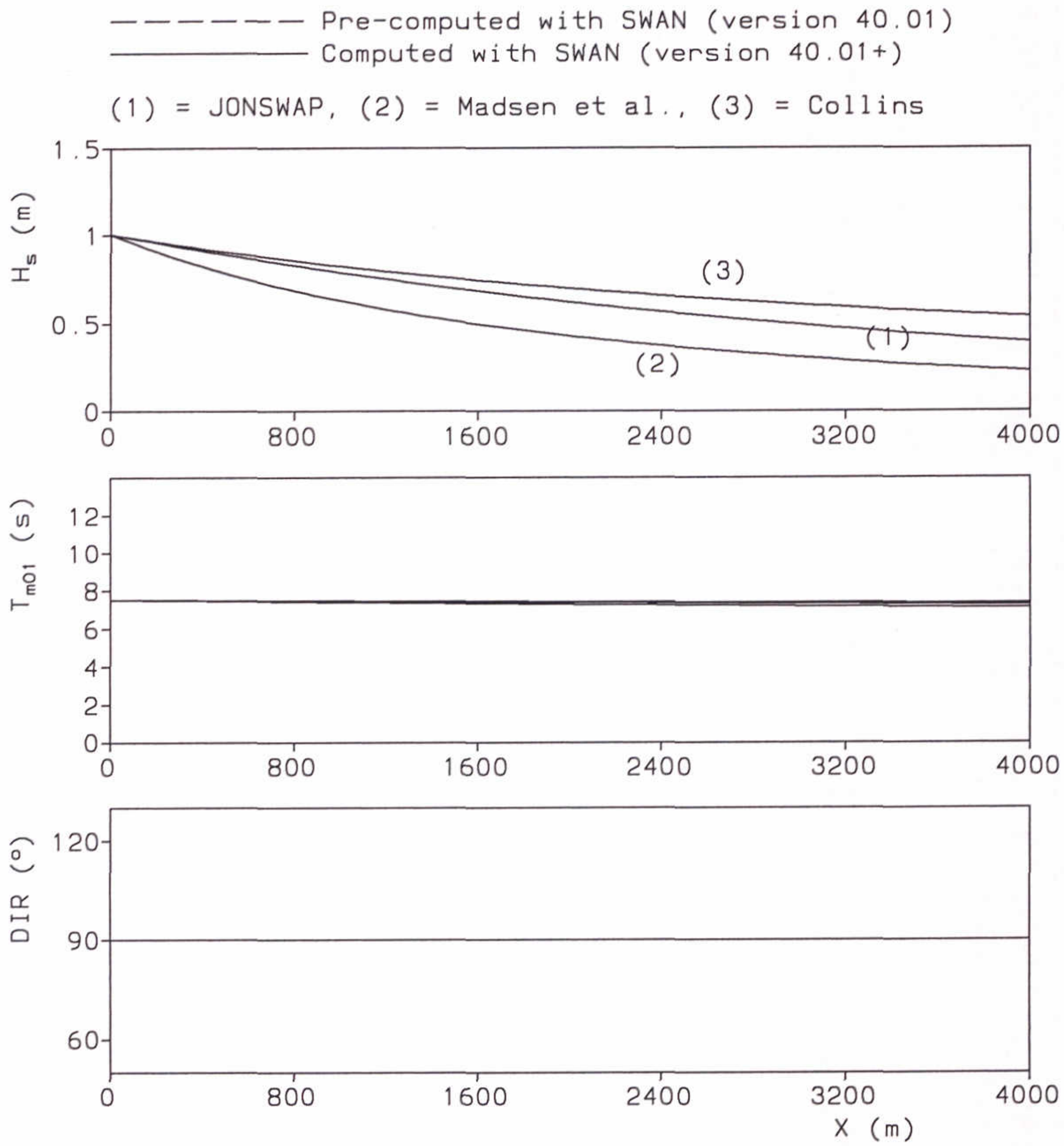


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A41wav01 A41

Bottom friction

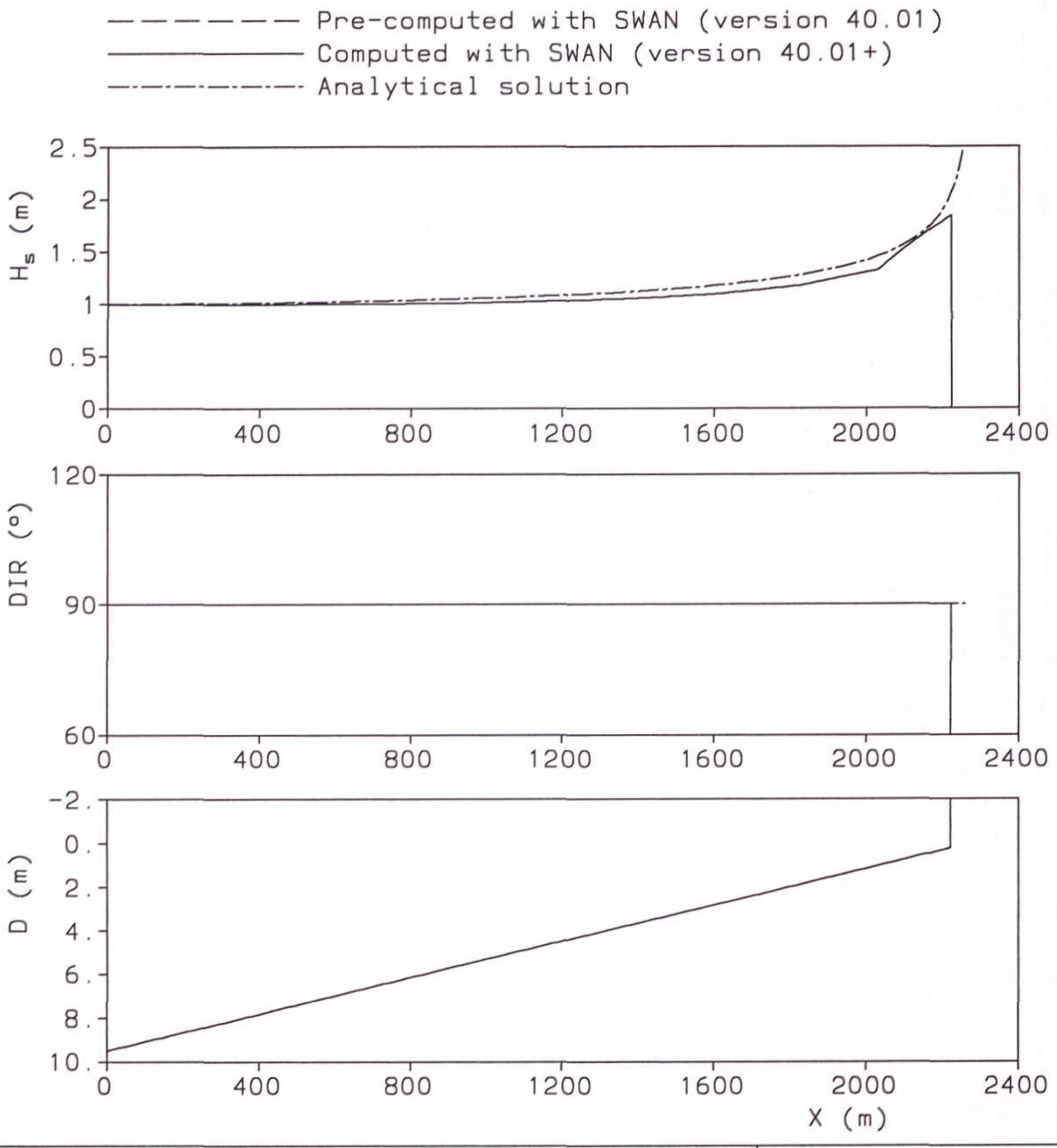
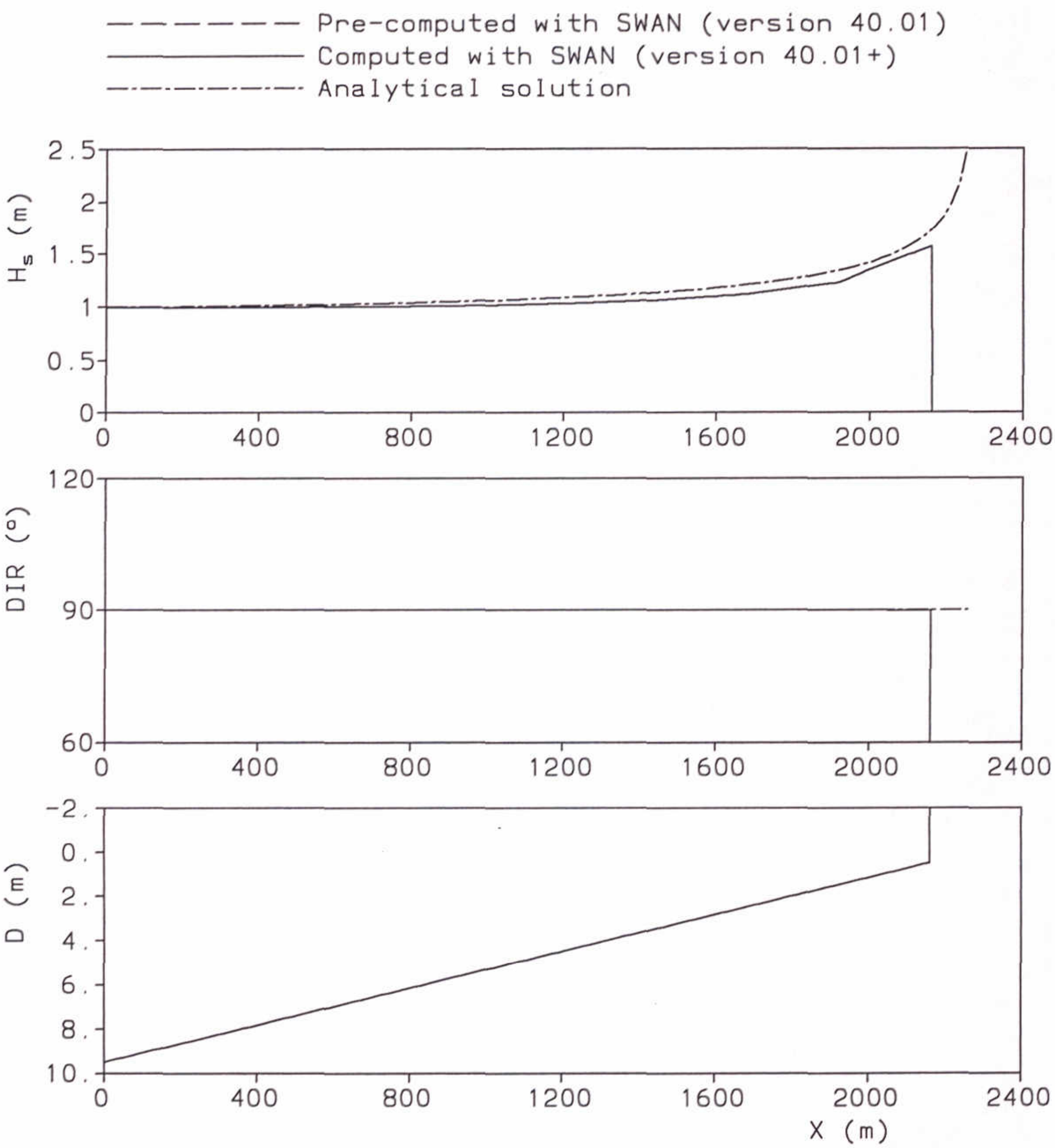


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A51crv01 A51a

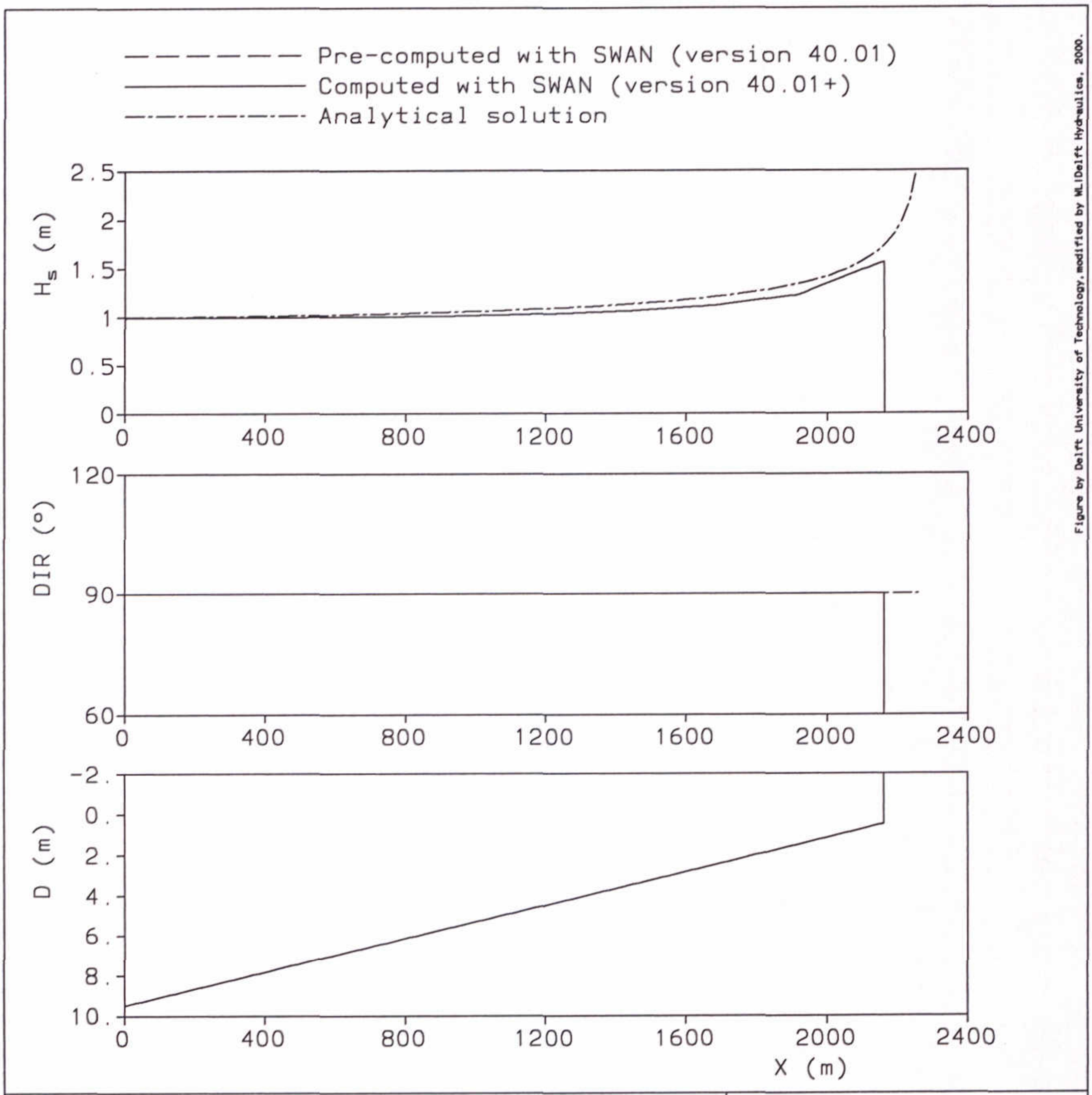
Shoaling on curvilinear grid 1



A51crv02 A51b

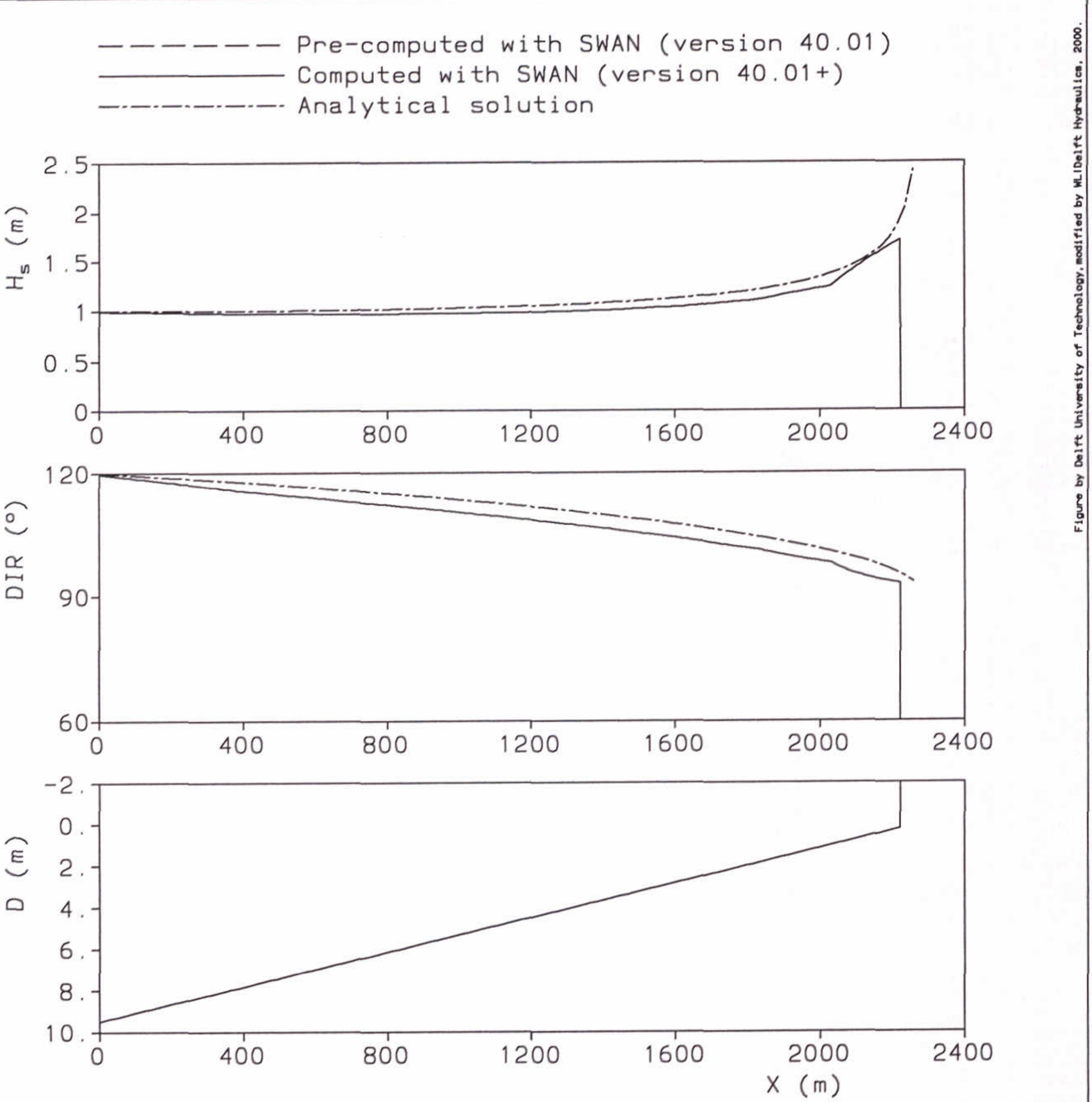
Shoaling on curvilinear grid 2

Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.



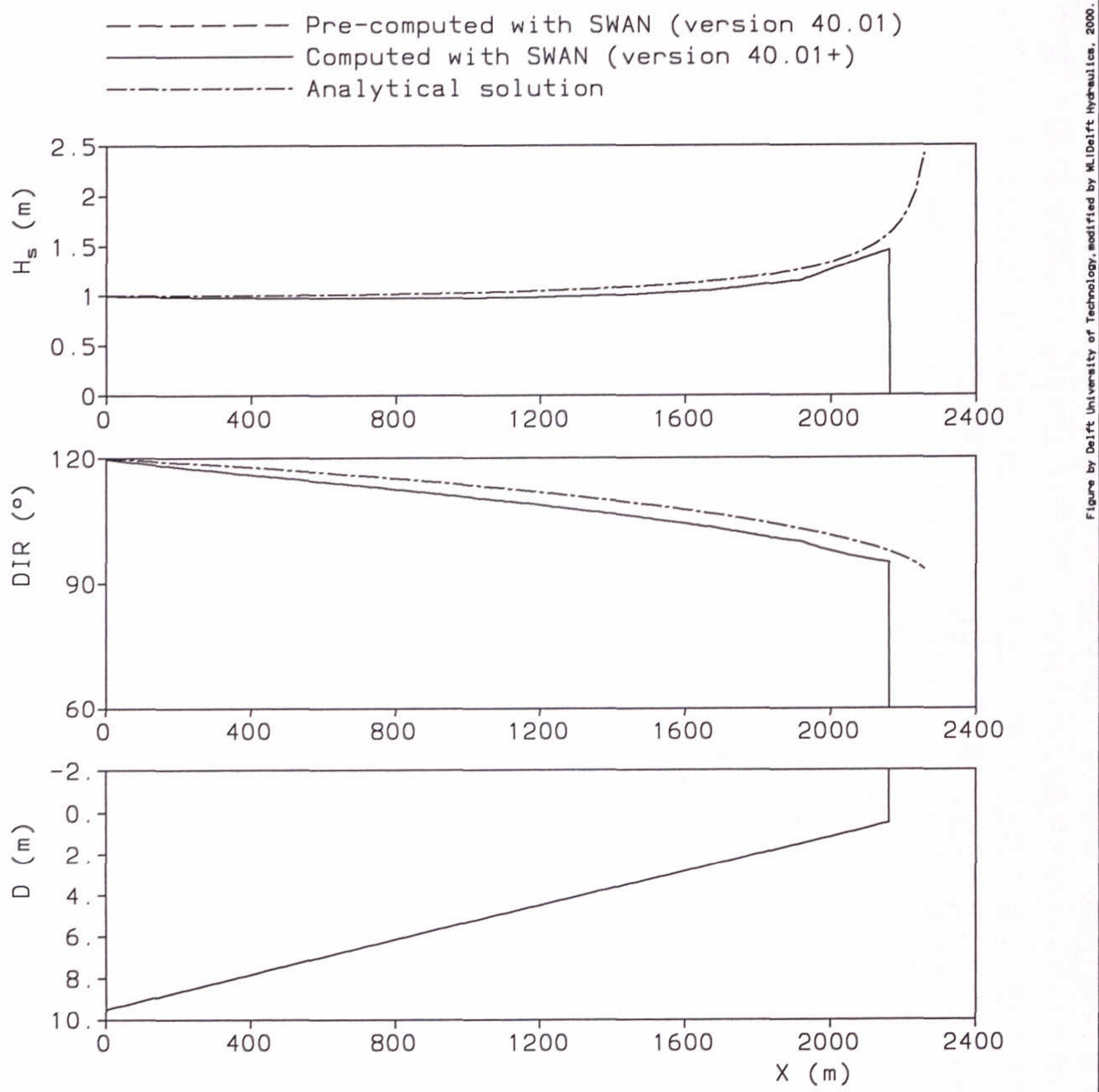
A51crv03 A51c

Shoaling on curvilinear grid 3



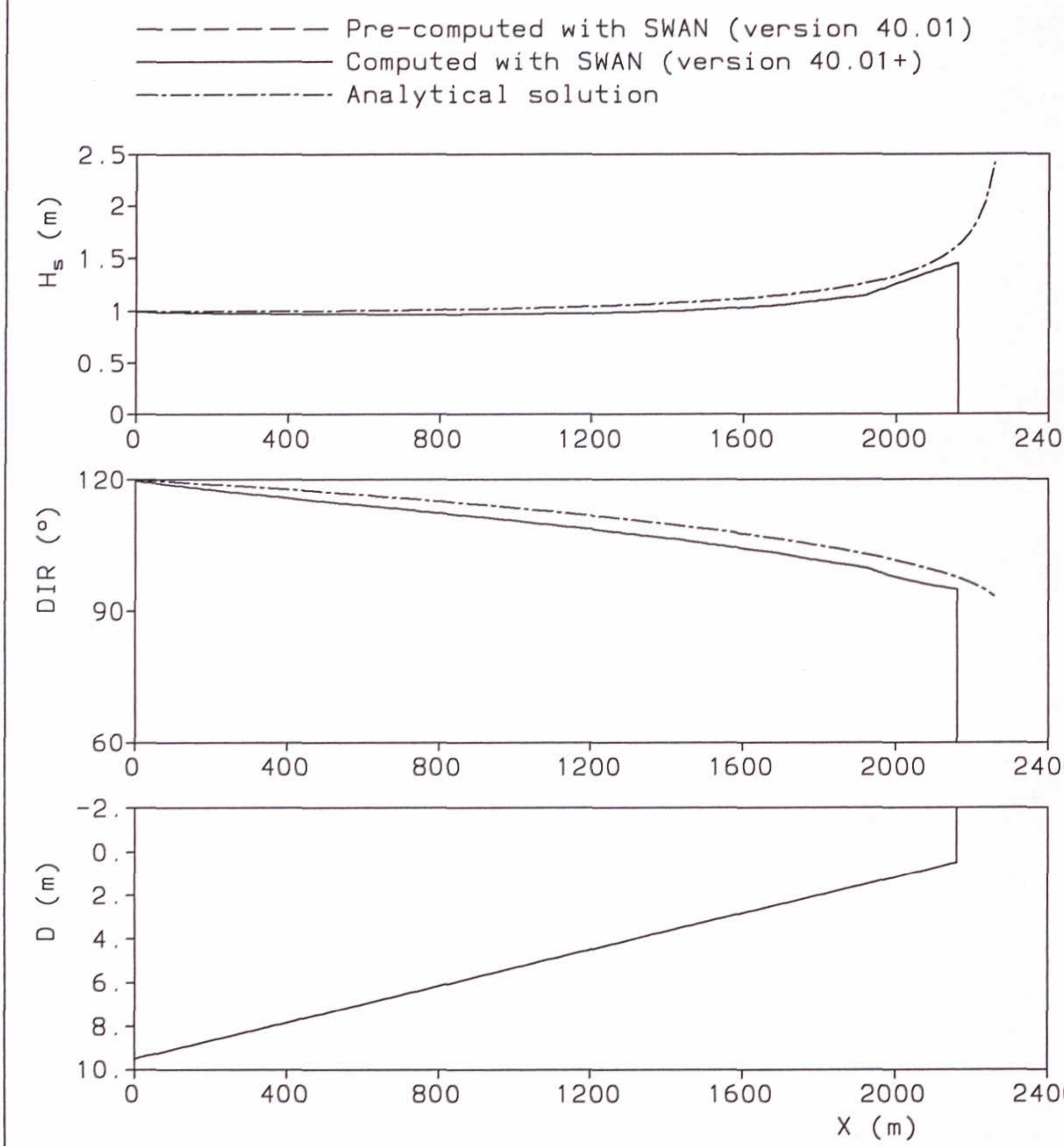
A52crv01 A52a

Refraction on curvilinear grid 1



A52crv02 A52b

Refraction on curvilinear grid 2



A52crv03 A52c

Refraction on curvilinear grid 3

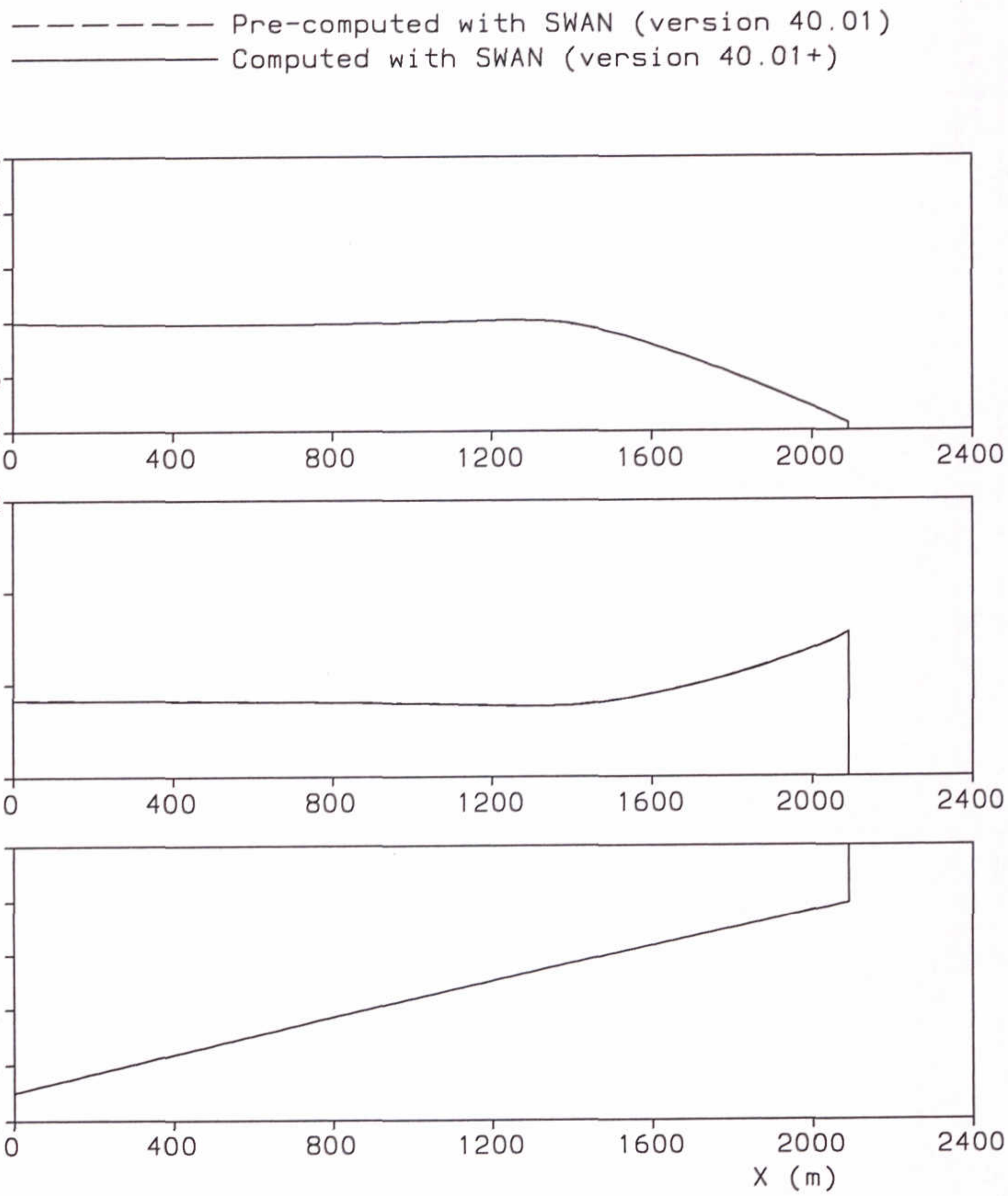
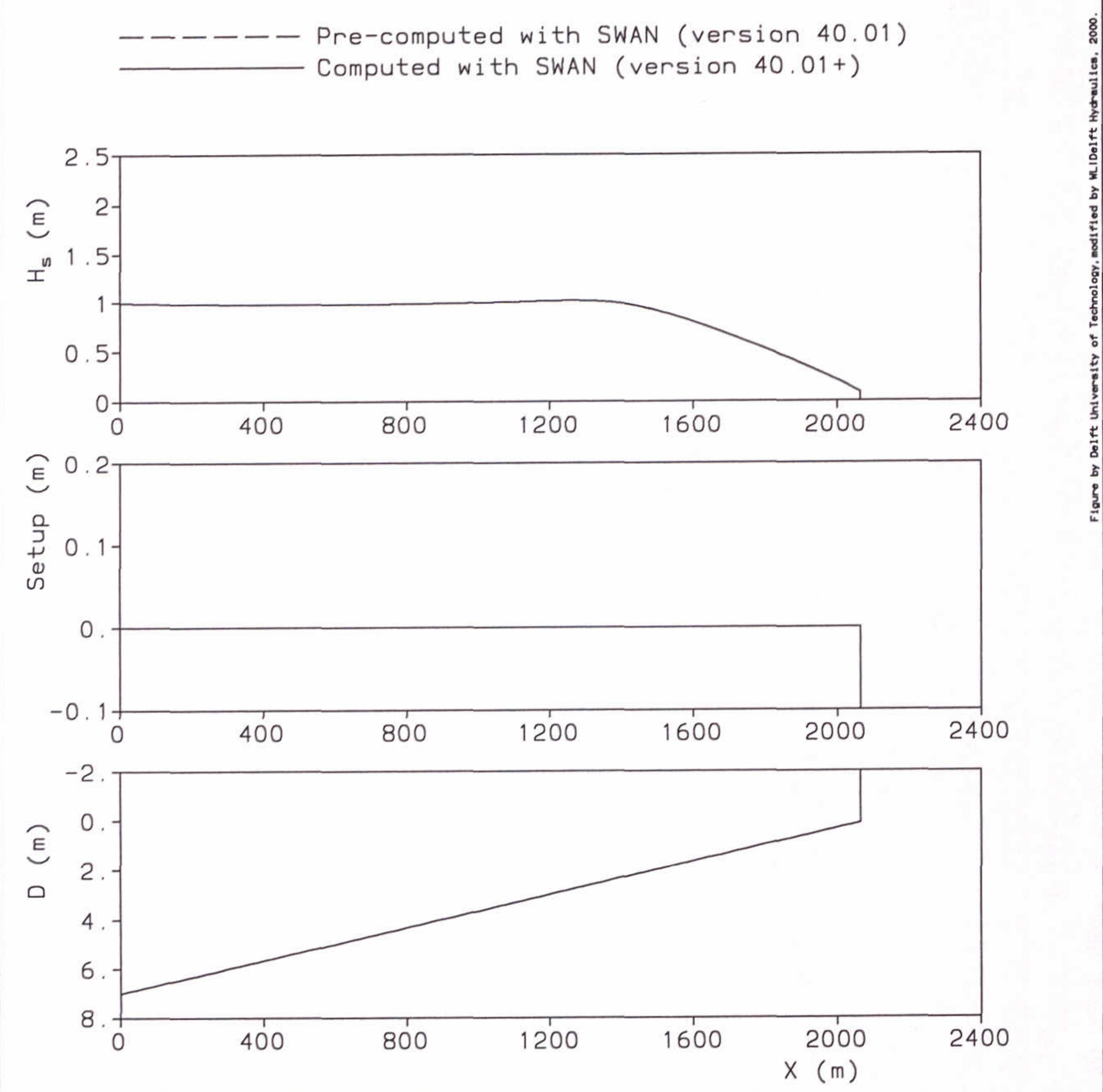


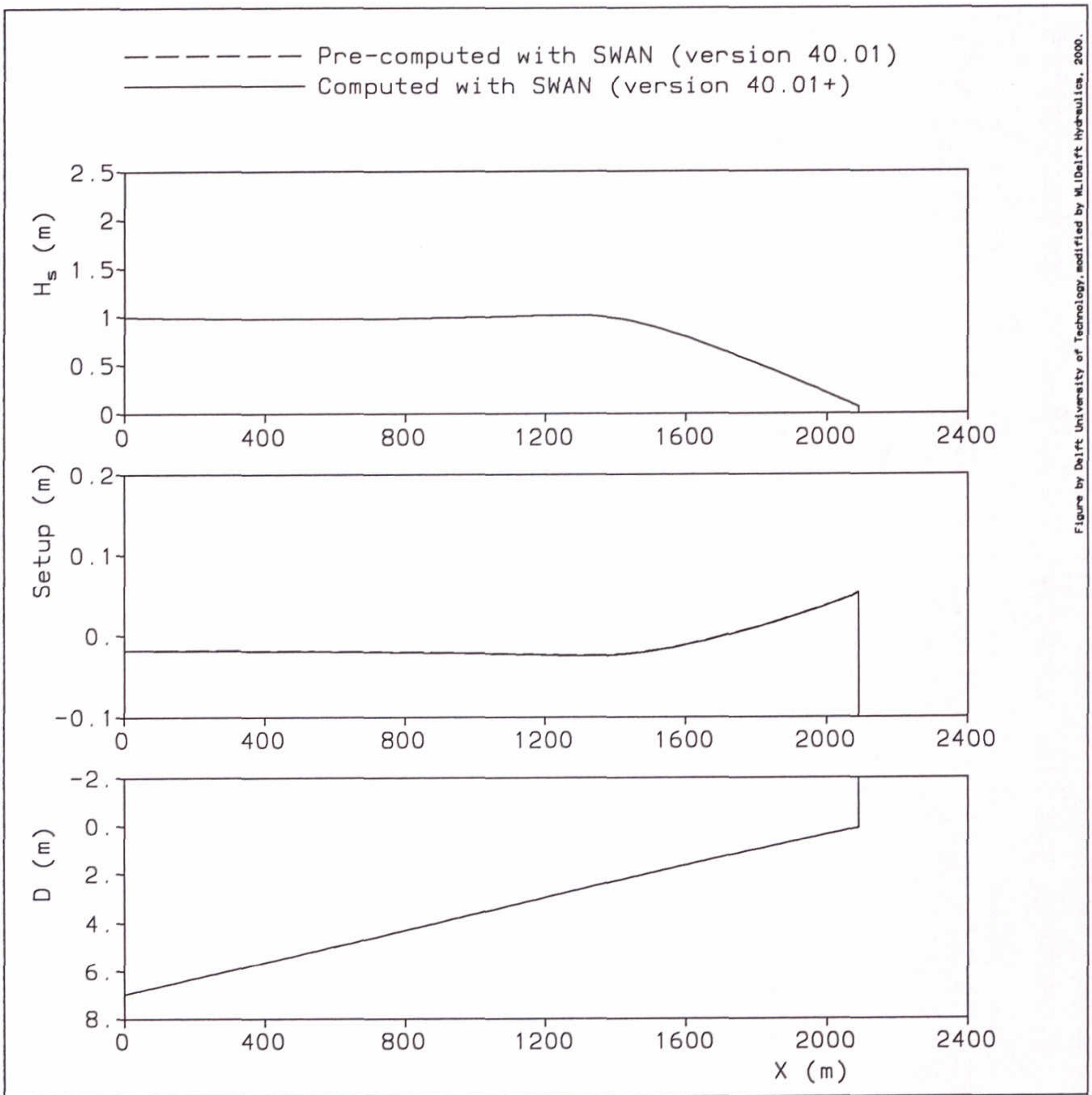
Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A53crv01	A53a	
Setuptup on high res. curvil. grid 1		



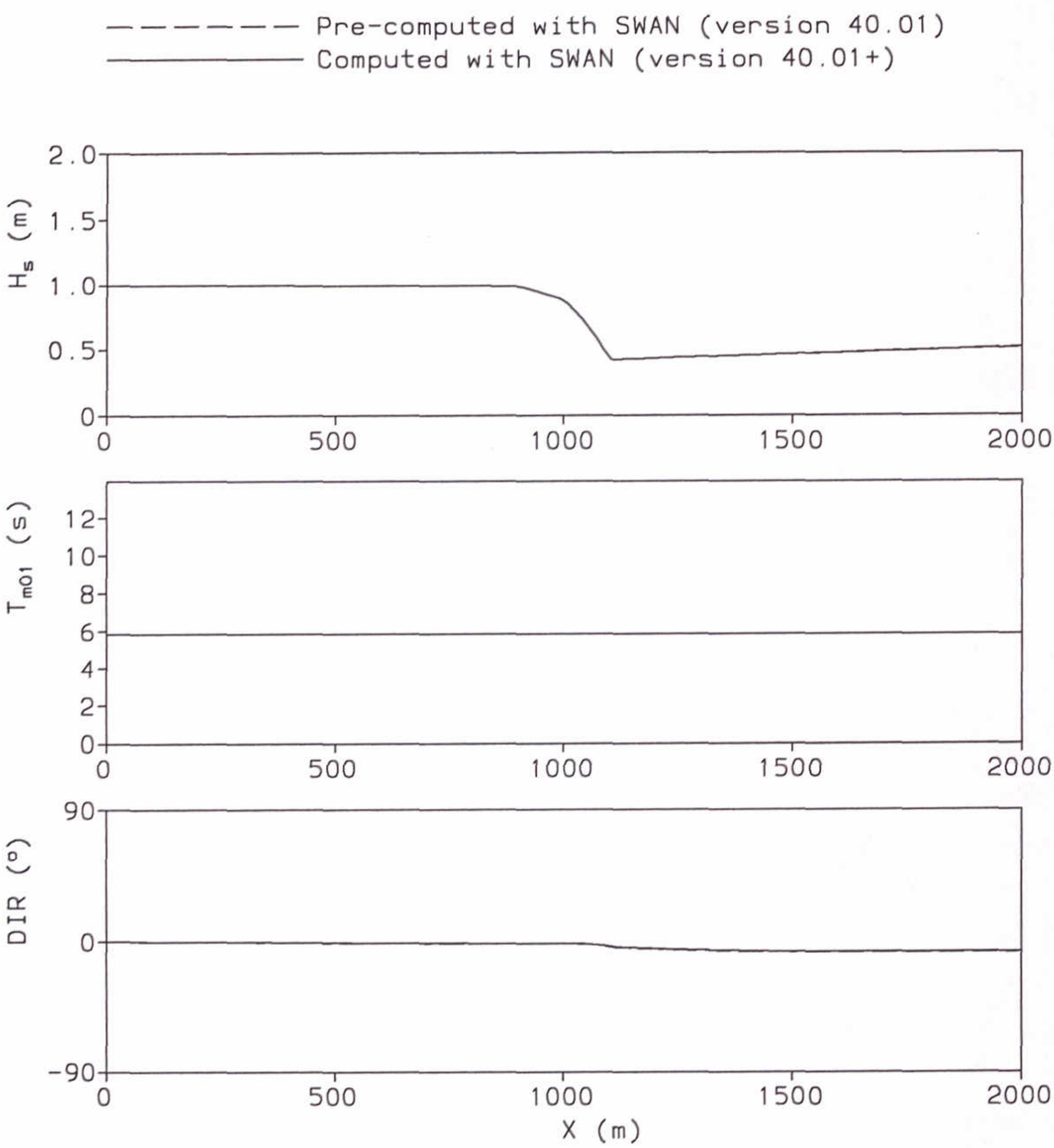
A53crv02 A53b

Setuptup on high res. curvil. grid 2



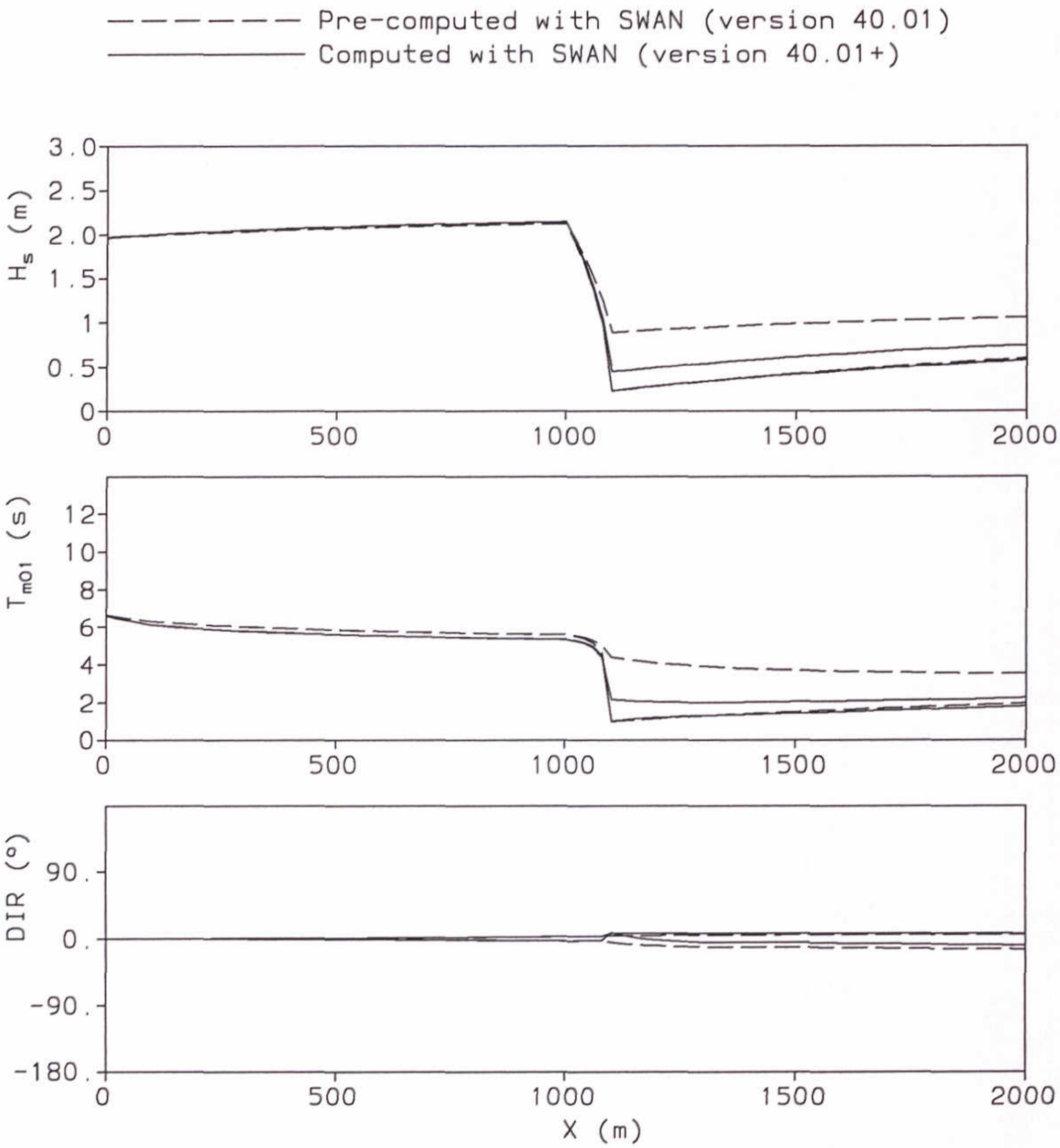
A53crv03 A53c

Setuptup on high res. curvil. grid 3



A61obs01 A61a

Obstacles



A61obs02	A61b	
Obstacles		

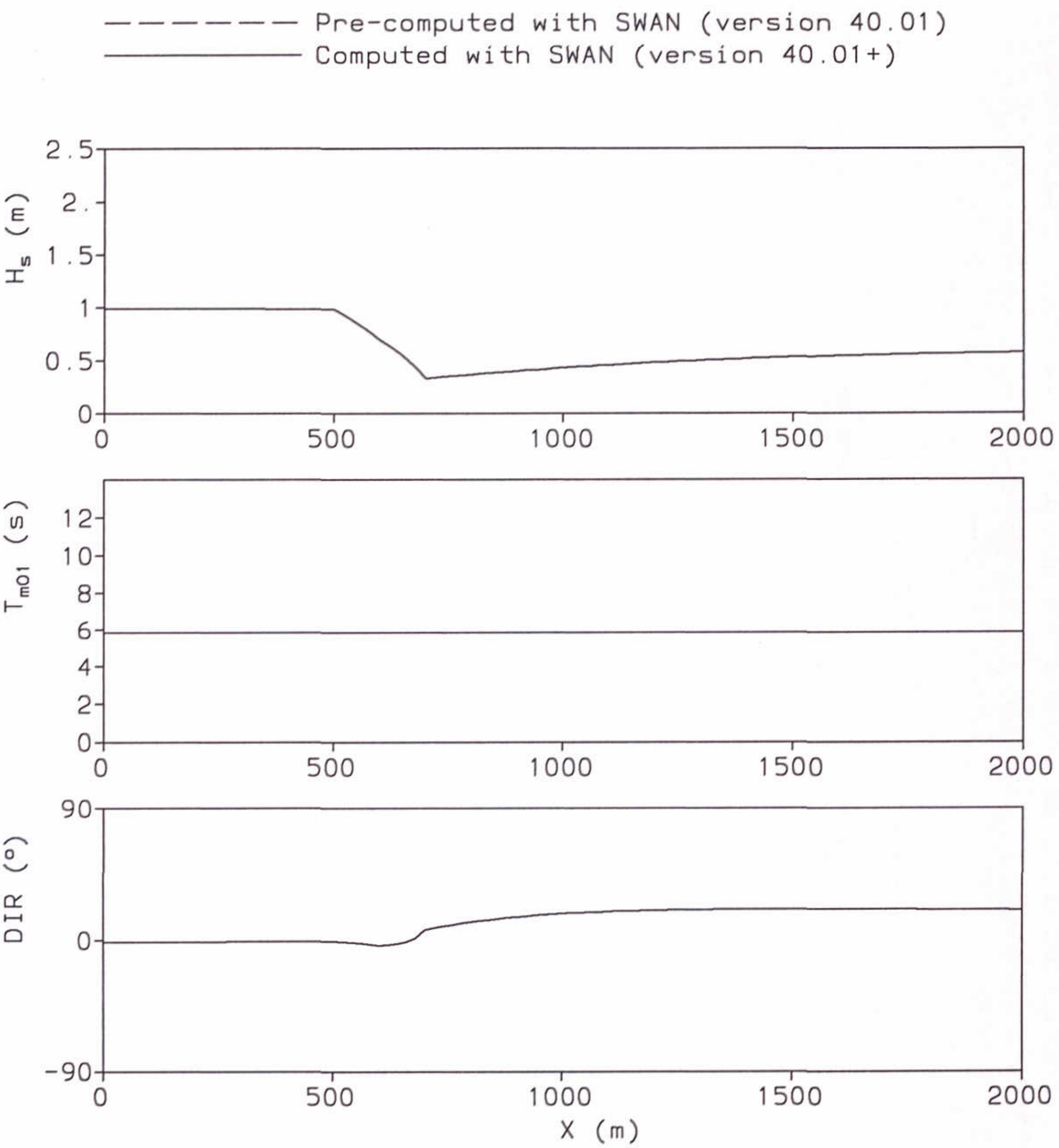
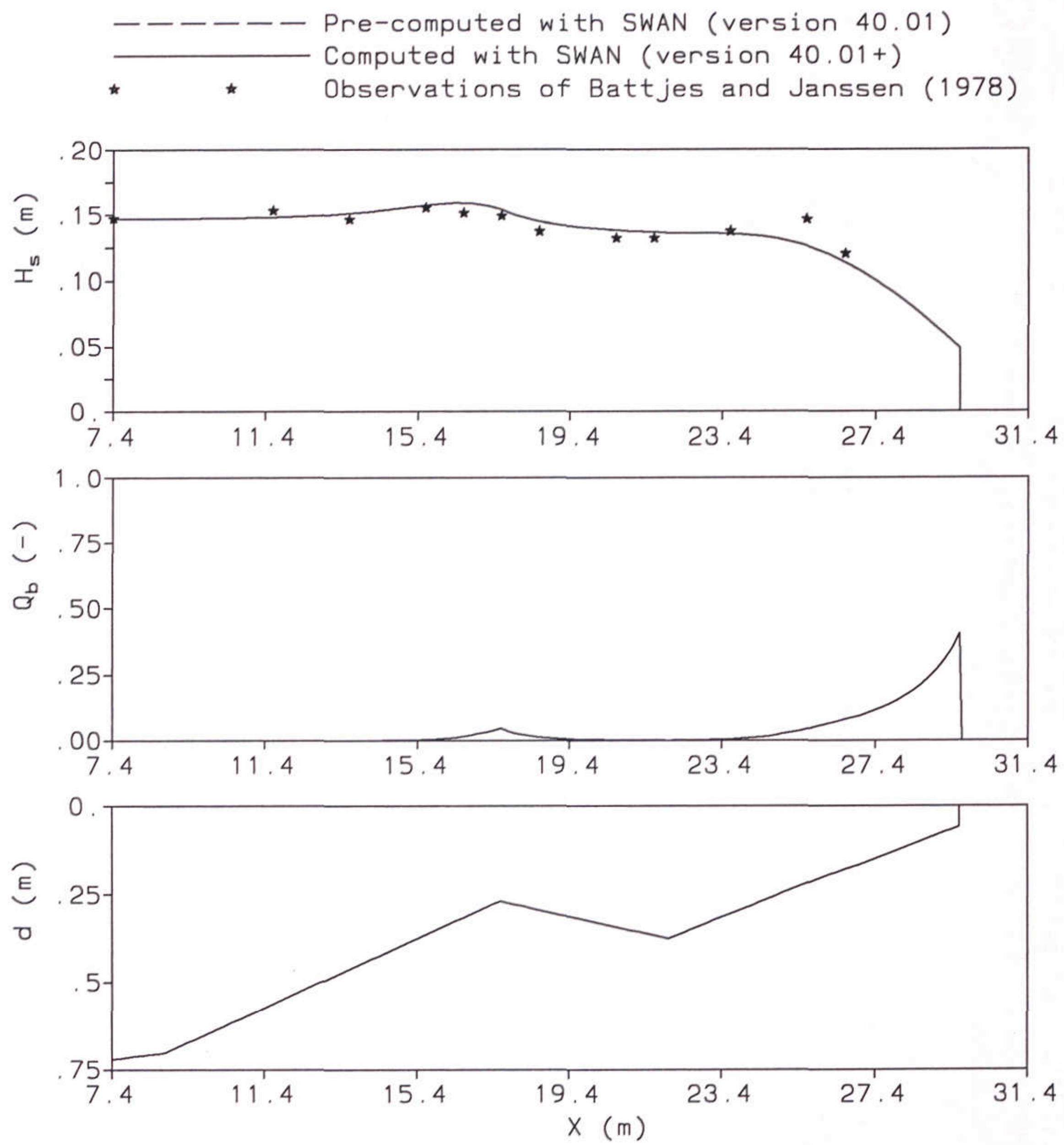


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

A61obs03 A61c

Obstacles



L11wav01 L11a

Depth-induced wave breaking: run 13

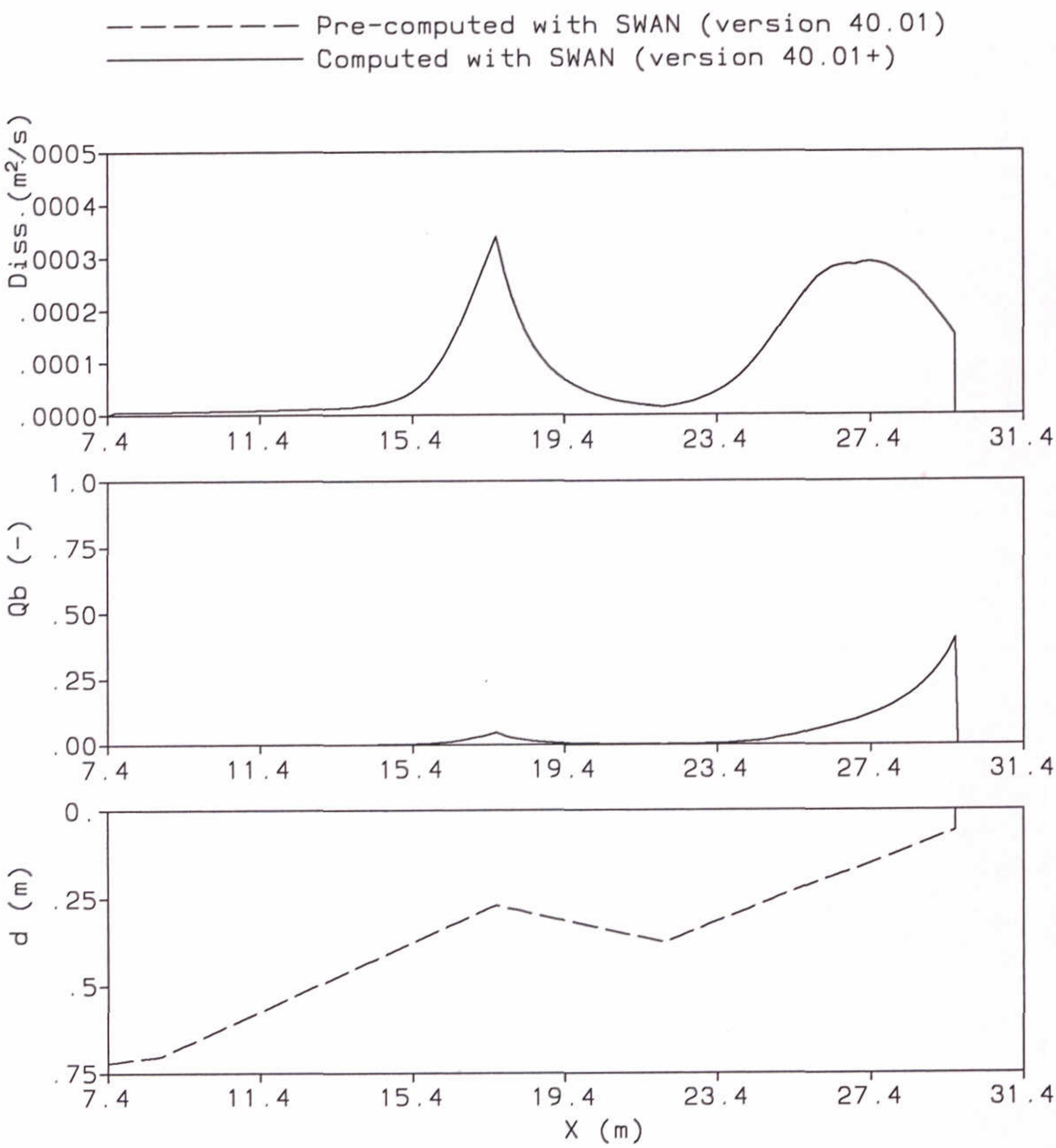


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

L11wav01 L11b

Depth-induced wave breaking: run 13

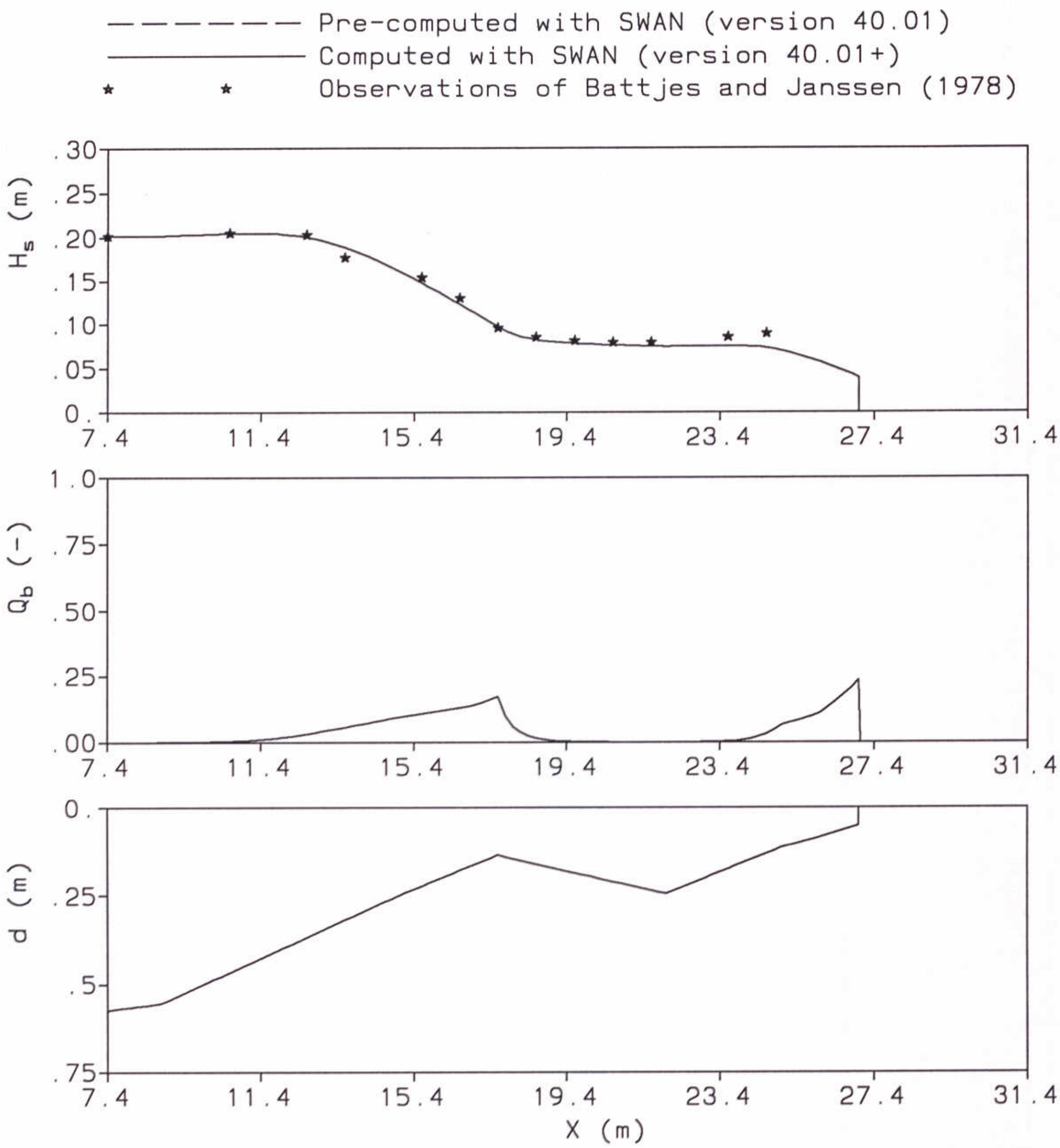
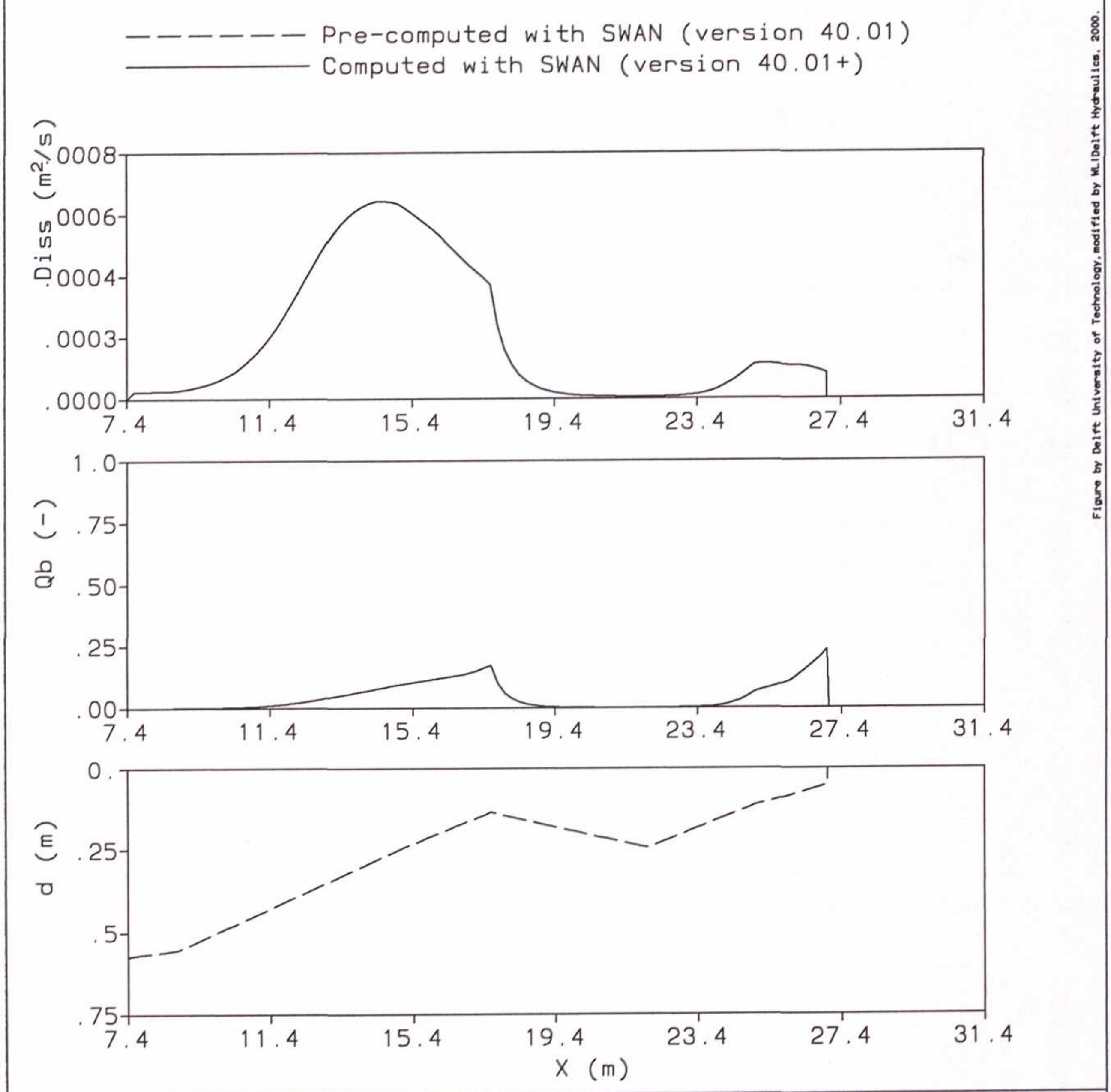


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

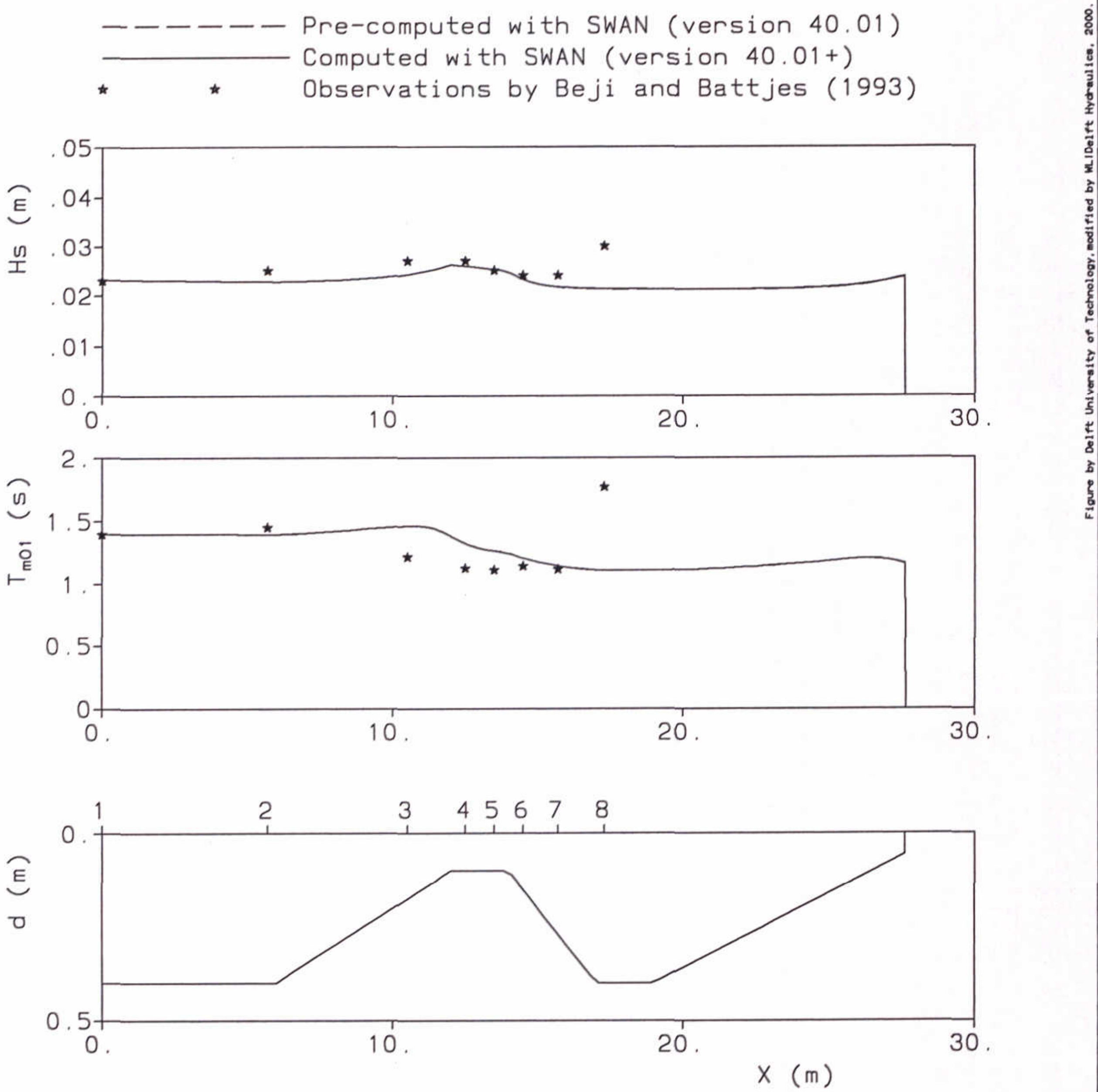
L11wav02 L11c

Depth-induced wave breaking: run 15



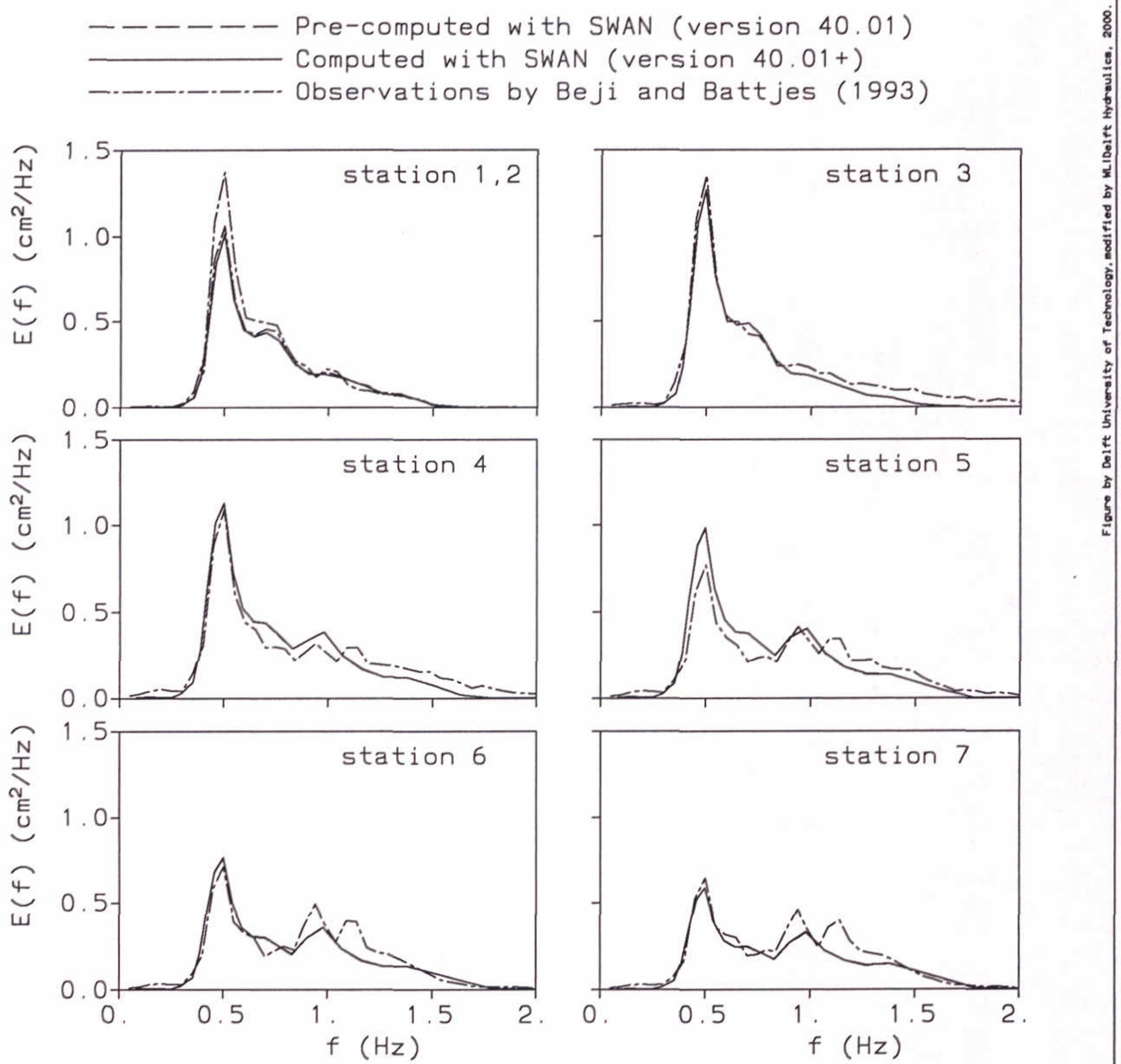
L11wav02 L11d

Depth-induced wave breaking: run 15



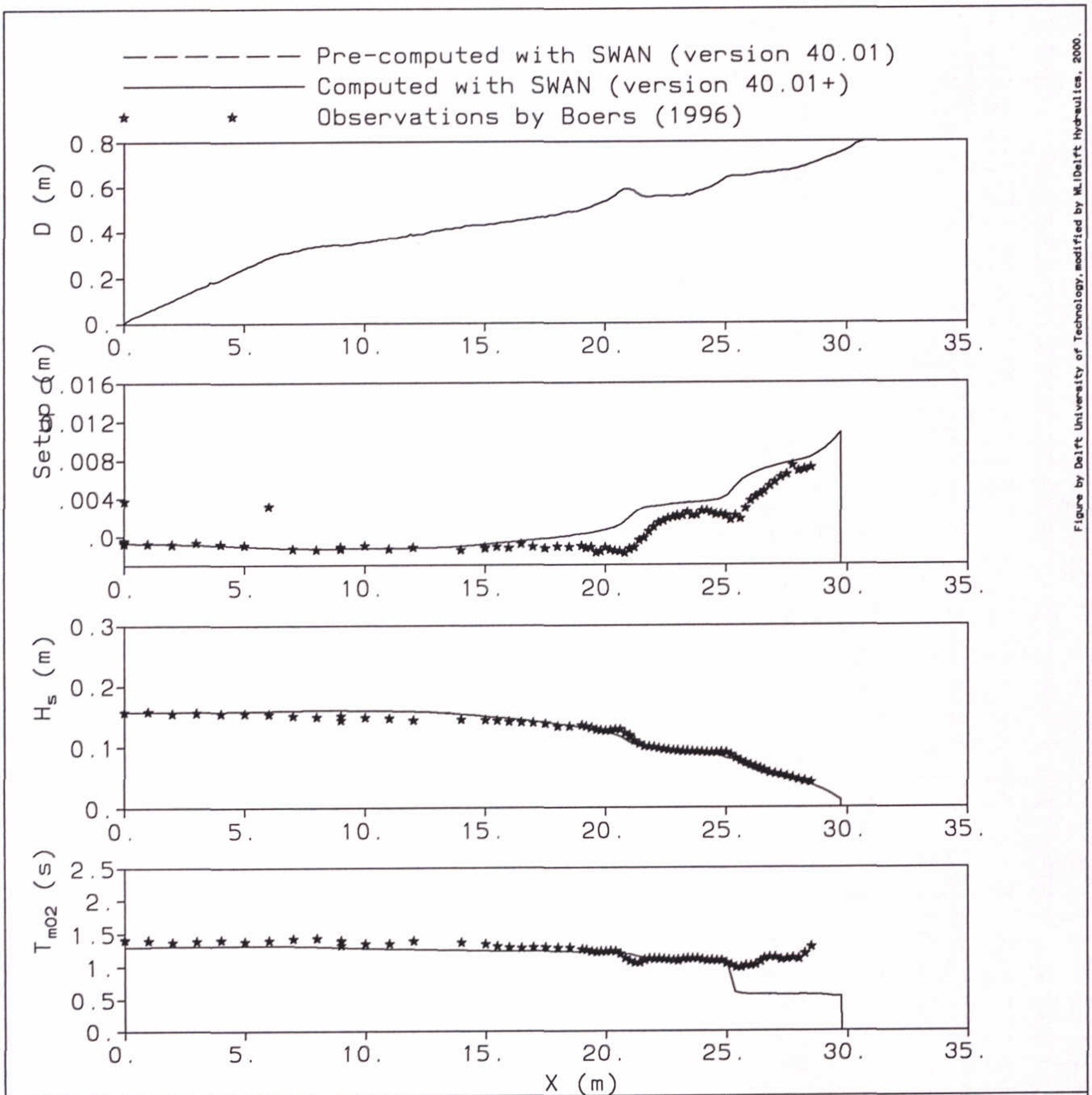
L21tri01 L21a

Triad wave-wave interactions



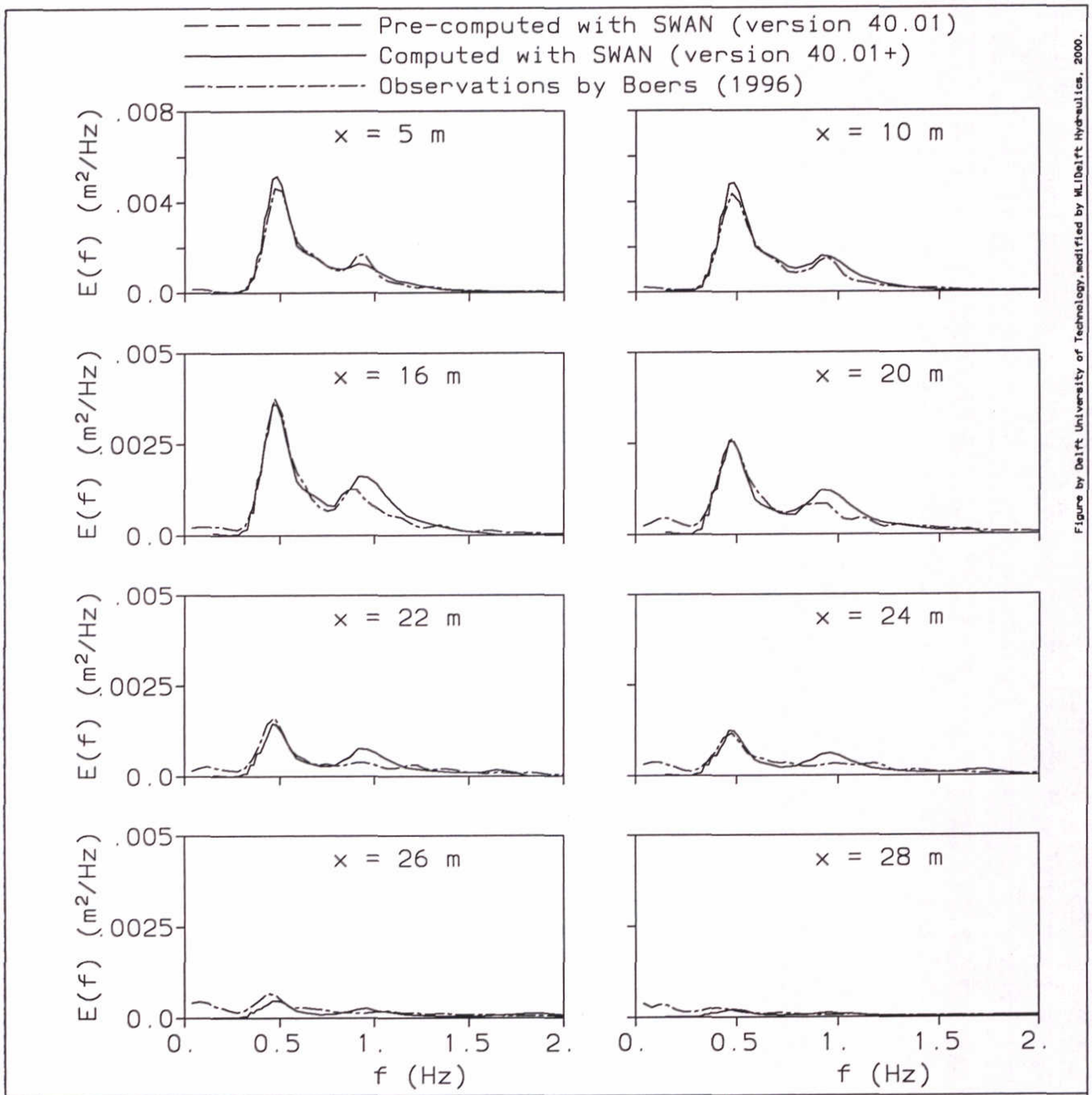
L21tri01 L21b

Triad wave-wave interactions



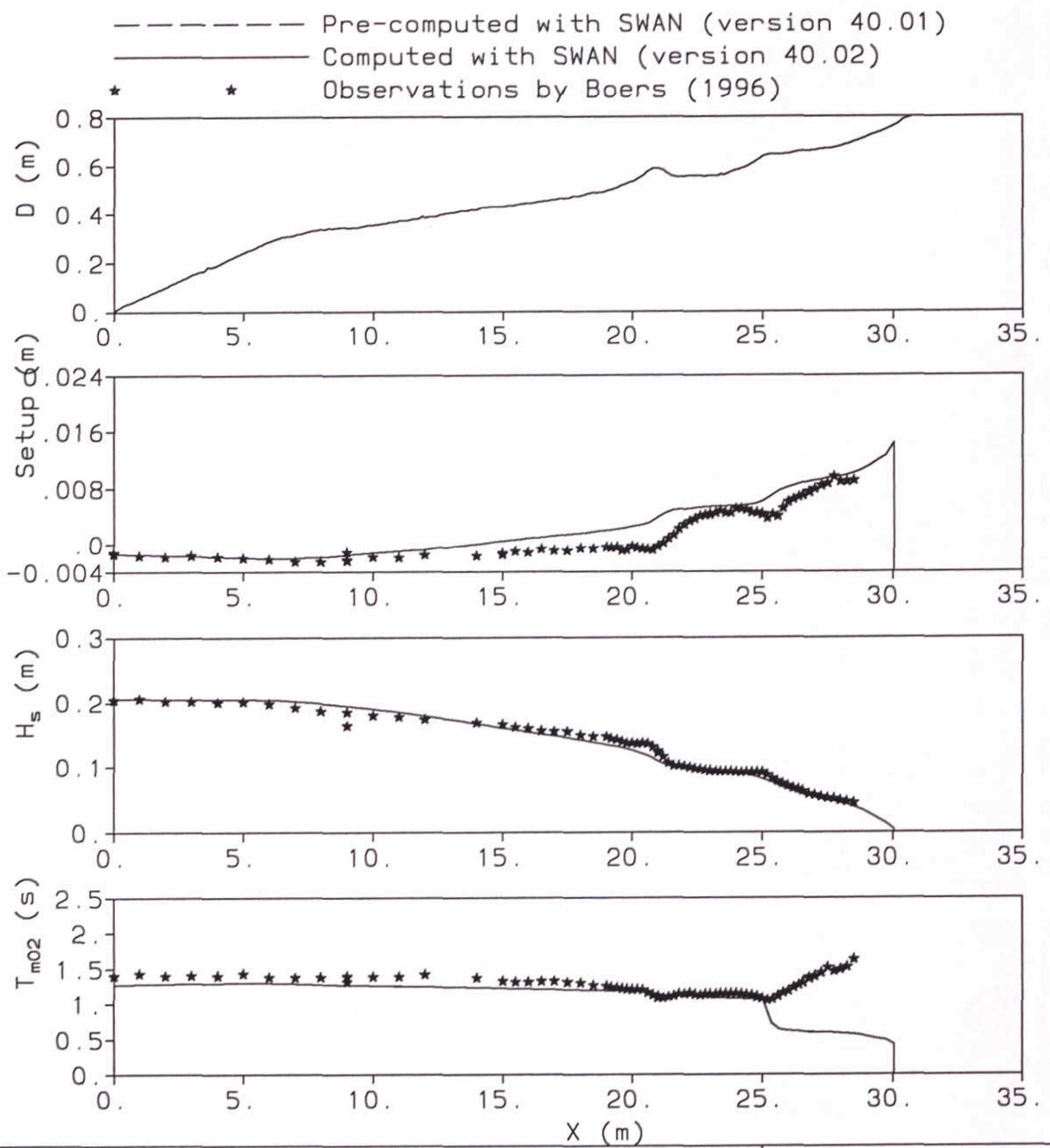
L31set01 L31a

Flume experiment of Boers: test 1A



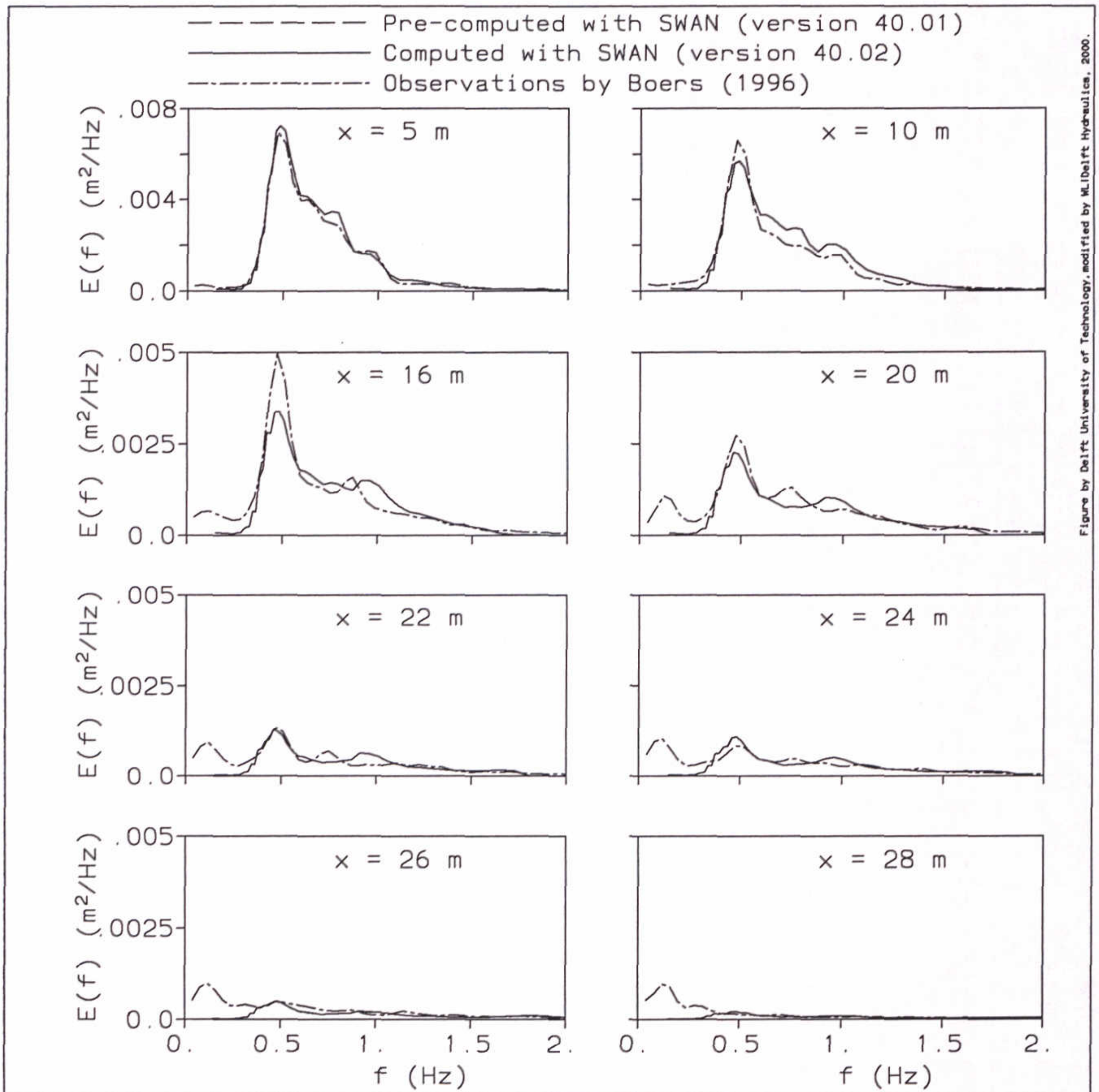
L31set01 L31b

Flume experiment of Boers: test 1A



L31set02 L31c

Flume experiment of Boers: test 1B



L31set02 L31d

Flume experiment of Boers: test 1B

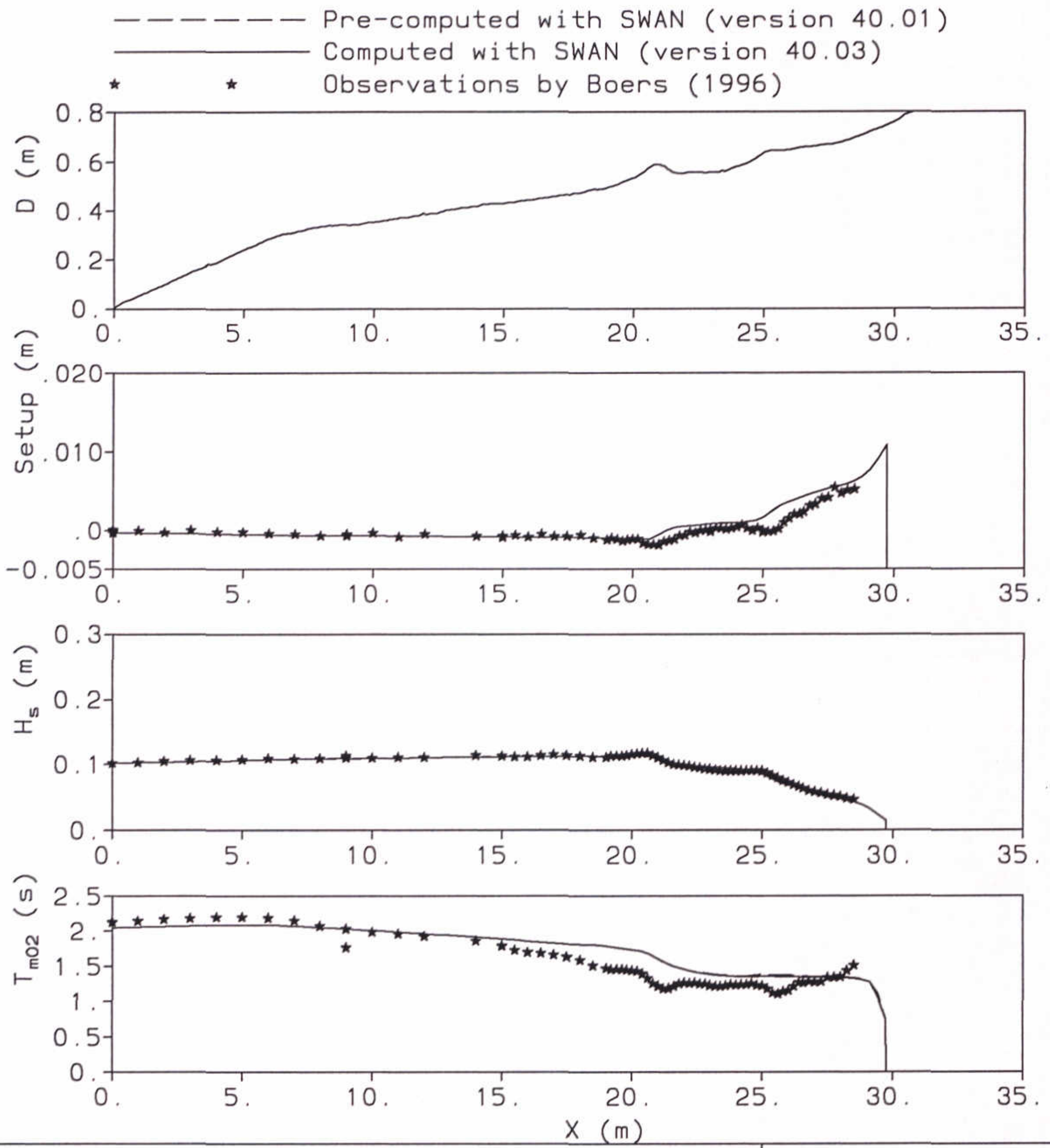
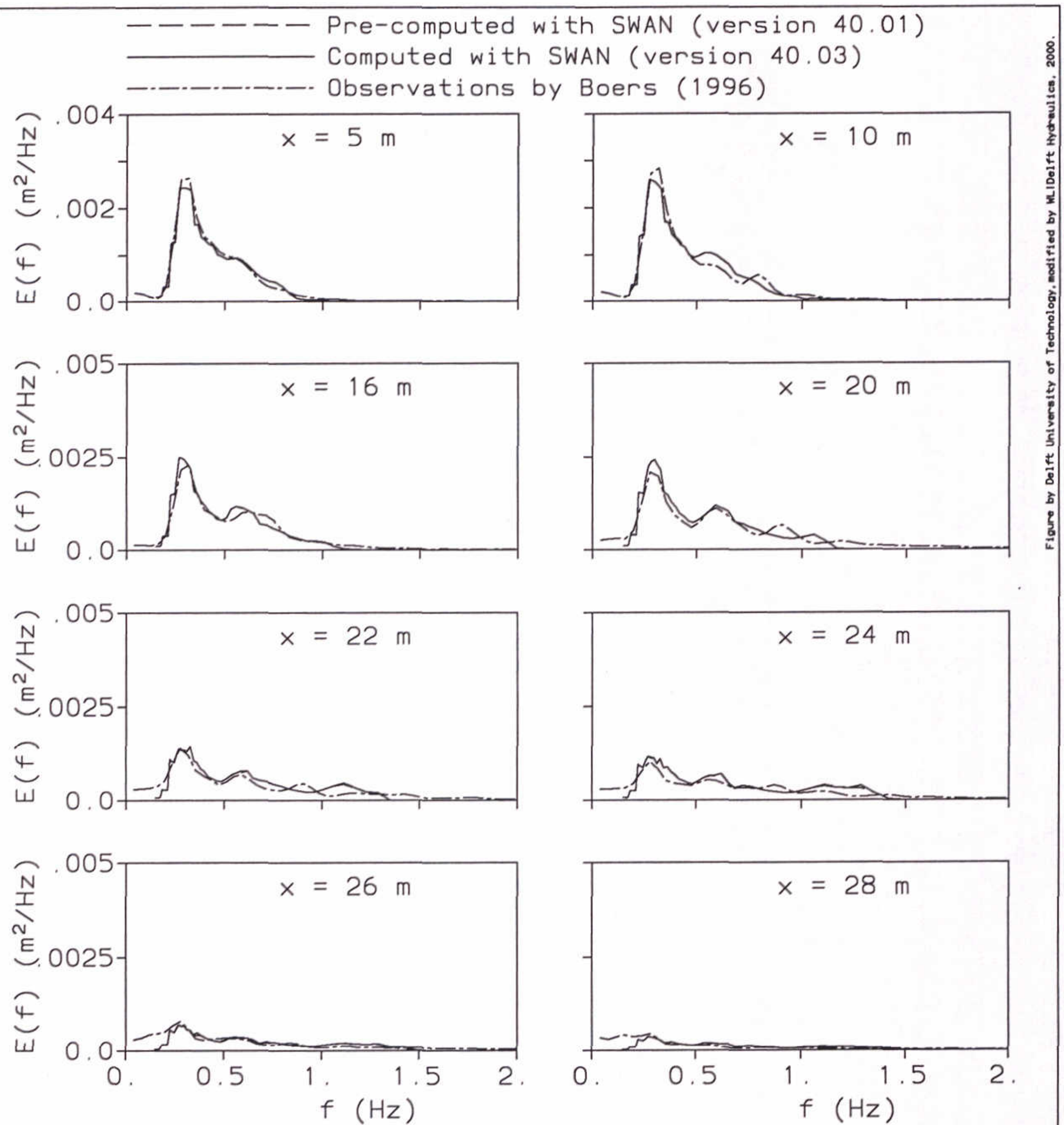


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

L31set03 L31e

Flume experiment of Boers: test 1C



L31set03 L31f

Flume experiment of Boers: test 1C

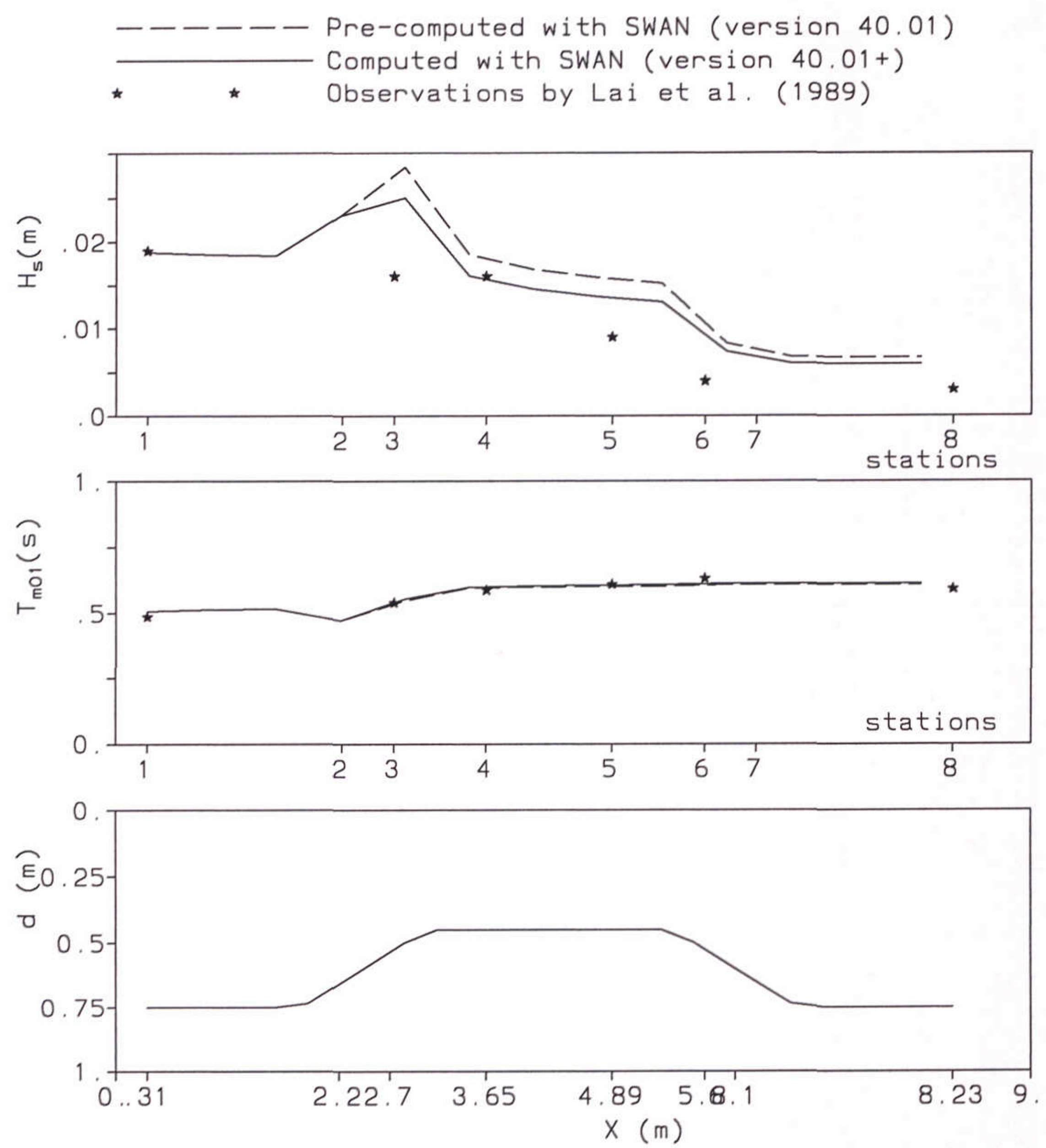
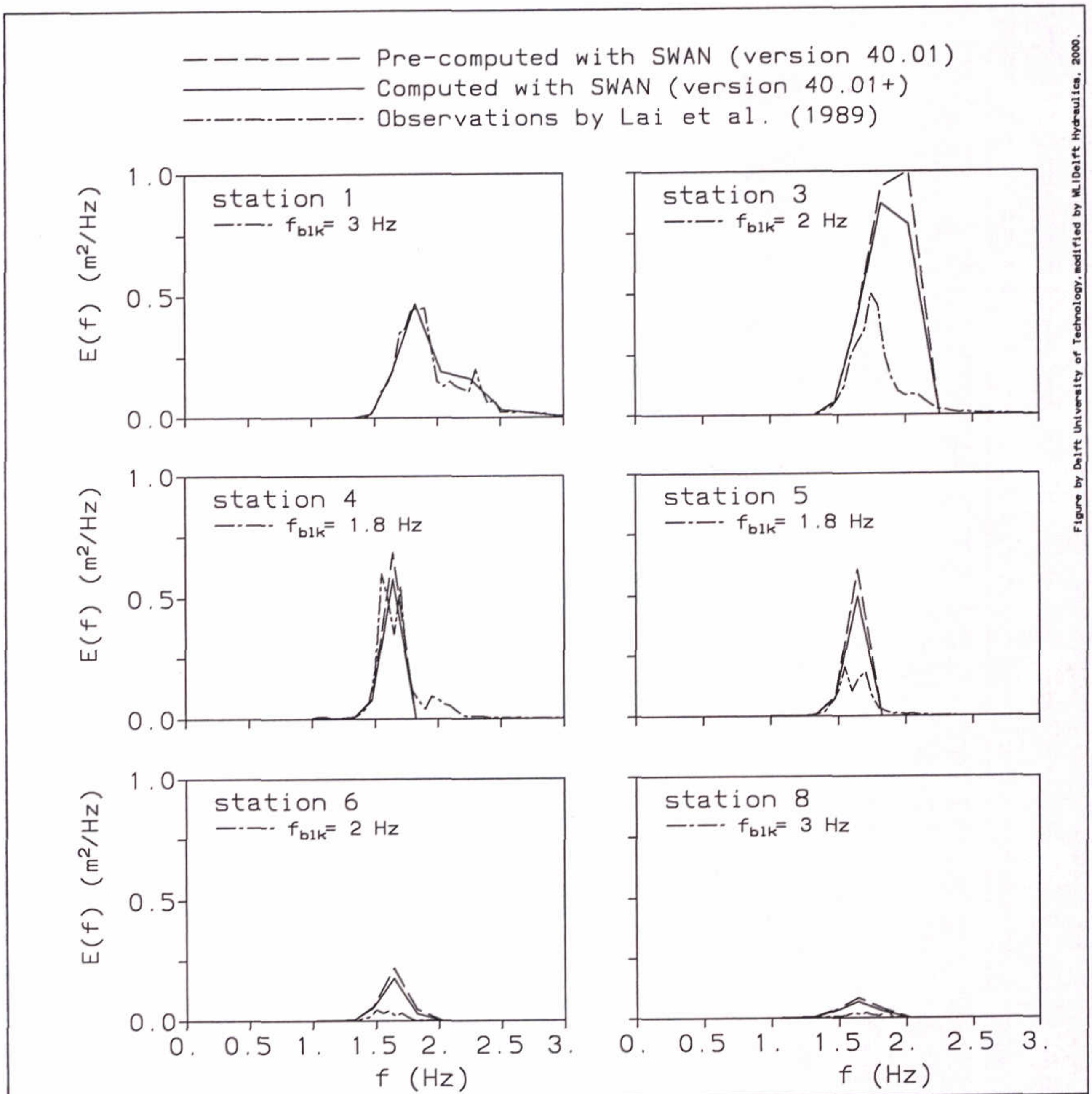


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

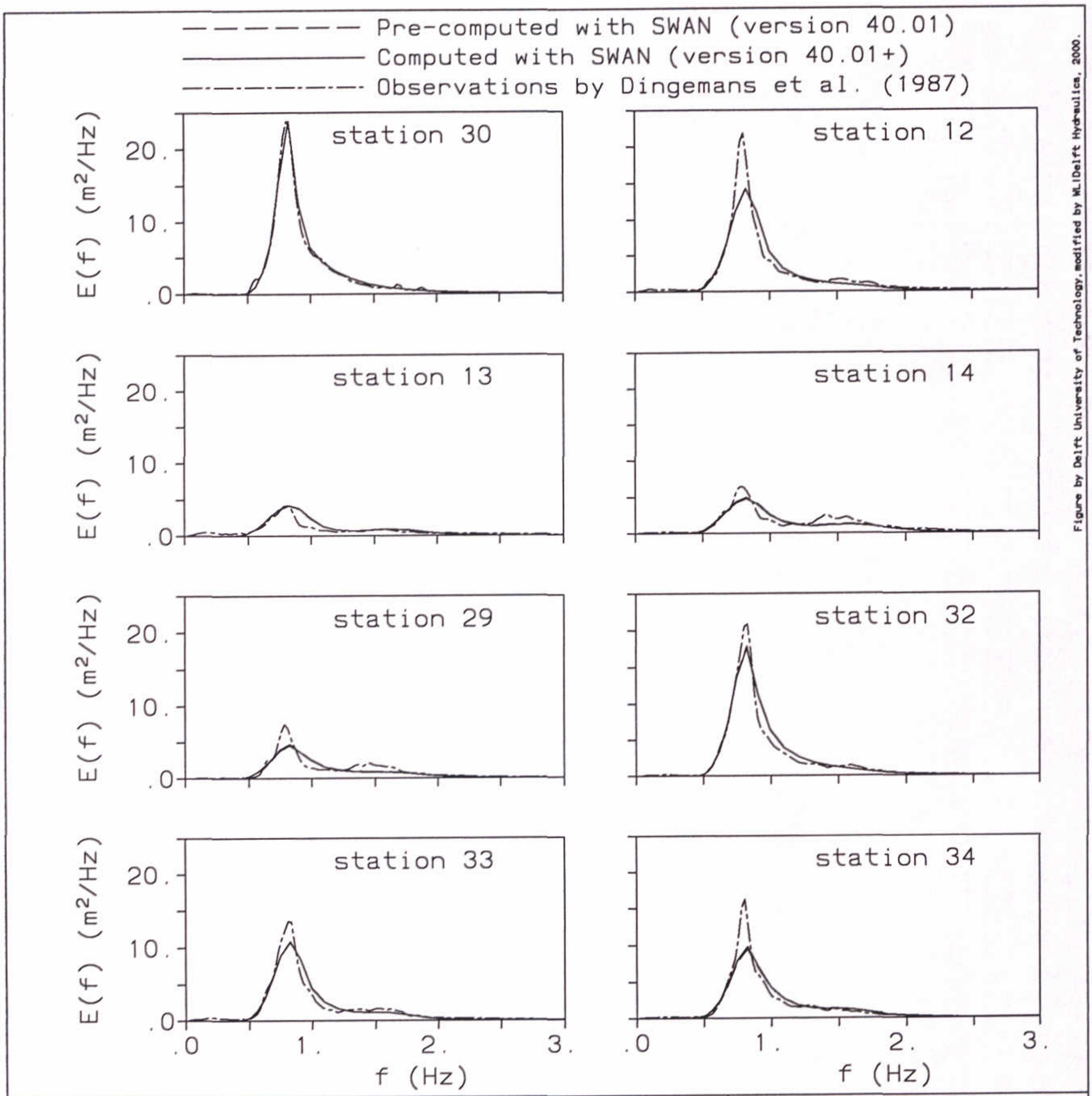
L41cur01 L41a

Wave blocking exp. by Lai et al.



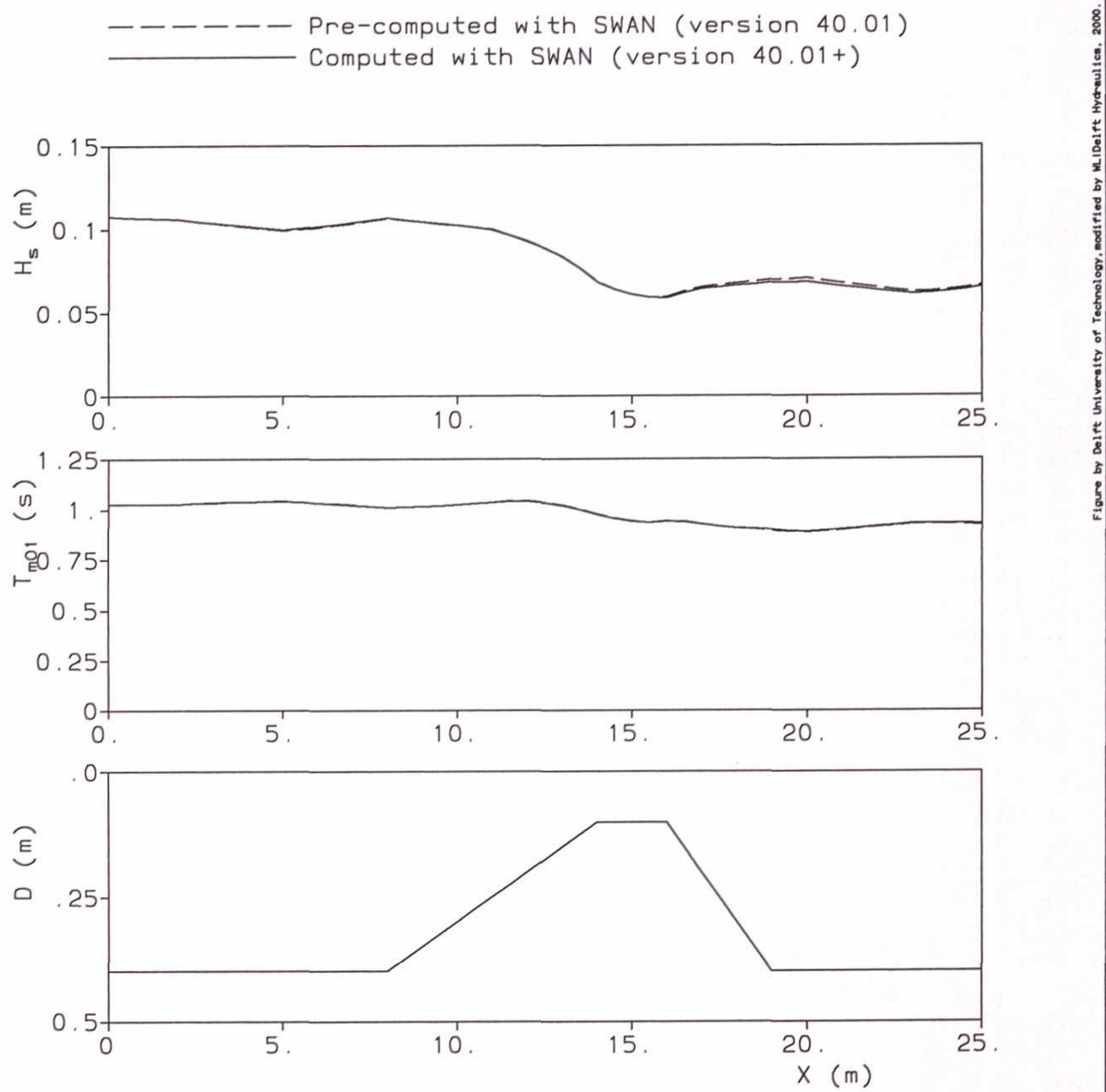
L41cur01 L41b

Wave blocking exp. by Lai et al.



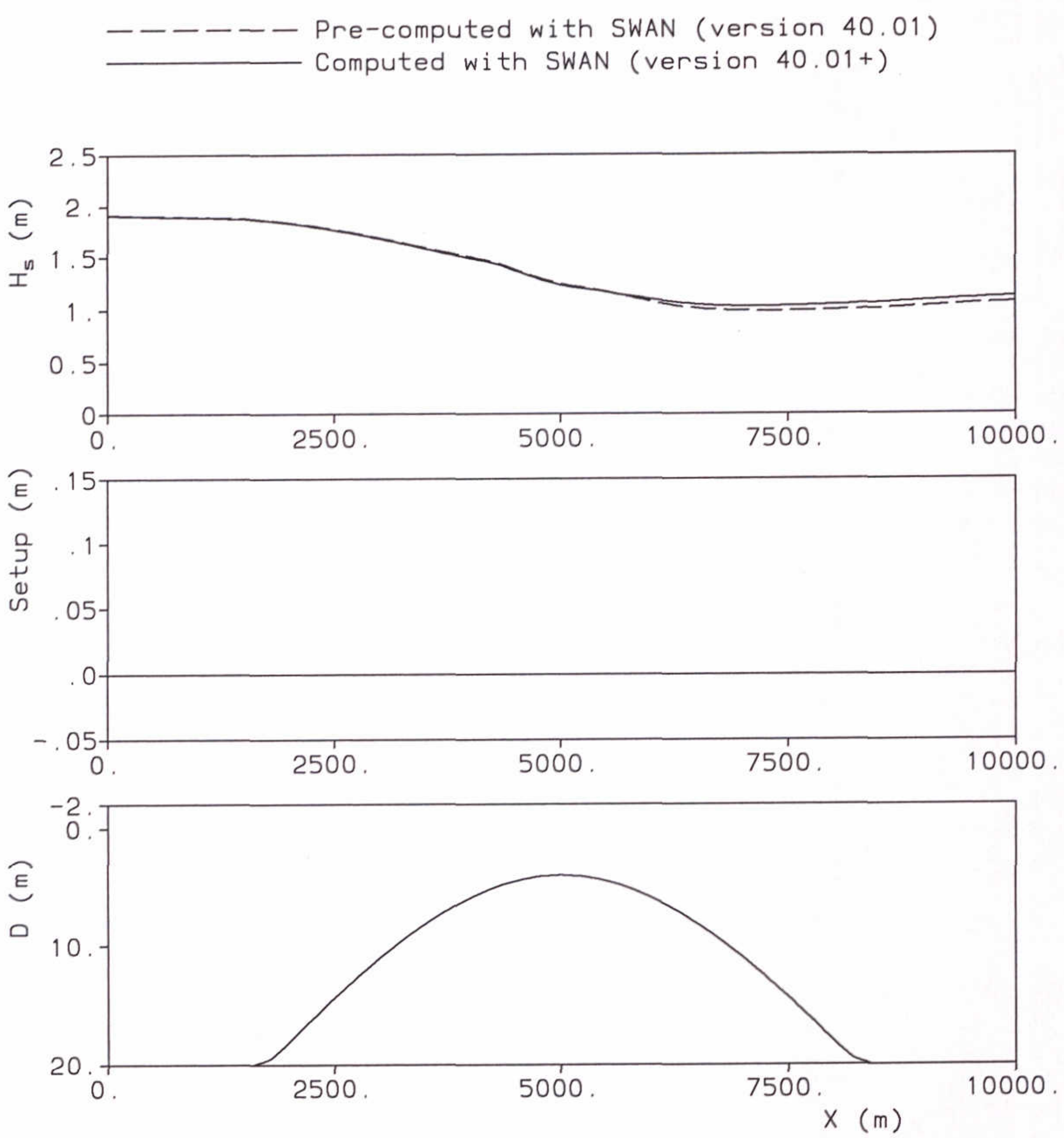
L51his01 L51a

Hiswa basin experiment: test me35



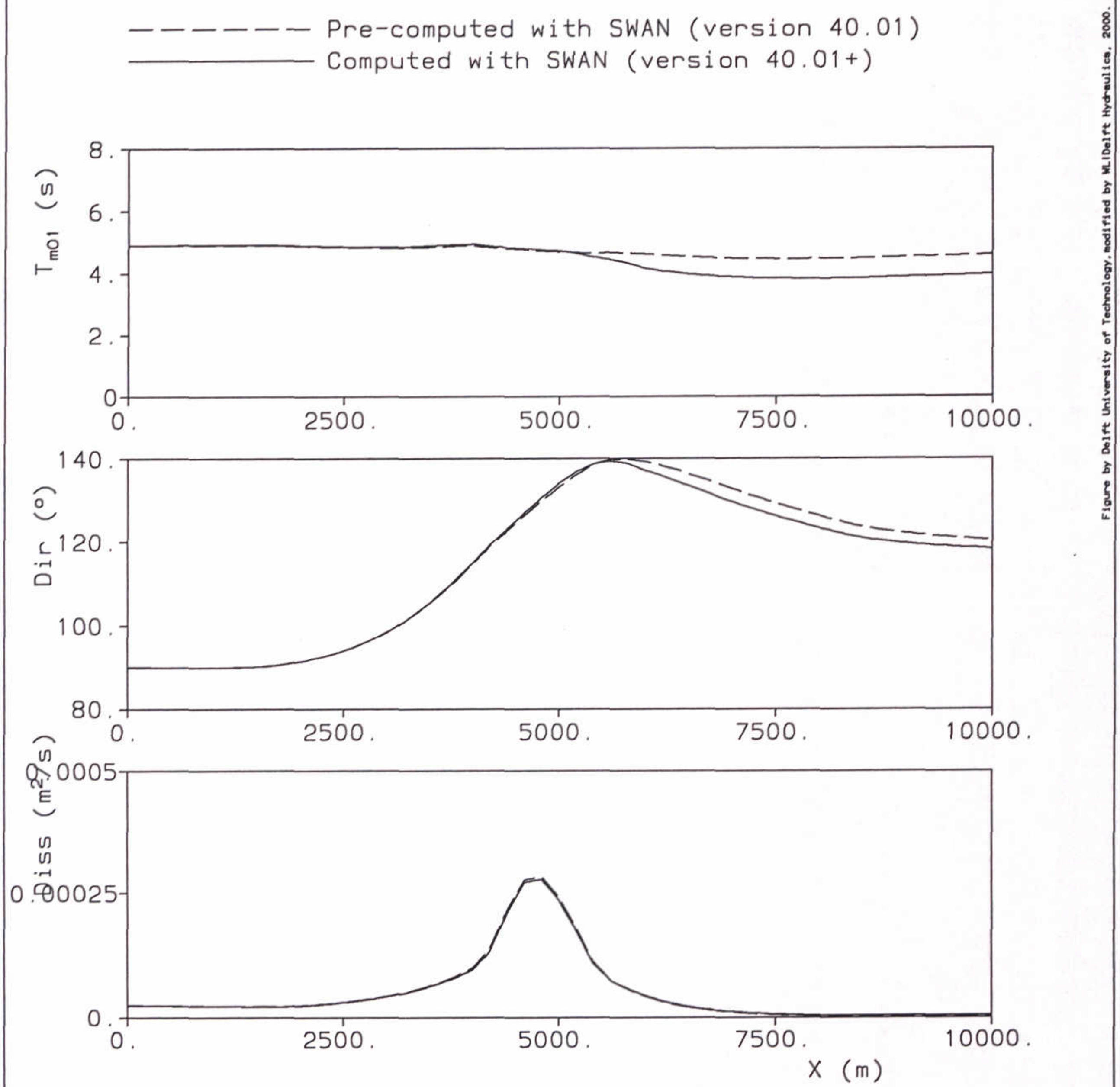
L51his01 L51b

Hiswa basin experiment: test me35



L61BarrC1 L61a

Barrier island: regular grid



L61BarrC1 L61b

Barrier island: regular grid

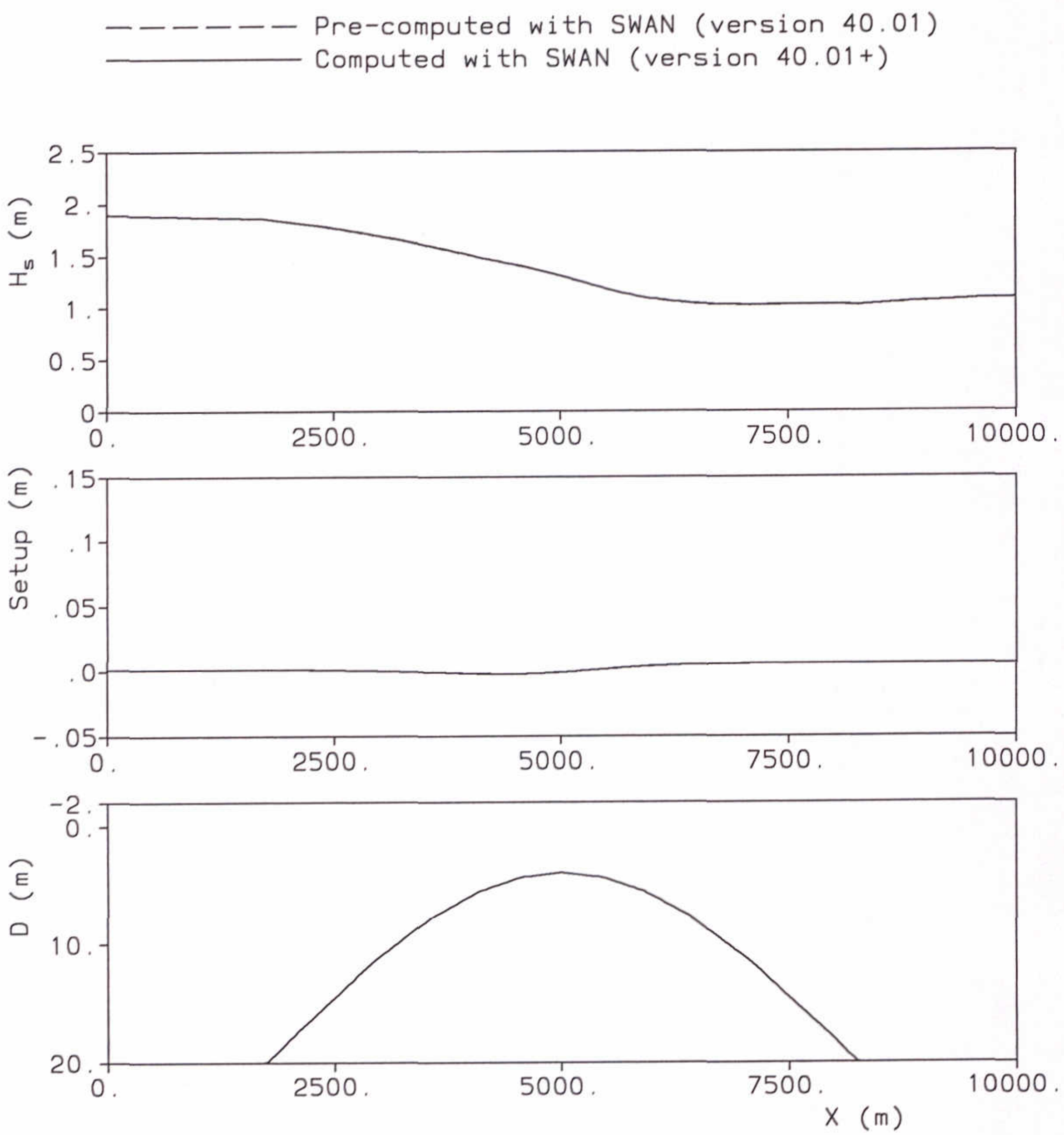
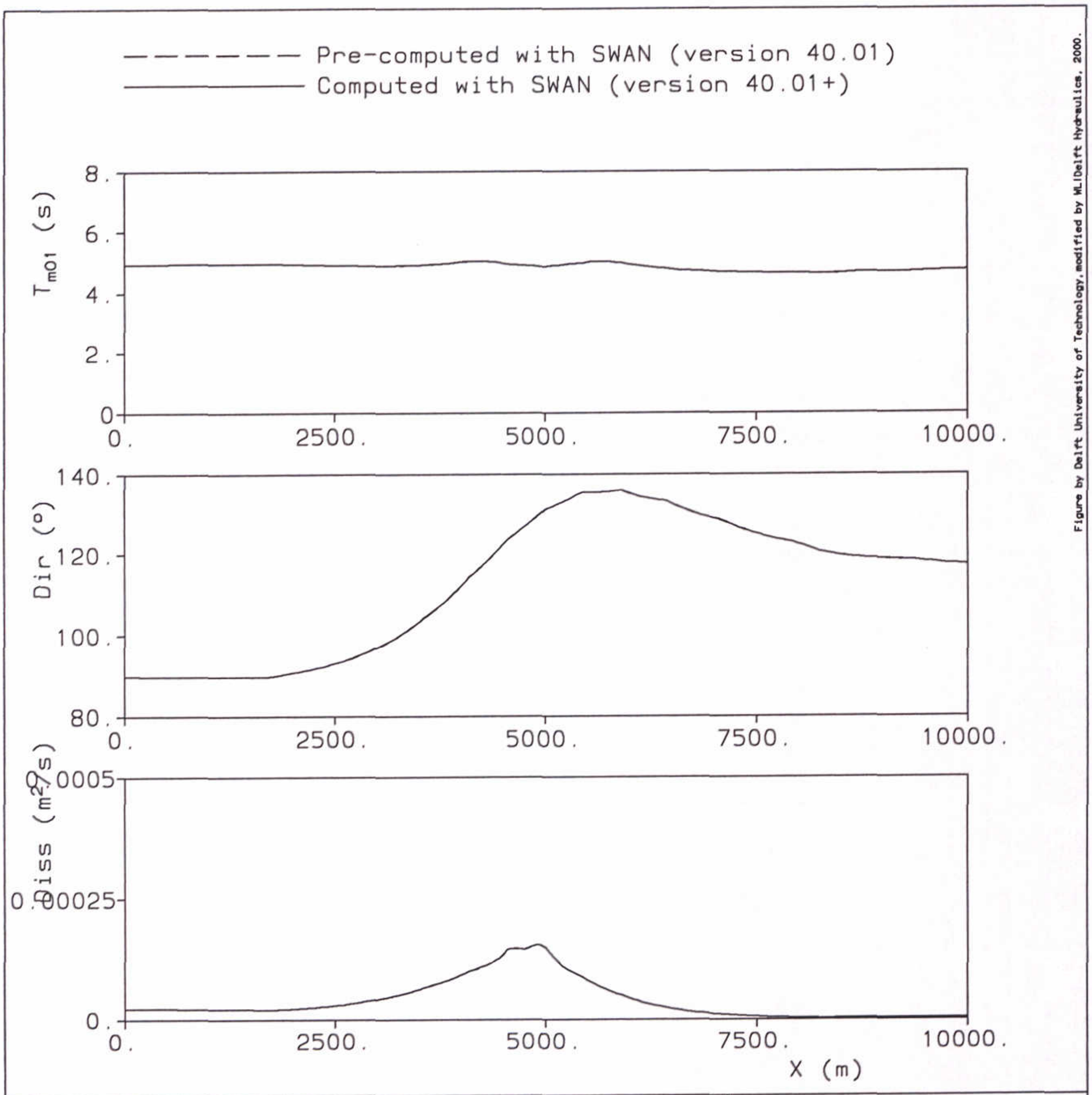


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

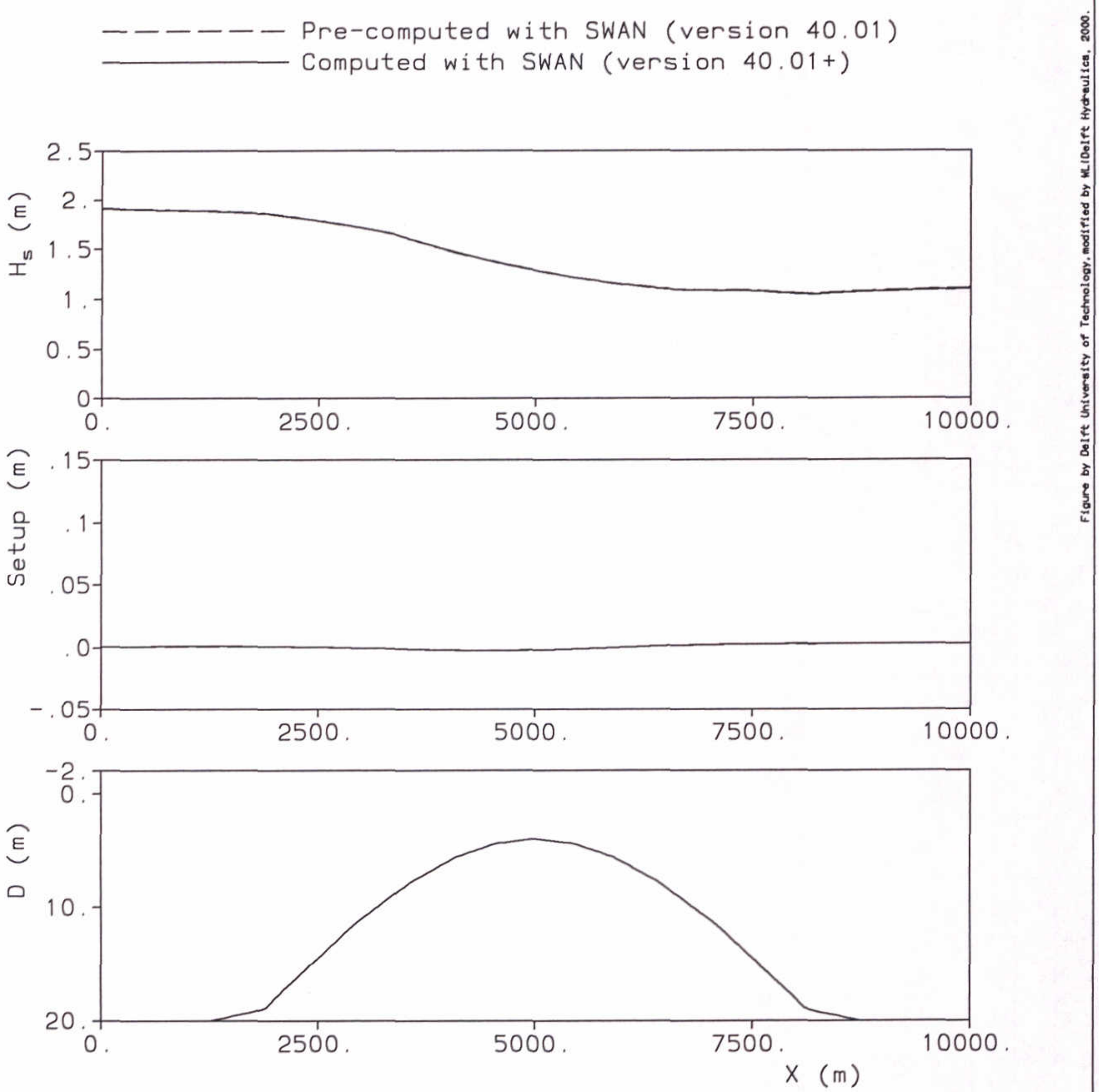
L61BarrC2 L61c

Barrier island: curvilinear grid 1



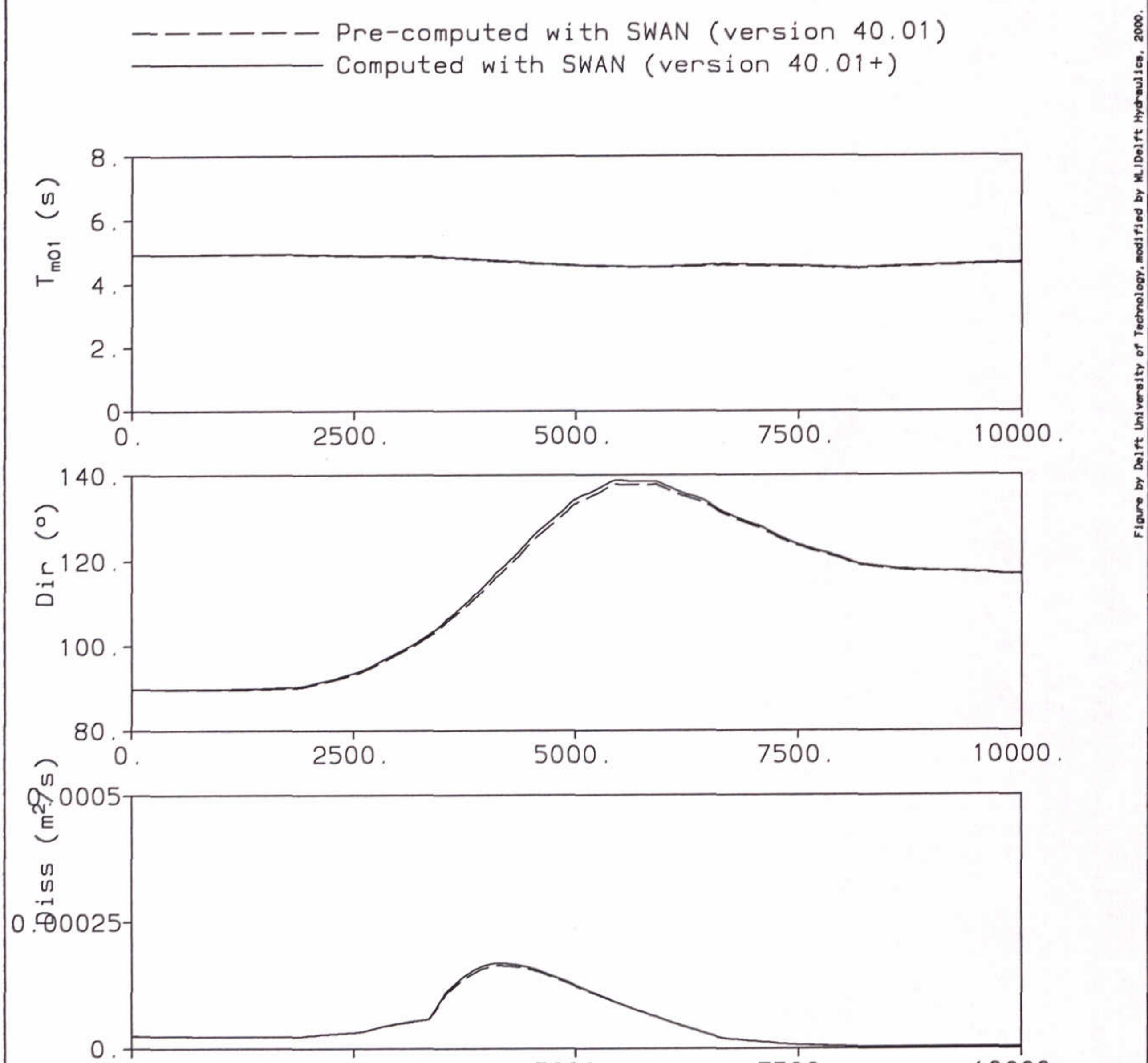
L61BarrC2 L61d

Barrier island: curvilinear grid 1



L61BarrC3 L61e

Barrier island: curvilinear grid 2



L61BarrC3 L61f

Barrier island: curvilinear grid 2

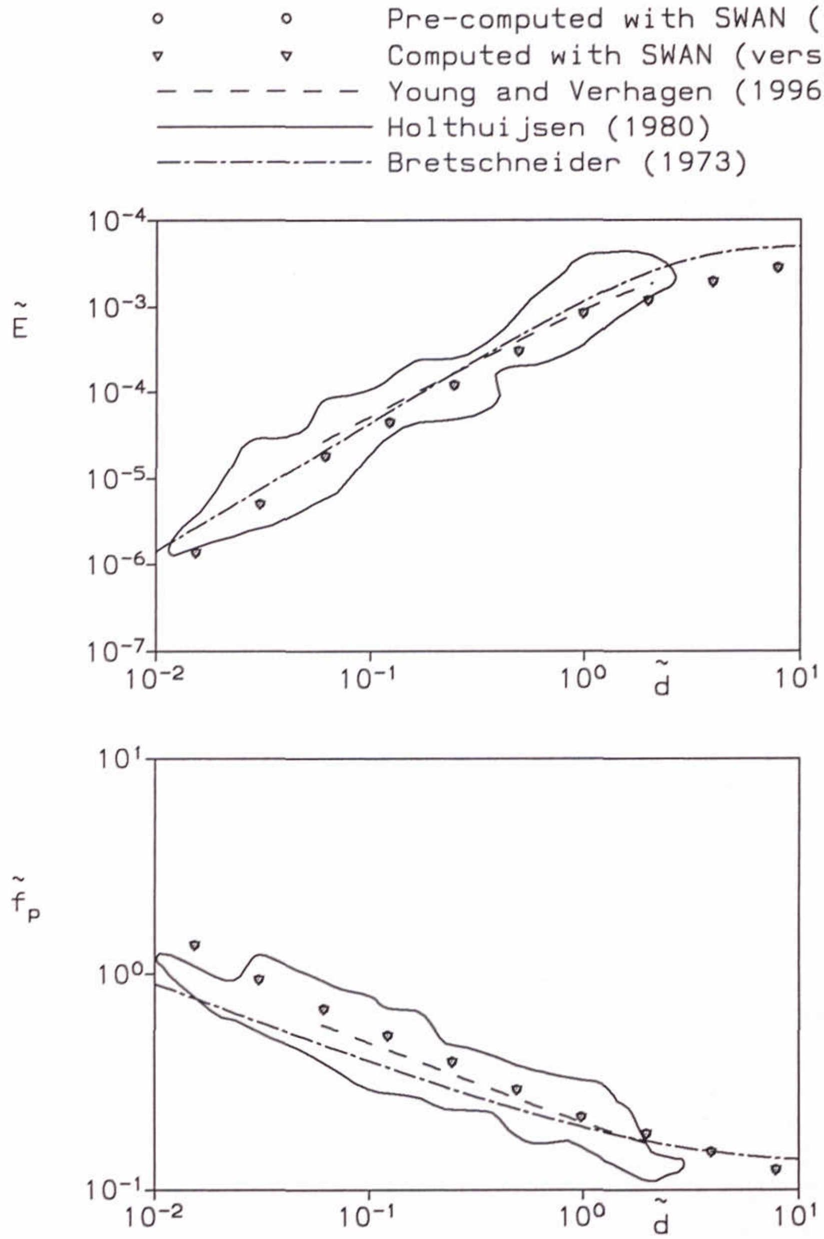
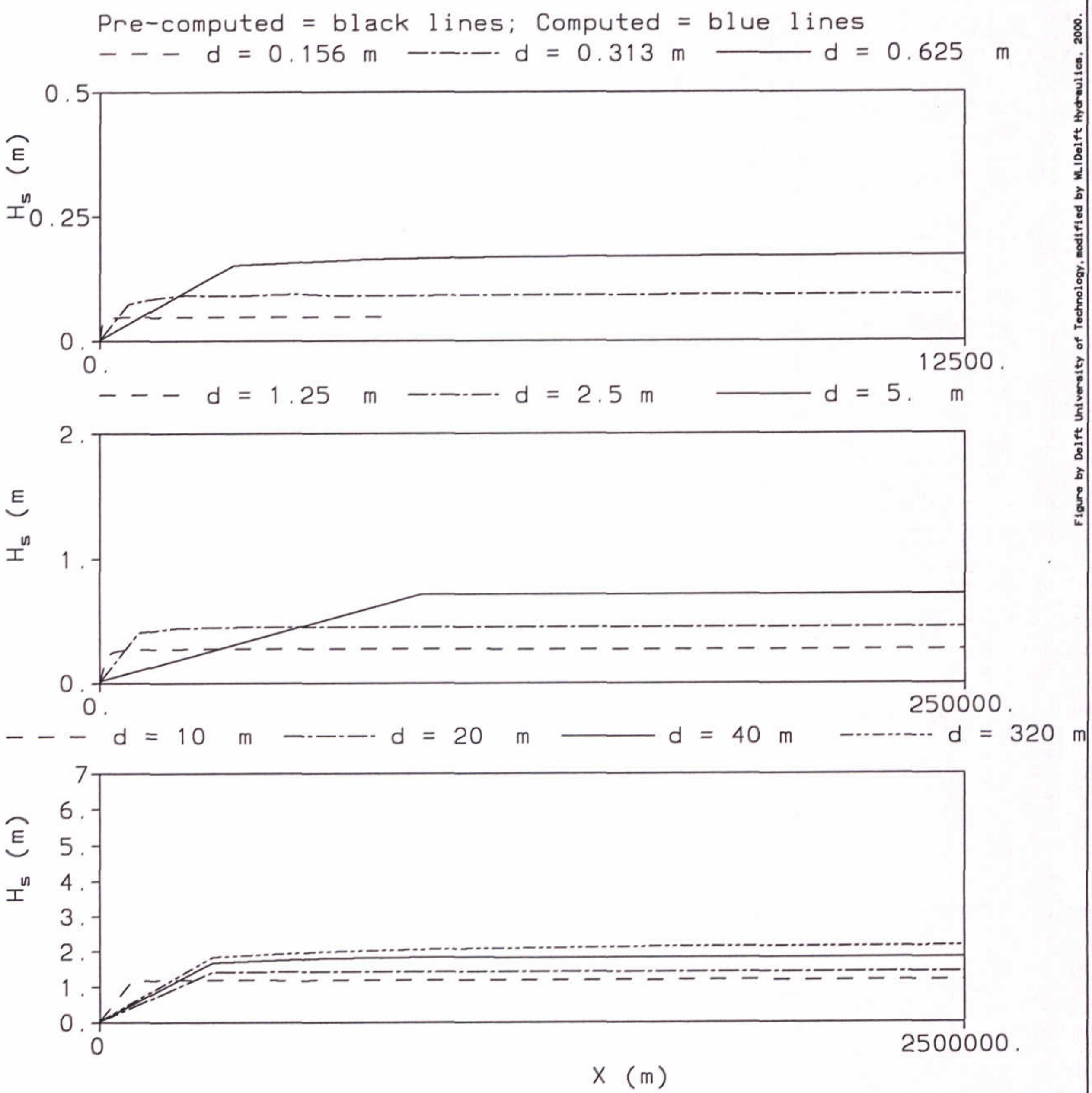


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

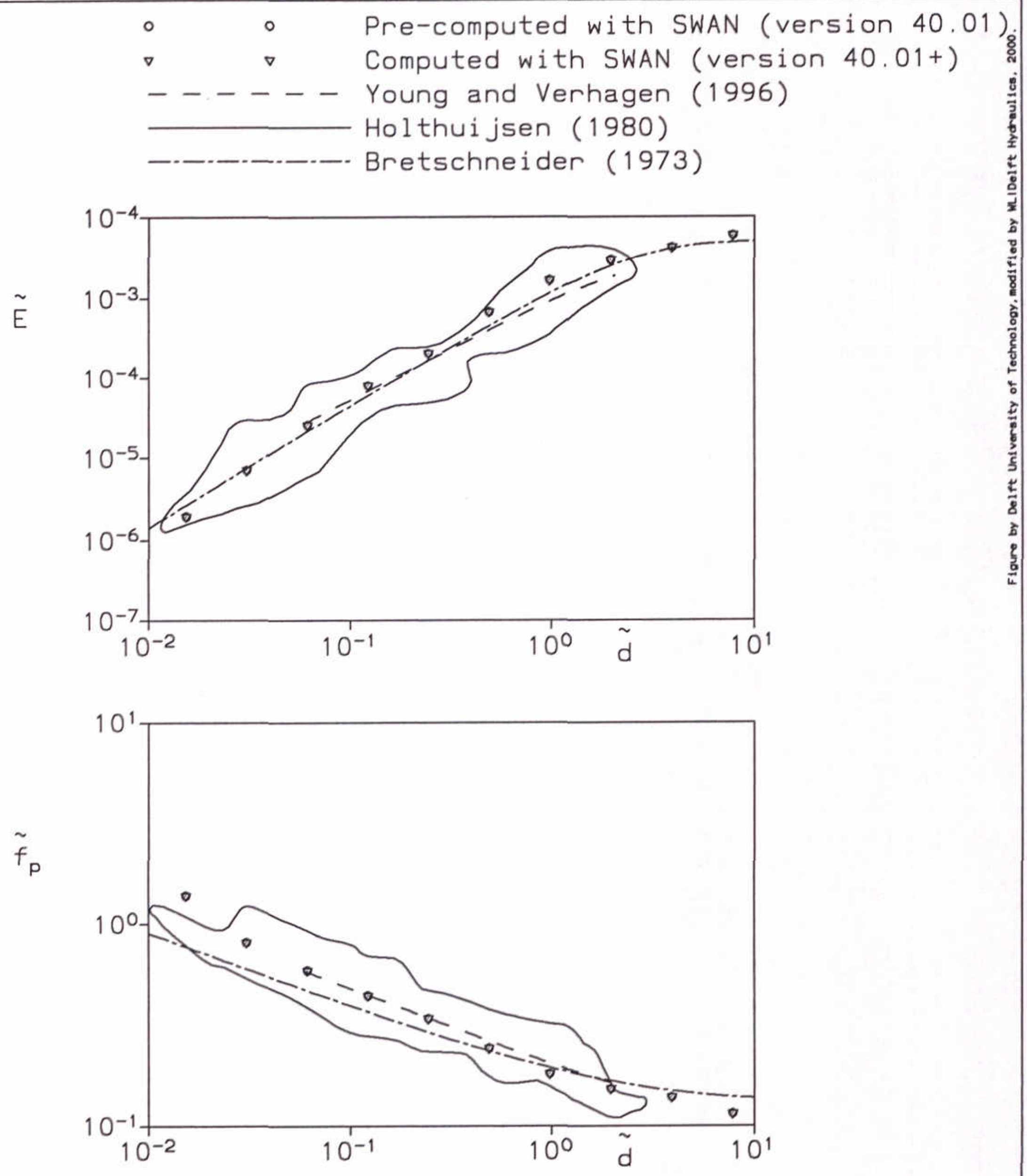
F11grs01 F11a

Wave growth: GEN3, U10= 10 m/s



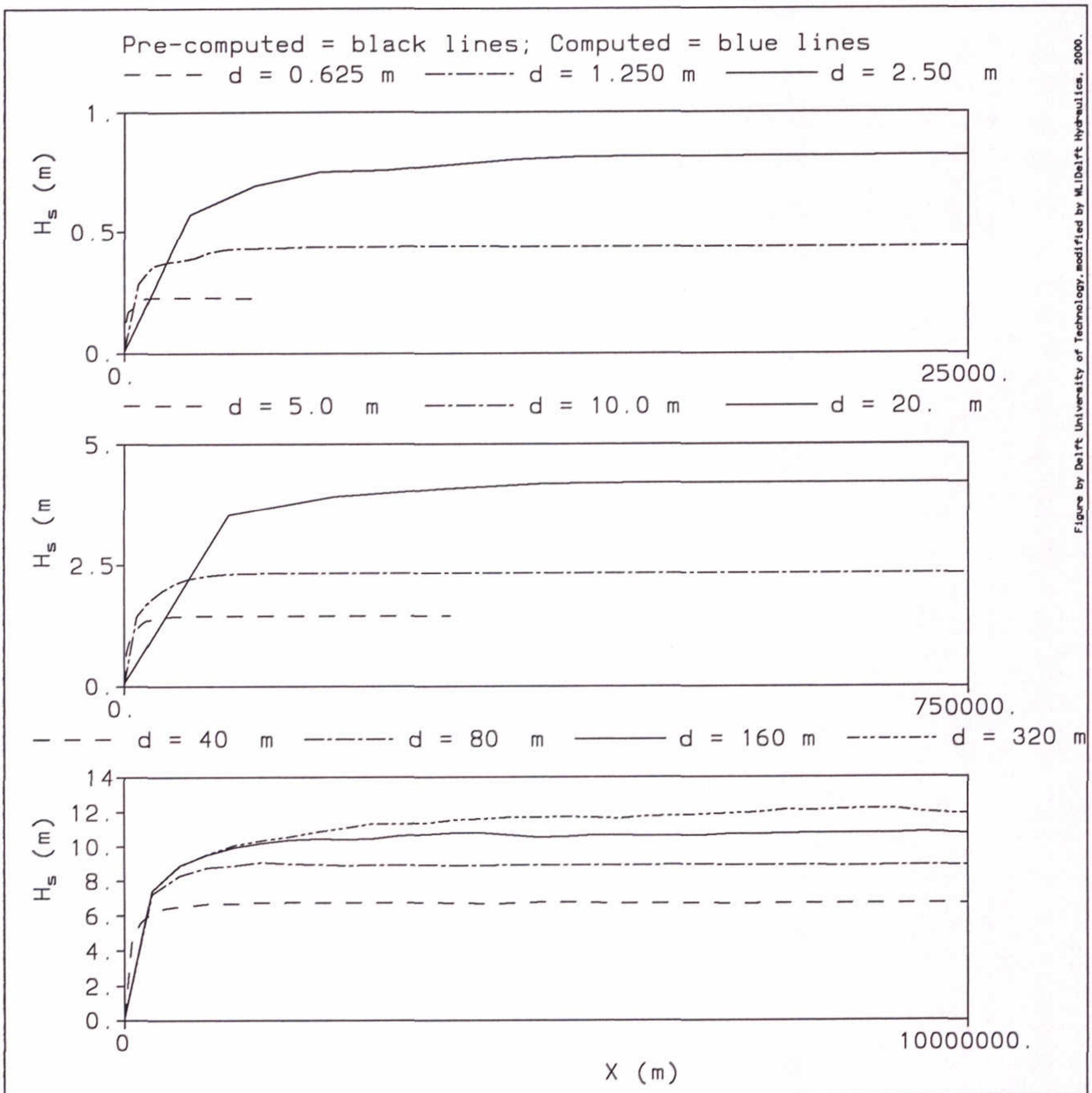
F11grs01 F11b

Depth-limited wave growth



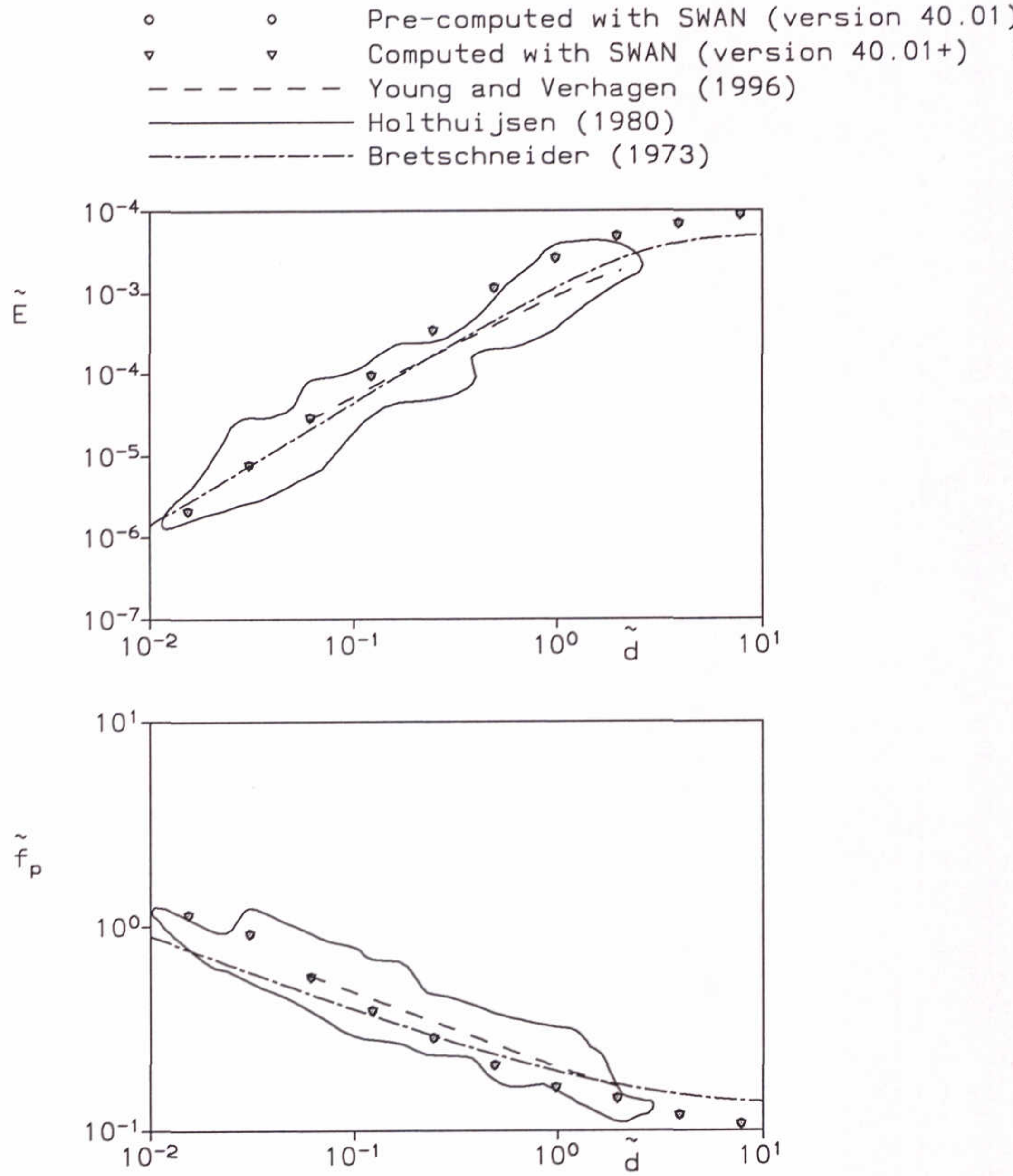
F12grs01 F12a

Wave growth: GEN3, U10= 20 m/s



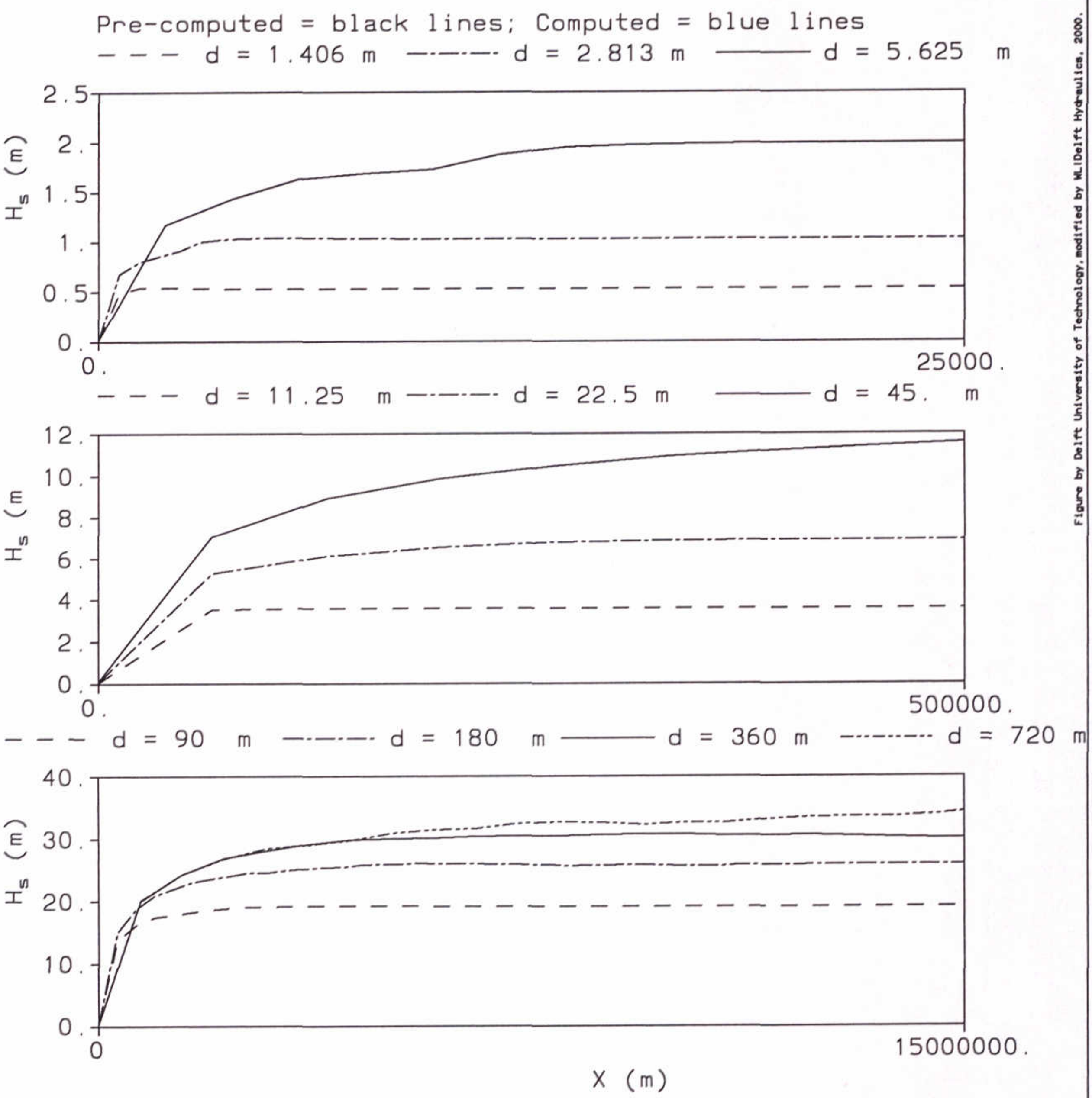
F12grs01 F12b

Depth-limited wave growth



F13grs01 F13a

Wave growth: GEN3, U10= 30 m/s



F13grs01 F13b

Depth-limited wave growth

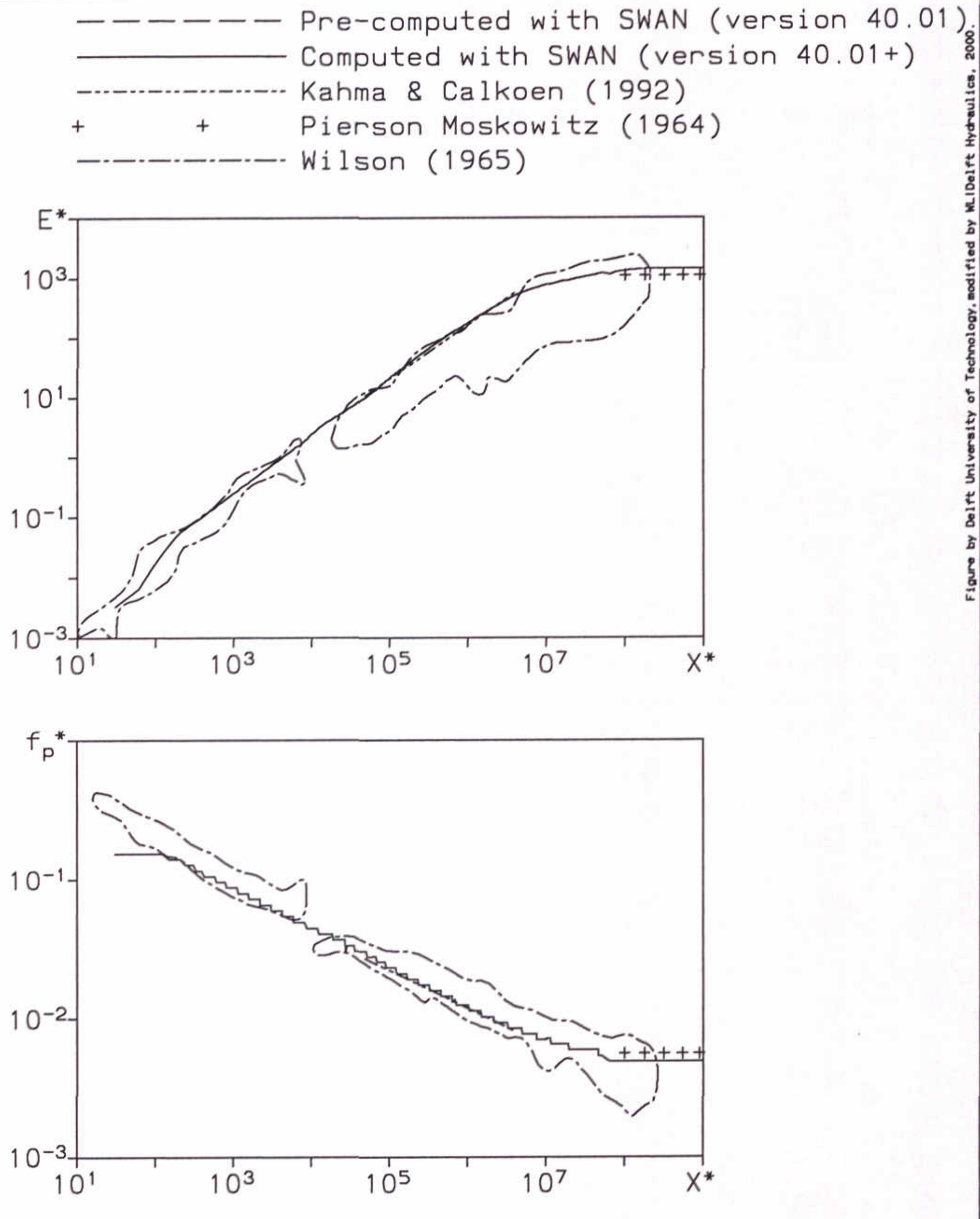
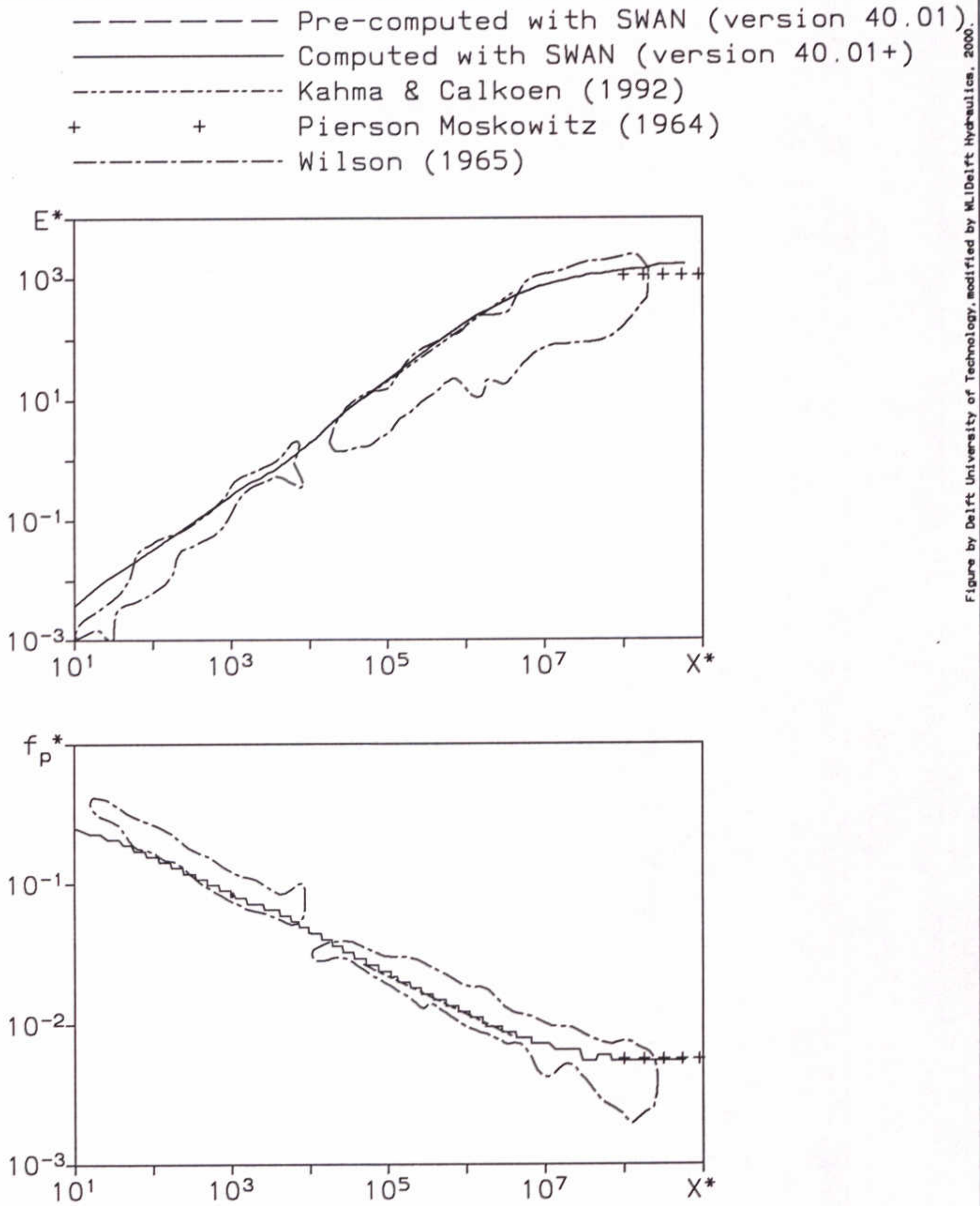


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

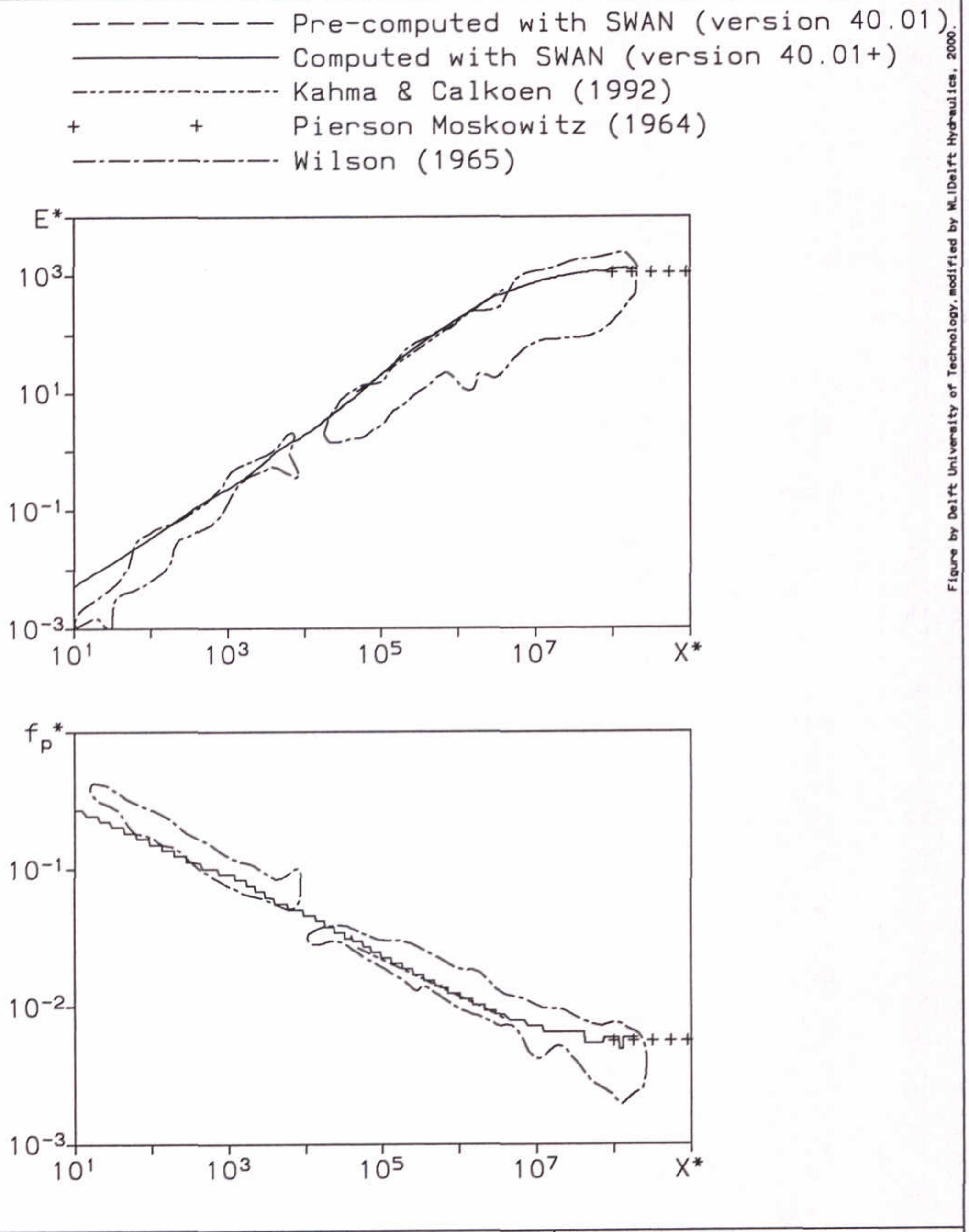
F21grd01 F21

Wave growth: GEN3, U10= 10 m/s



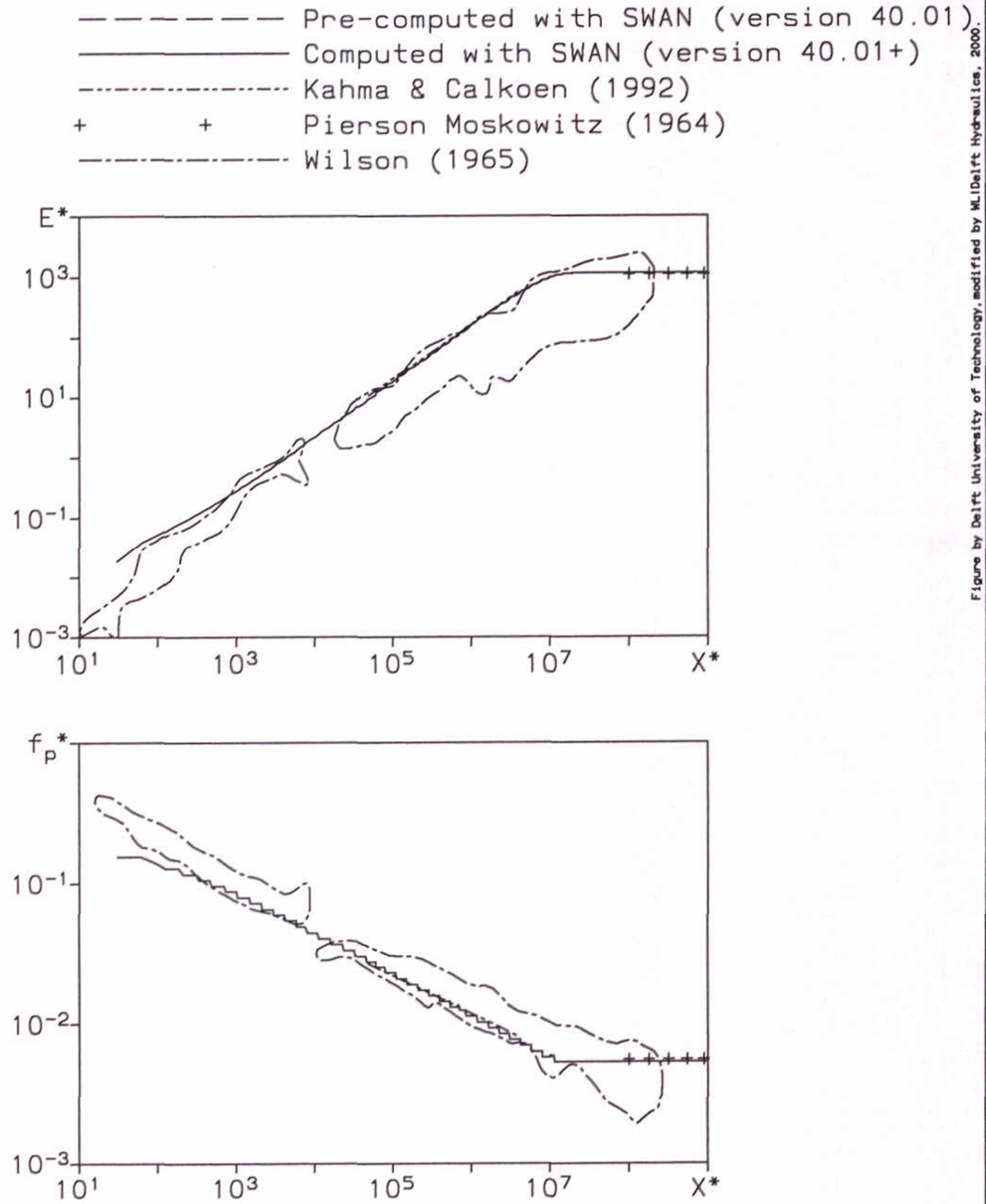
F22grd01 F22

Wave growth: GEN3, U10= 20 m/s



F23grd01 F23

Wave growth: GEN3, U10= 30 m/s



F24grd01 F24

Wave growth: GEN2, U10= 10 m/s

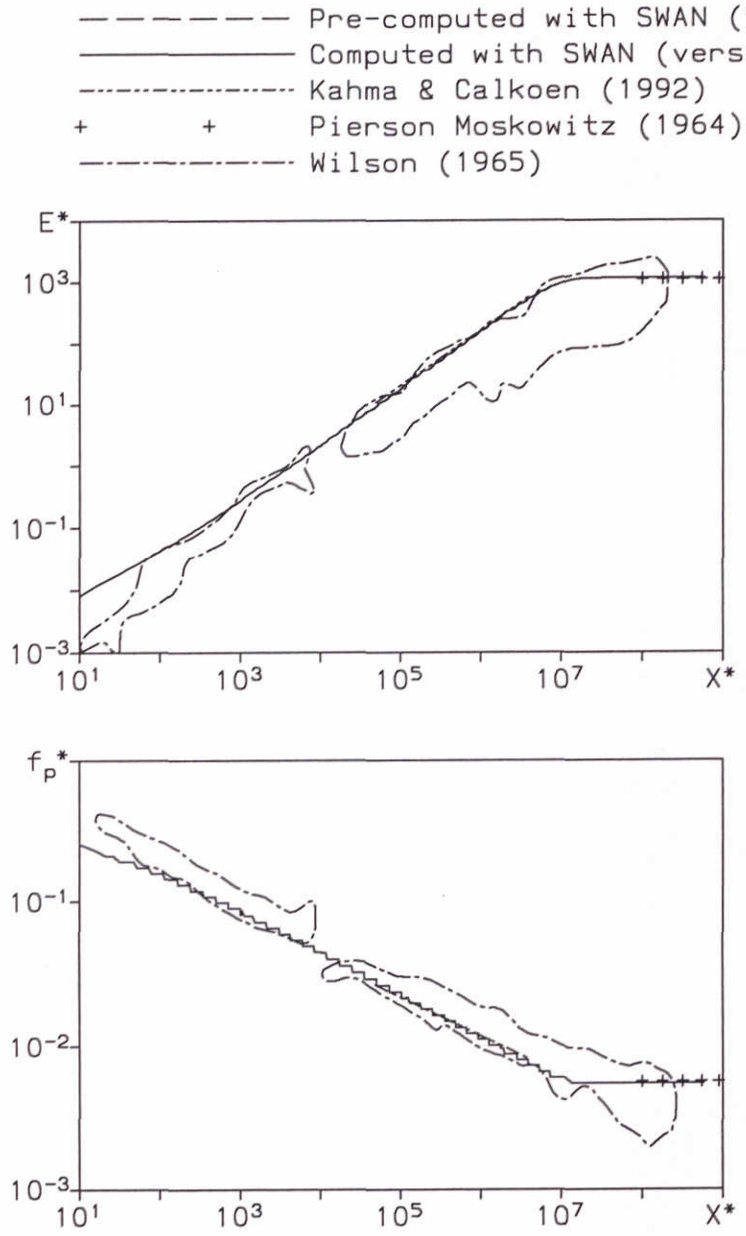
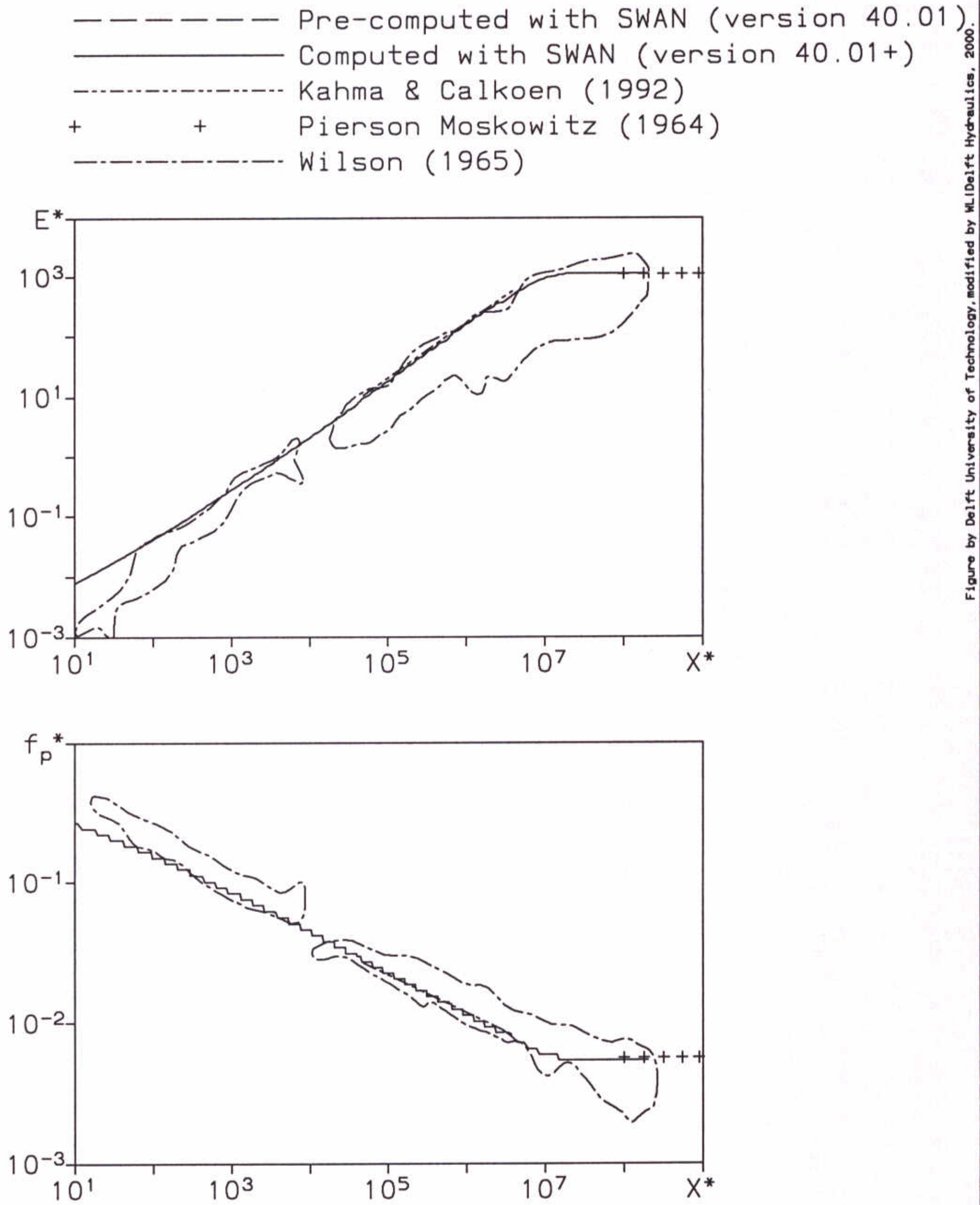


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F25grd01 F25

Wave growth: GEN2, U10= 20 m/s



F26grd01 F26

Wave growth: GEN2, U10= 30 m/s

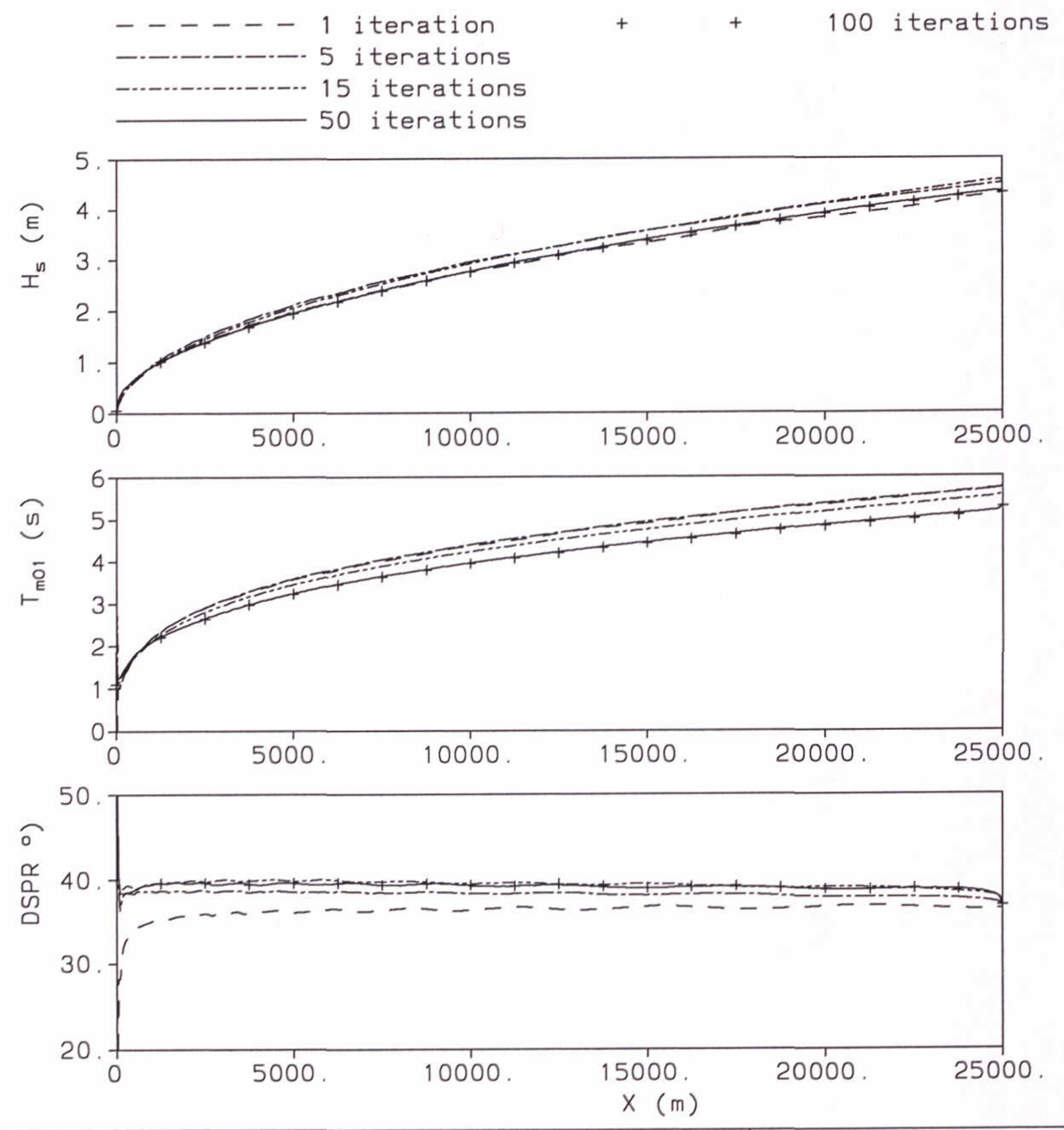
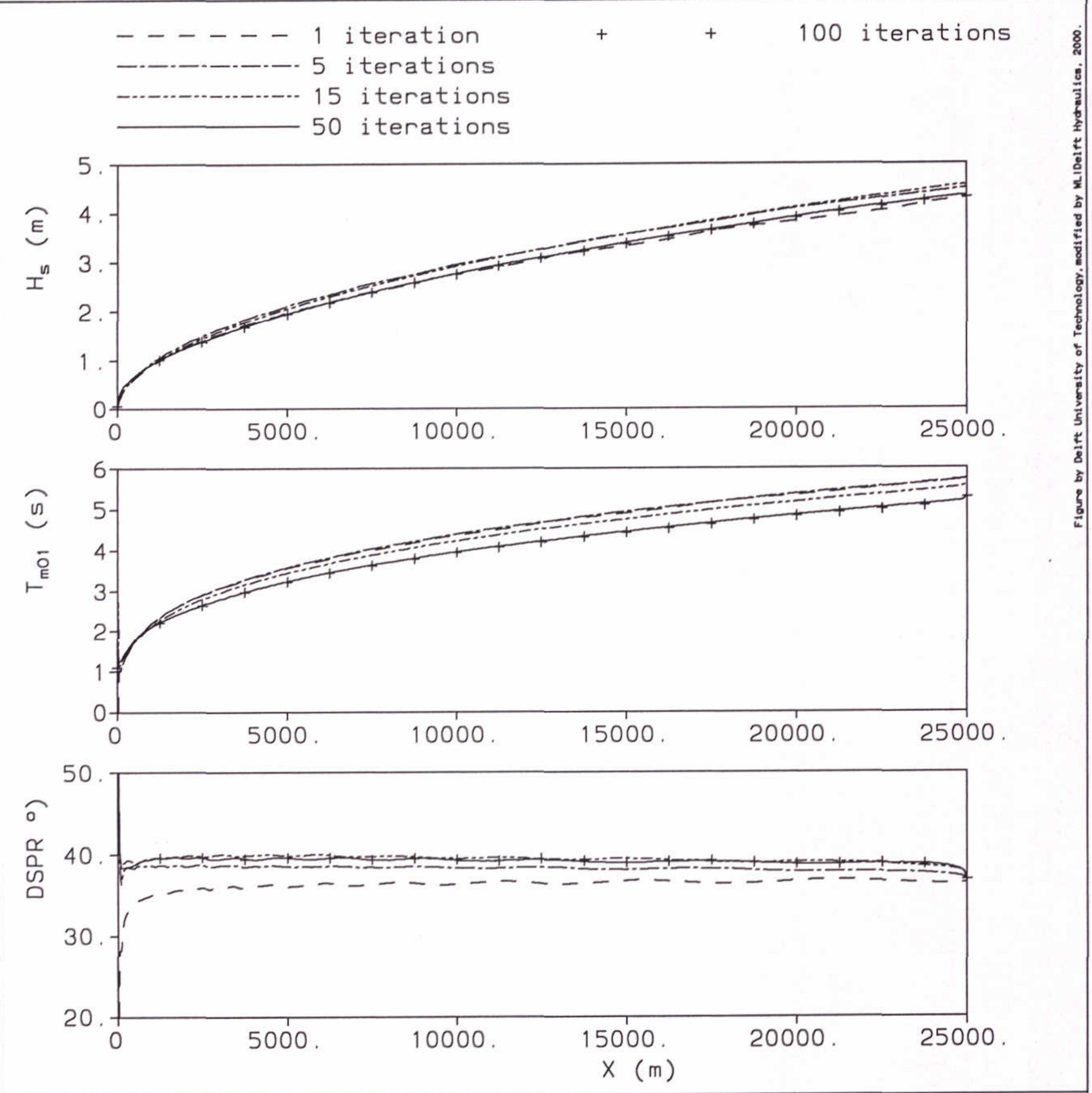


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

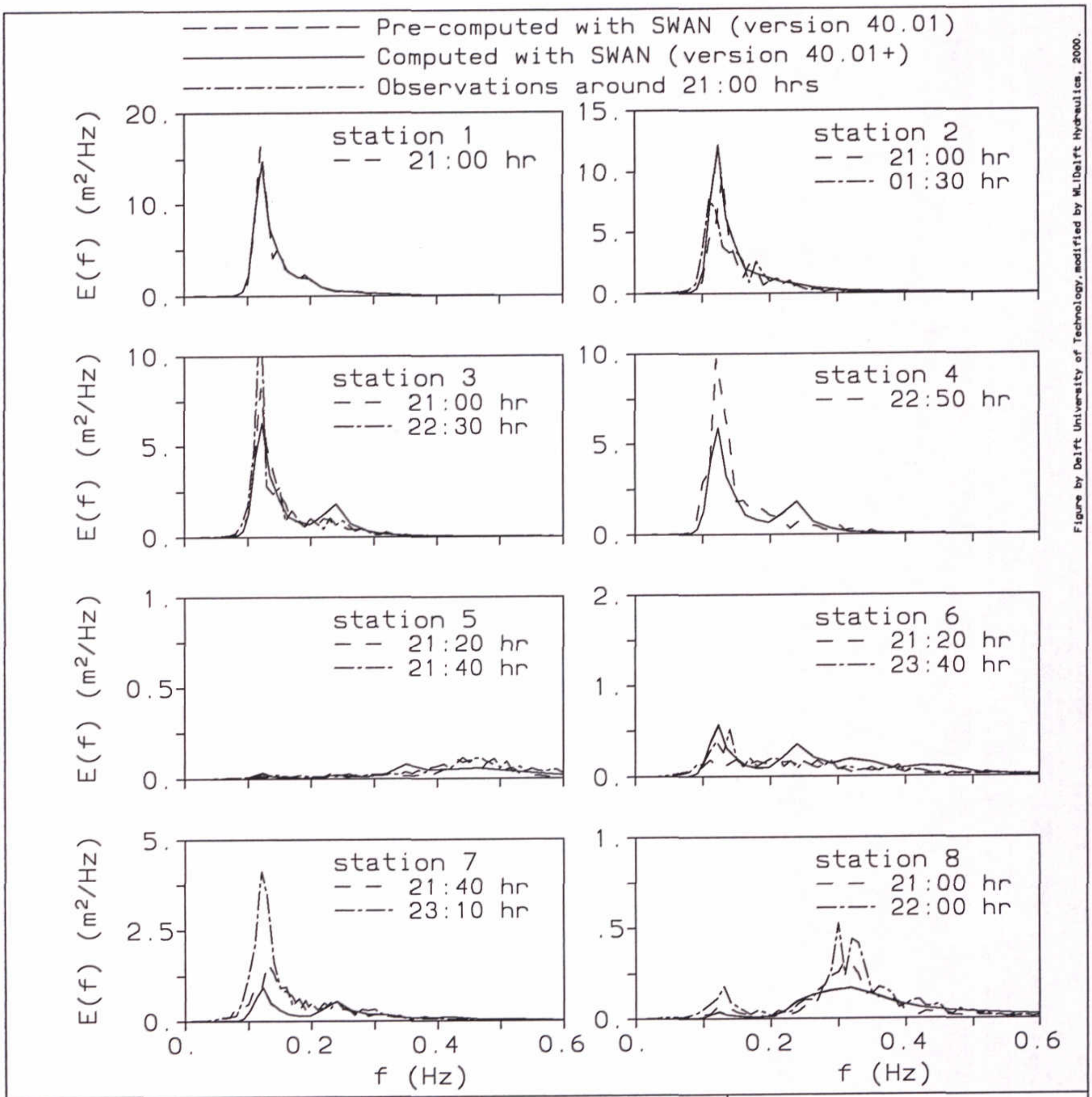
F27grd01 F27a

Model convergence (computed)



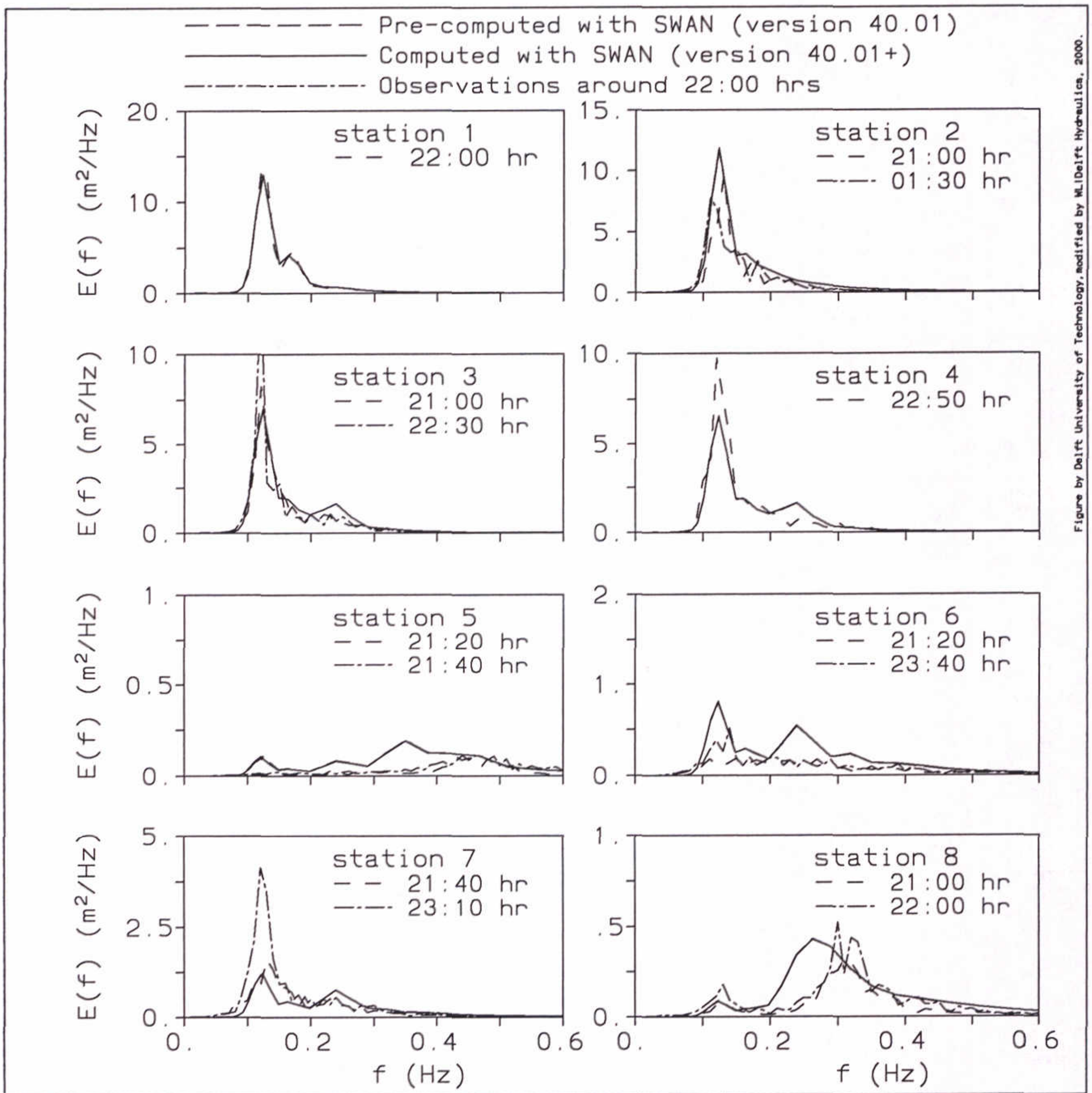
F27grd01 F27b

Model convergence (precomp)



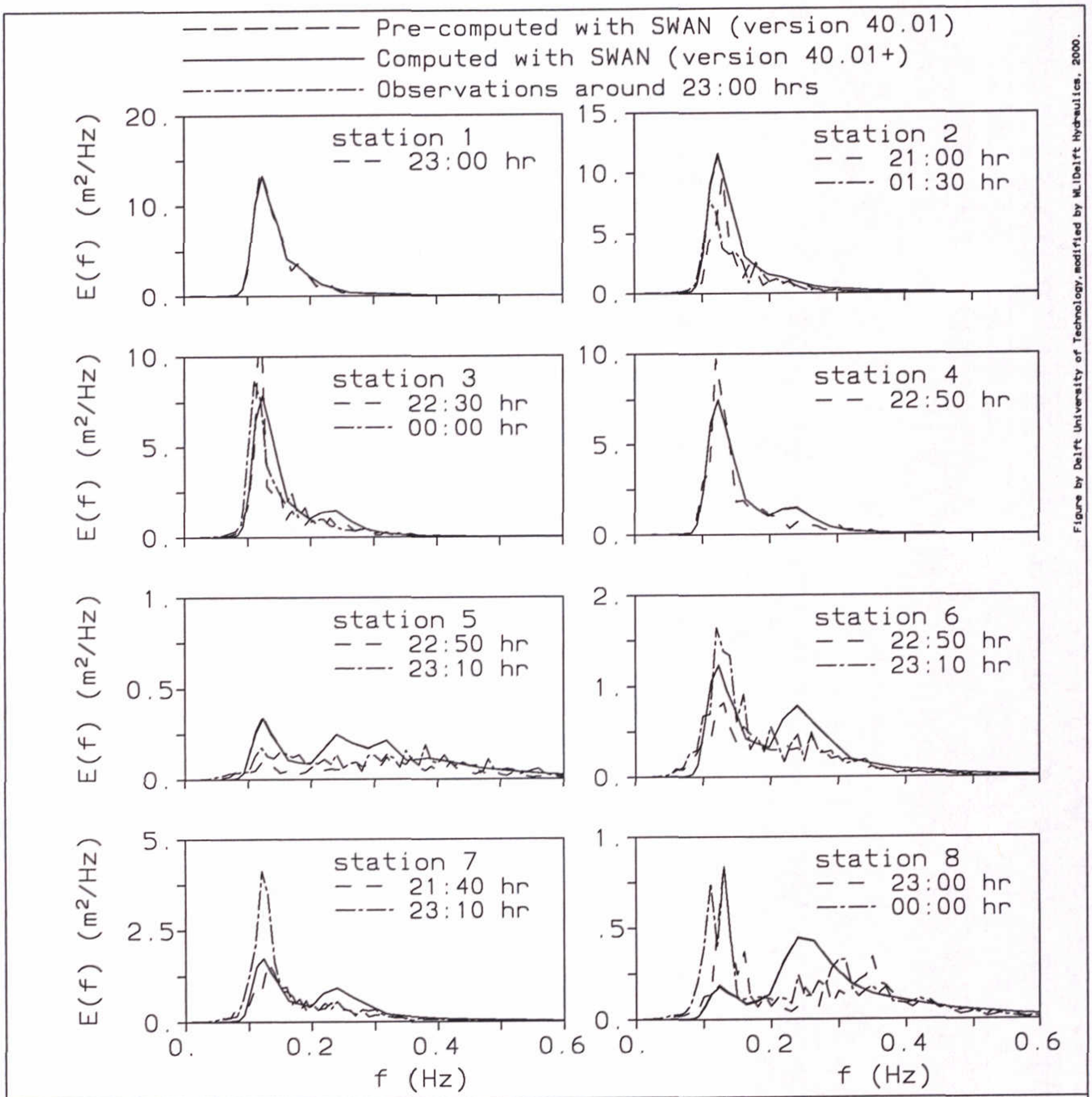
F31har01 F31a

Haringvliet: 21:00 UTC (run 1)



F31har02 F31b

Haringvliet: 22:00 UTC (run 2)



F31har03 F31c

Haringvliet: 23:00 UTC (run 3)

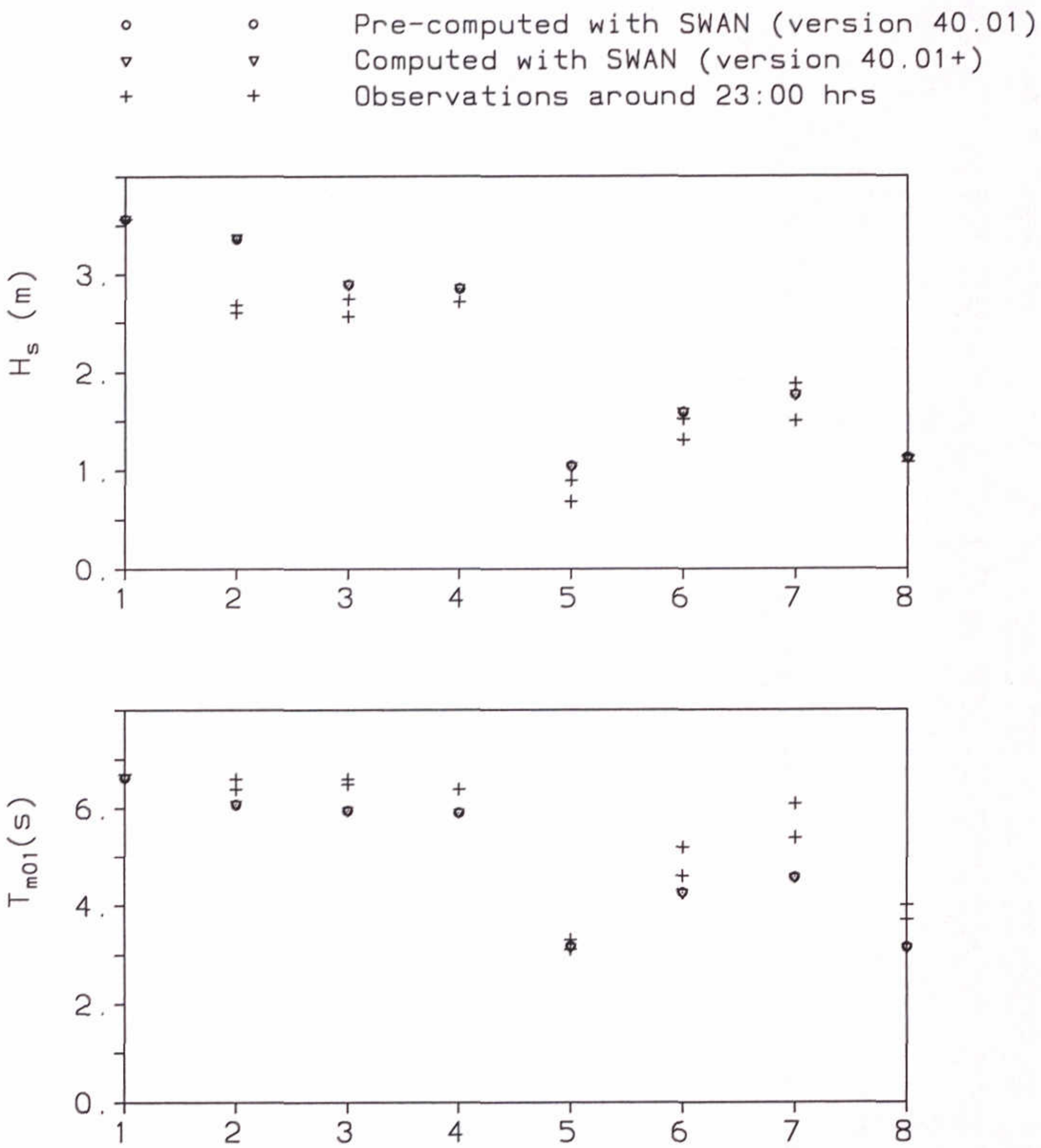
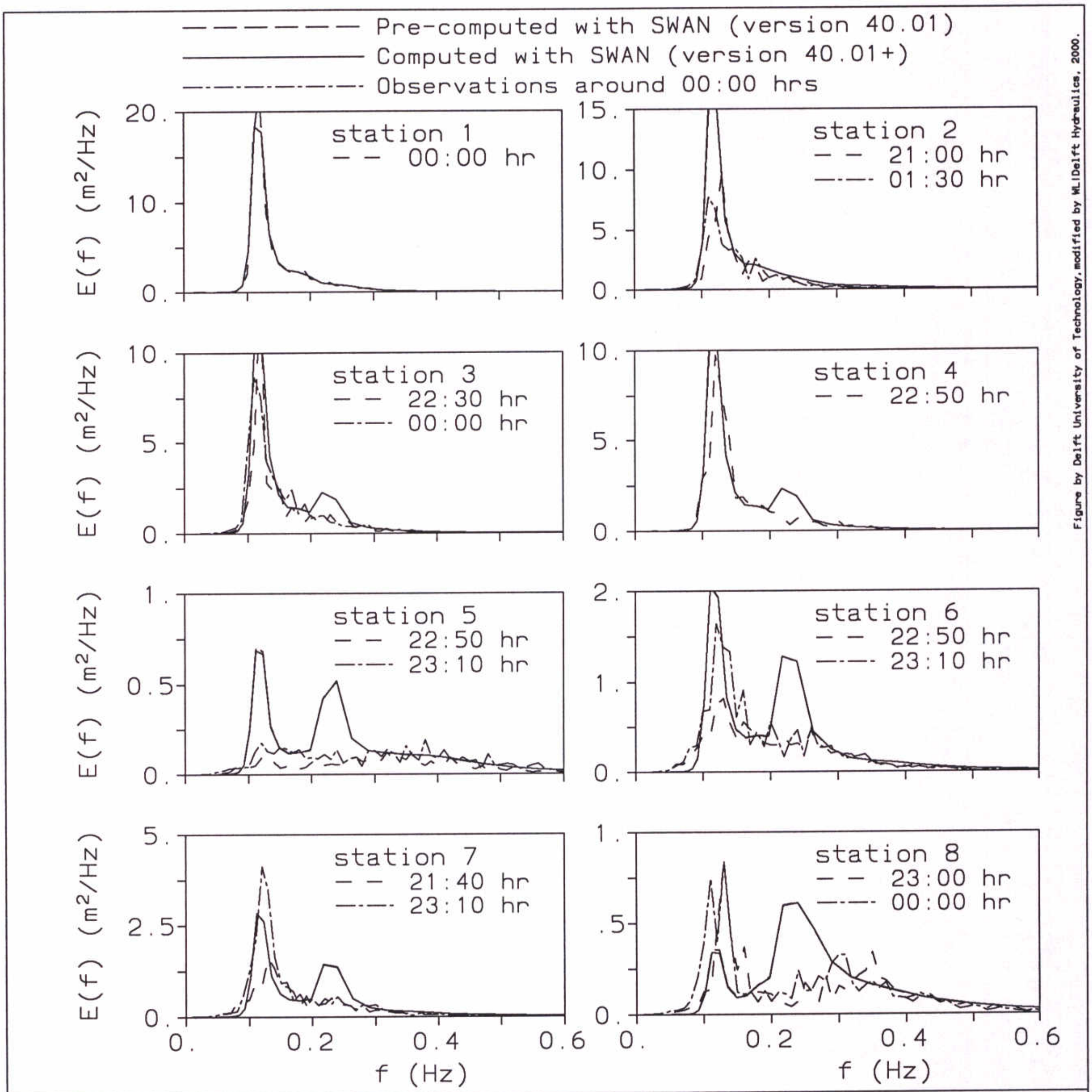


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

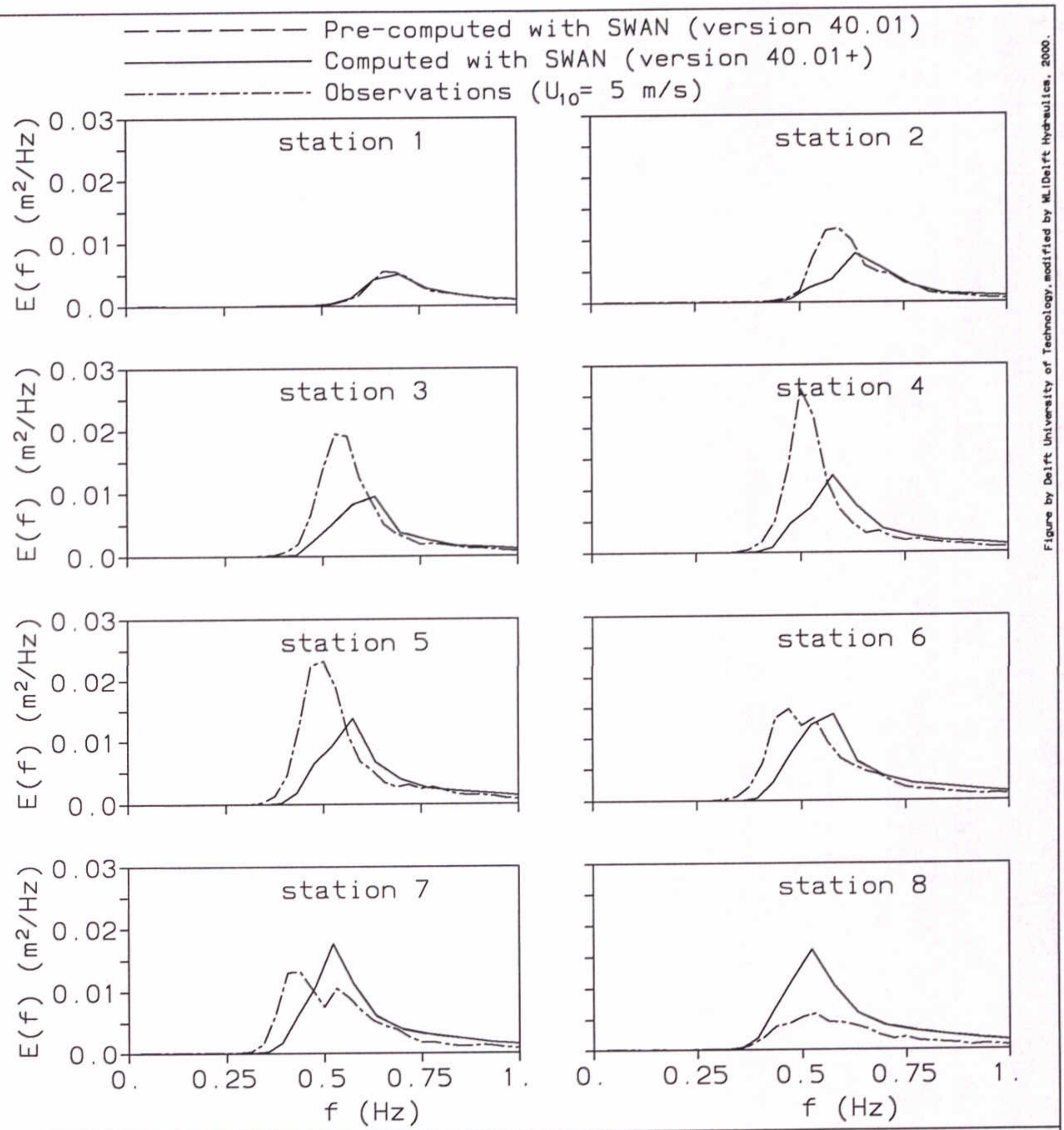
F31har03 F31d

Haringvliet: 23:00 UTC (run 3)



F31har04 F31e

Haringvliet: 00:00 UTC (run 4)



F41lak01 F41a

Lake George 19/02/1993 22.00

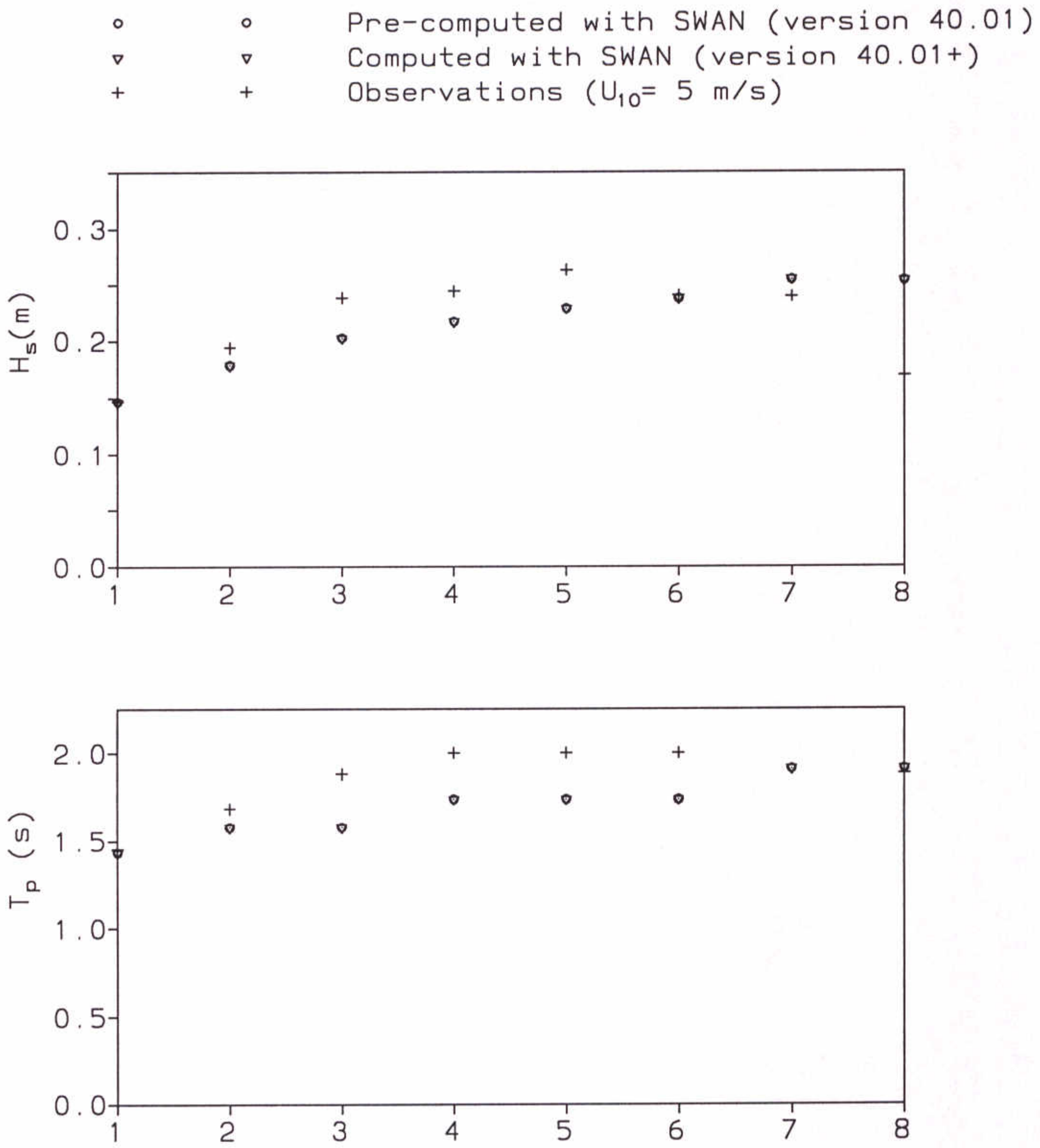
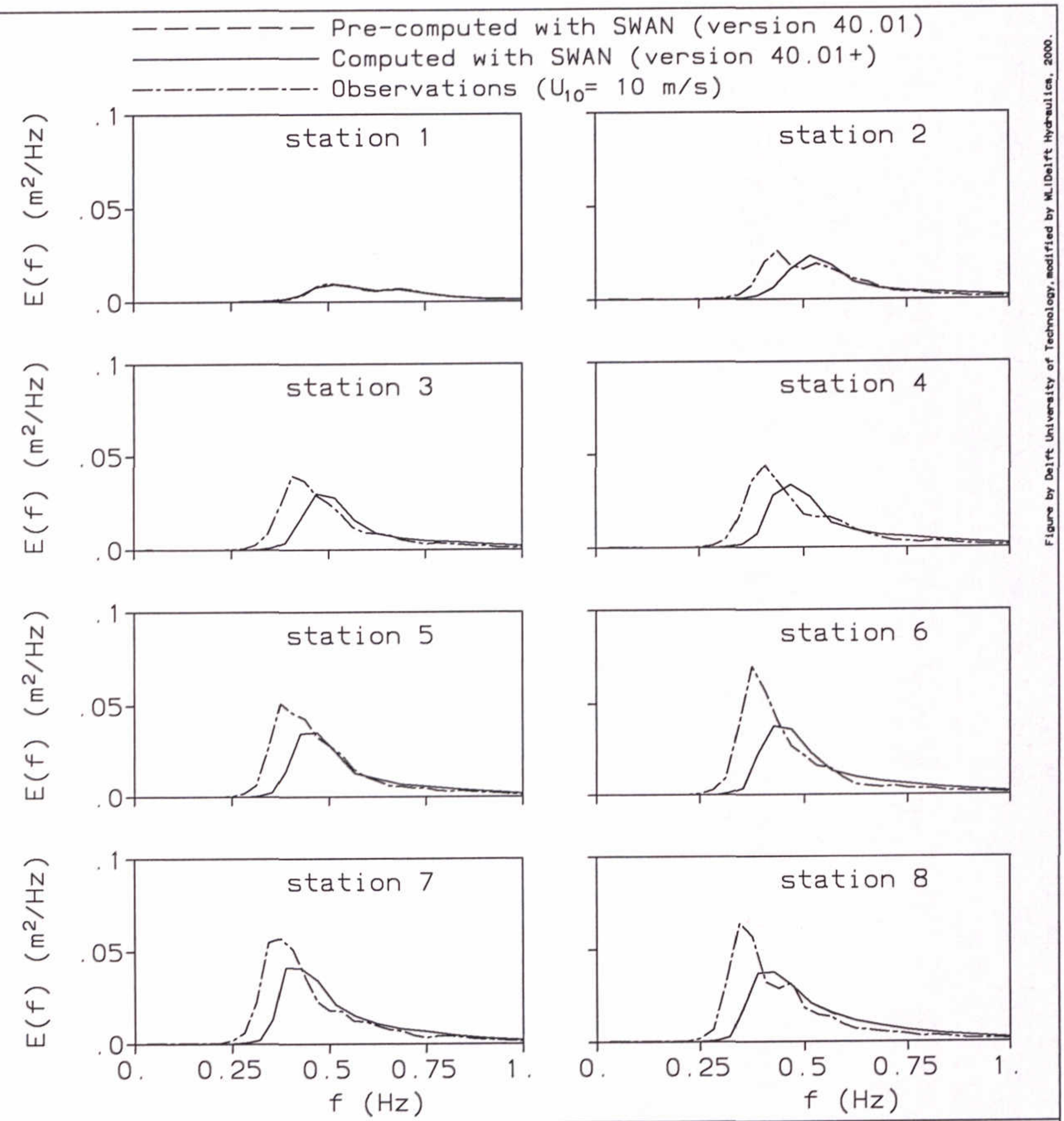


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F41lak01 F41b

Lage George 19/02/1993 22.00



F41lak02 F41c

Lake George 3/10/1993 17.00

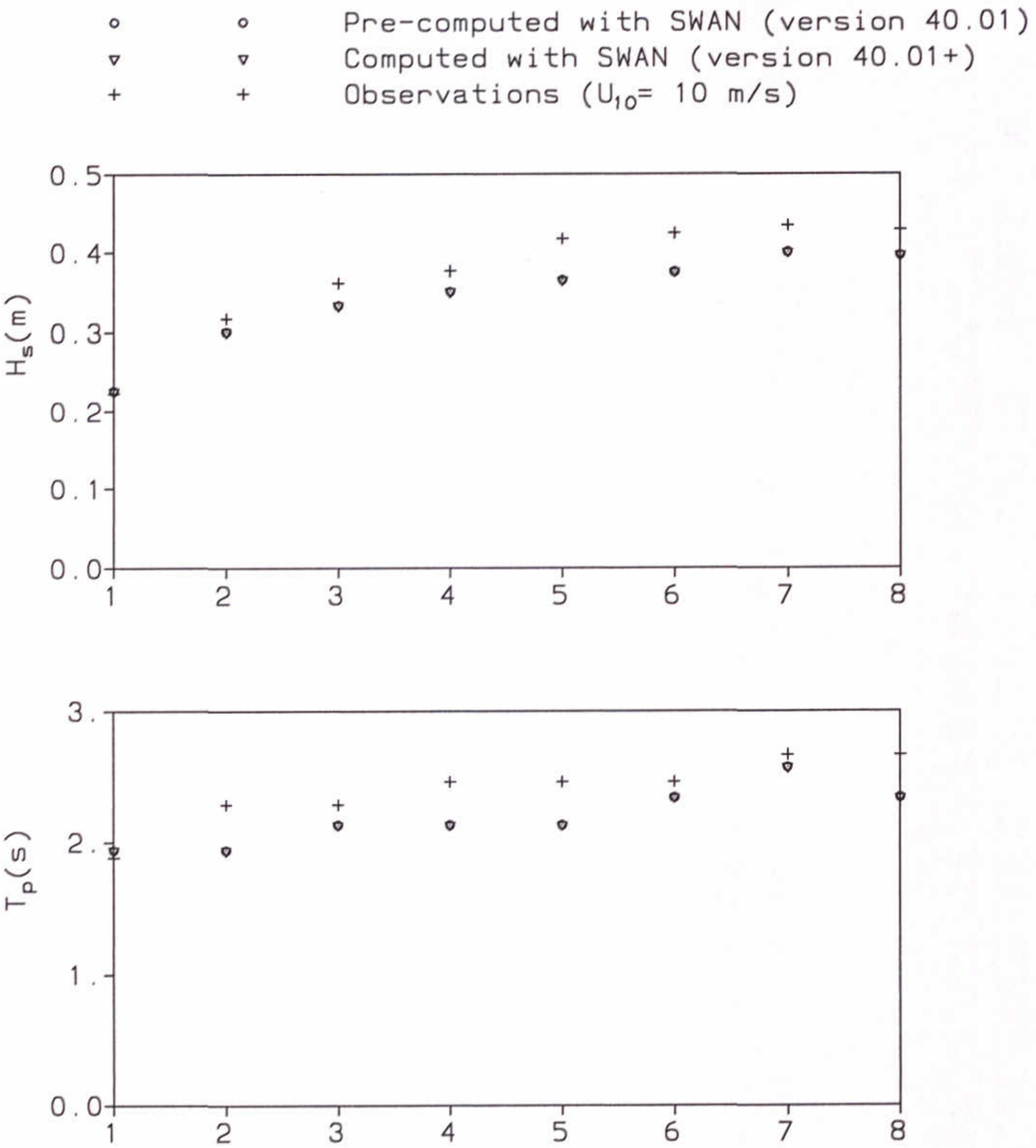
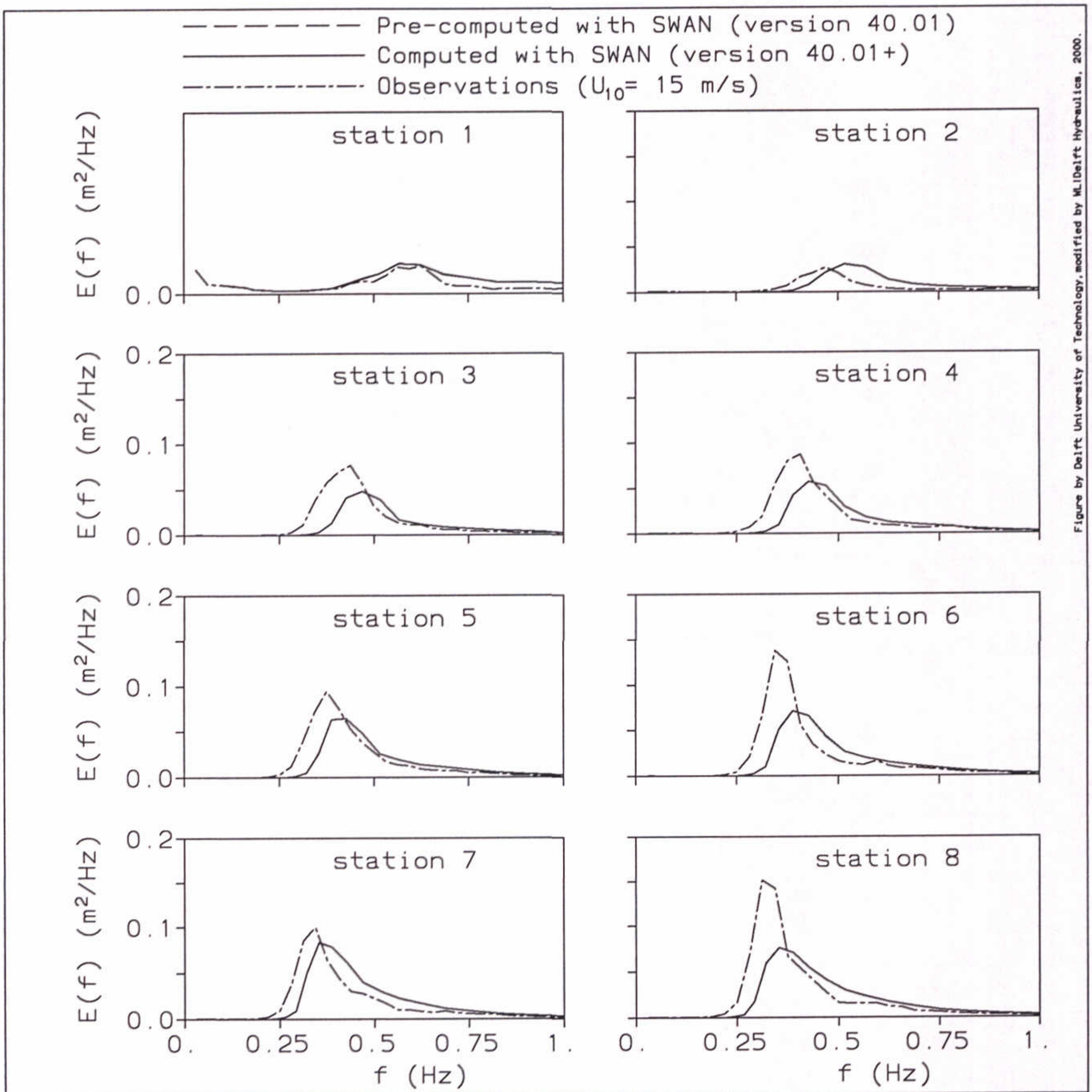


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

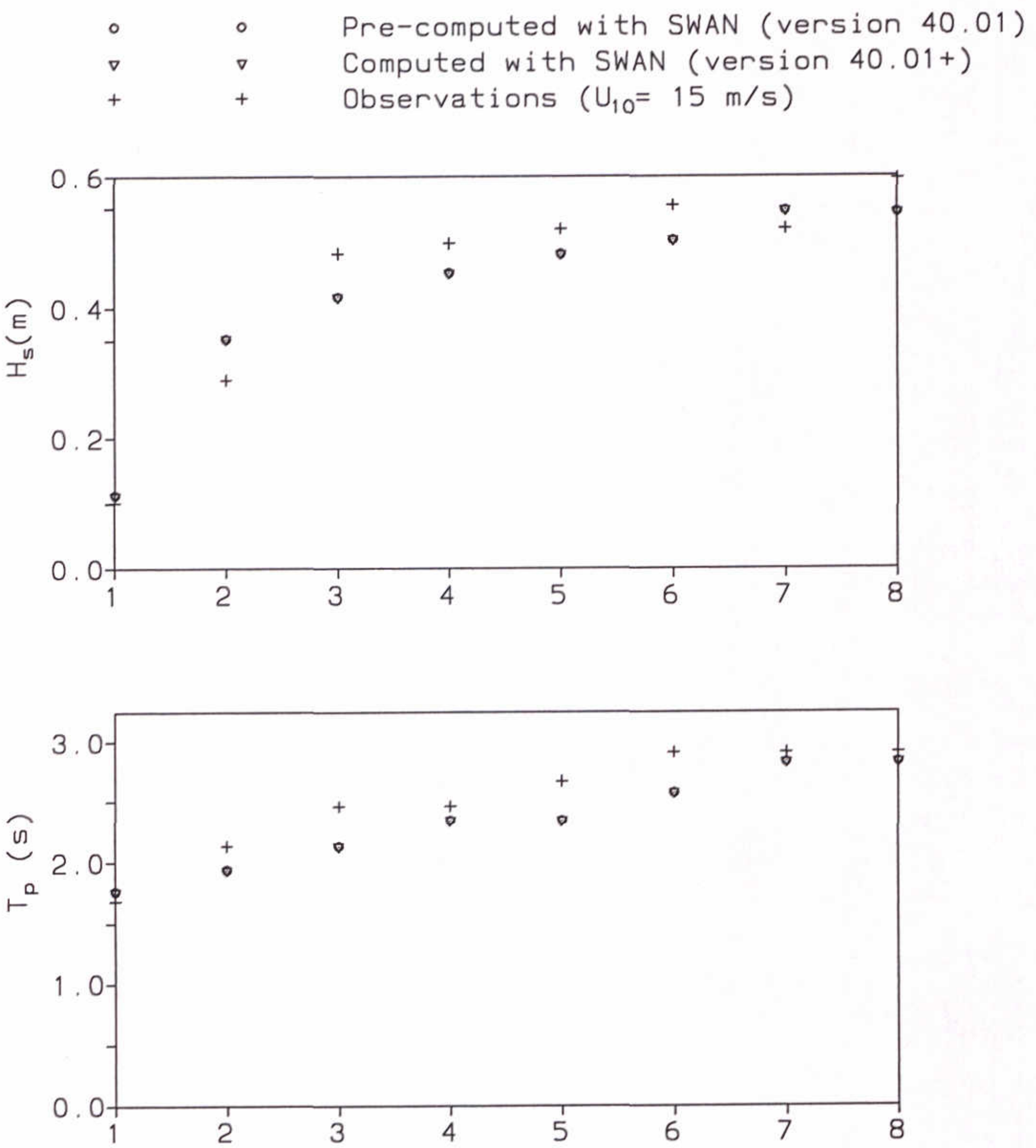
F41lak02 F41d

Lage George 3/10/1993 17.00



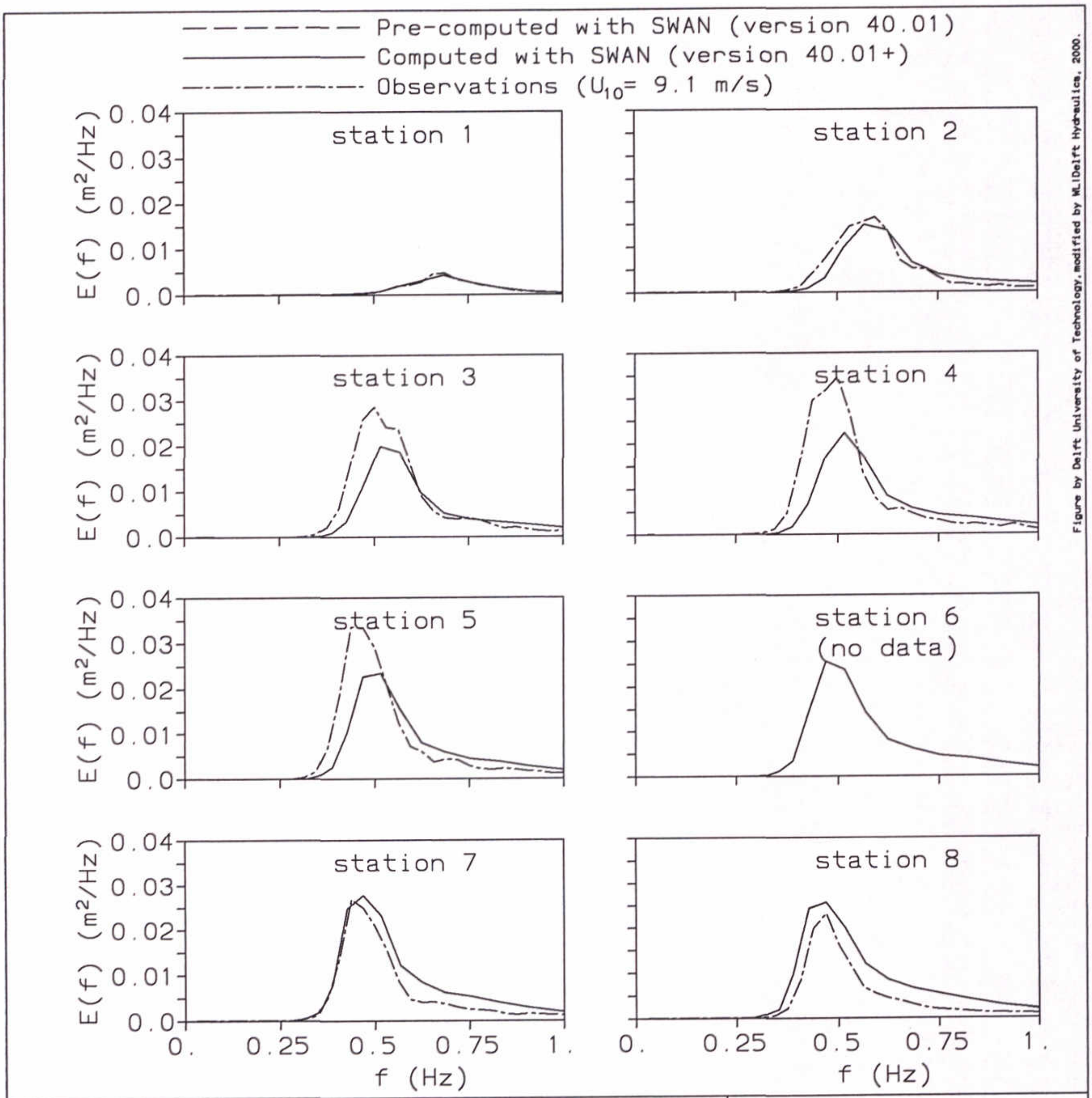
F41lak03 F41e

Lake George 21/11/1992 16.00



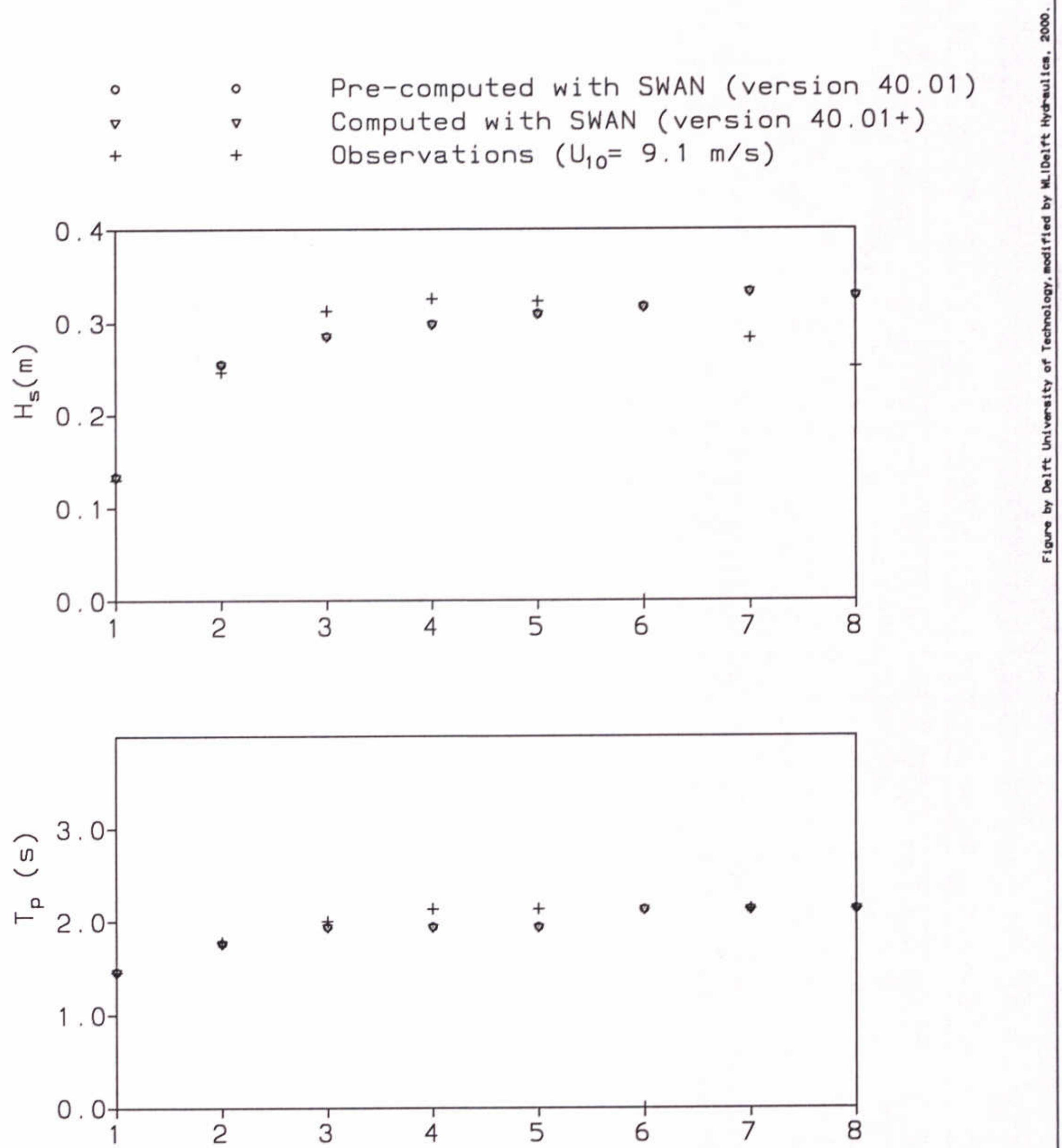
F41lak03 F41f

Lage George 21/11/1992 16.00



F41lak04 F41g

Lake George 12/05/1992 12.00



F41lak04 F41h

Lage George 12/05/1992 12.00

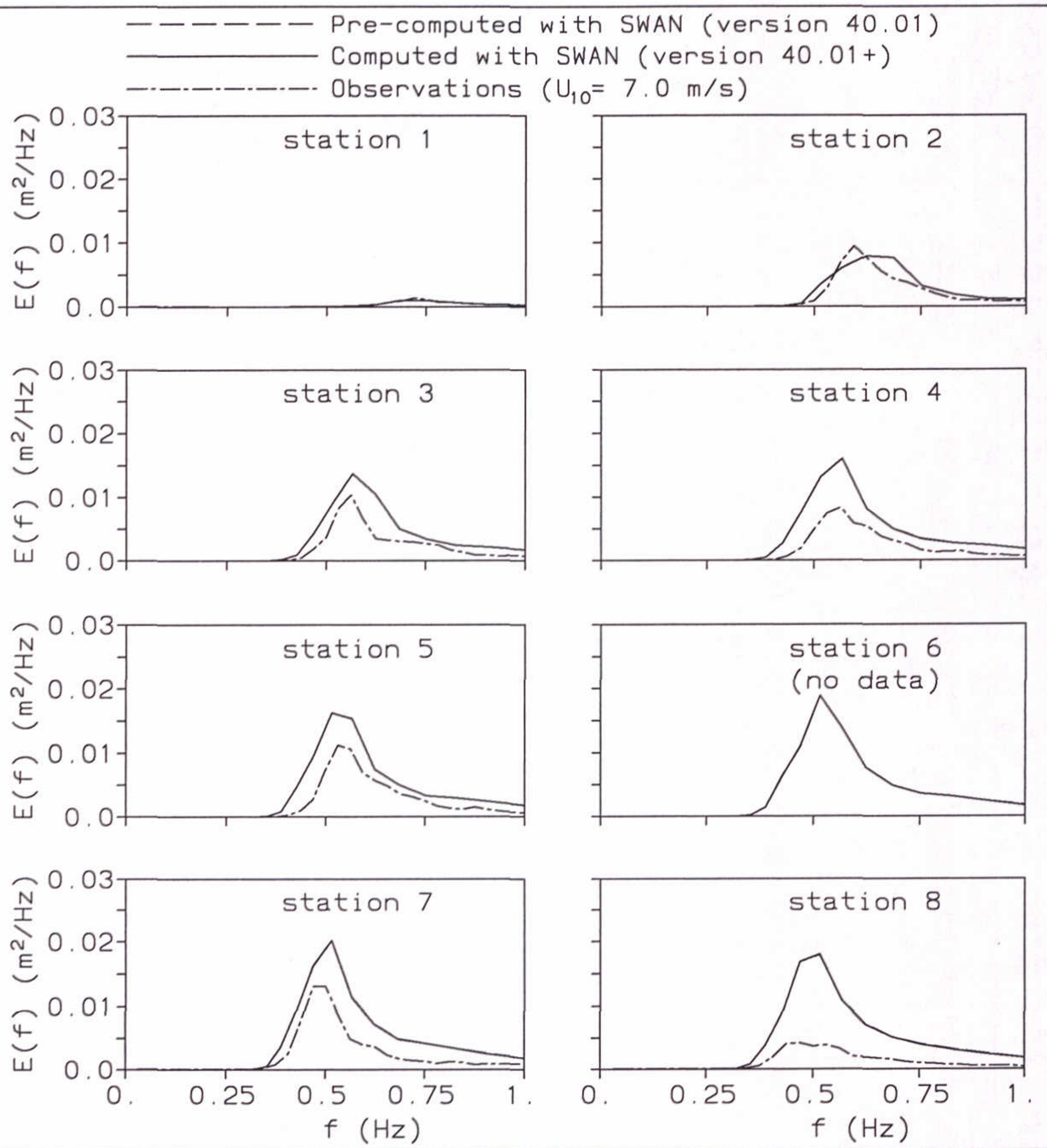


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F41lak05 F41i

Lake George 01/06/1992 22.00

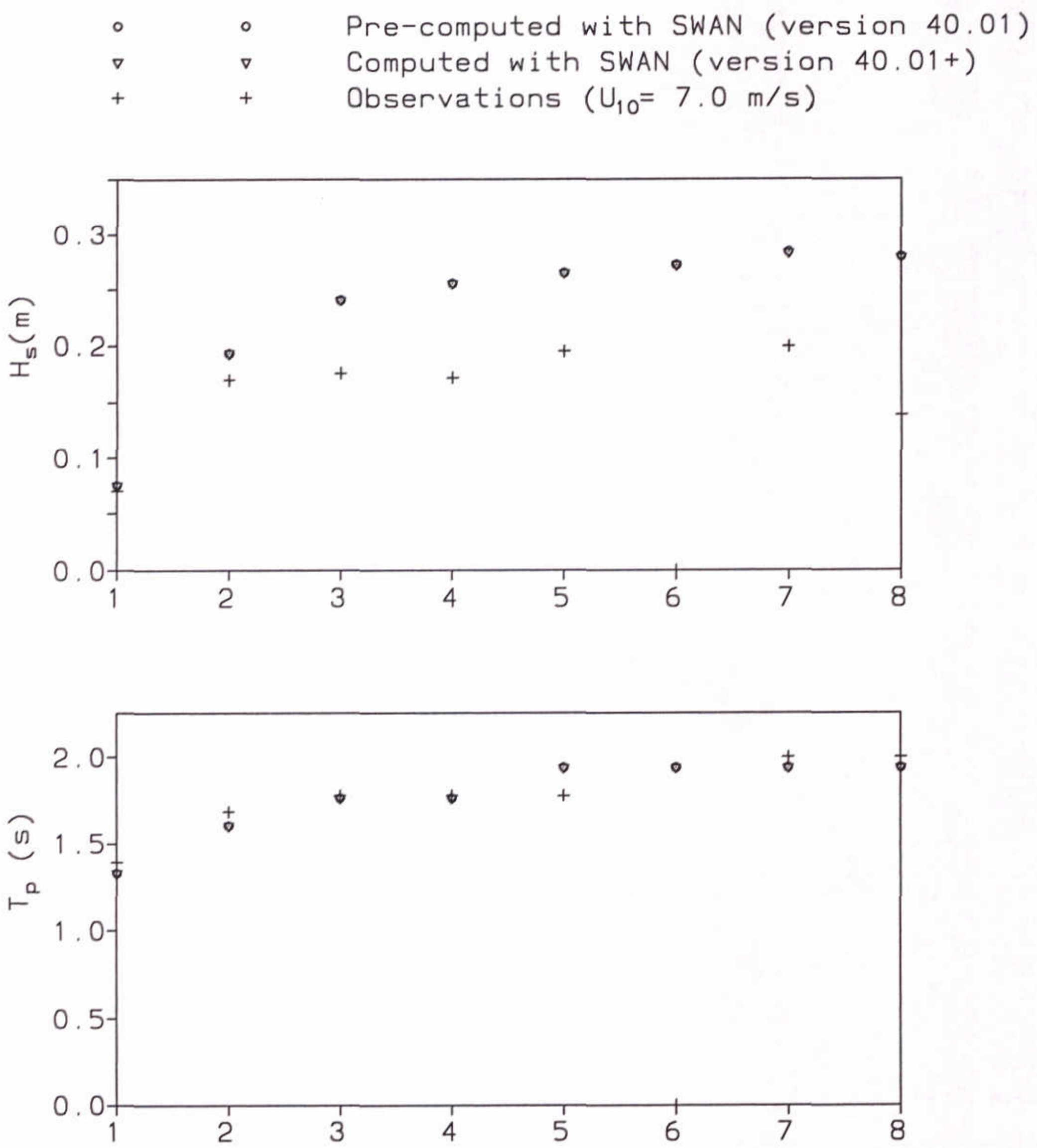
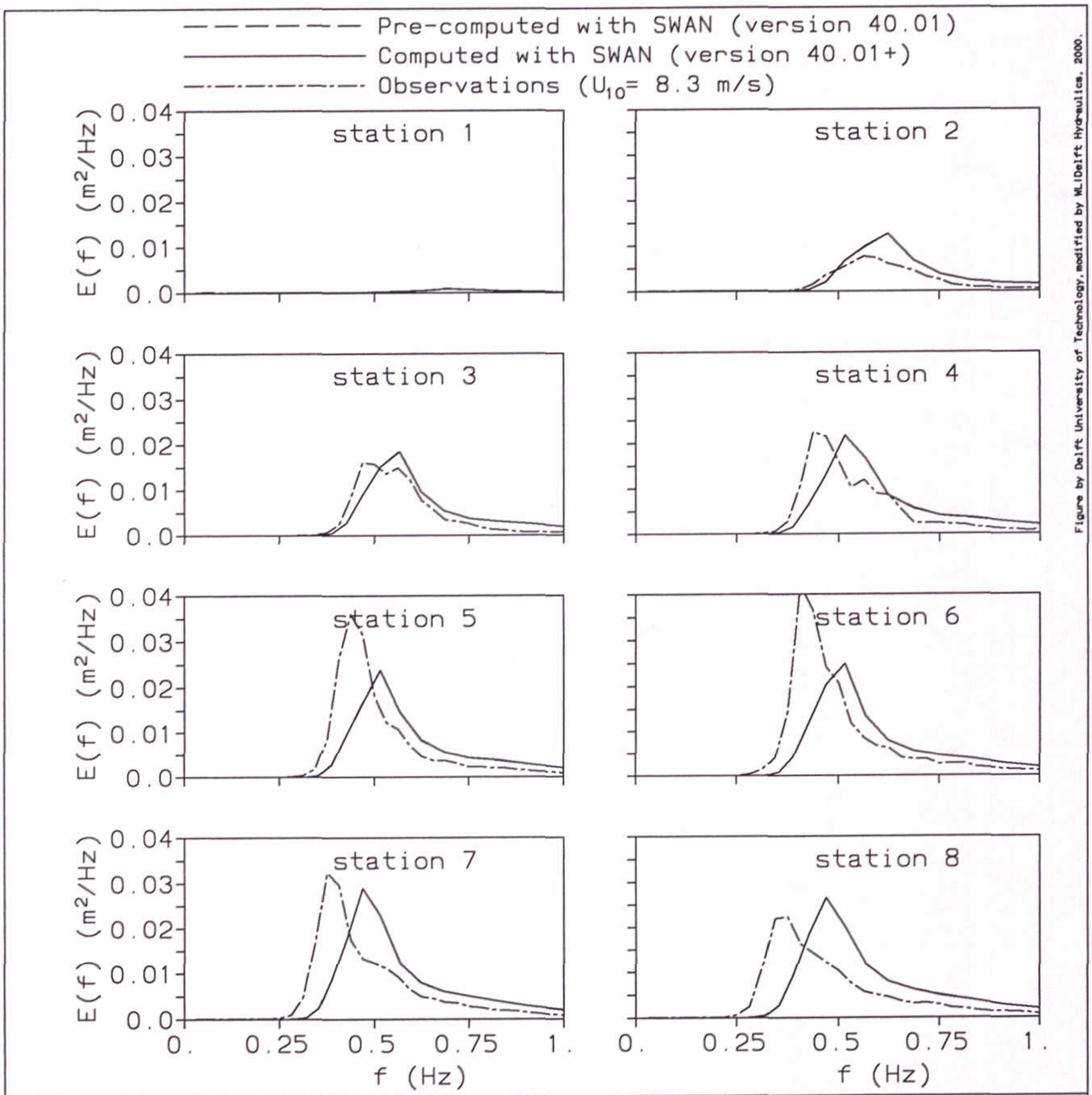


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F41lak05 F41j

Lage George 01/06/1992 22.00



F41lak06 F41k

Lake George 31/10/1992 02.00

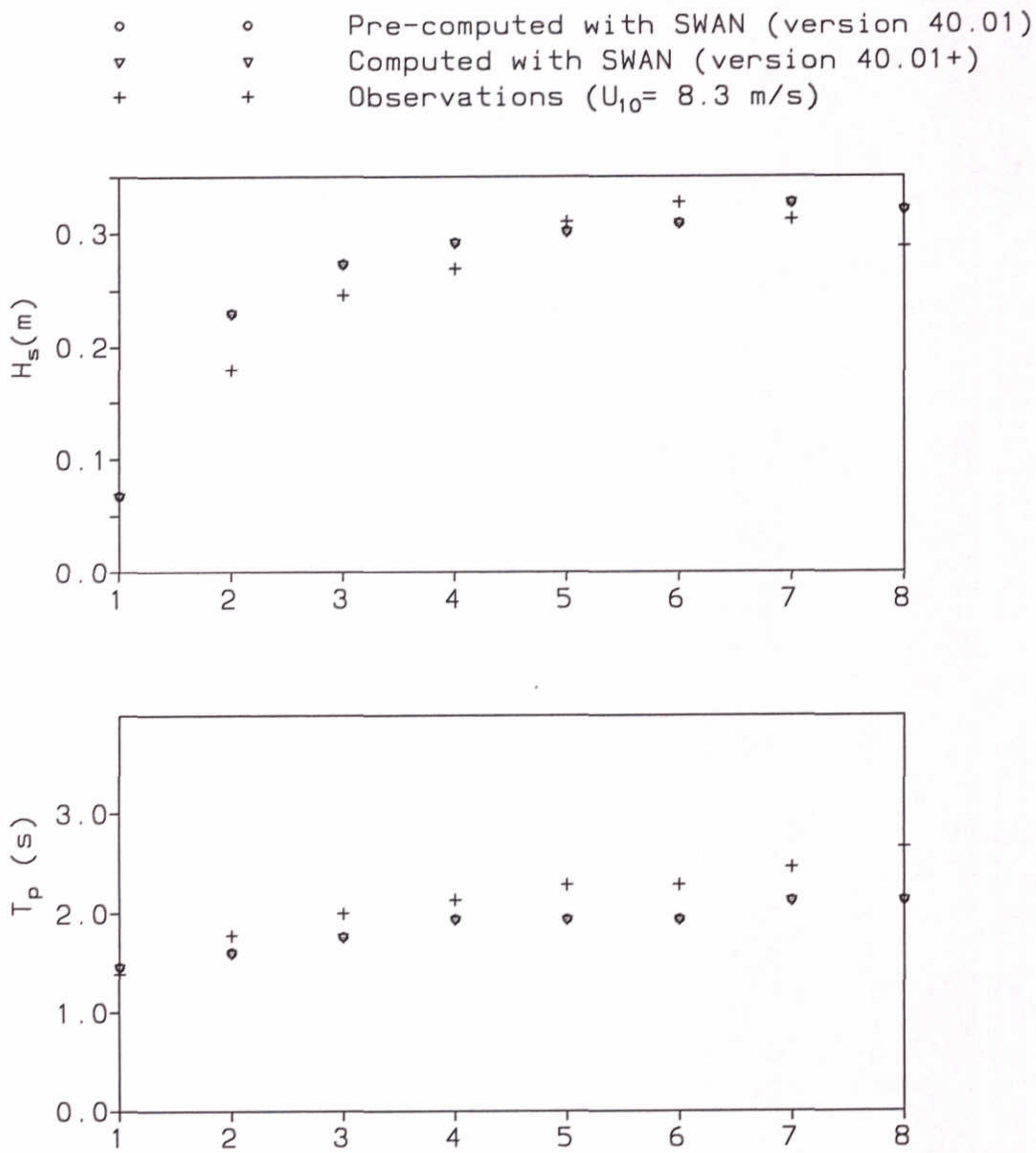
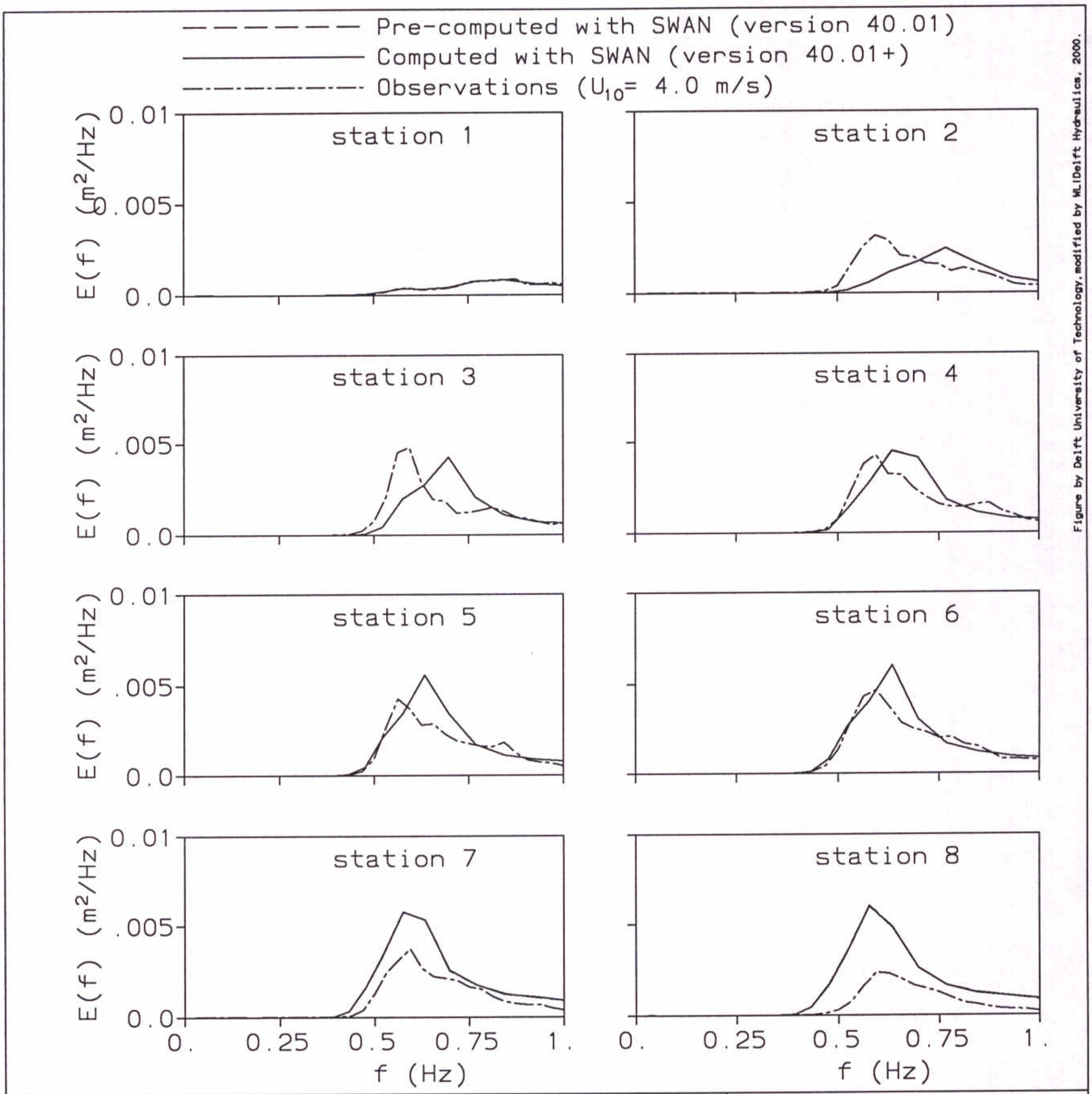


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

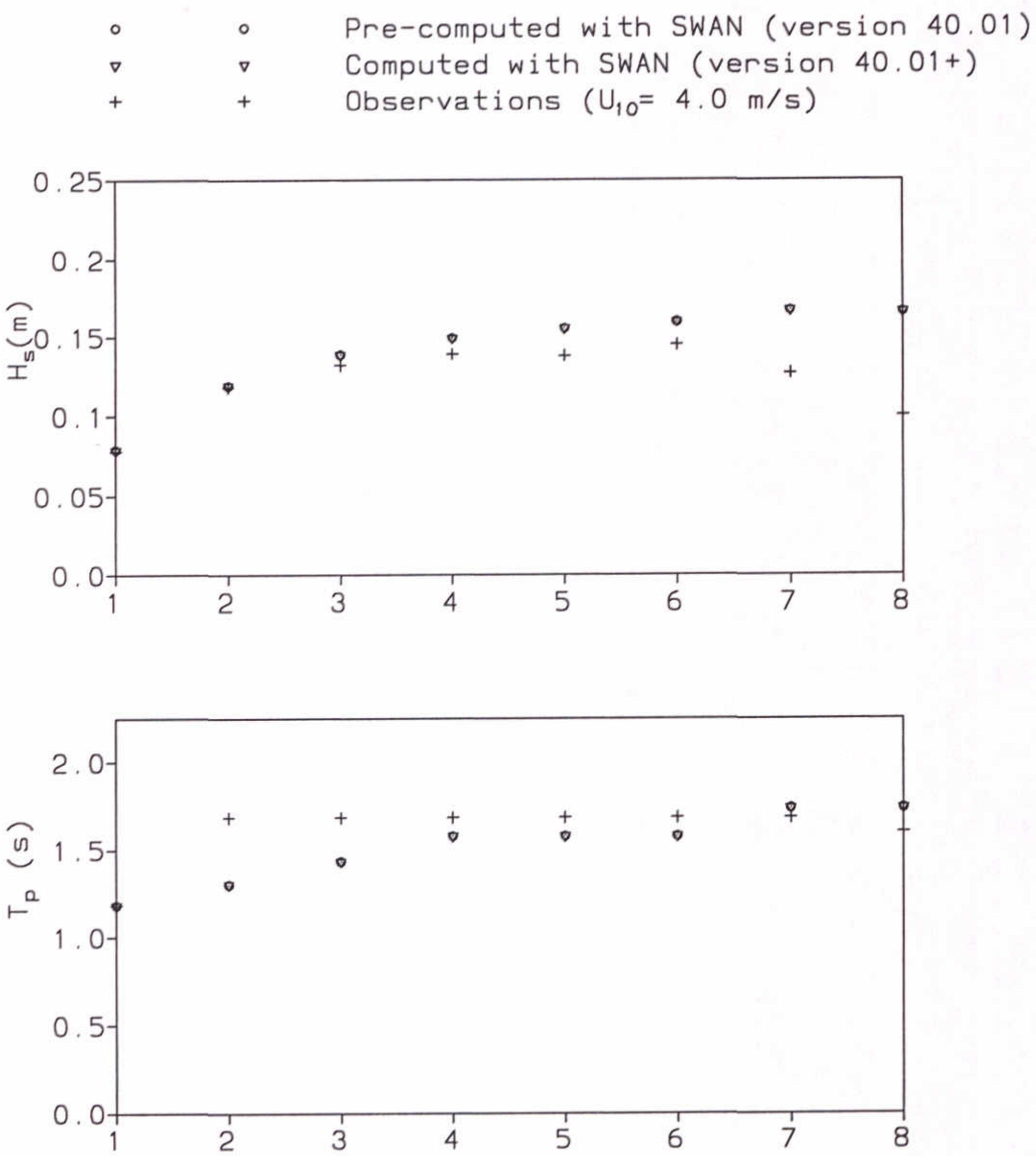
F41lak06 F411

Lage George 31/10/1992 02.00



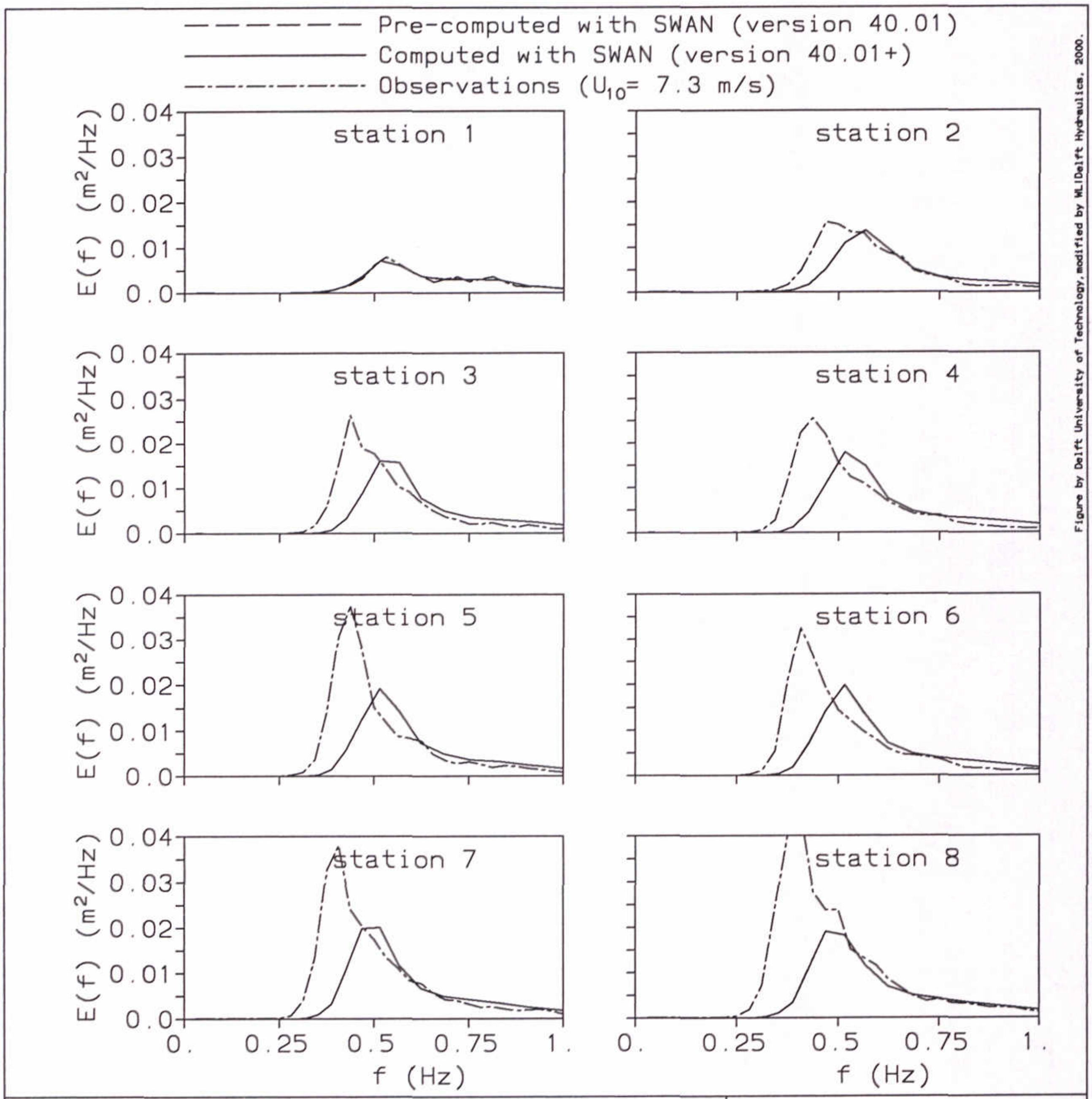
F41lak07 F41m

Lake George: 09/11/1992 09.00



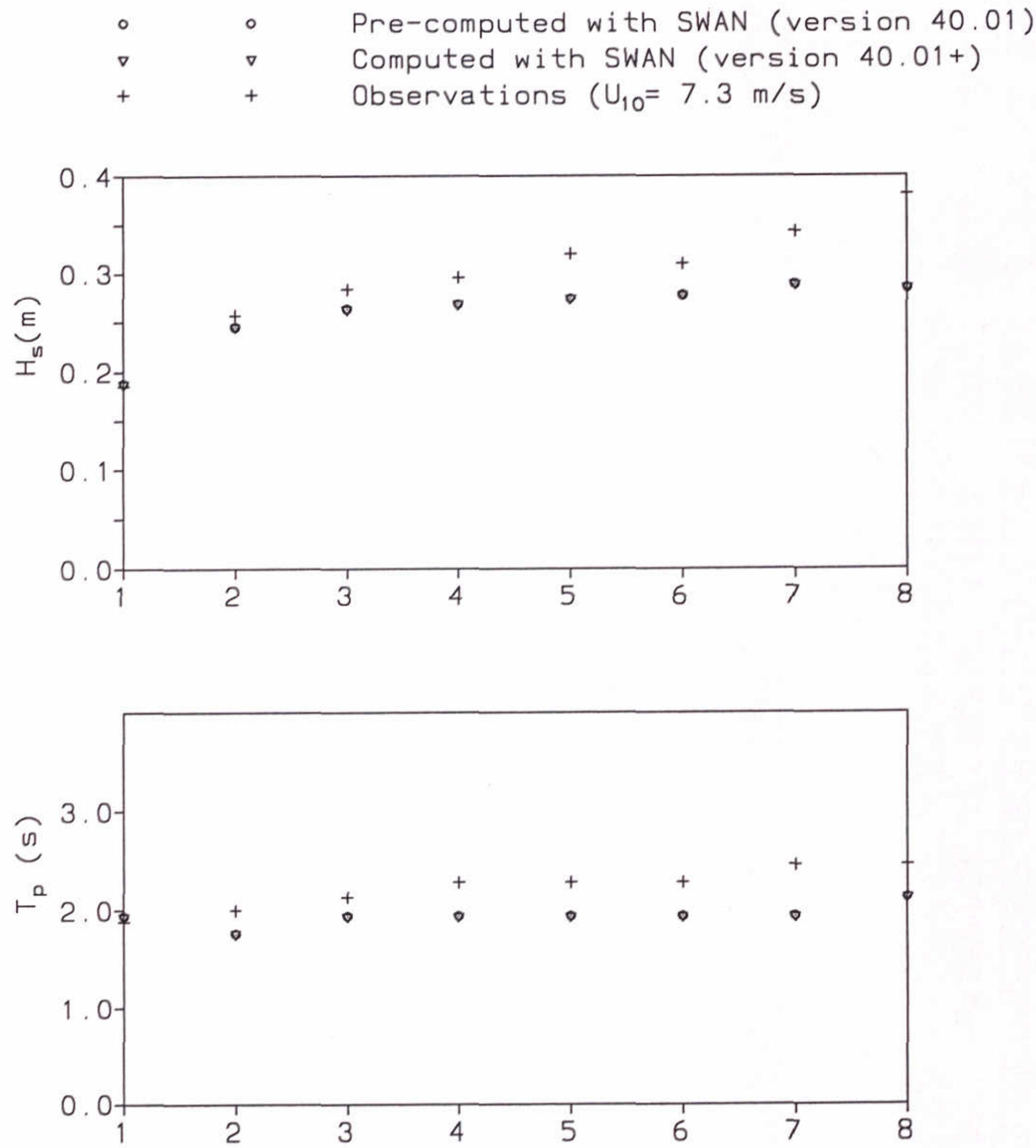
F41lak07 F41n

Lage George 09/11/1992 09.00



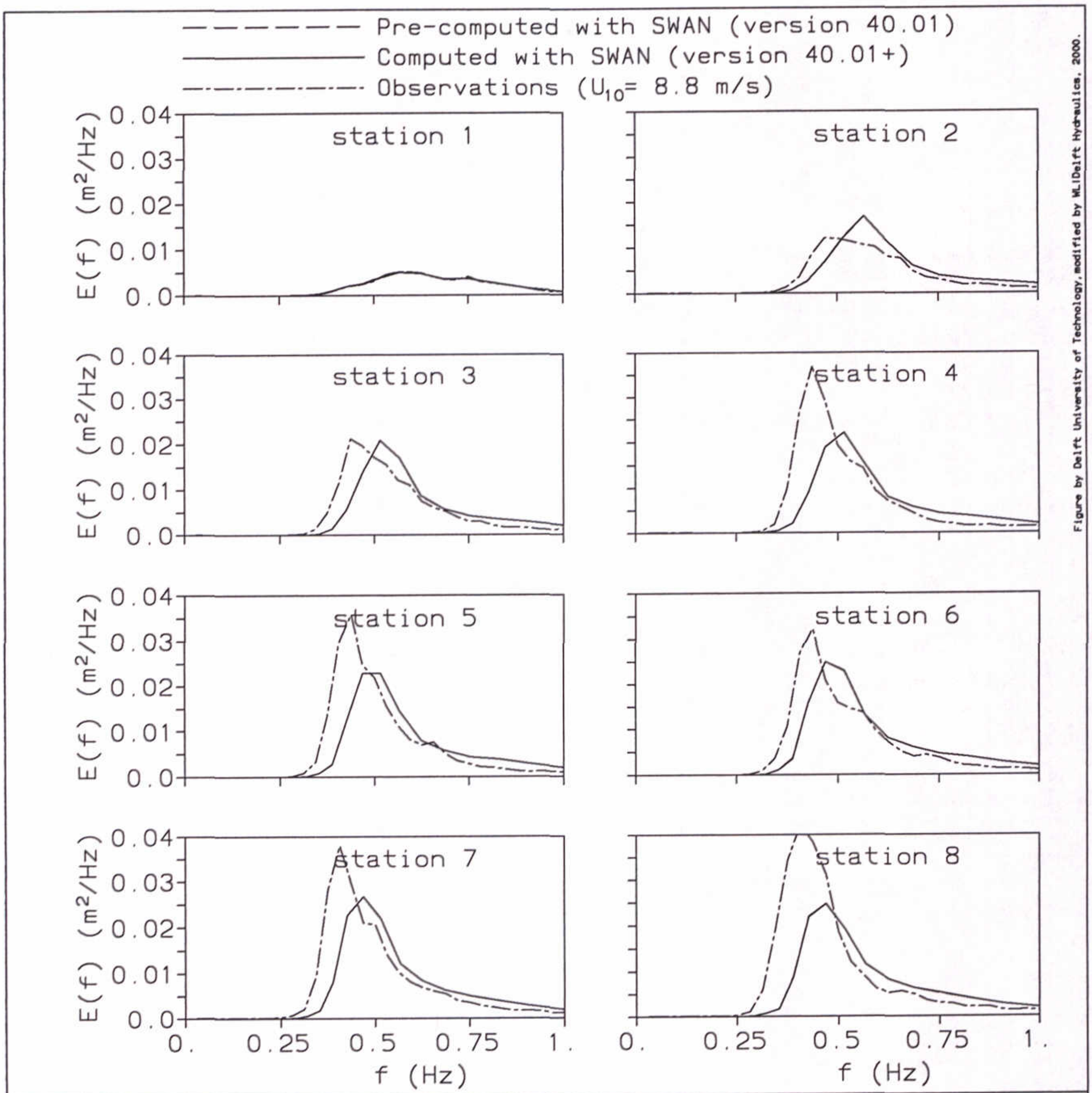
F41lak08 F41o

Lake George 03/10/1993 15.00



F41lak08 F41p

Lage George 03/10/1993 15.00



F41lak09 F41q

Lake George 03/10/1993 16.00

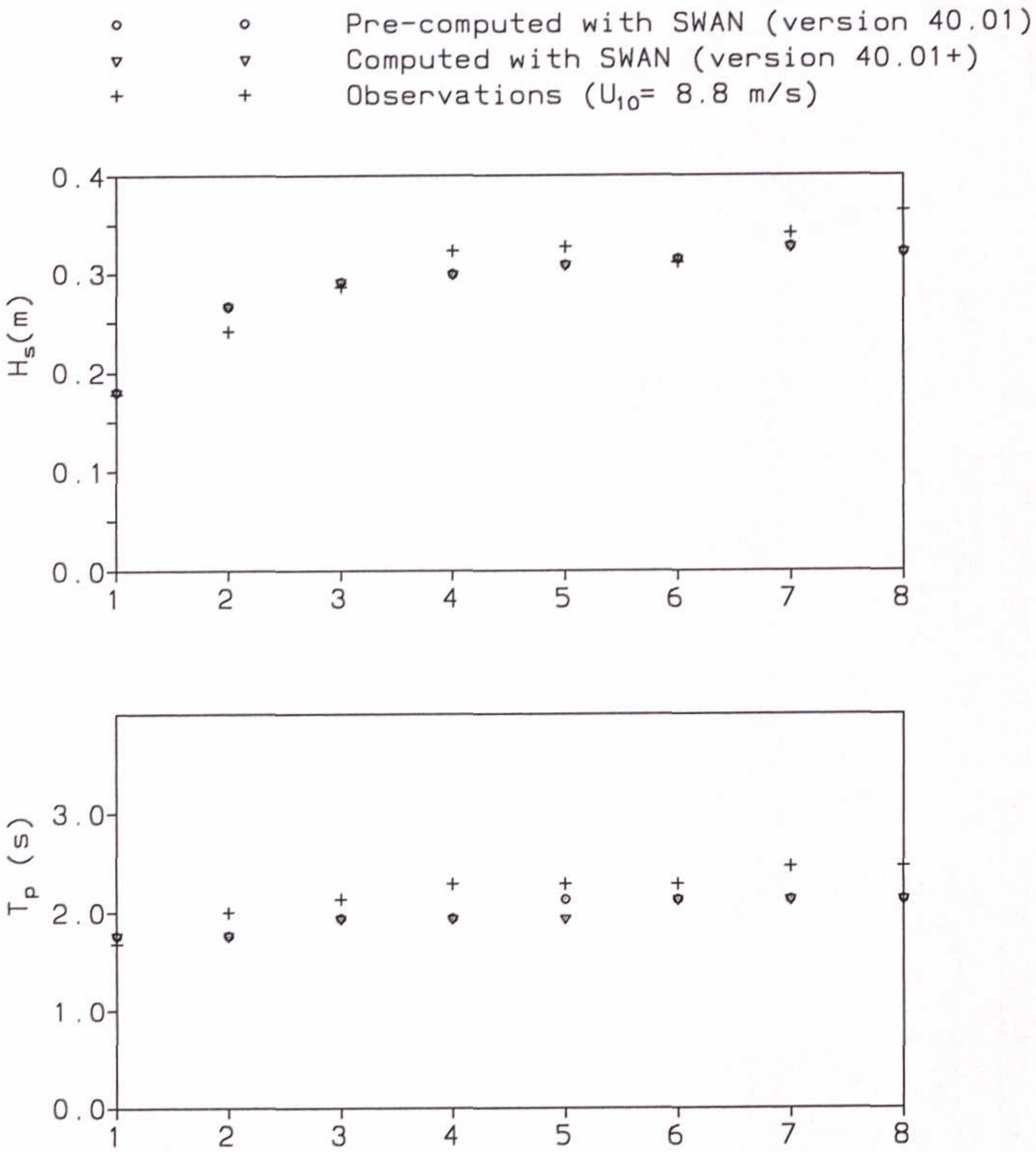
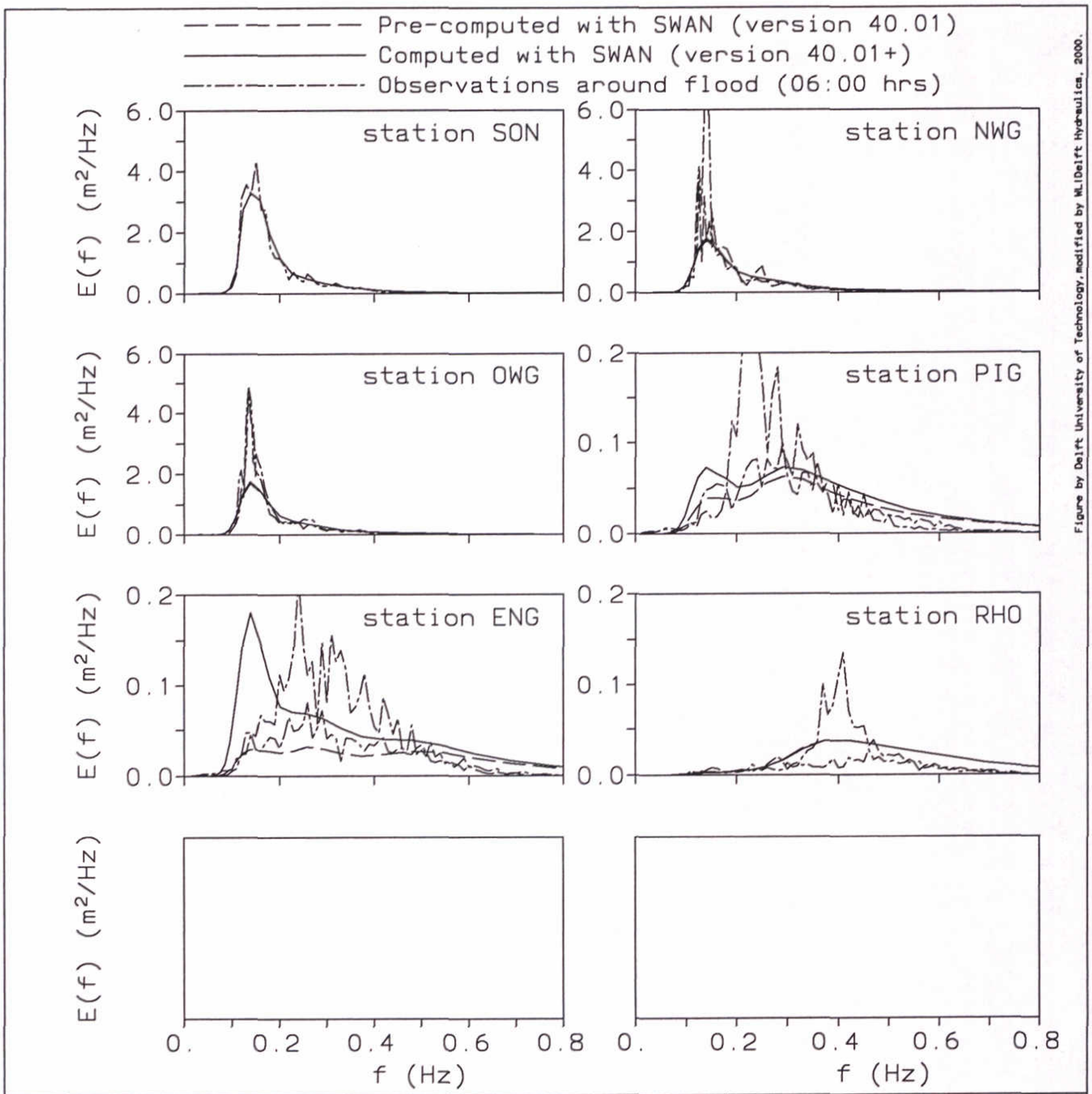


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

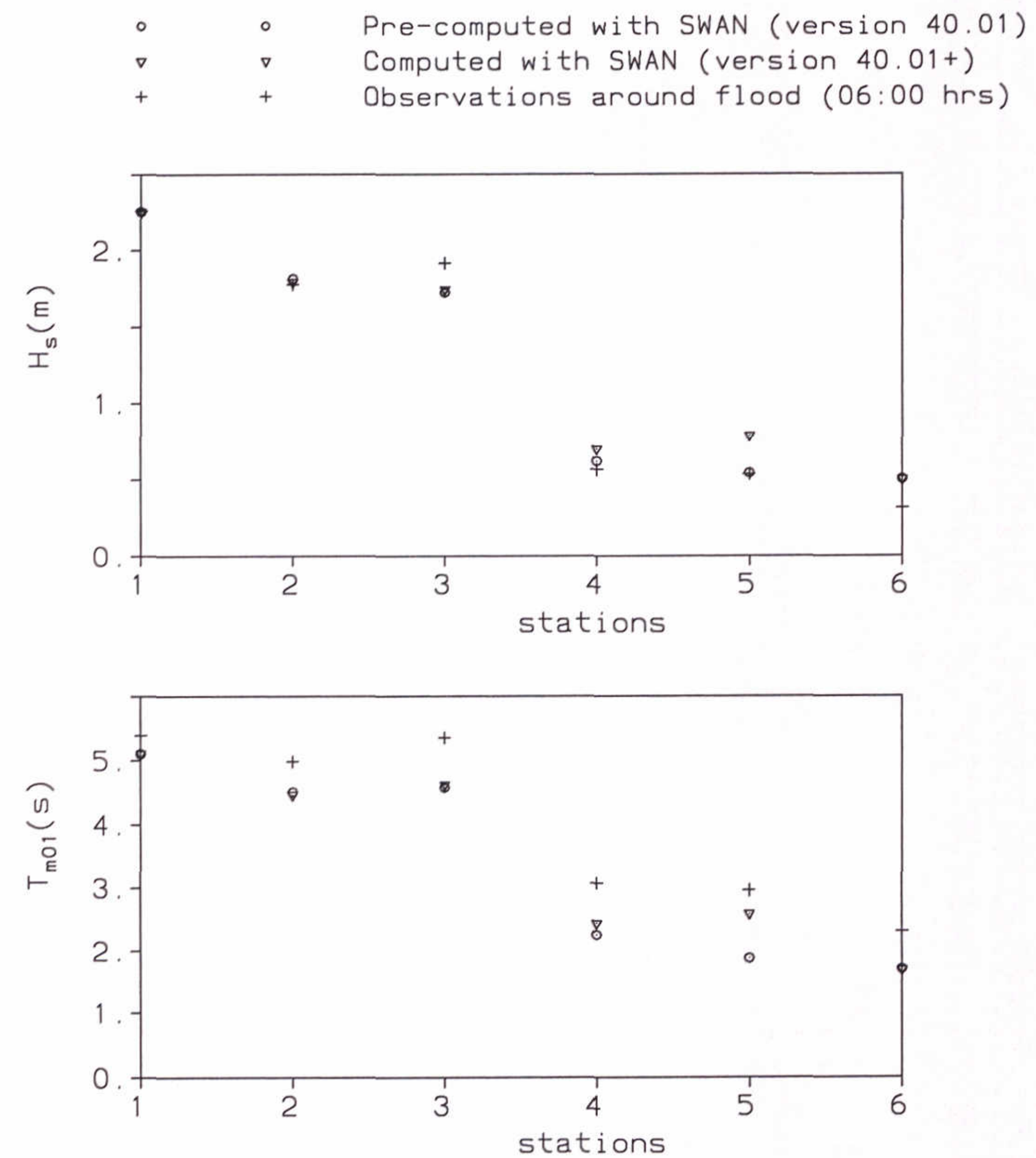
F41lak09 F41r

Lage George 03/10/1993 16.00



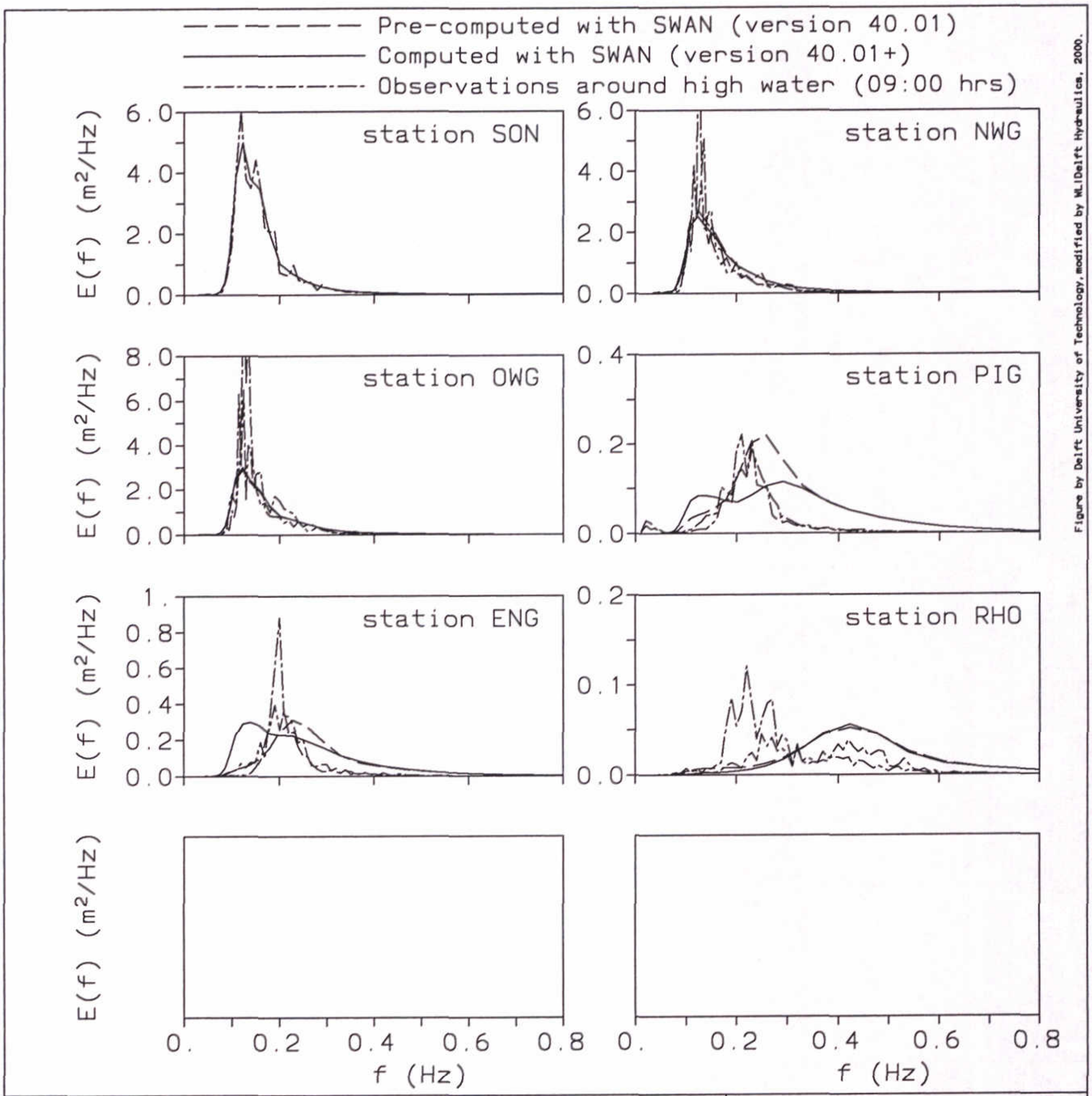
F51fri01 F51a

Friesche Zeegat: flood current



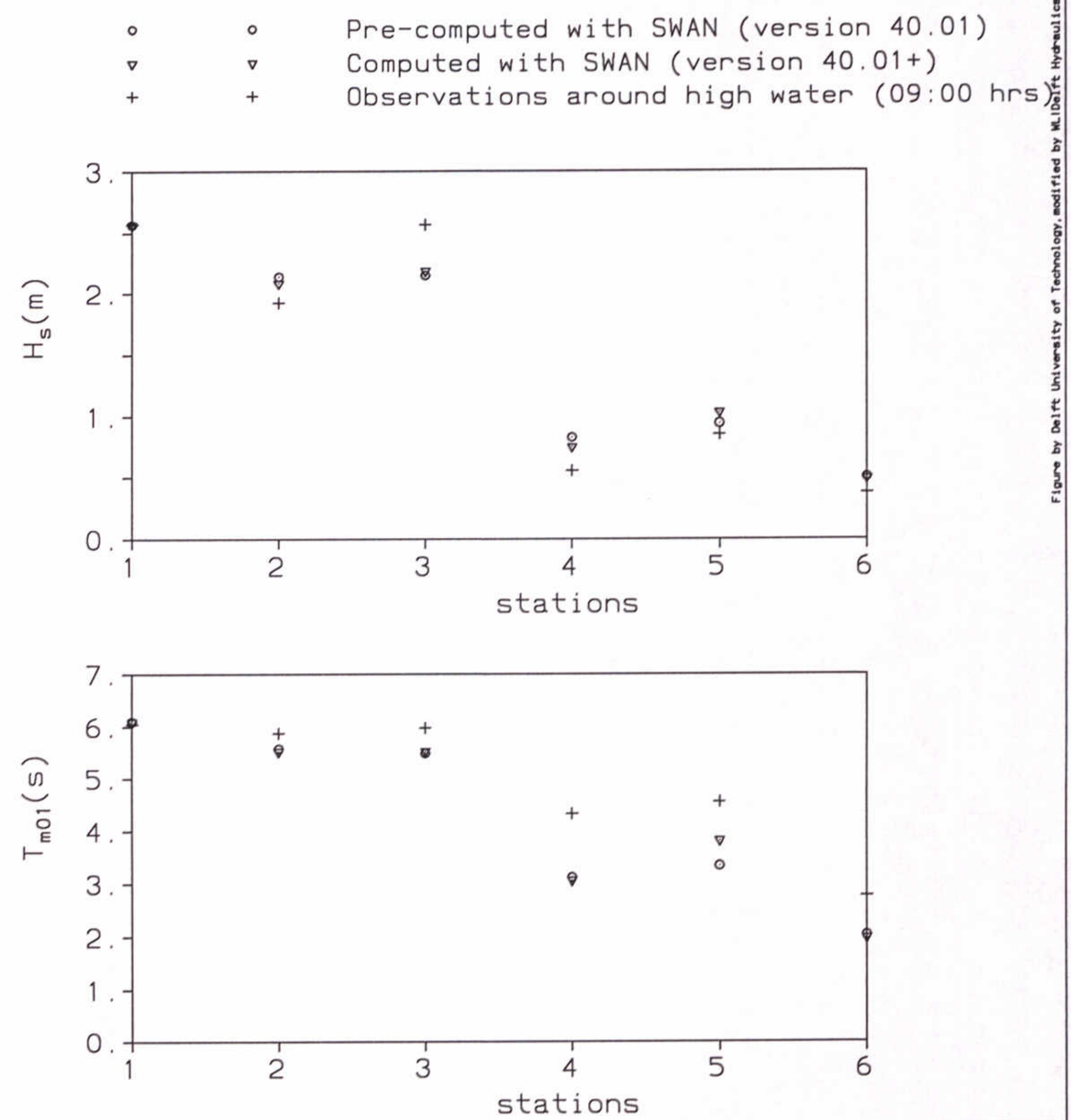
F51fri01 F51b

Friesche Zeegat: flood current



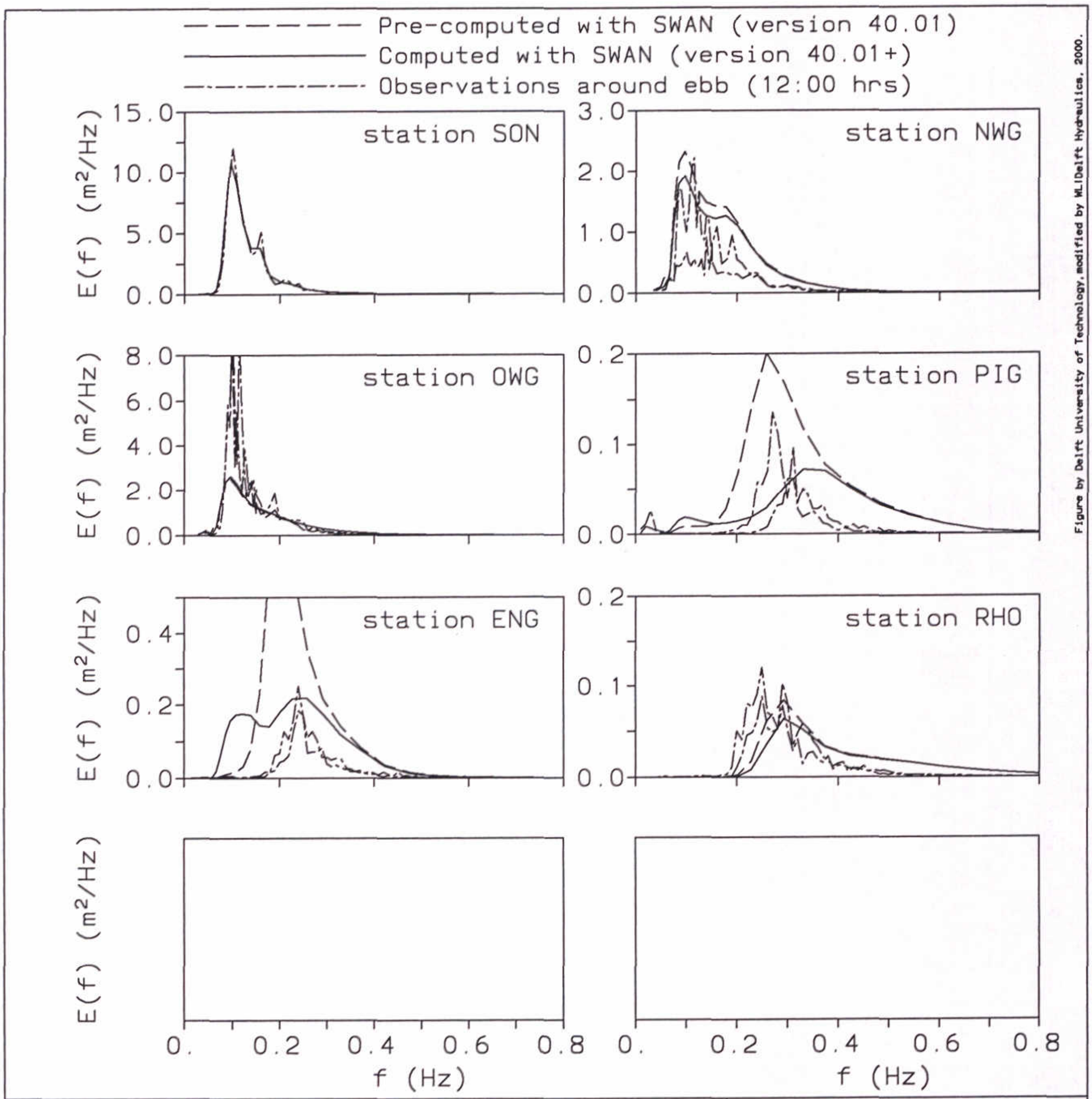
F51fri02 F51c

Friesche Zeegat: high water



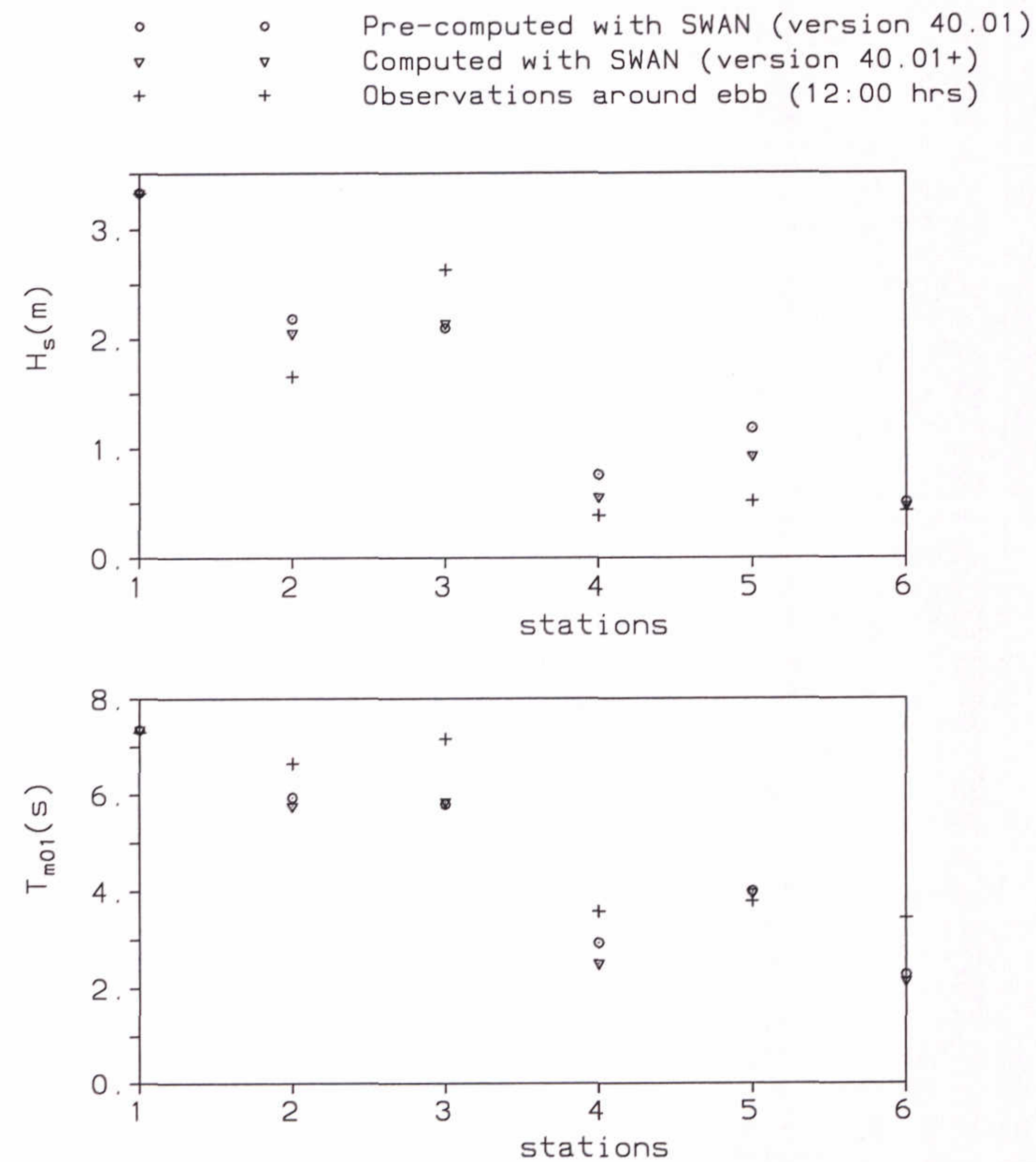
F51fri02 F51d

Friesche Zeegat: high water



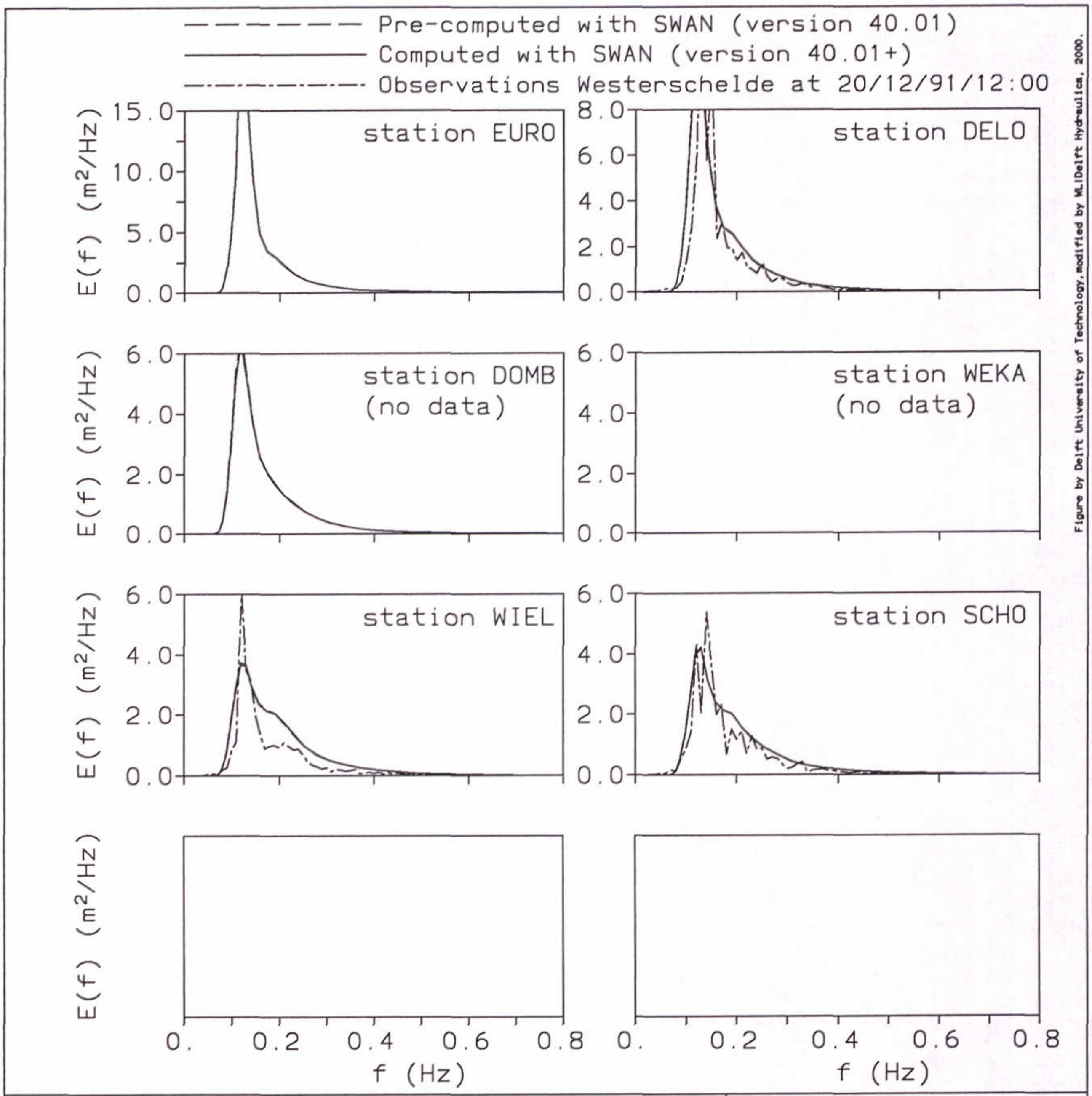
F51fri03 F51e

Friesche Zeegat: ebb current



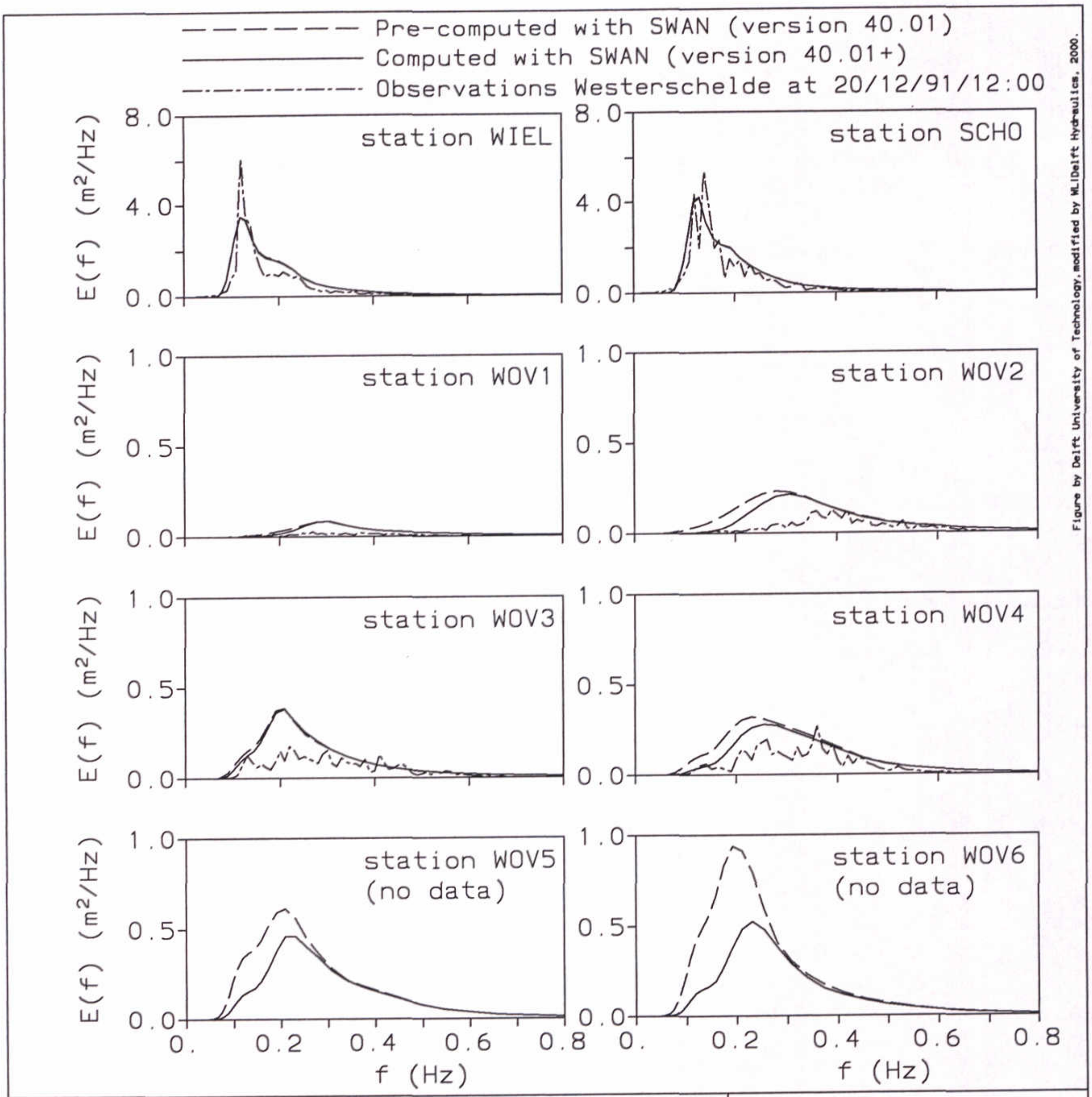
F51fri03 F51f

Friesche Zeegat: ebb current



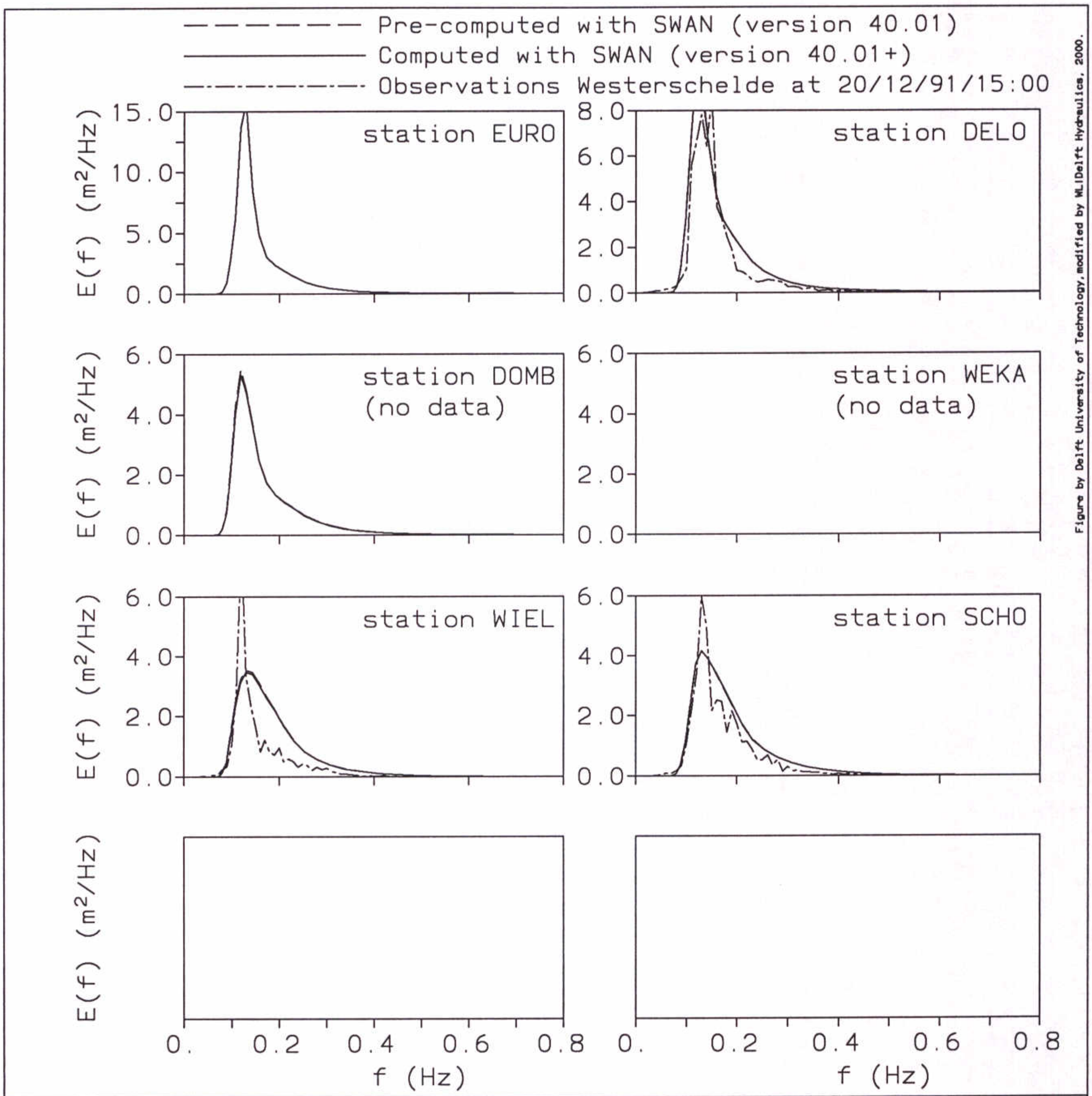
F61wsc01 F61a

Westerschelde Estuary



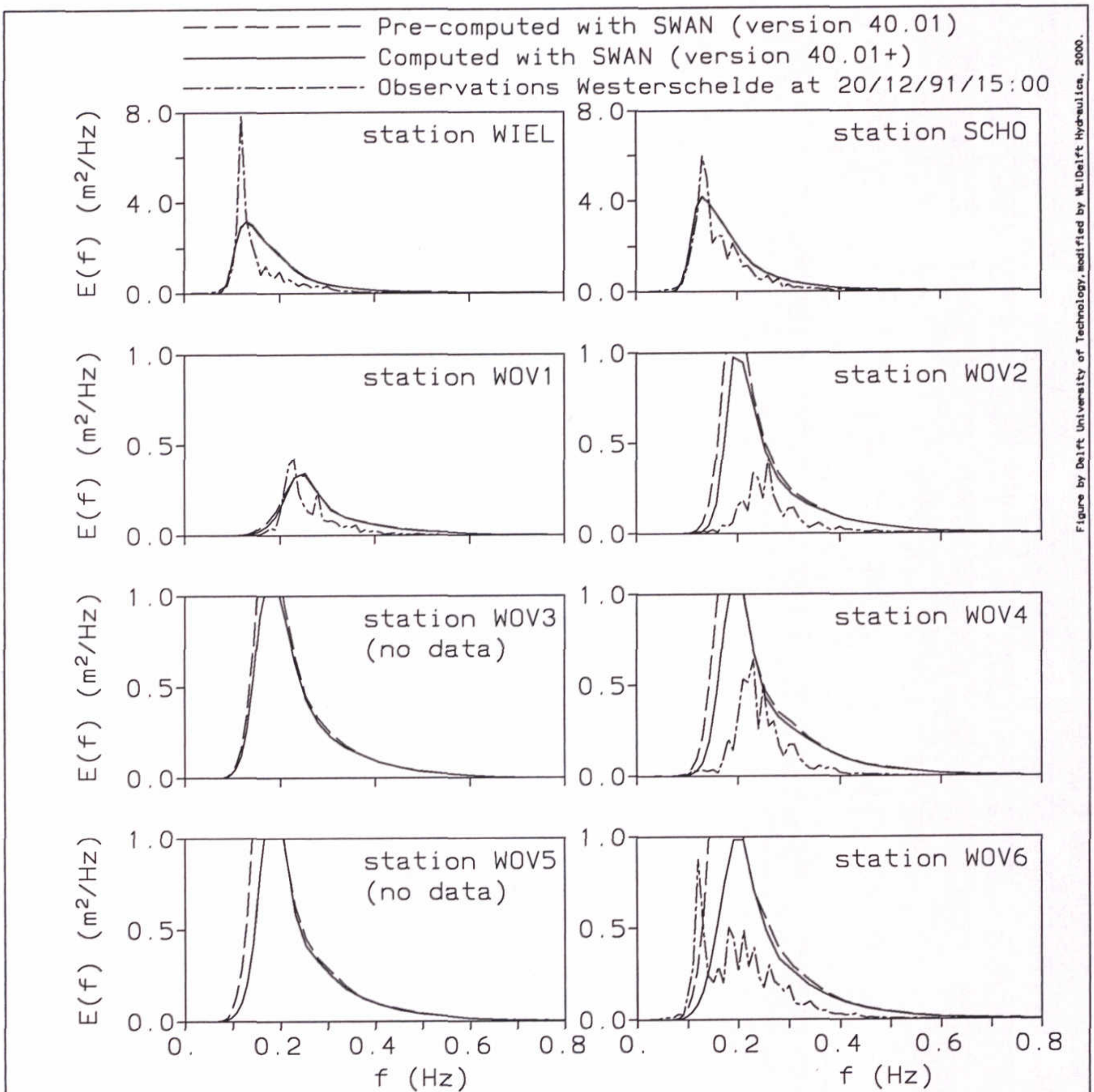
F61wsf01 F61b

Westerschelde Estuary



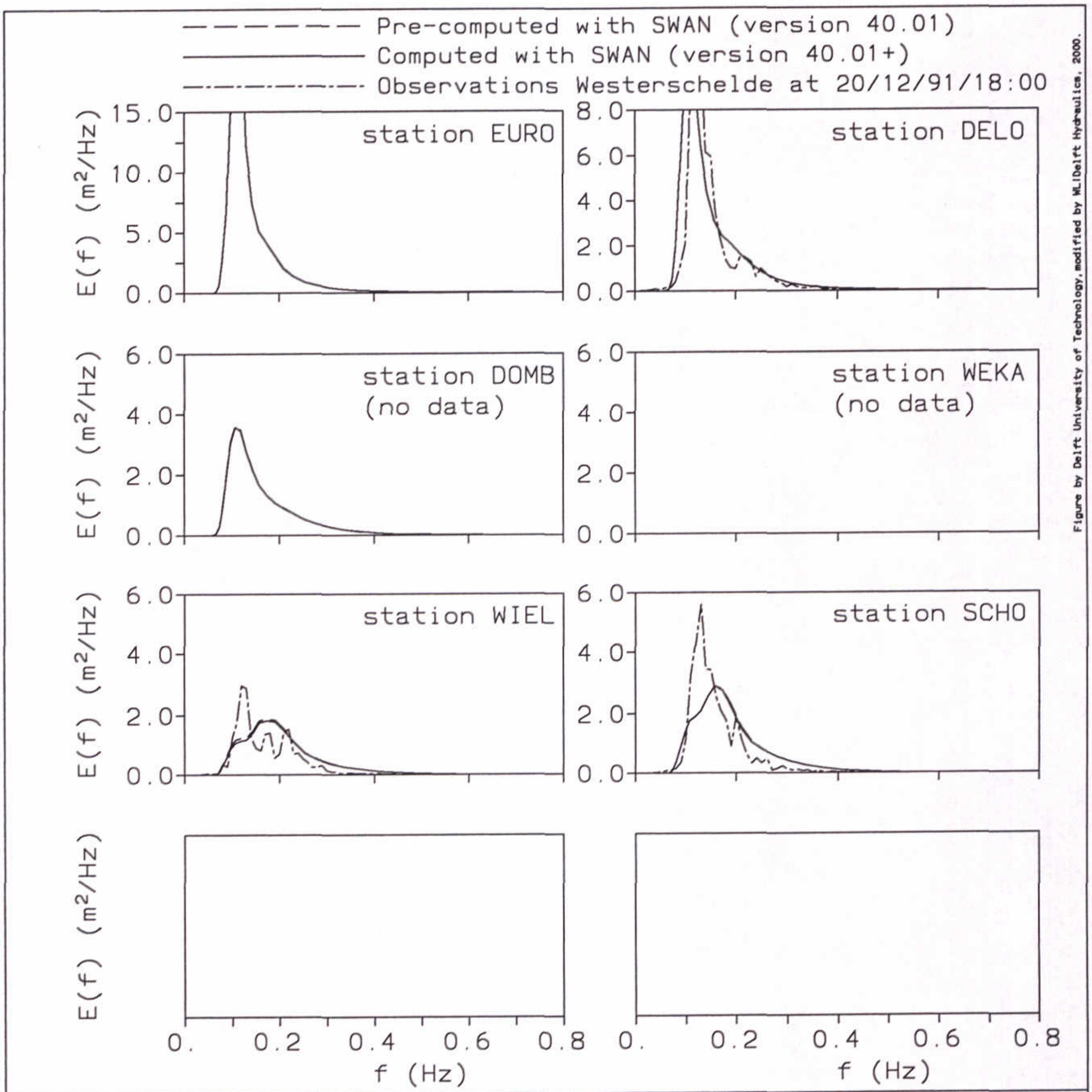
F61wsc02 F61c

Westerschelde Estuary



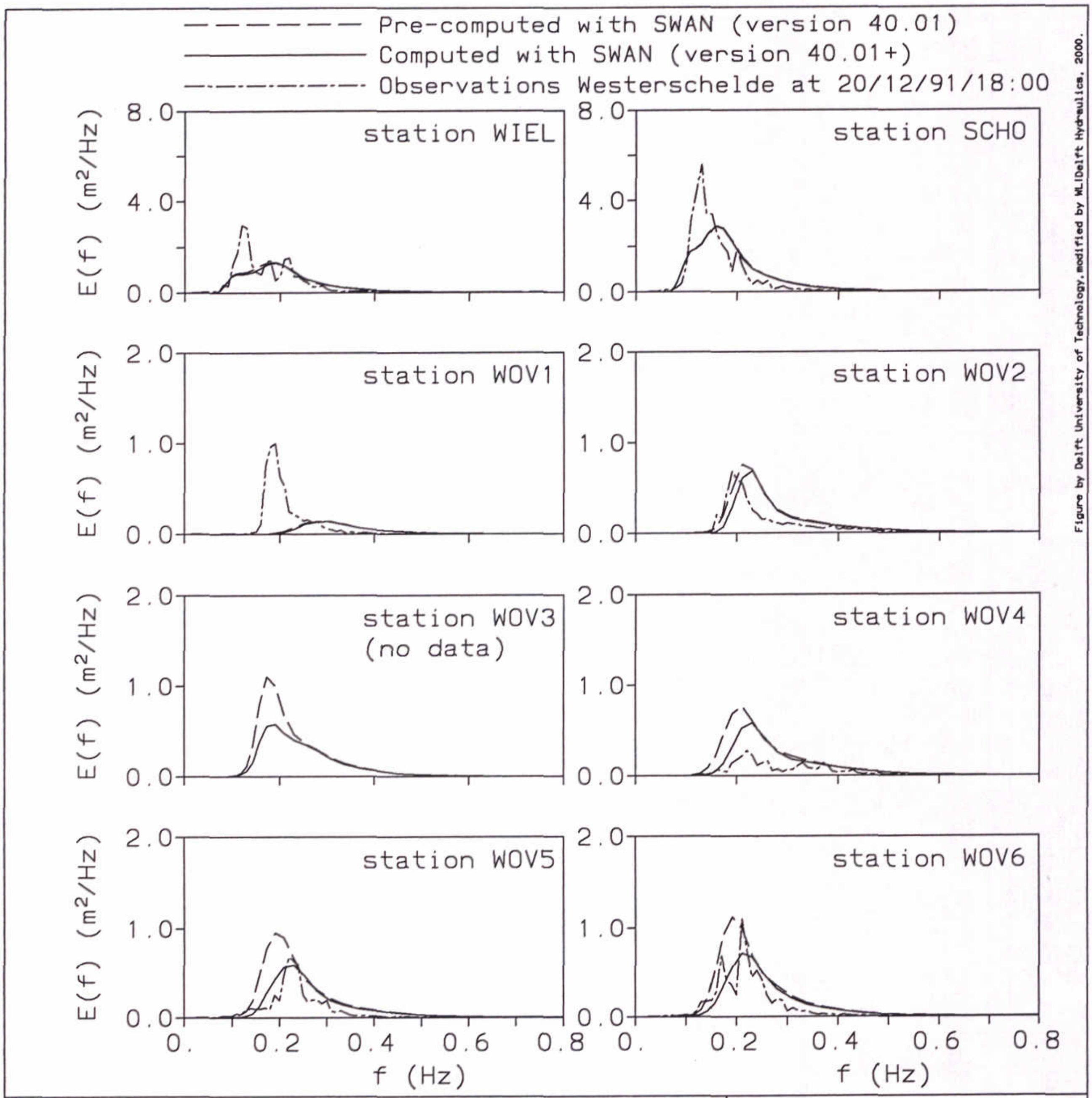
F61wsf02 F61d

Westerschelde Estuary



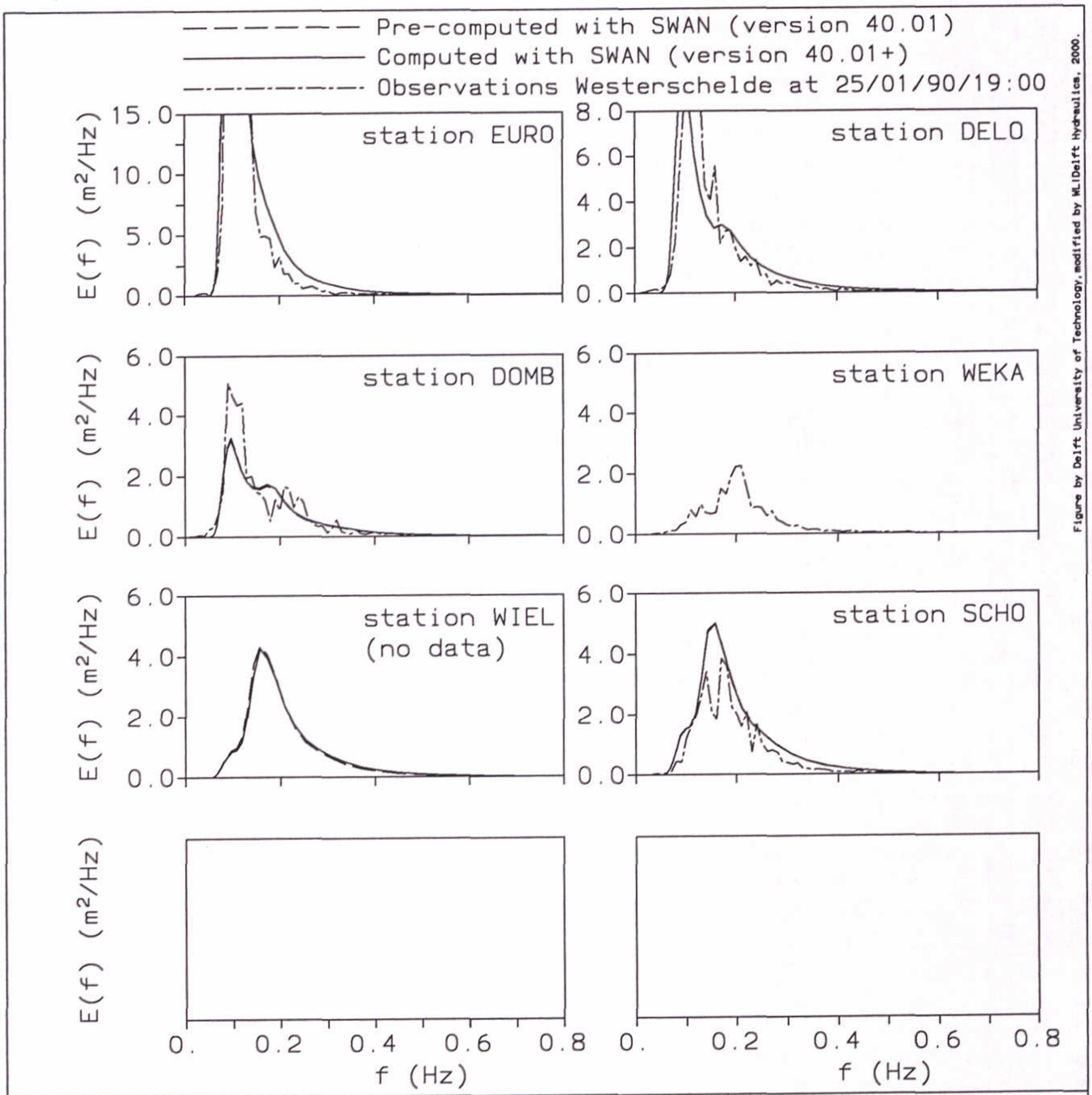
F61wsc03 F61e

Westerschelde Estuary



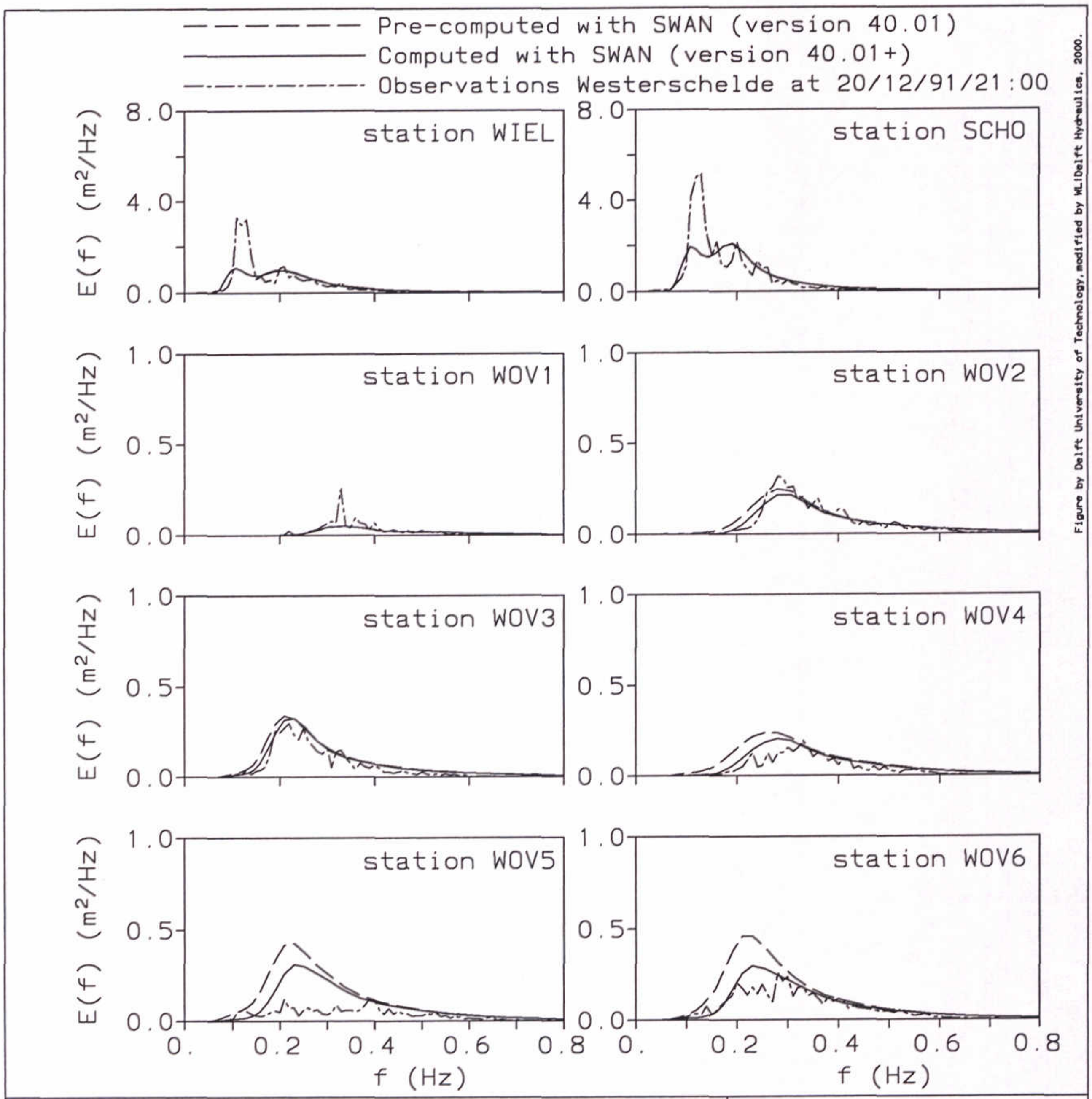
F61wsf03 F61f

Westerschelde Estuary



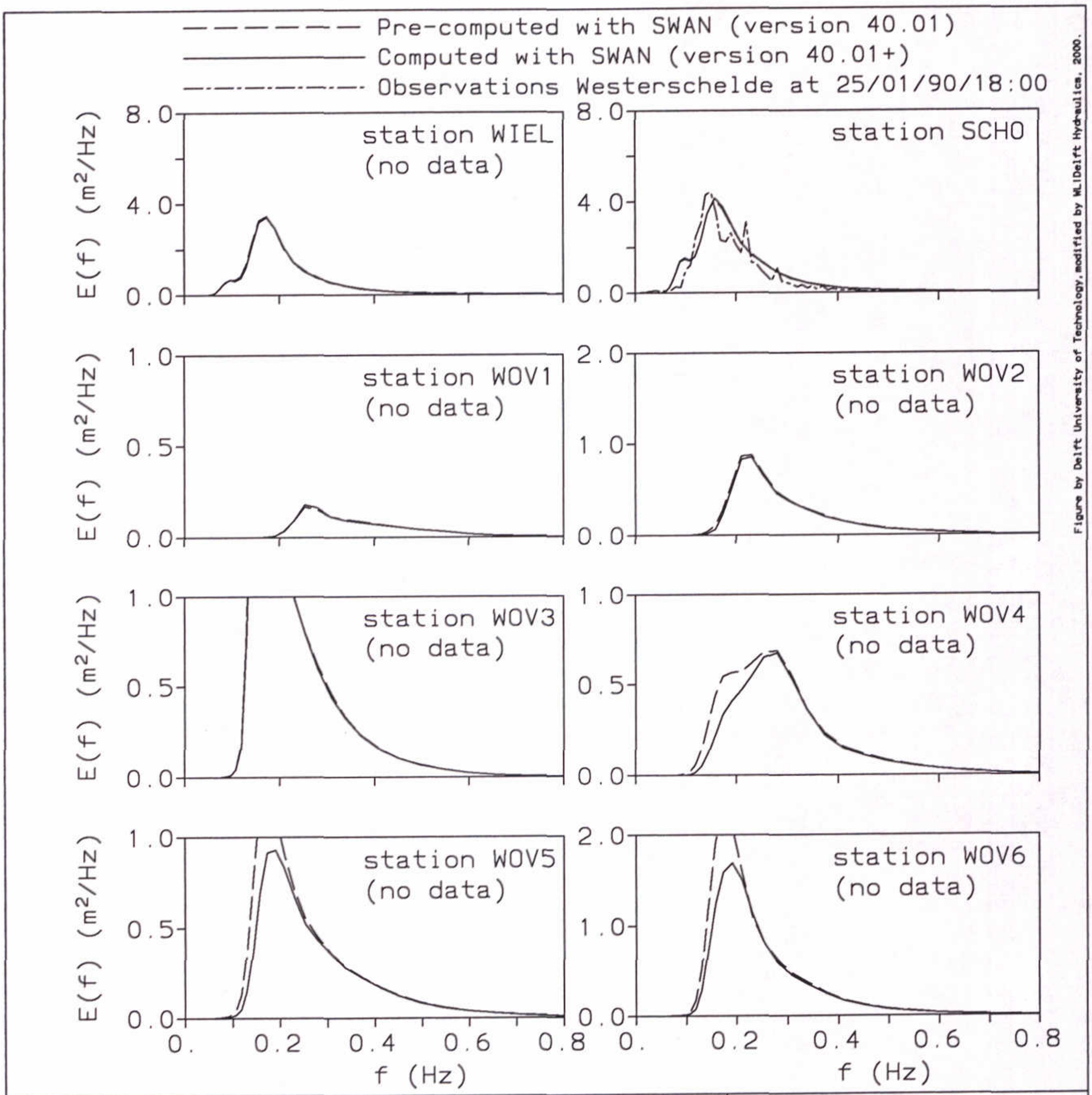
F61wsc06 F61g

Westerschelde Estuary



F61wsf04 F61h

Westerschelde Estuary



F61wsf05 F61j

Westerschelde Estuary

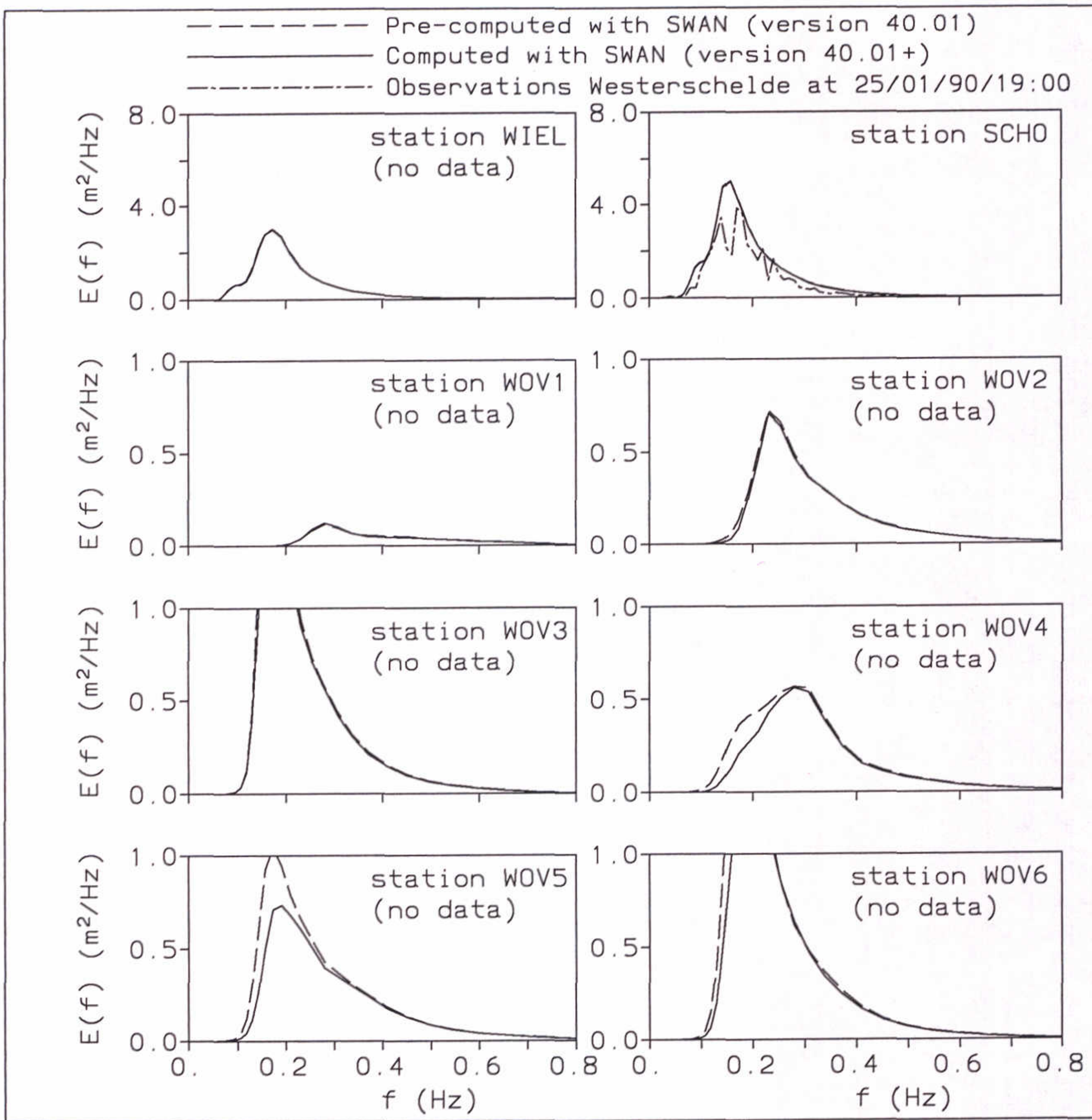
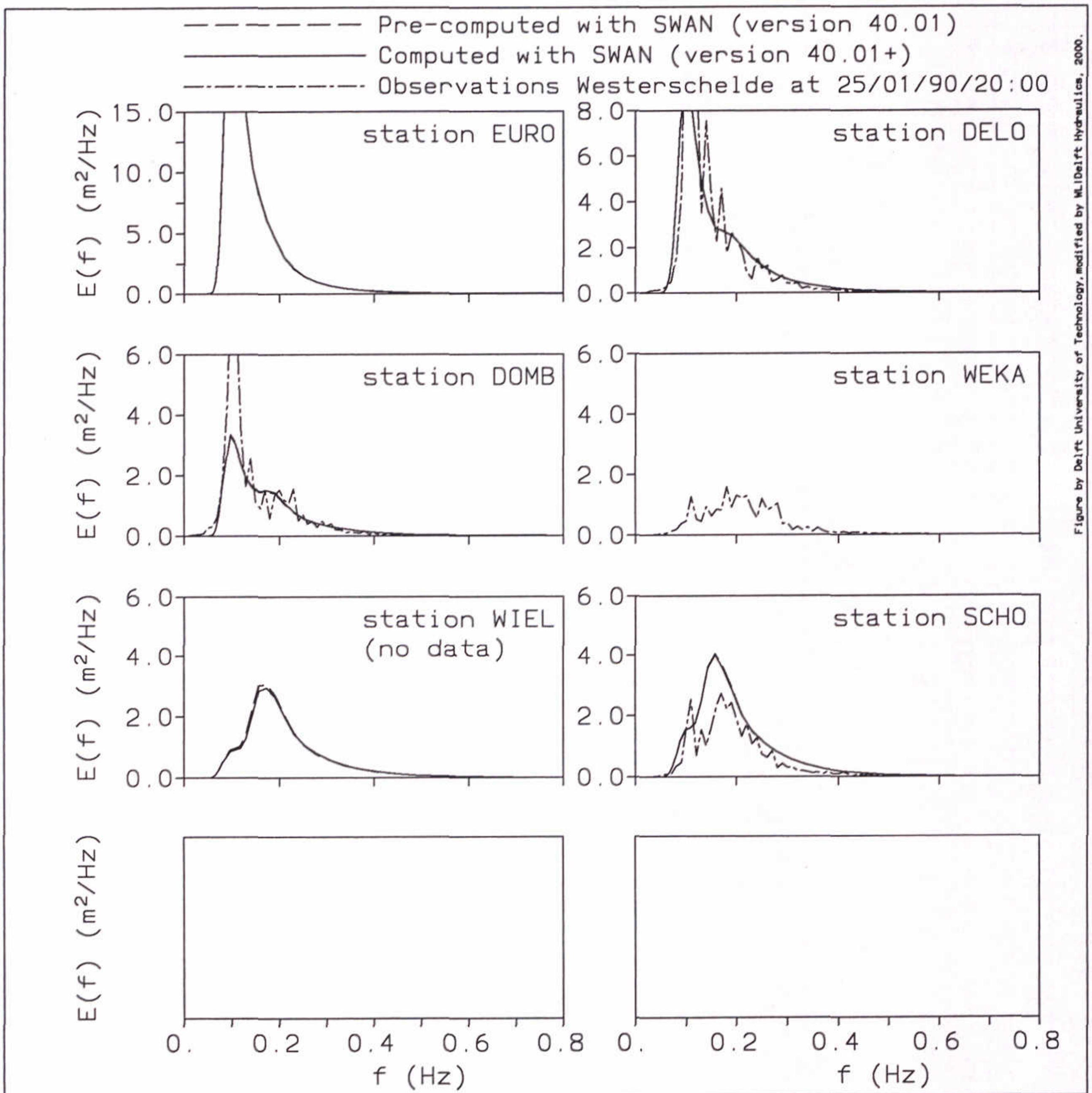


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

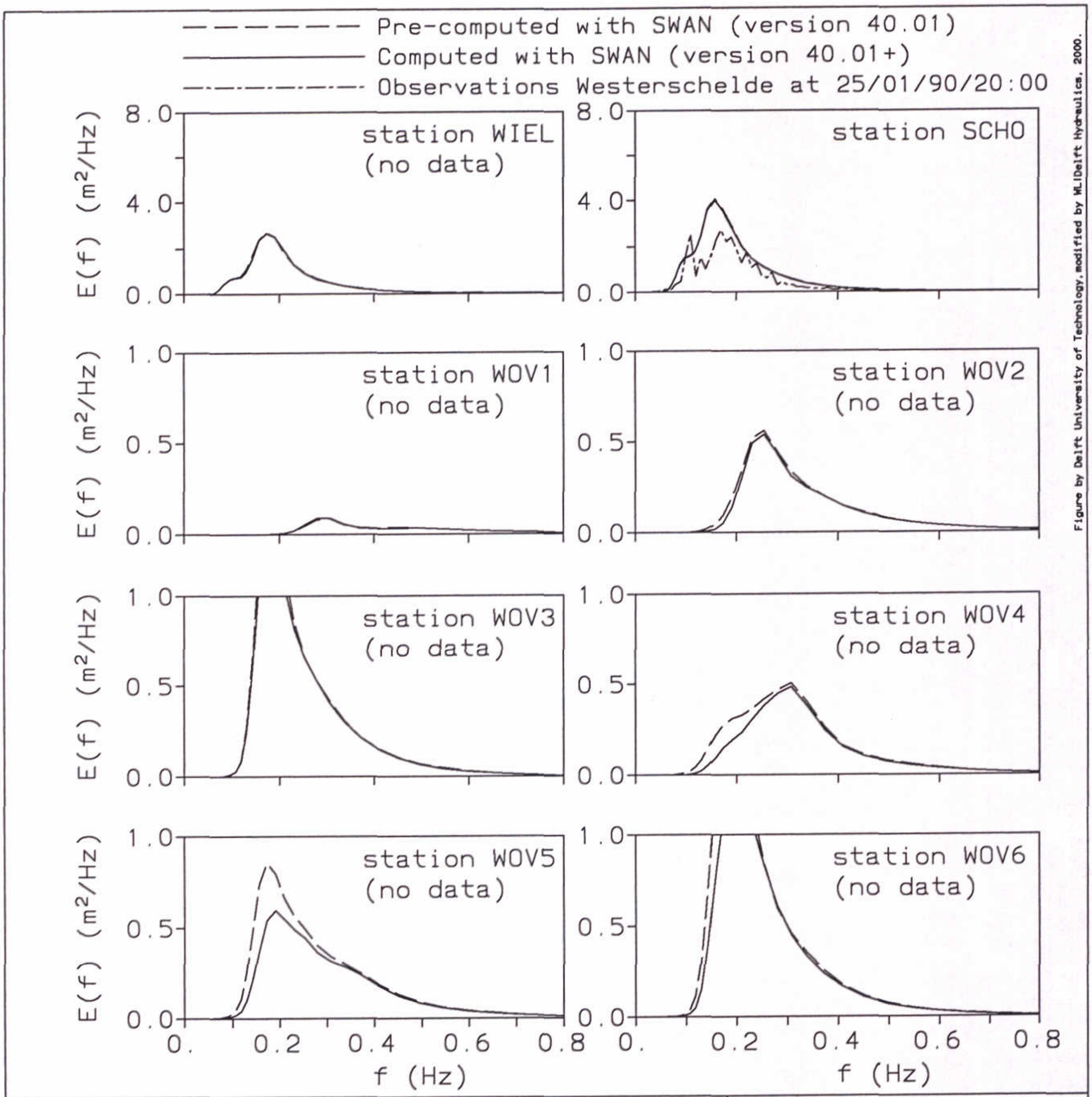
F61wsf06 F611

Westerschelde Estuary



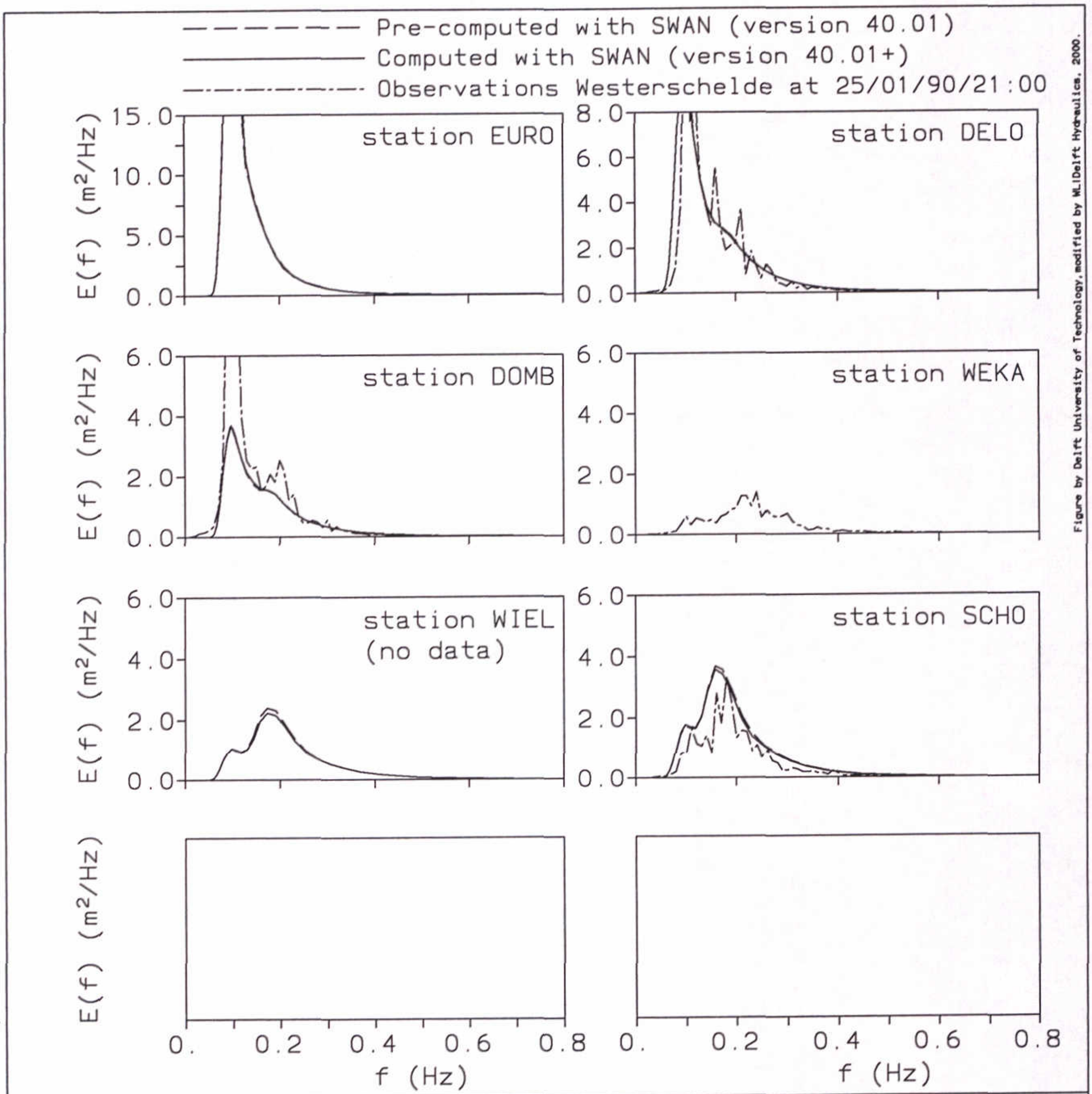
F61wsc07 F61m

Westerschelde Estuary



F61wsf07 F61n

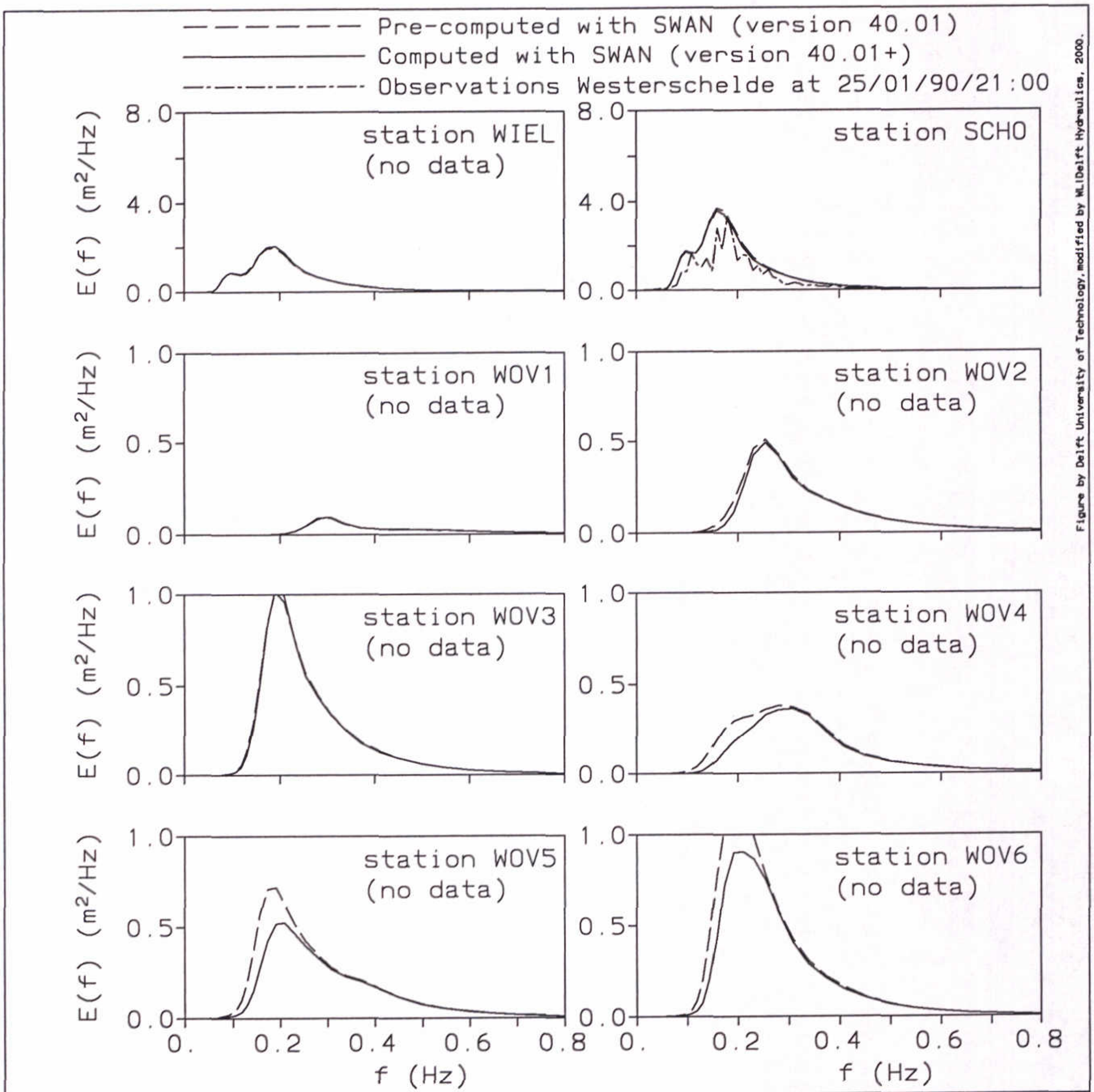
Westerschelde Estuary



F61wsc08 F61o

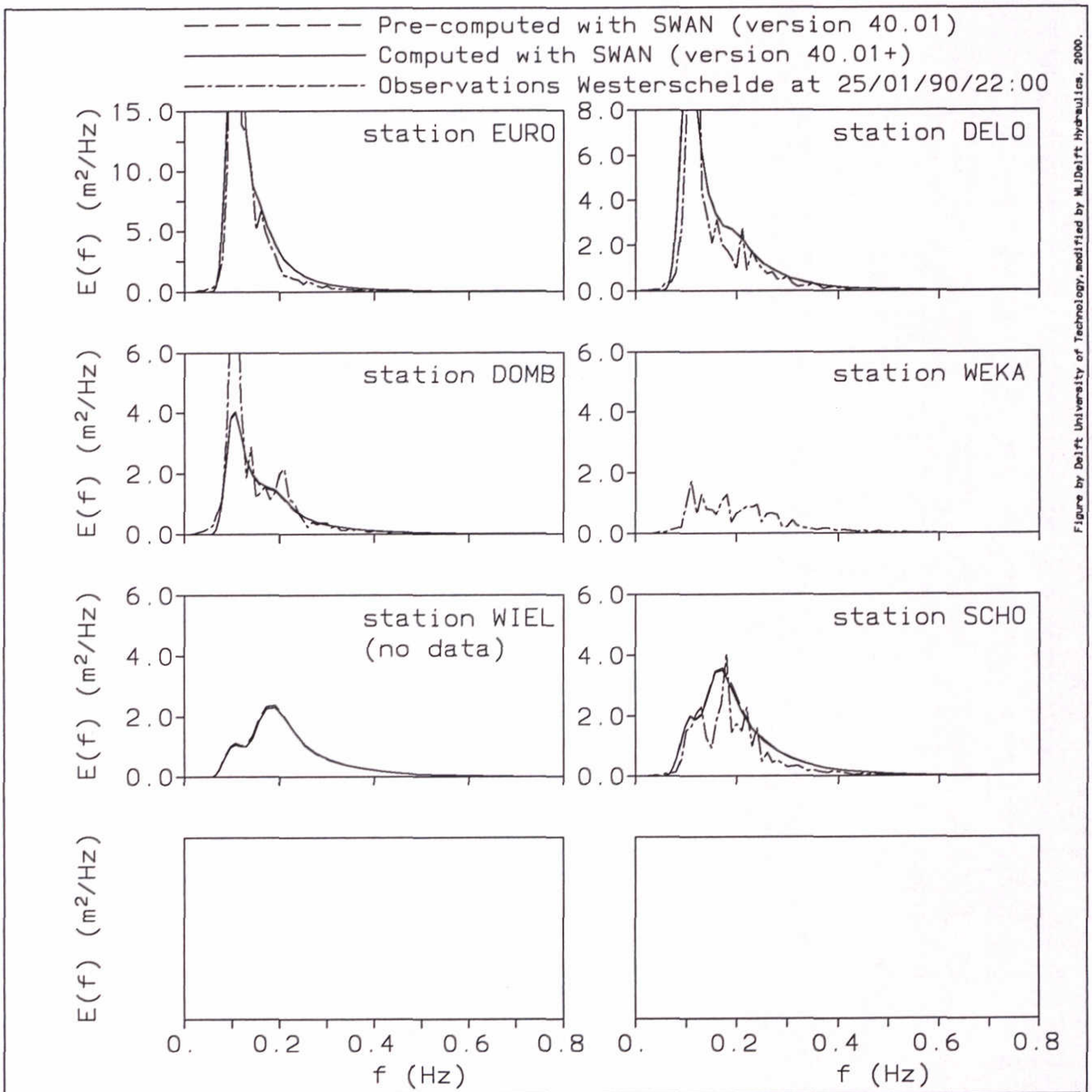
Westerschelde Estuary

Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.



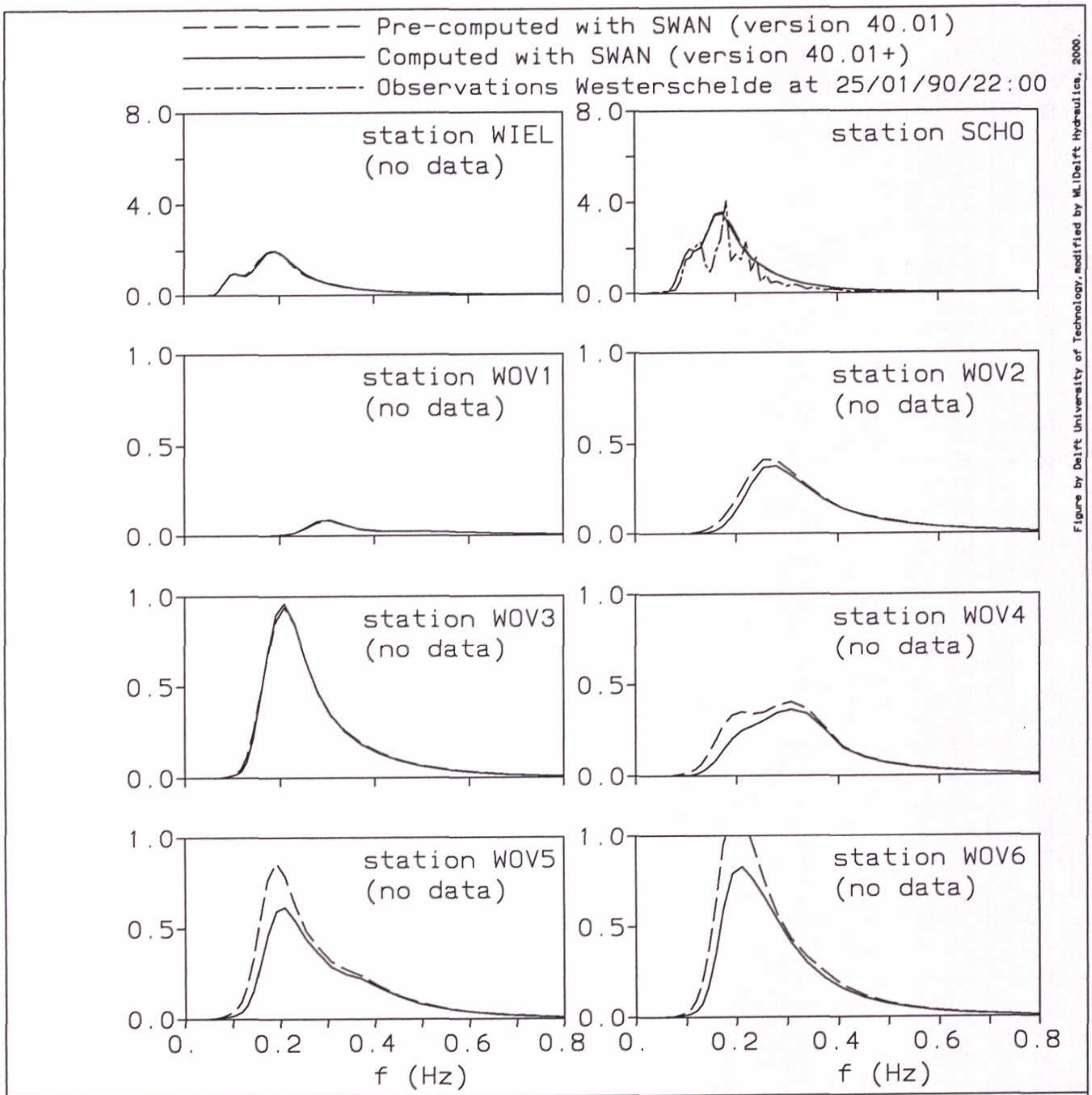
F61wsf08 F61p

Westerschelde Estuary



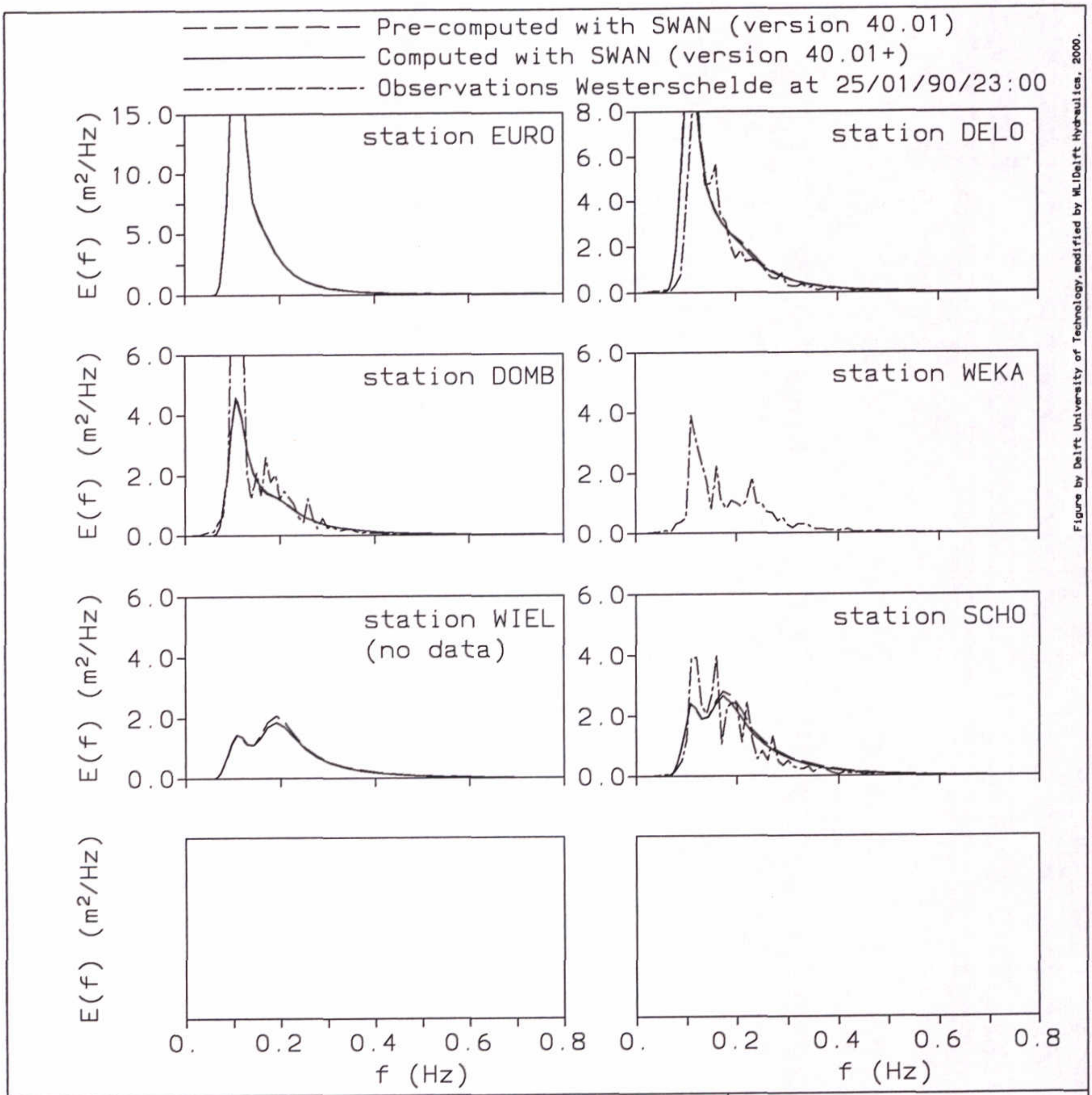
F61wsc09 F61q

Westerschelde Estuary



F61wsf09 F61r

Westerschelde Estuary



F61wsc10 F61s

Westerschelde Estuary

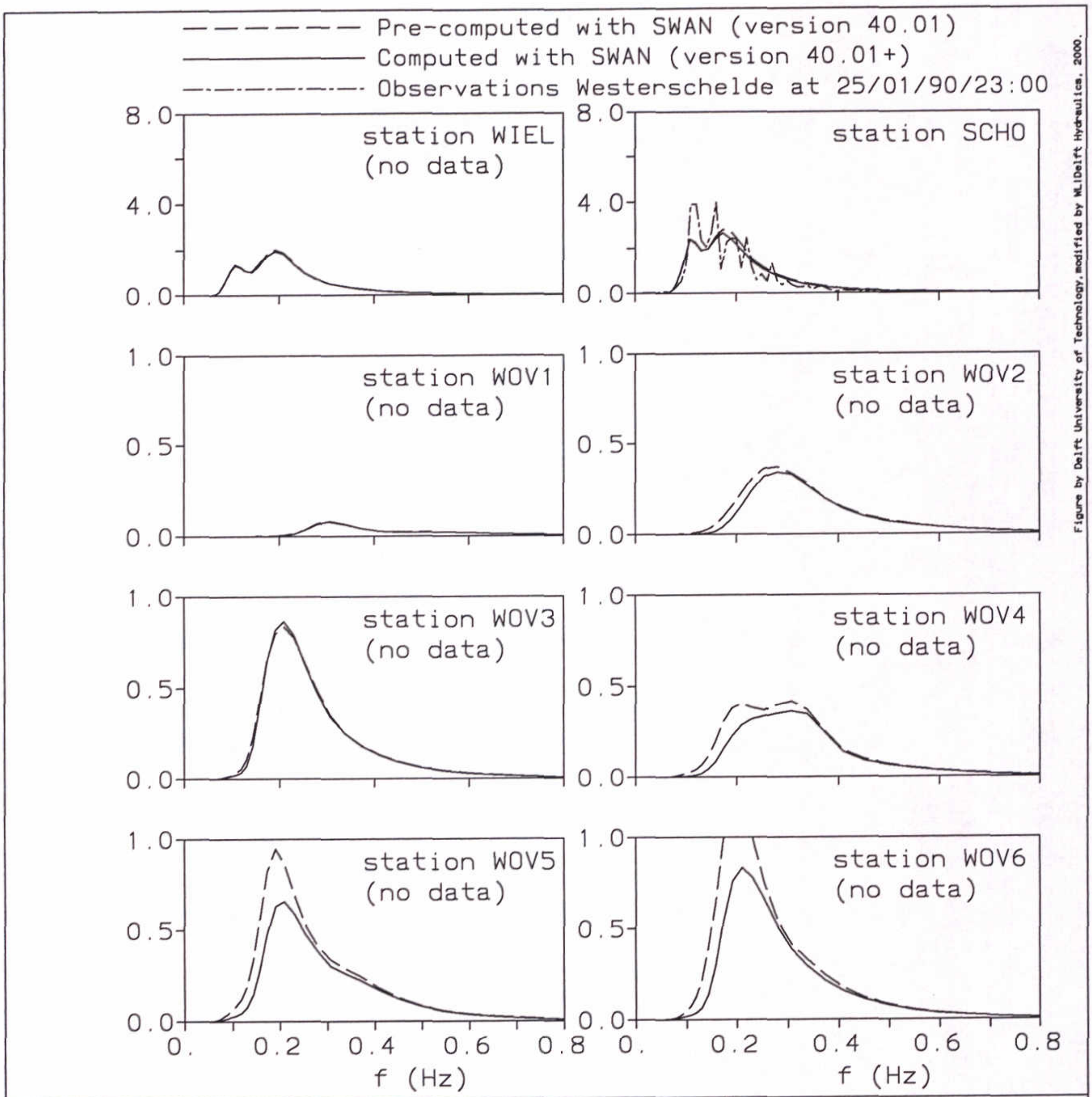
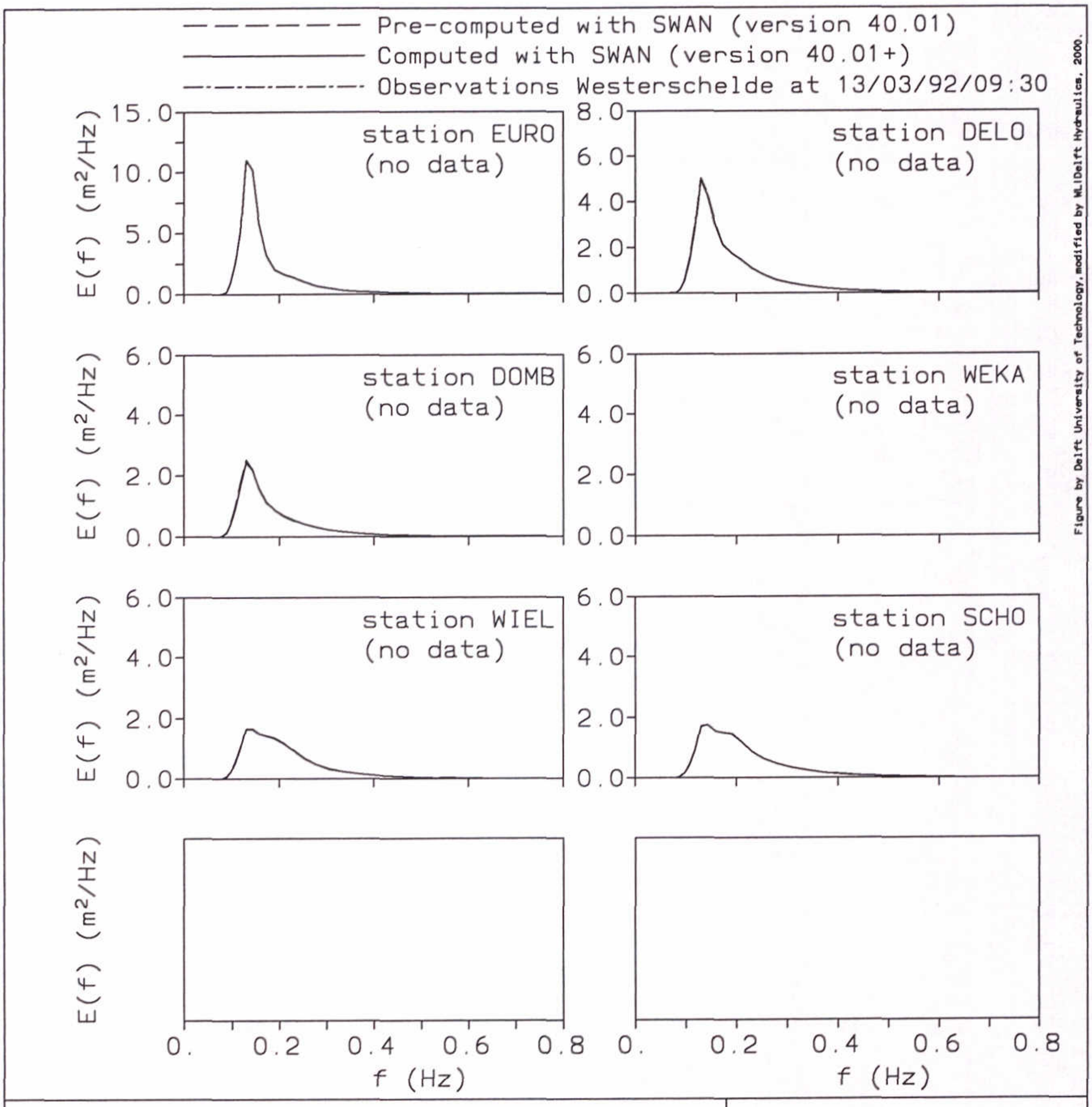


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

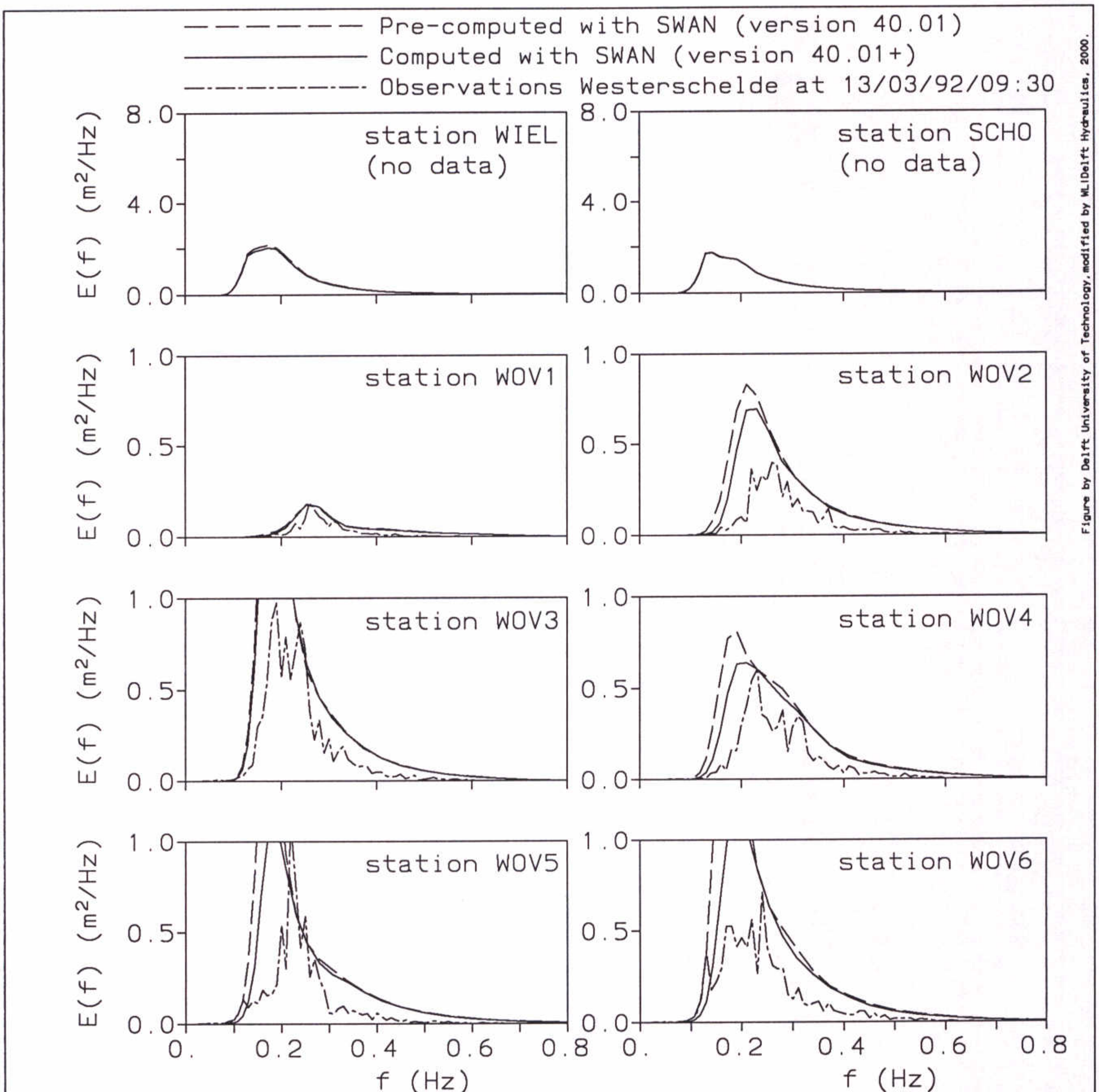
F61wsf10 F61t

Westerschelde Estuary



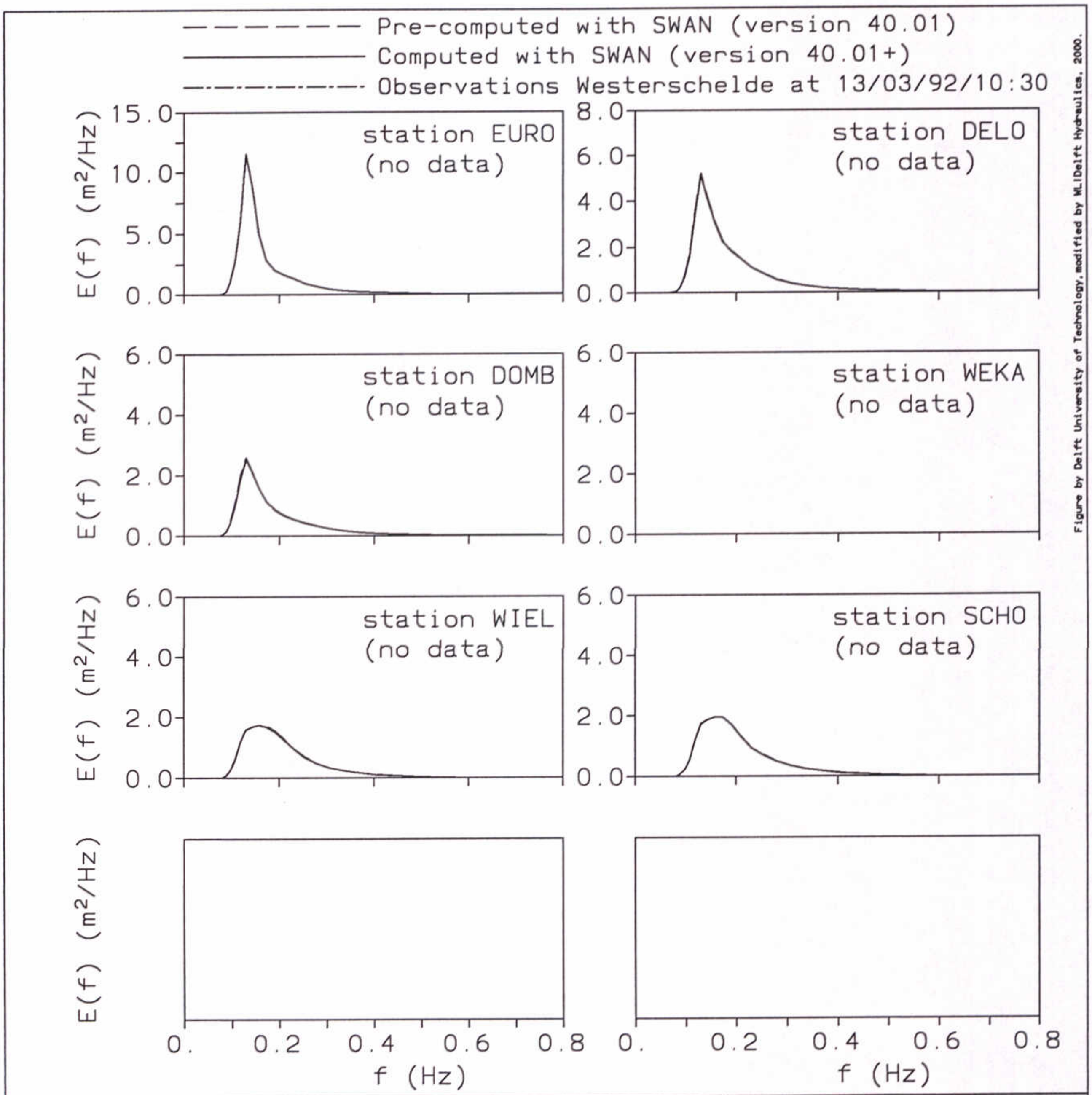
F61wsc11 F61u

Westerschelde Estuary



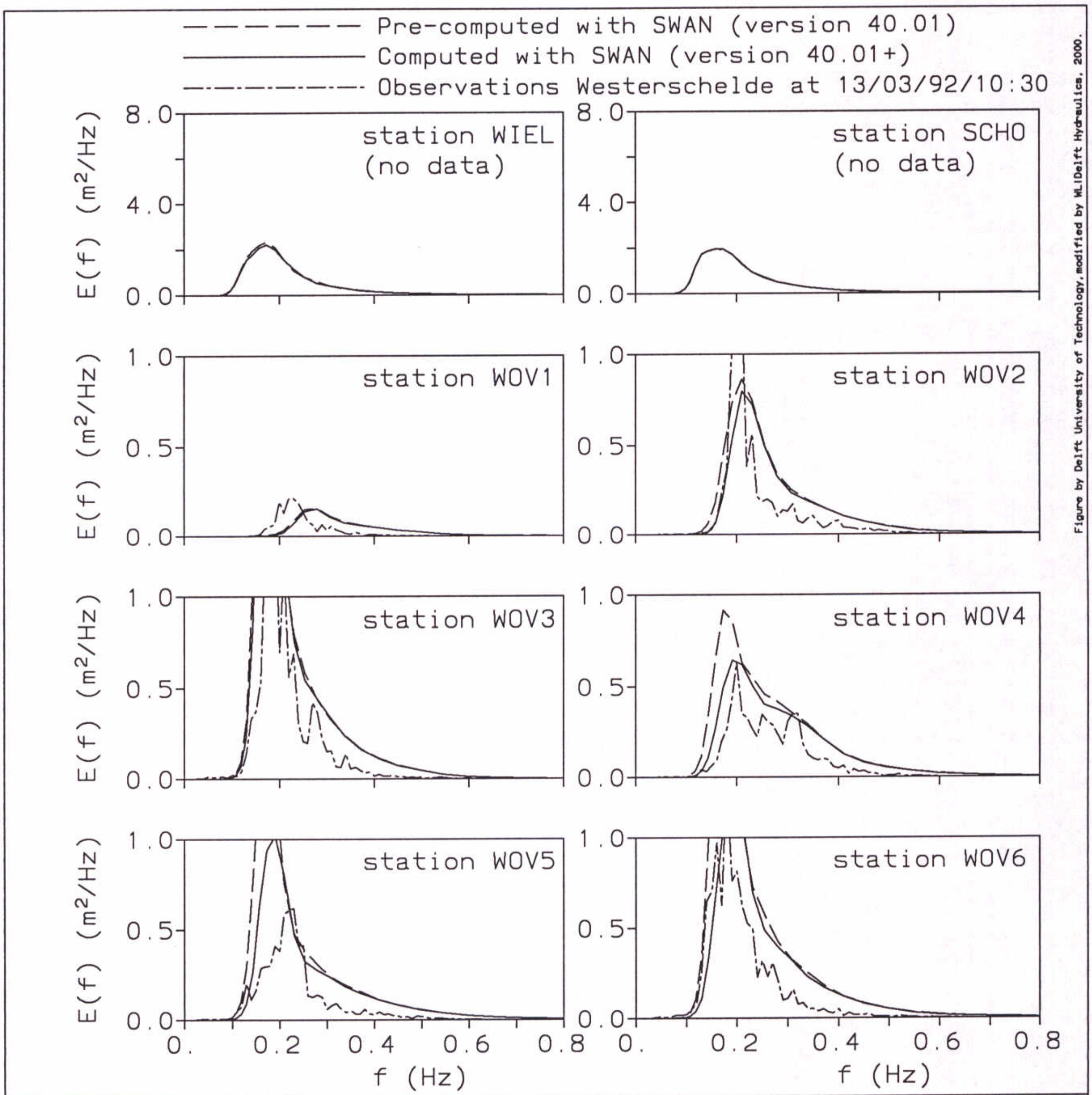
F61wsf11 F61v

Westerschelde Estuary



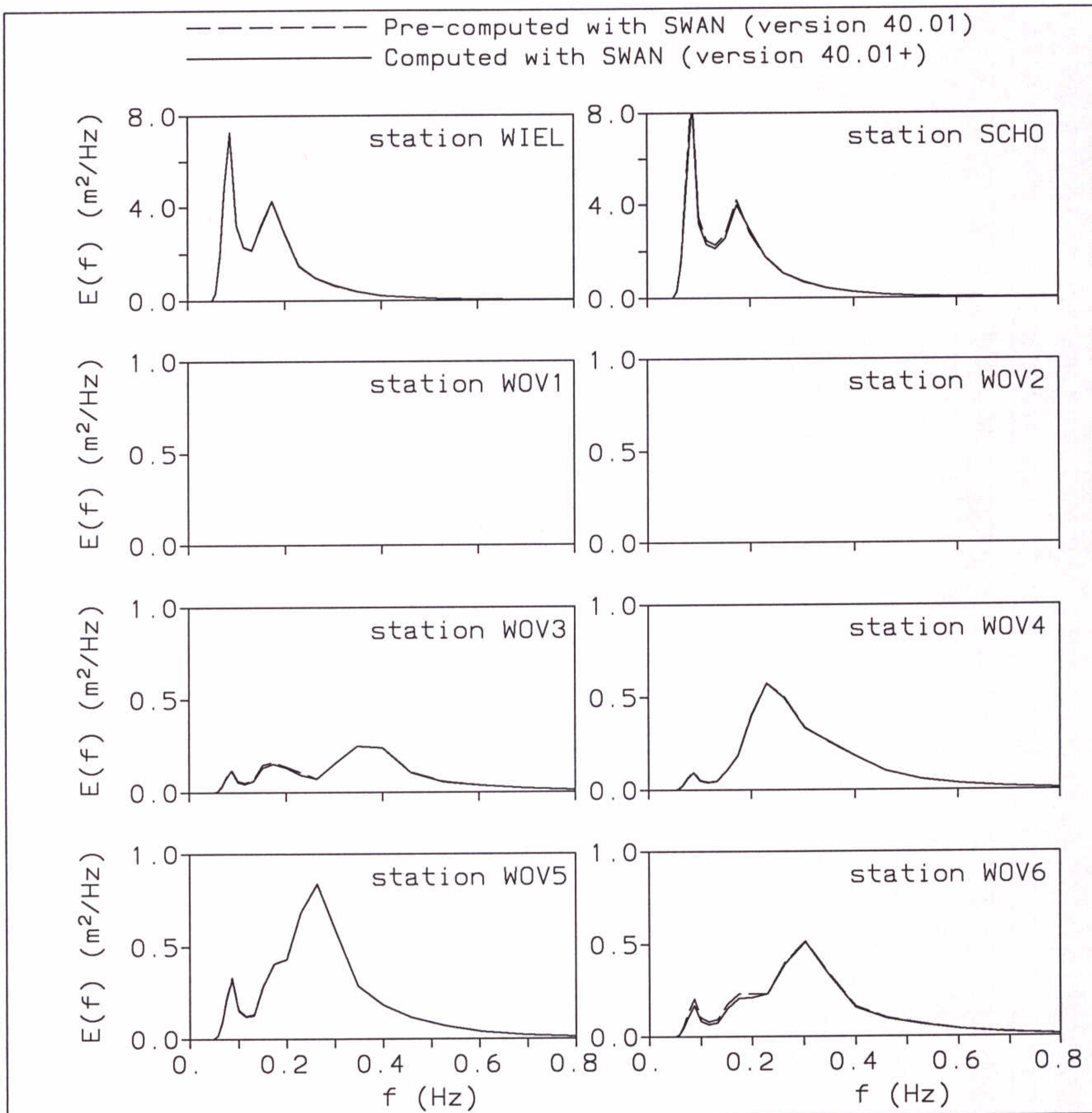
F61wsc12 F61w

Westerschelde Estuary



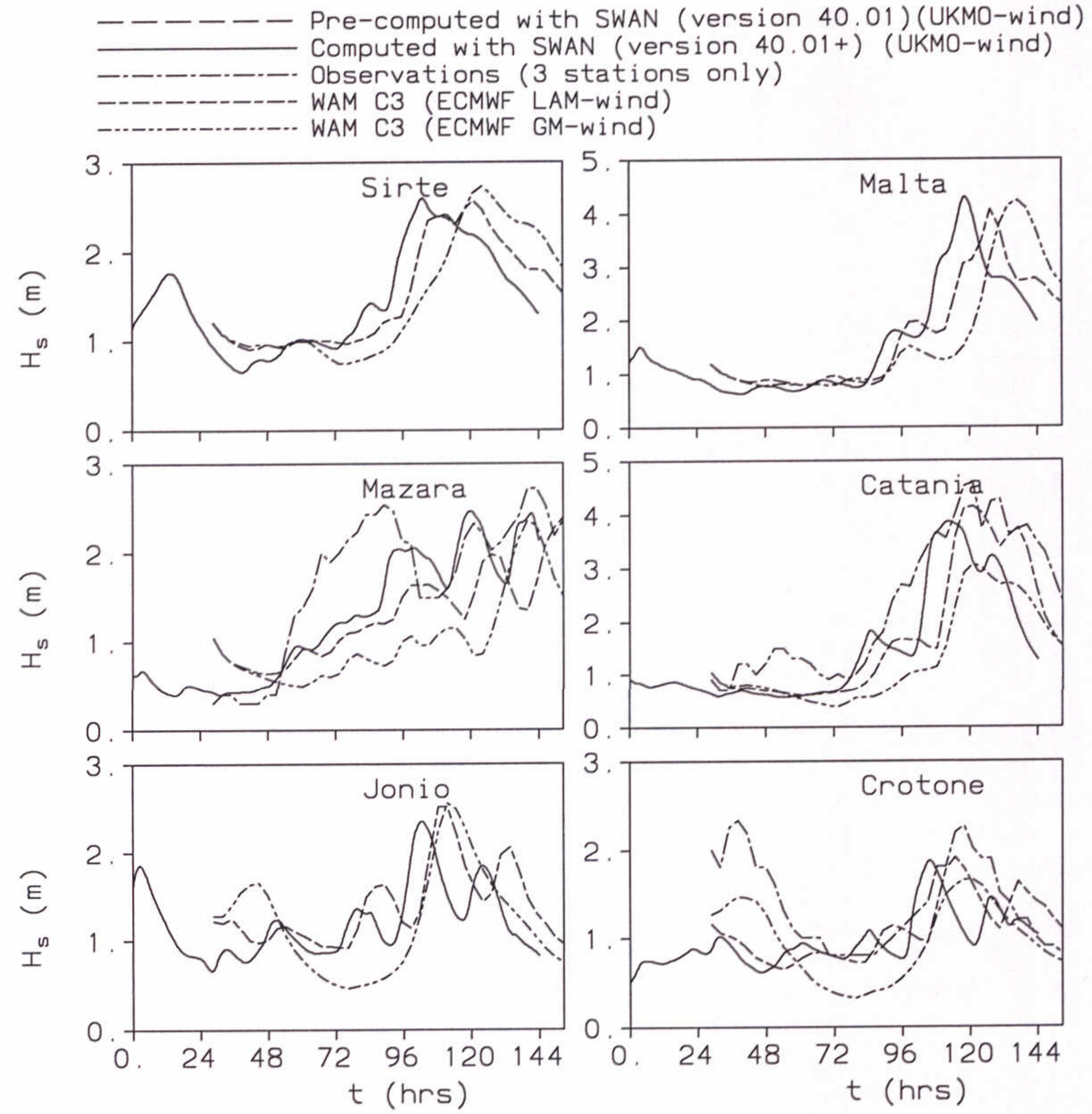
F61wsf12 F61x

Westerschelde Estuary



F62wes01 F62

Westerschelde: curvi grid 1



F71med01 F71a

Mediterranean Sea

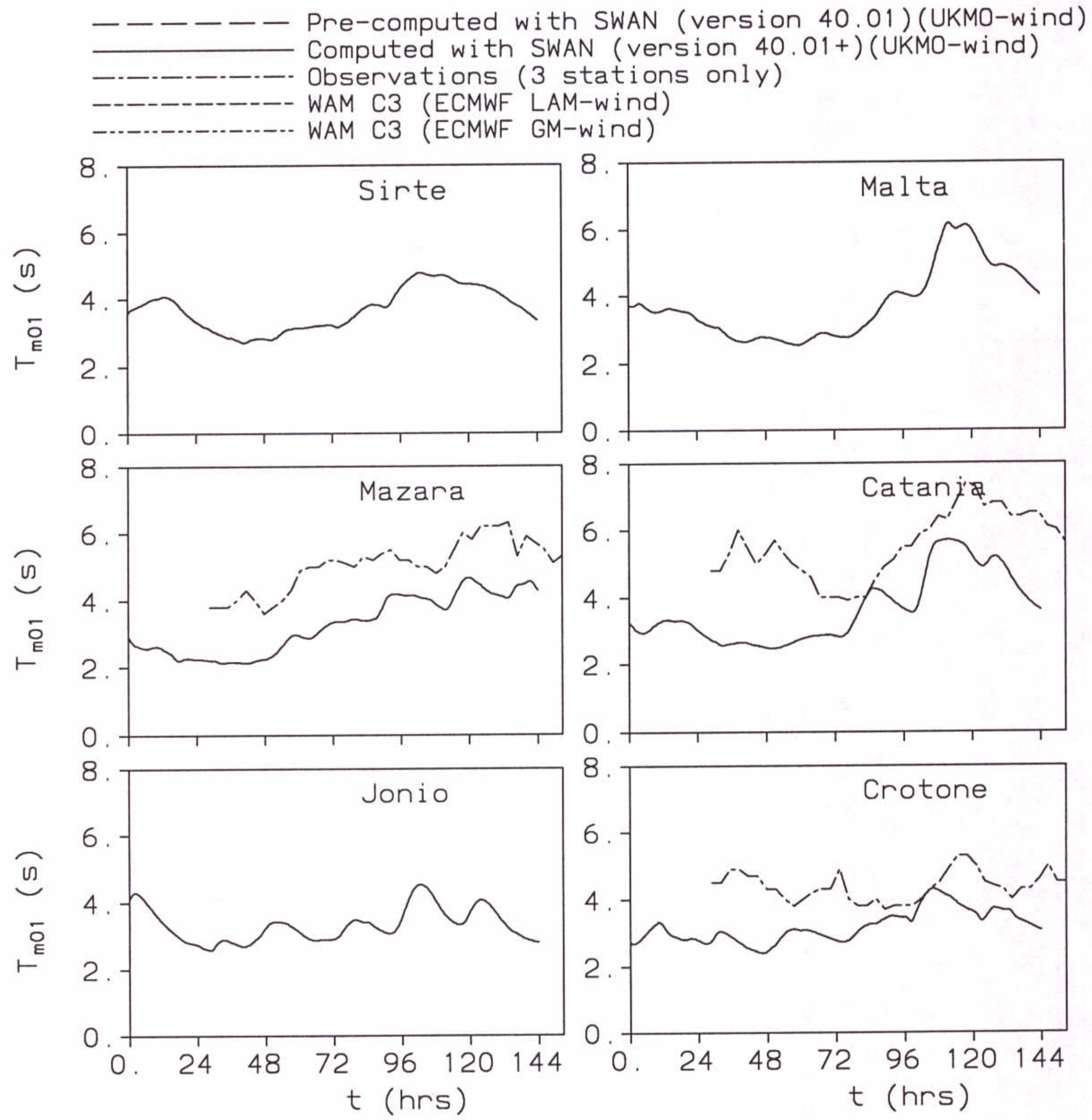
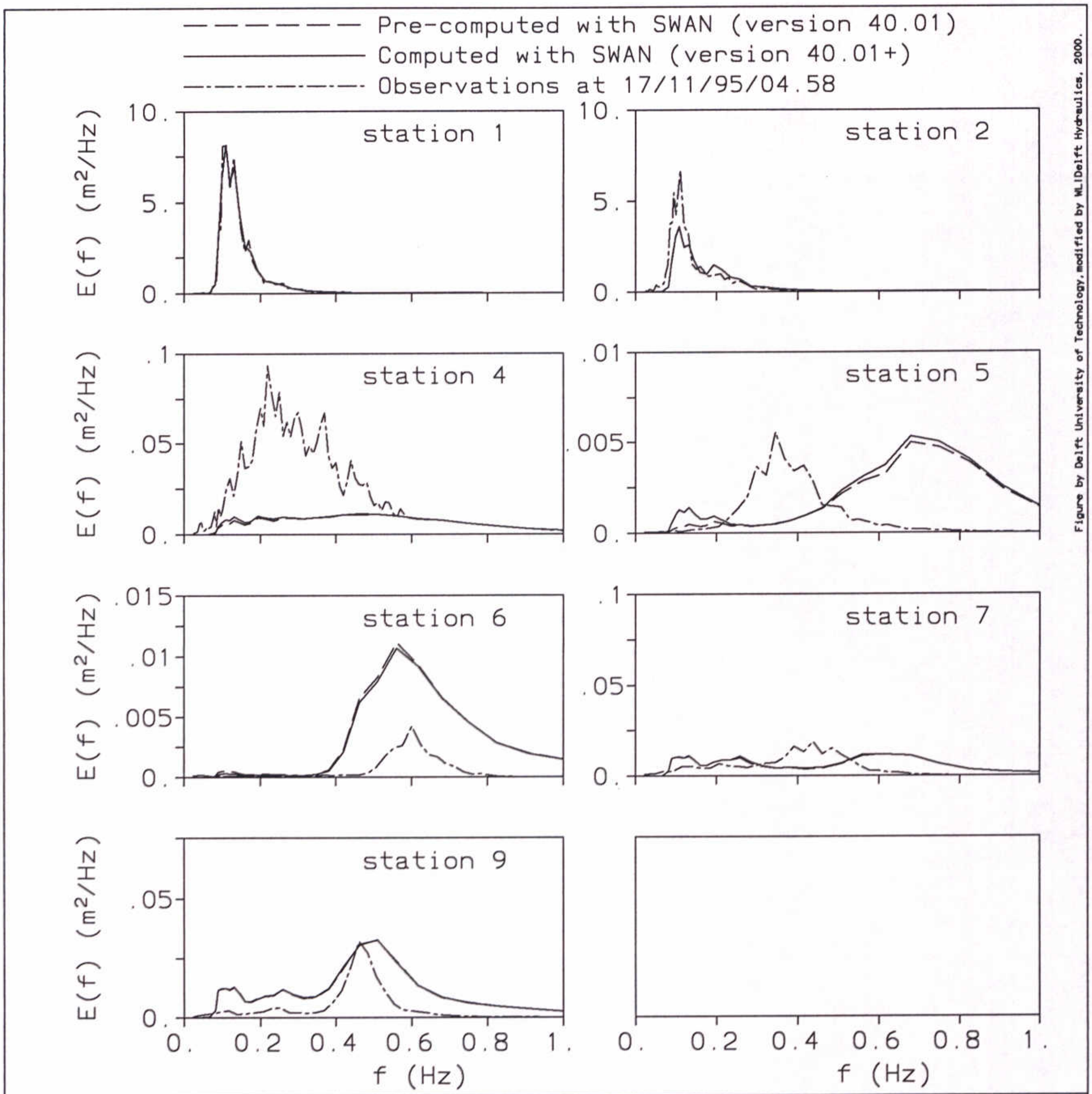


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

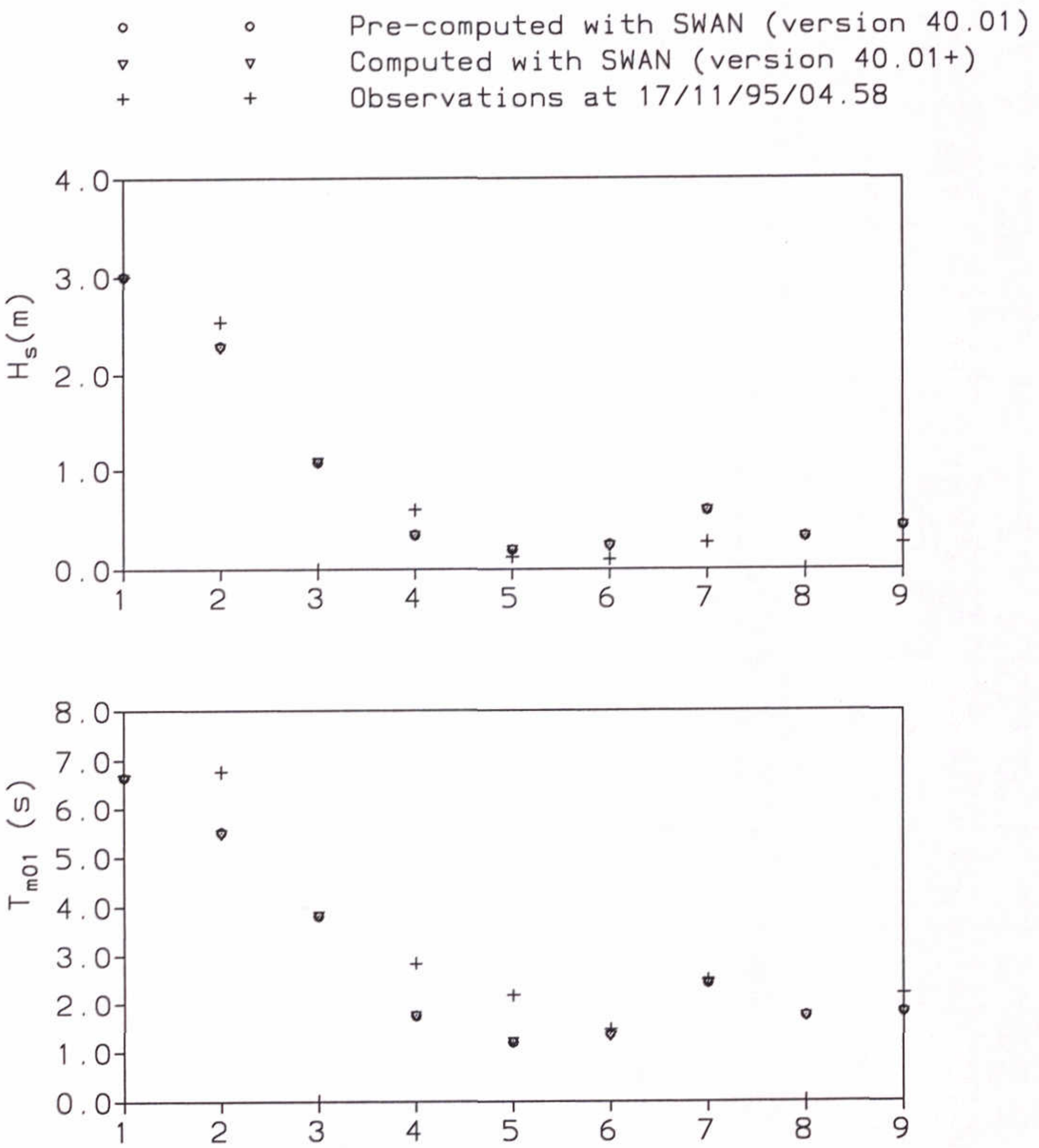
F71med01 F71b

Mediterranean Sea



F81nor01 F81a

Norderneyer Seegat



F81nor01 F81b

Norderneyer Seegat

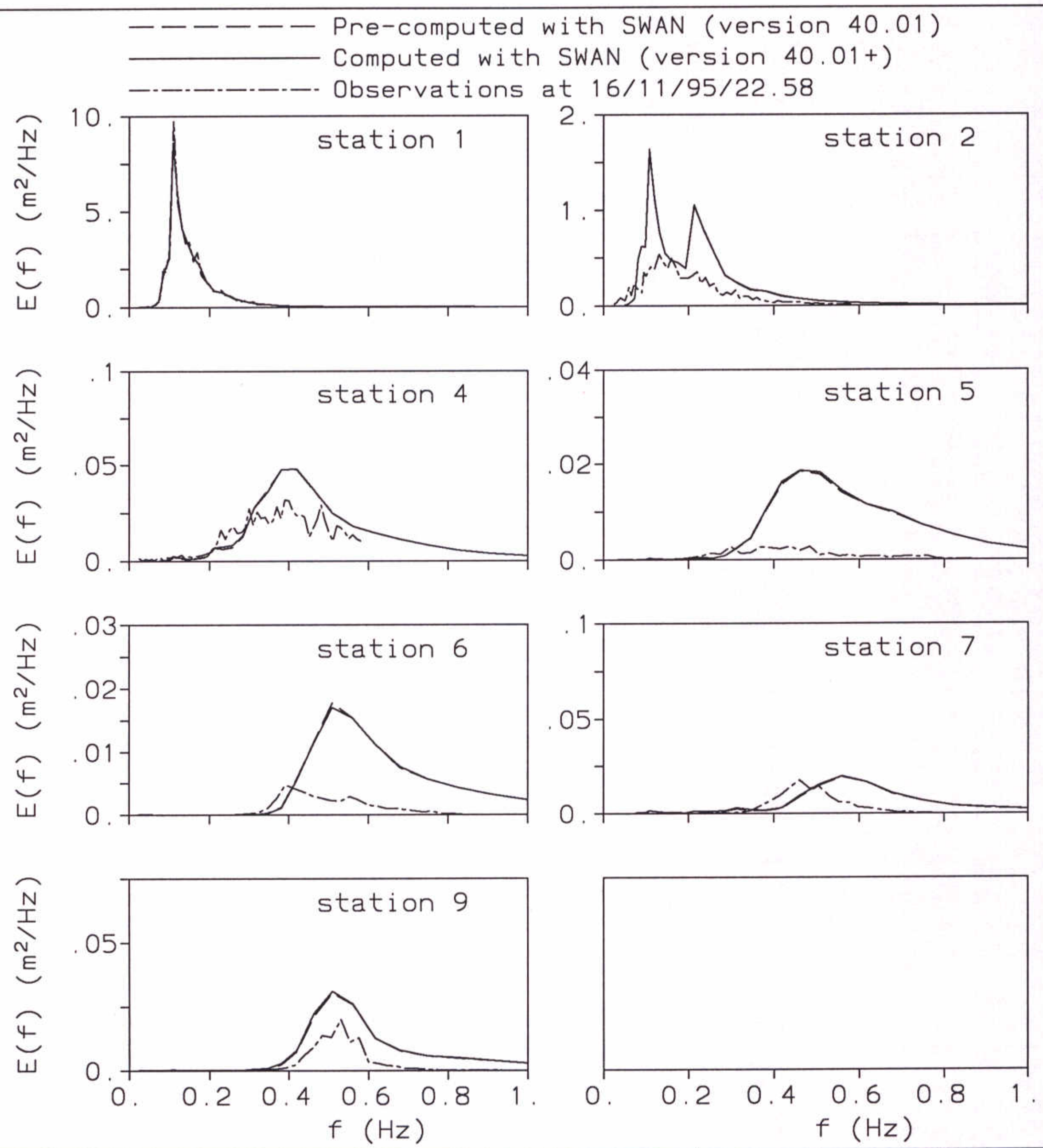
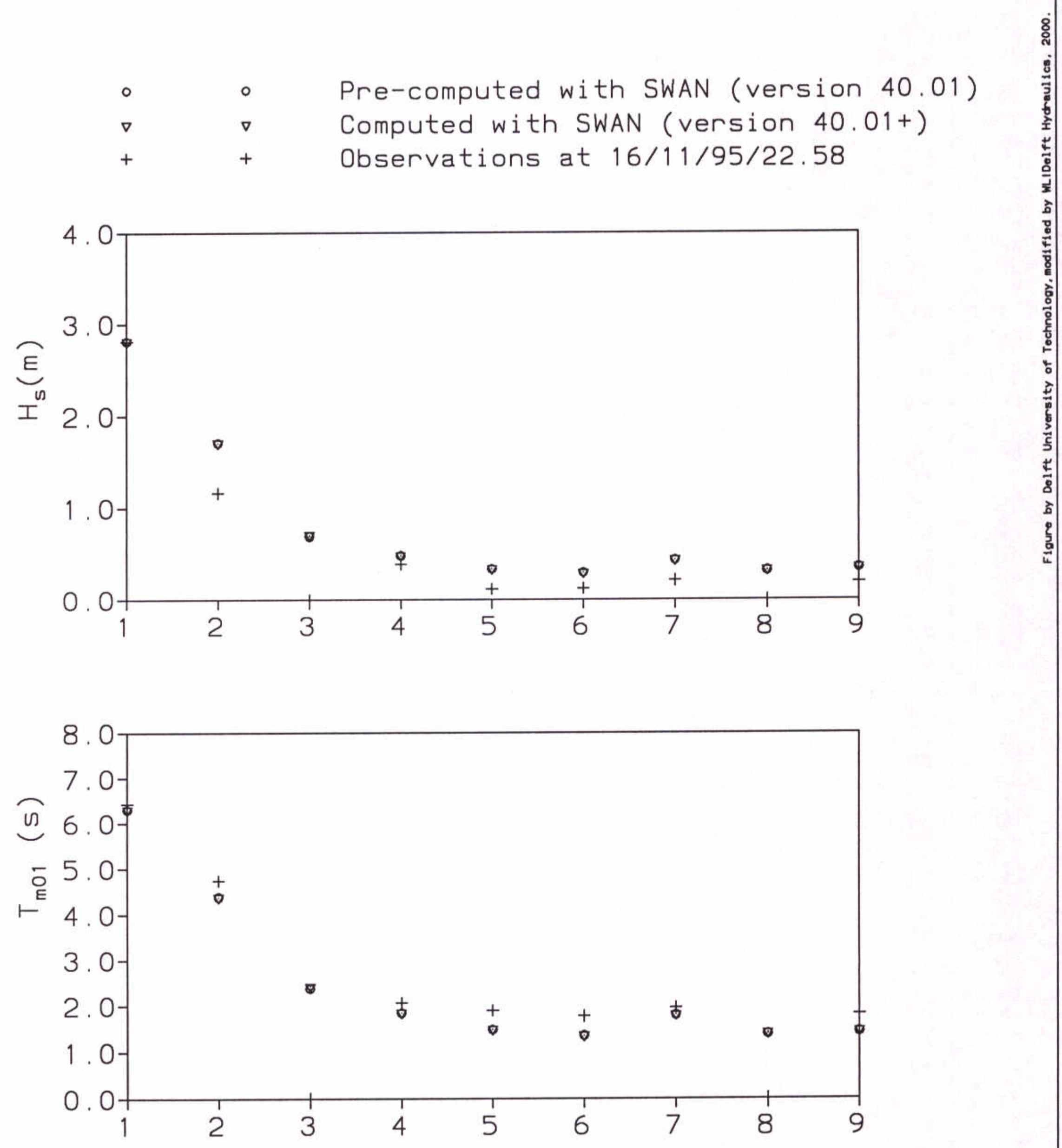


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

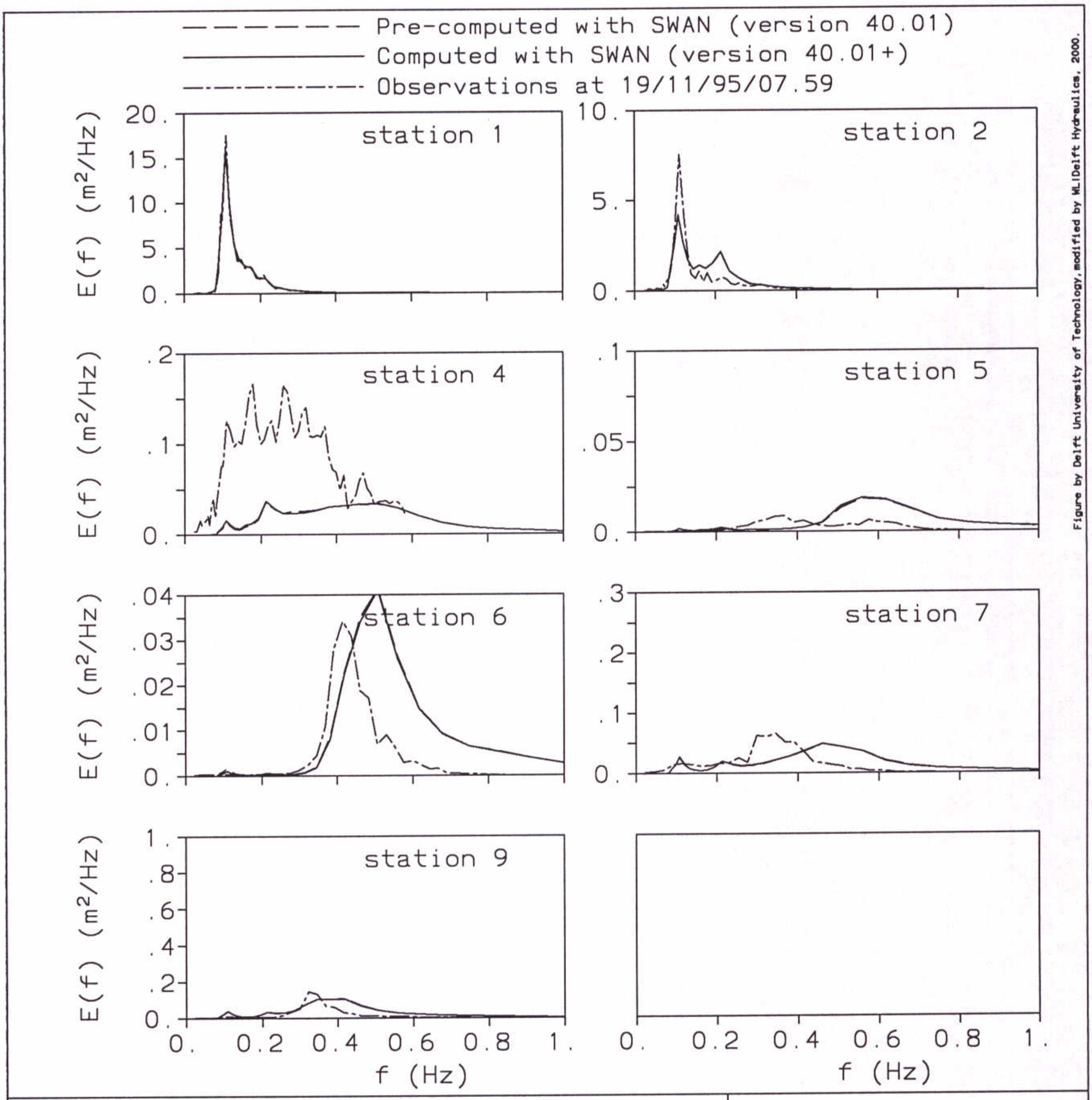
F81nor02 F81c

Norderneyer Seegat



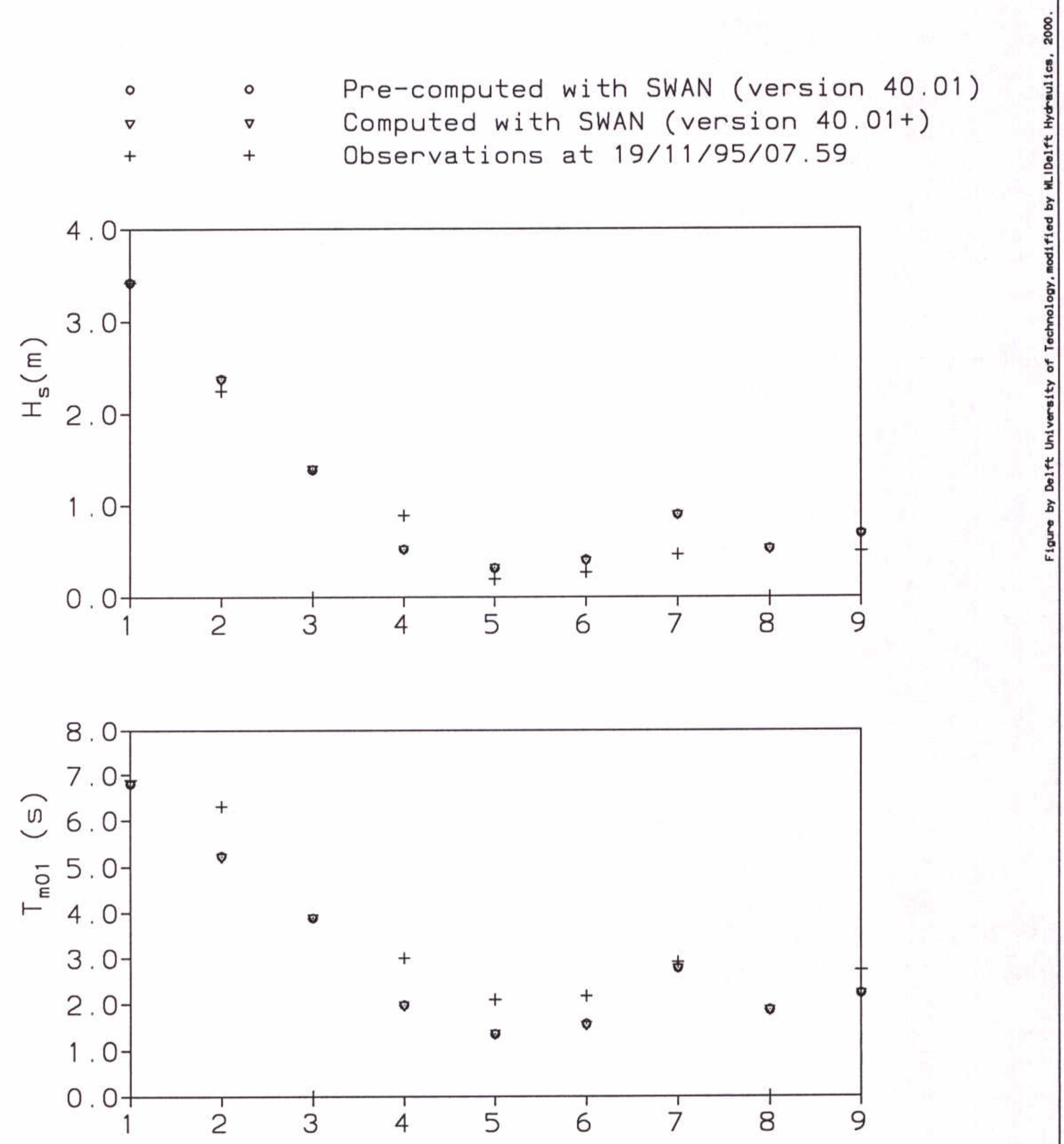
F81nor02 F81d

Norderneyer Seegat



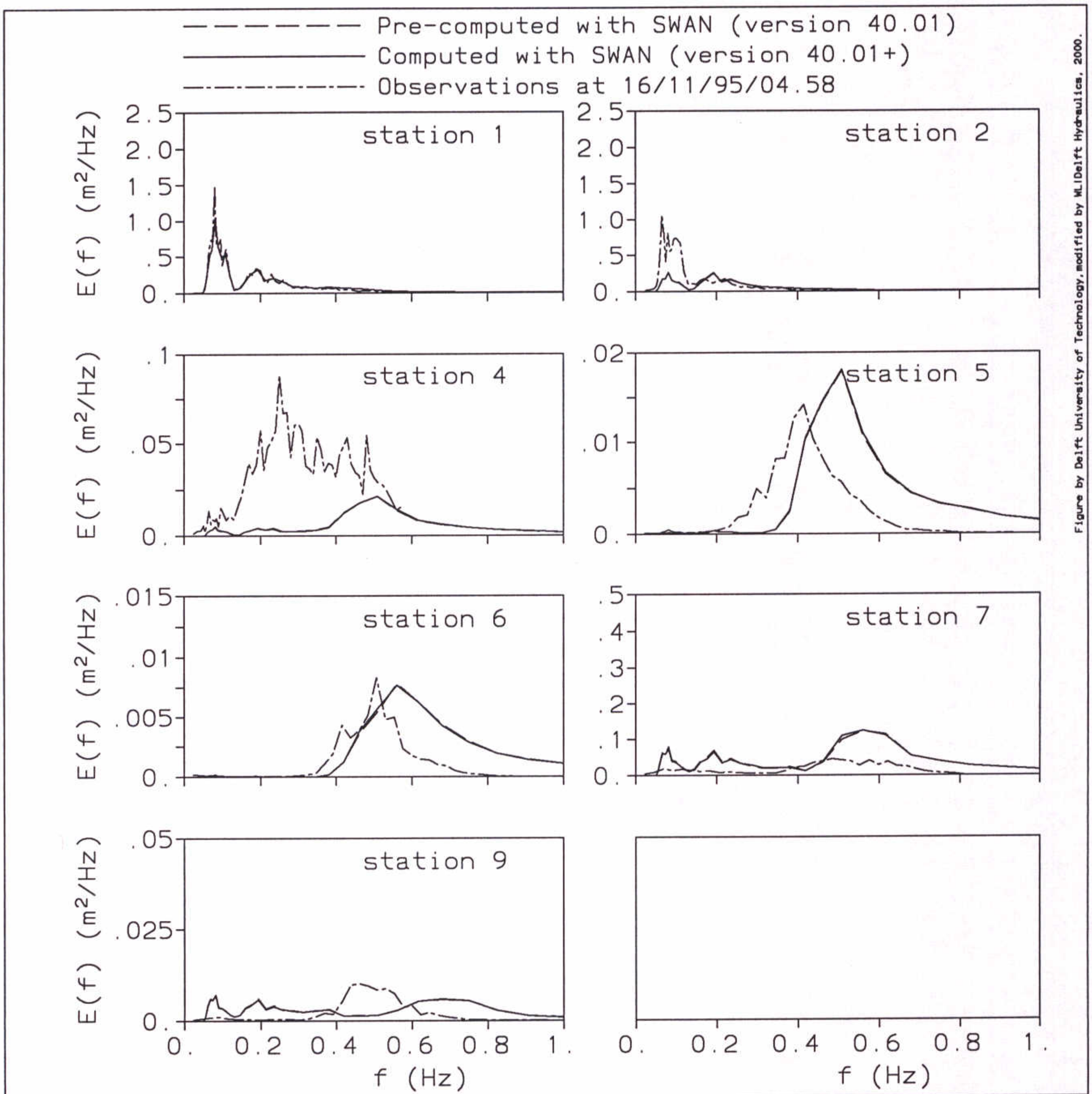
F81nor03 F81e

Norderneyer Seegat



F81nor03 F81f

Norderneyer Seegat



F81nord4 F81g

Norderneyer Seegat

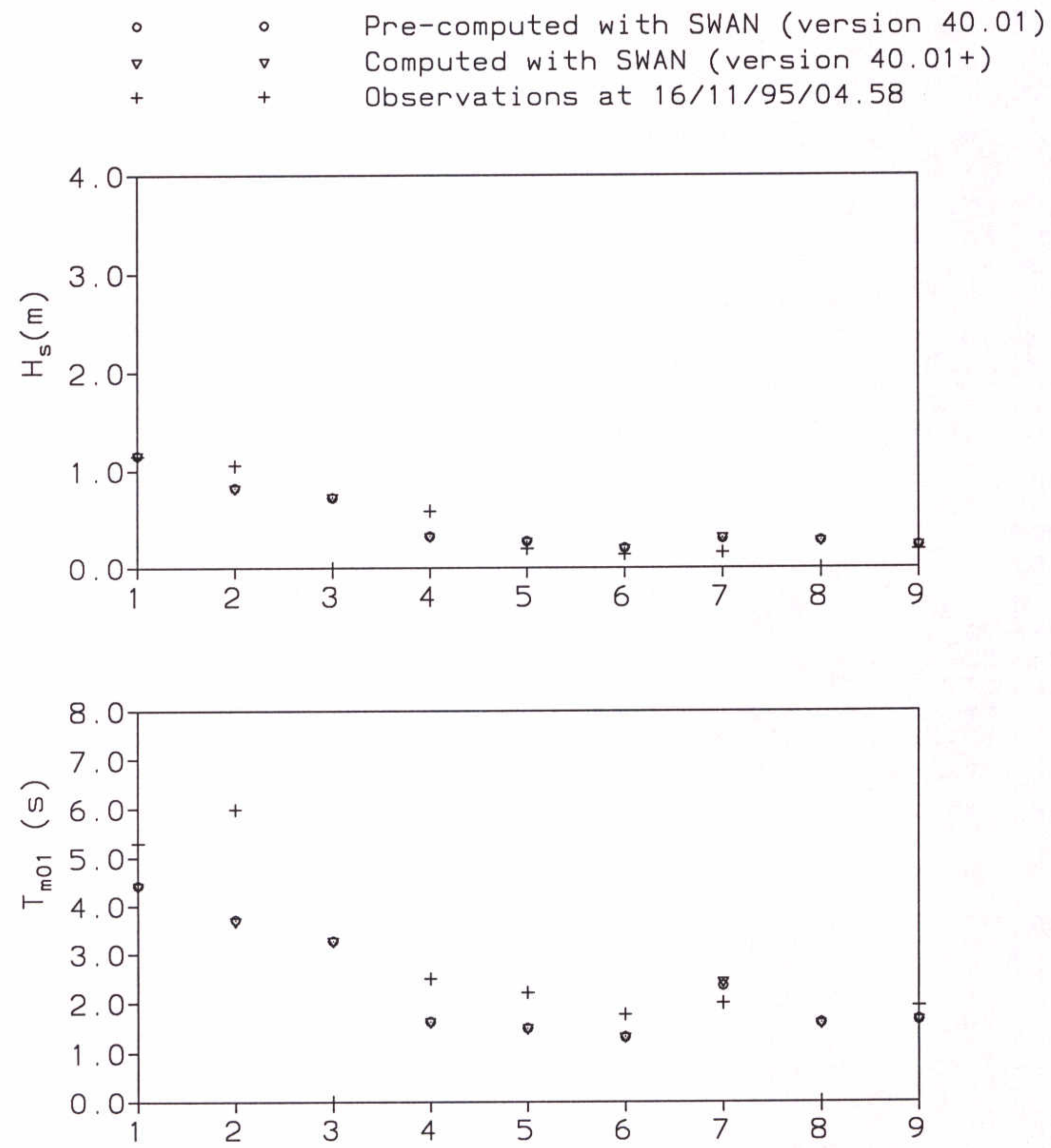


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F81nor04 F81h

Norderneyer Seegat

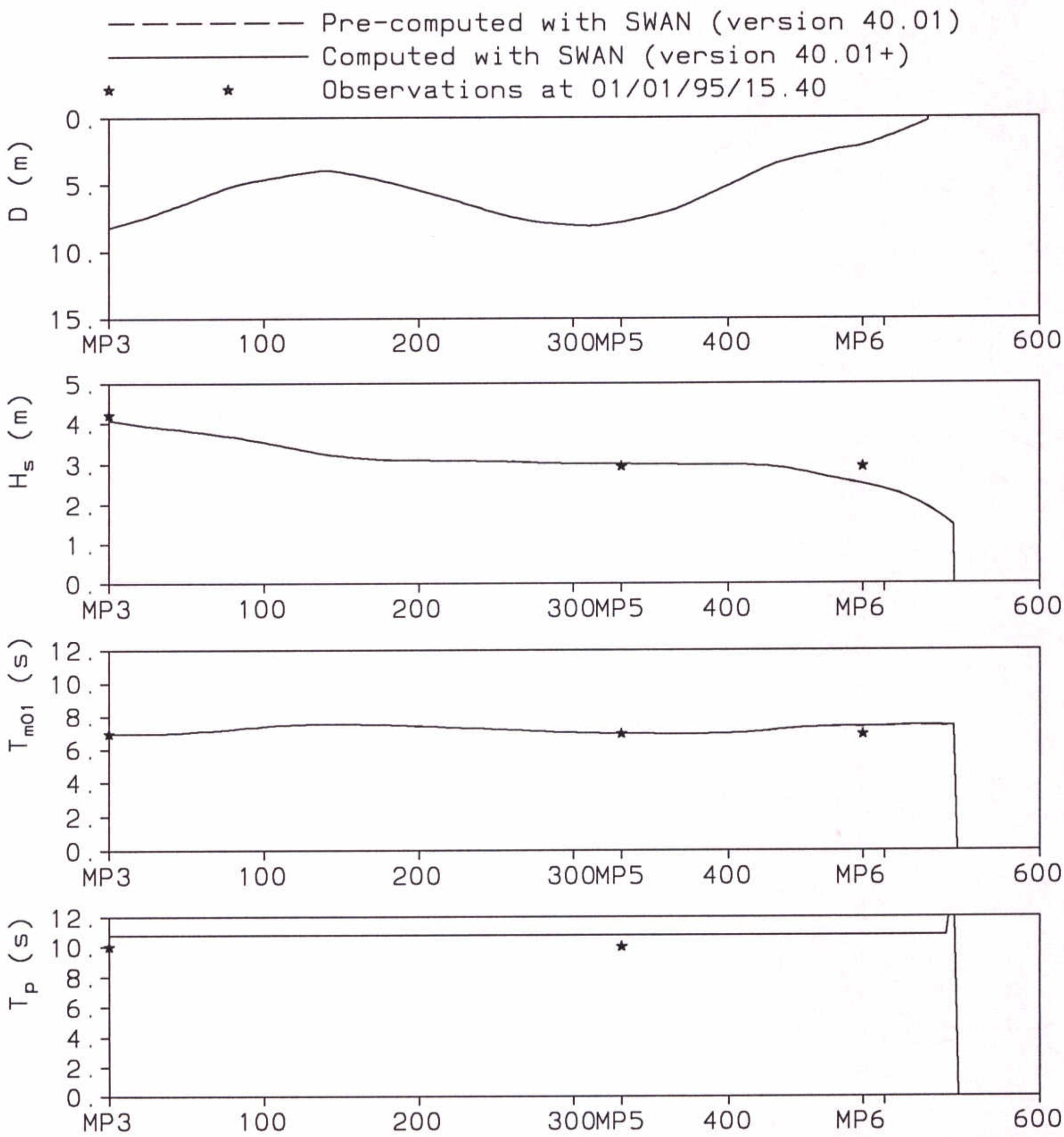
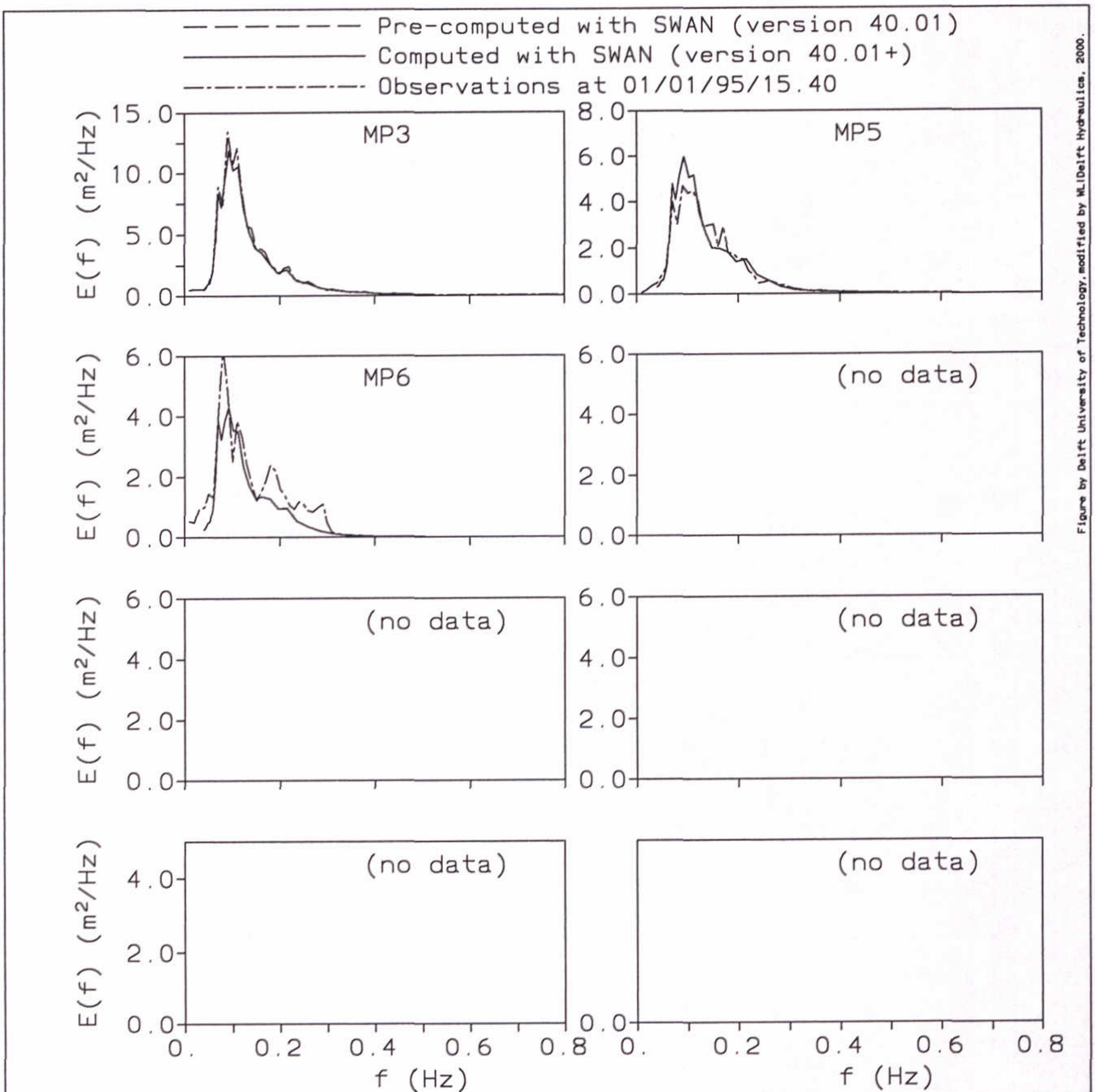


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

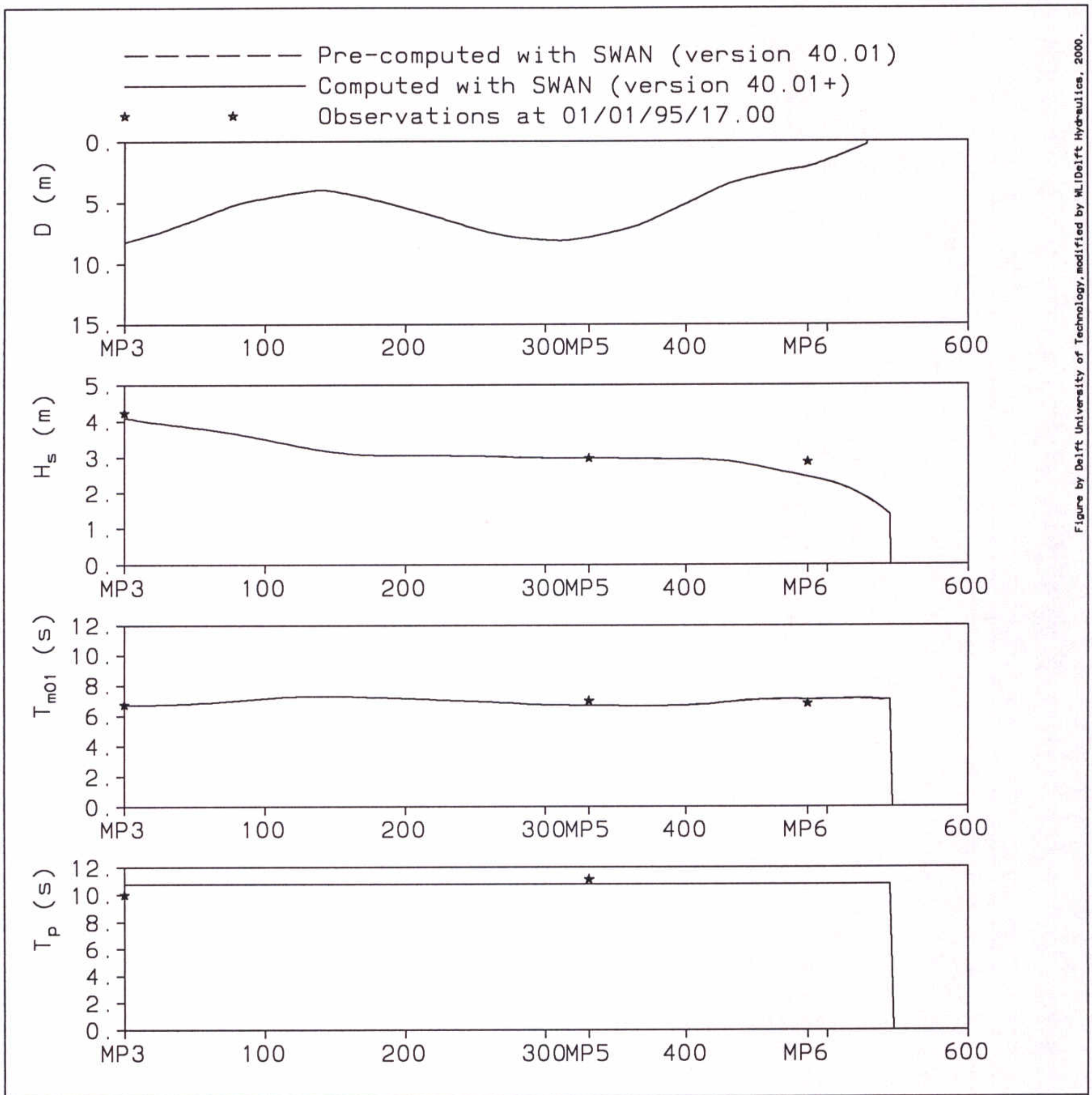
F91pet01 F91a

Petten field case



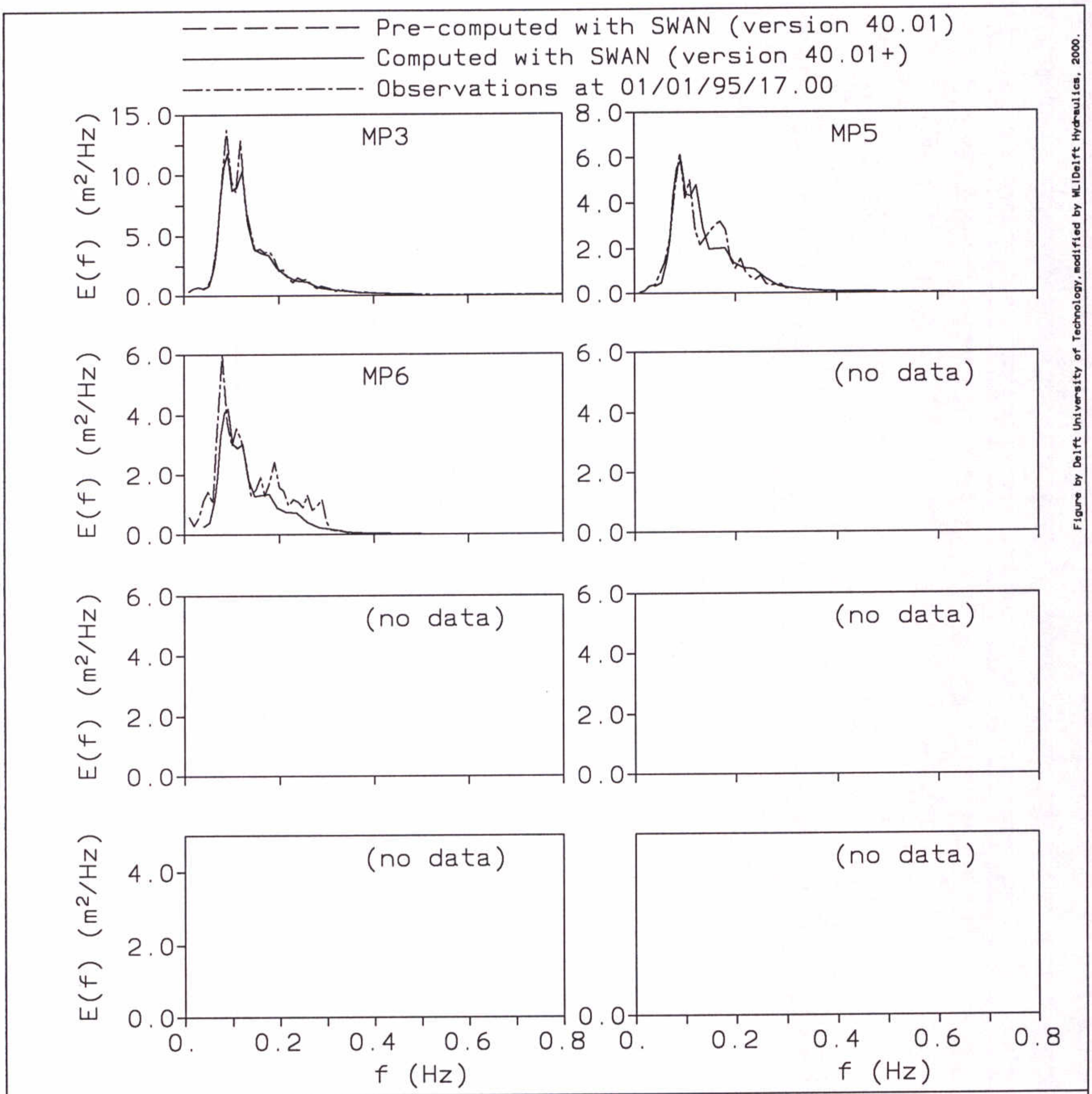
F91pet01 F91b

Petten field case



F91pet02 F91c

Petten field case



F91pet02 F91d

Petten field case

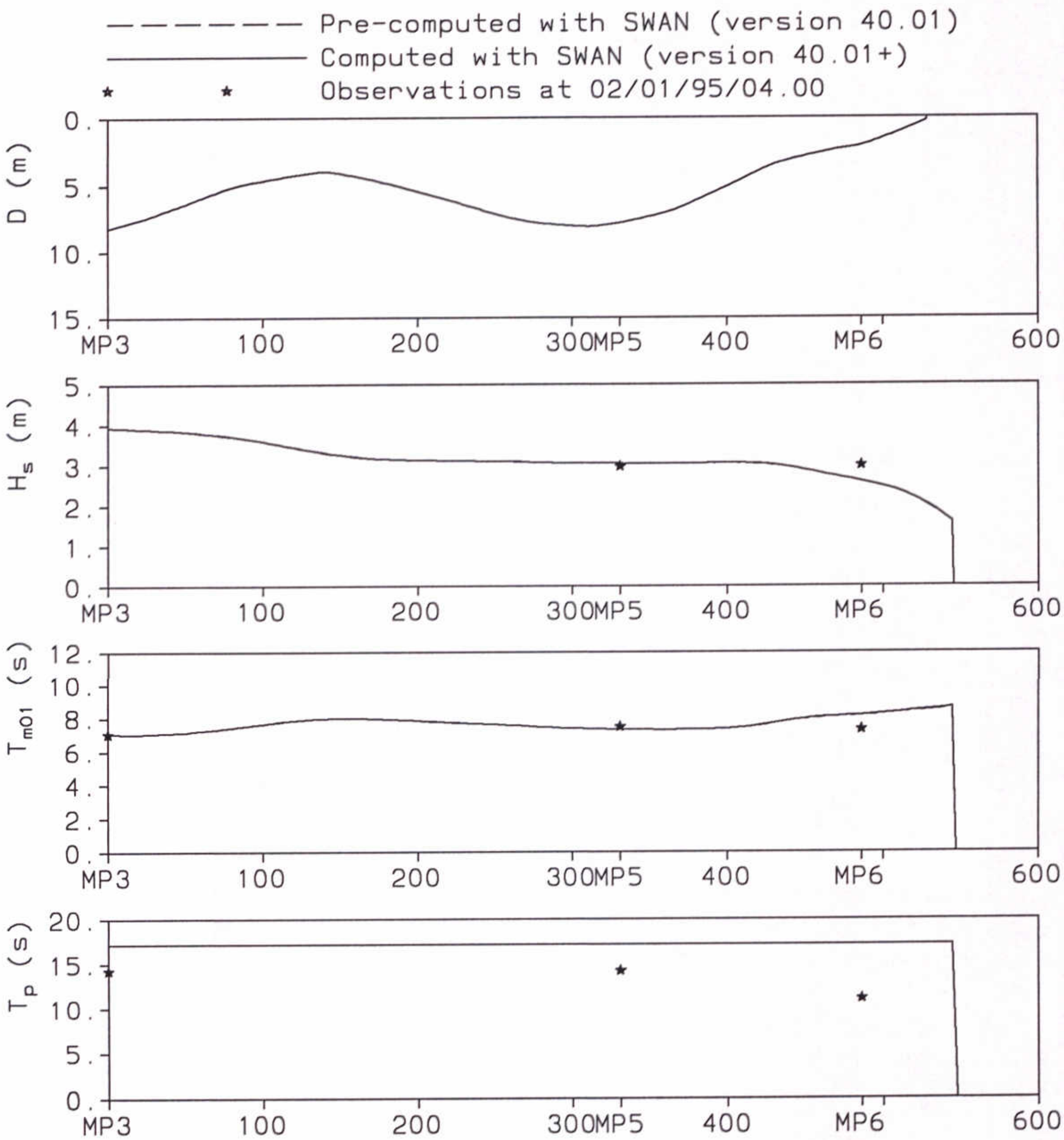
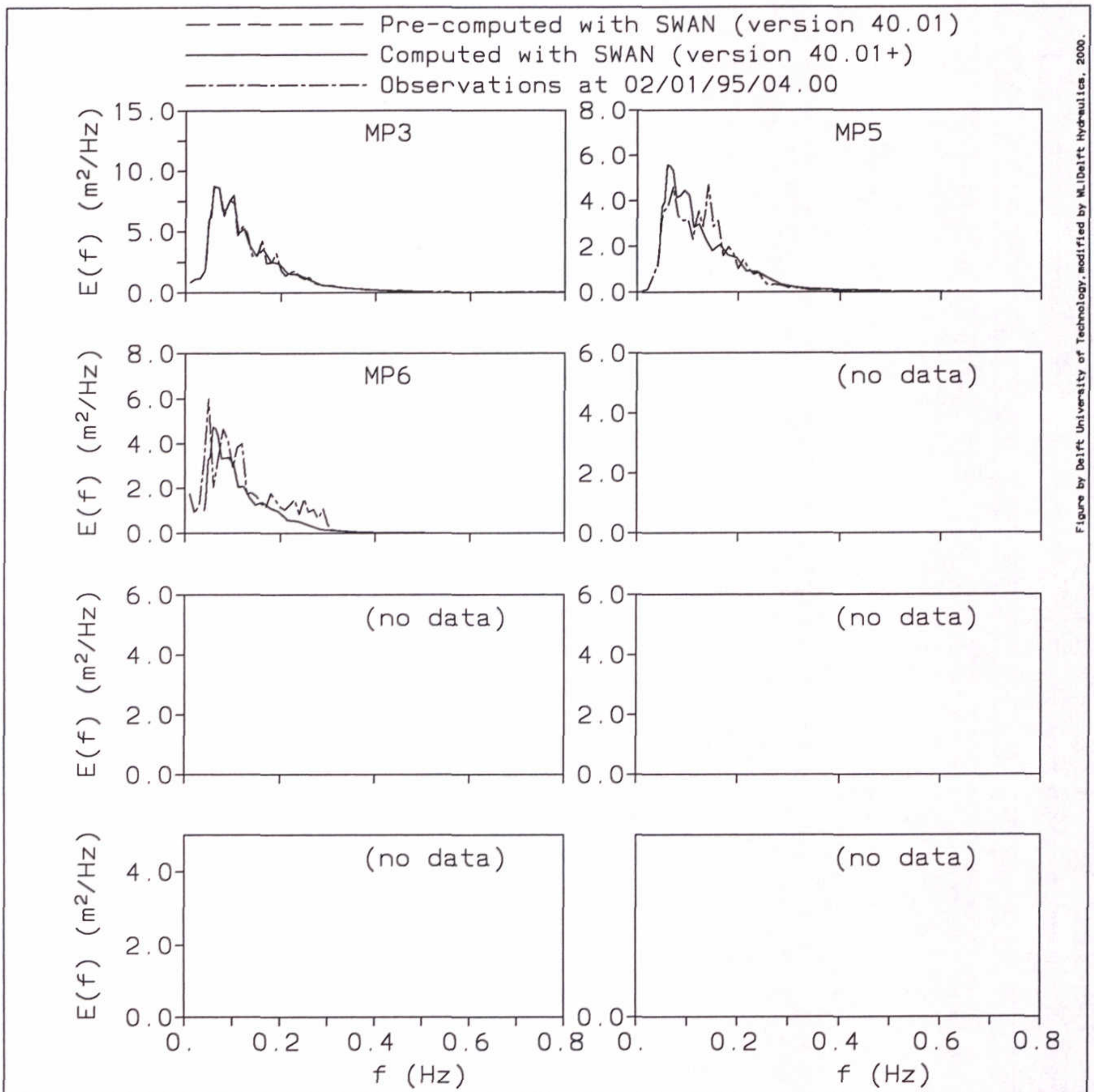


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

F91pet03

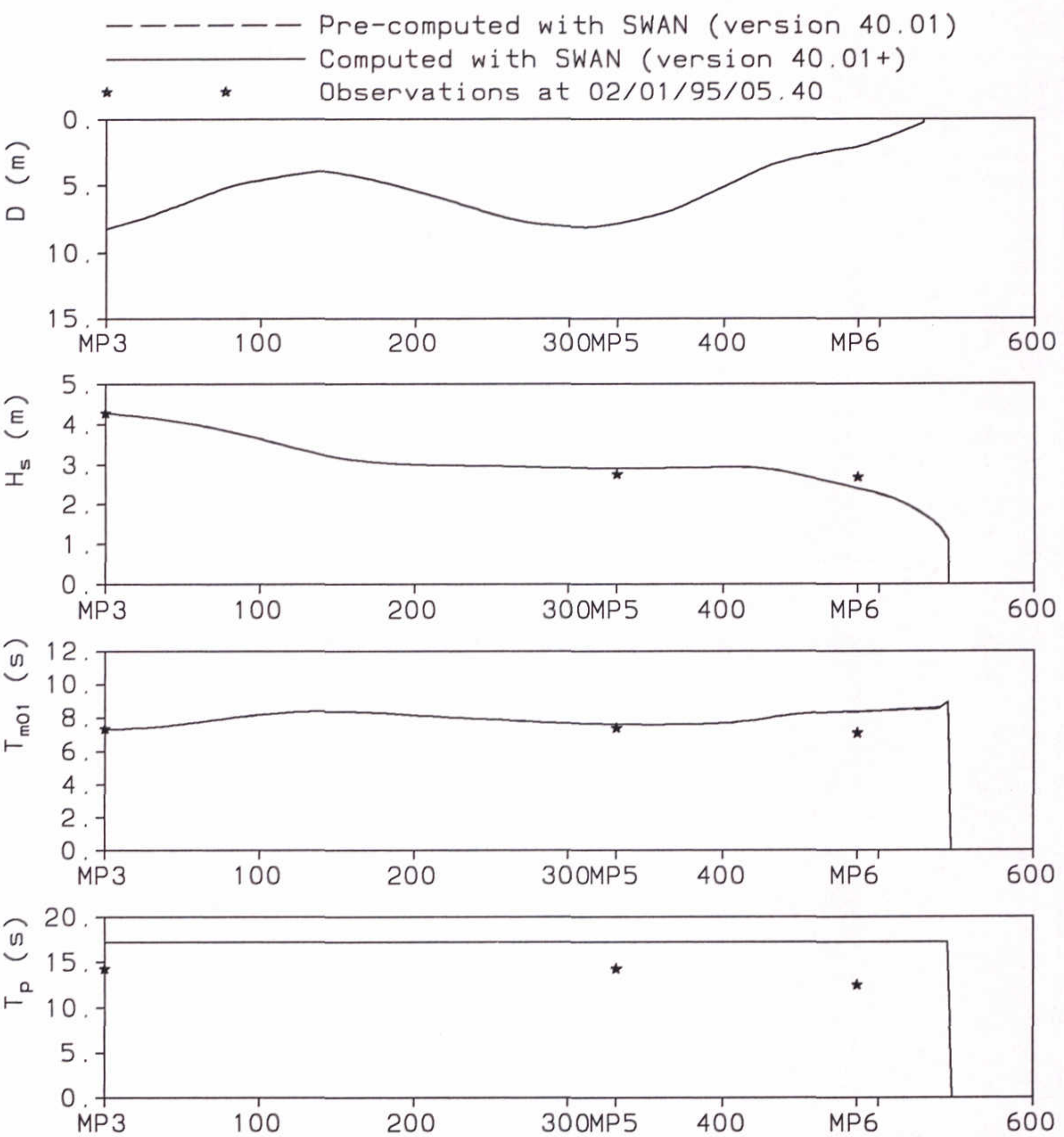
Petten field case

F91e



F91pet03 F91f

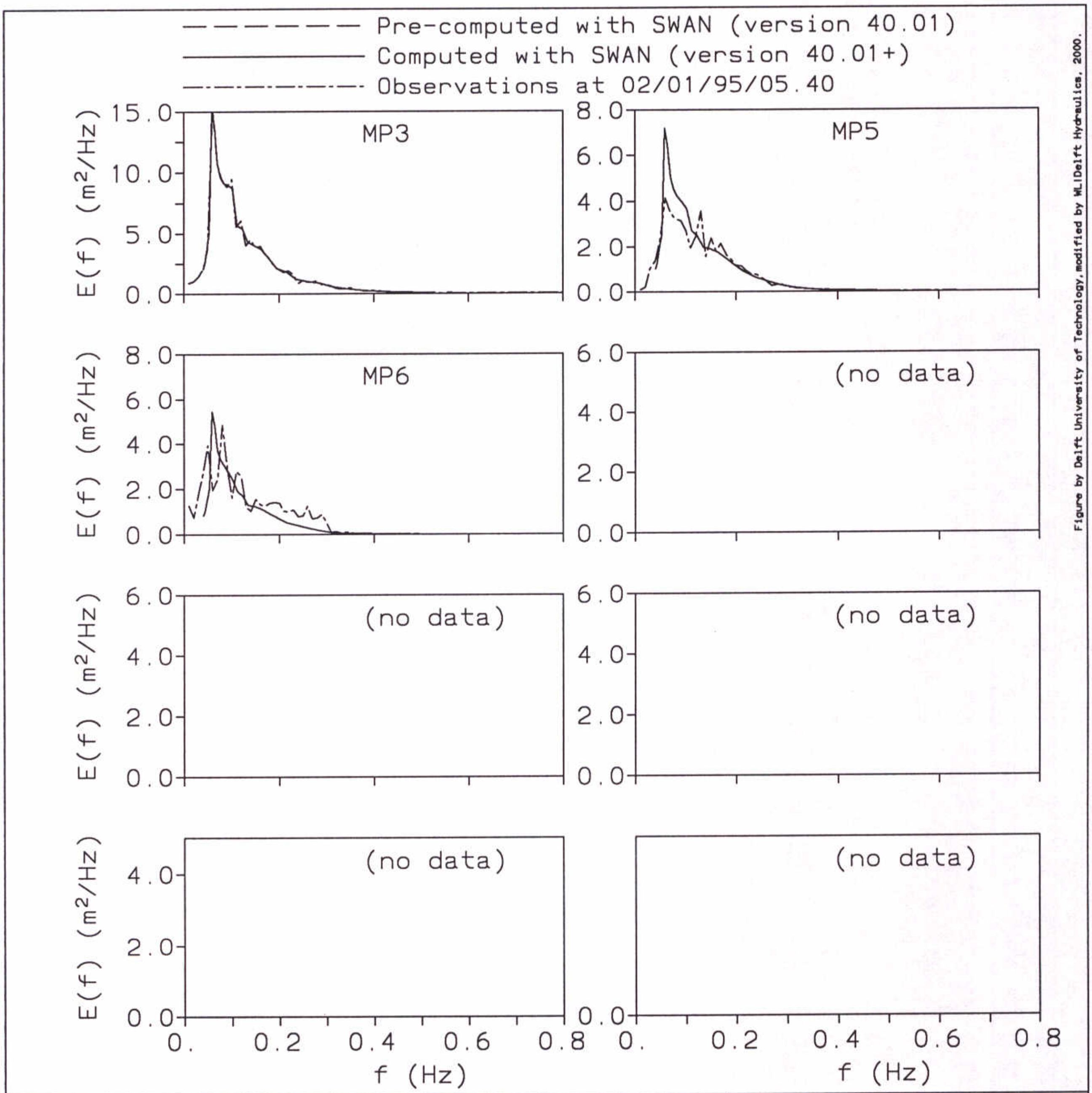
Petten field case



F91pet04

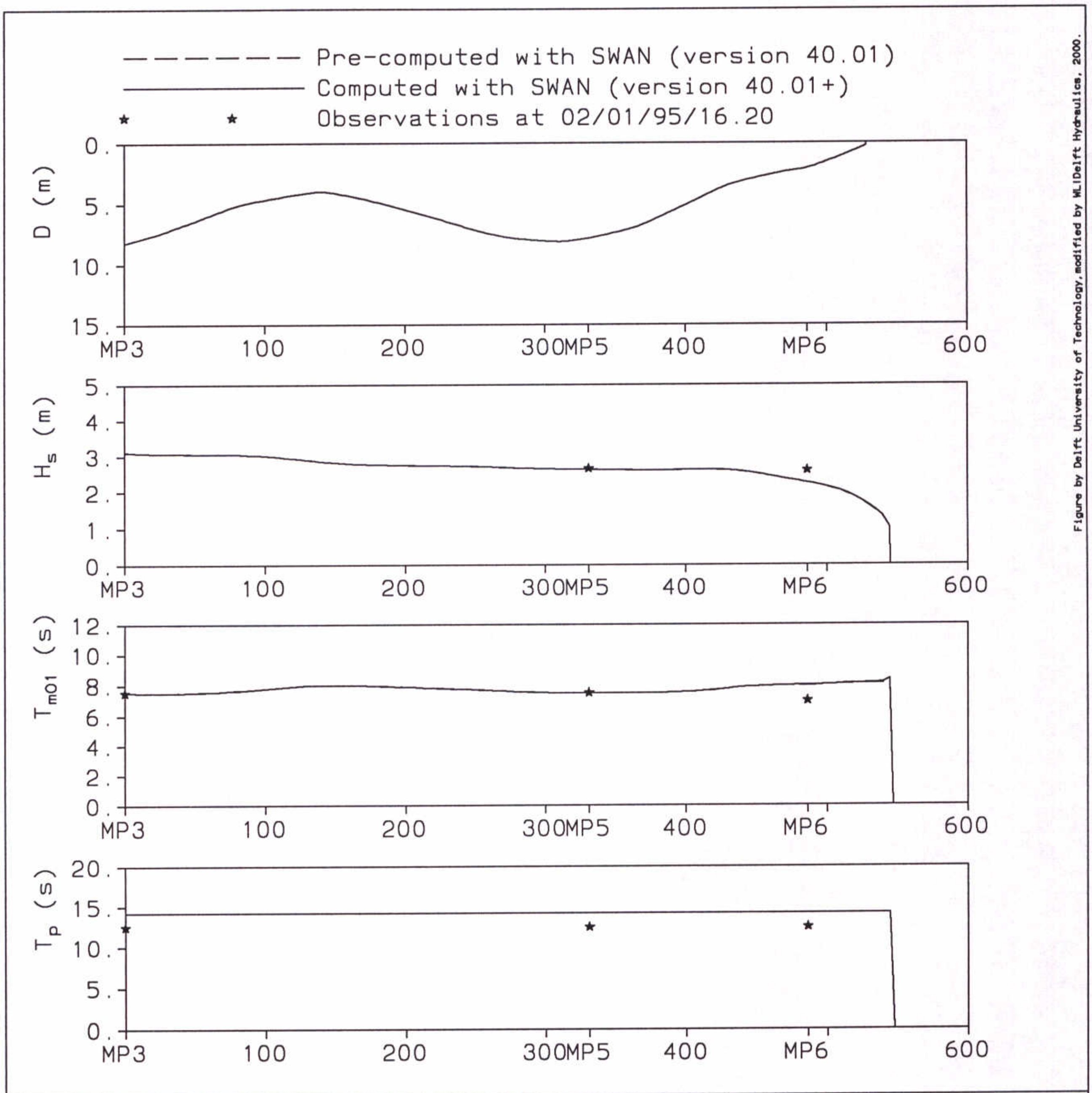
Petten field case

F91g



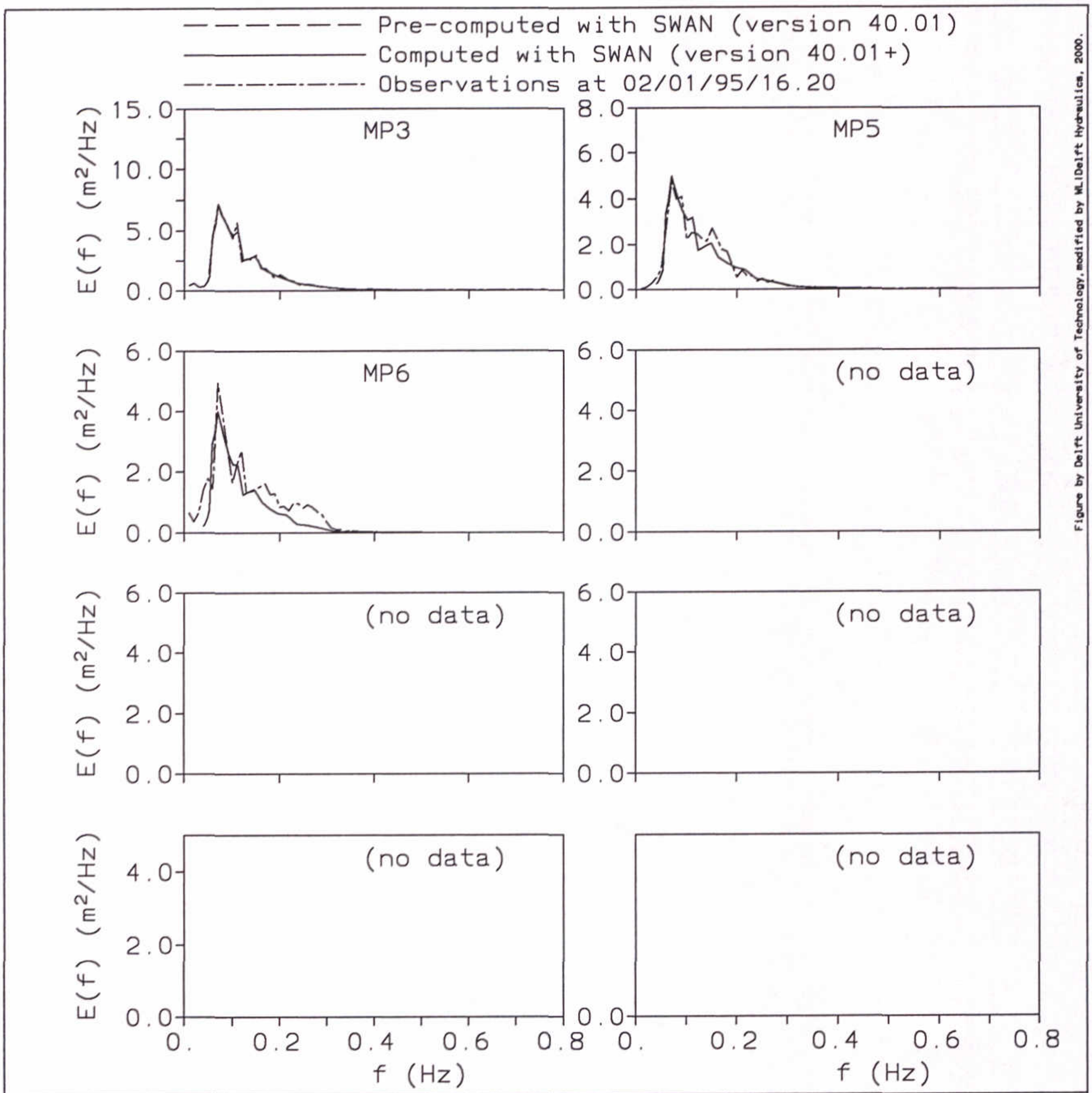
F91pet04 F91h

Petten field case



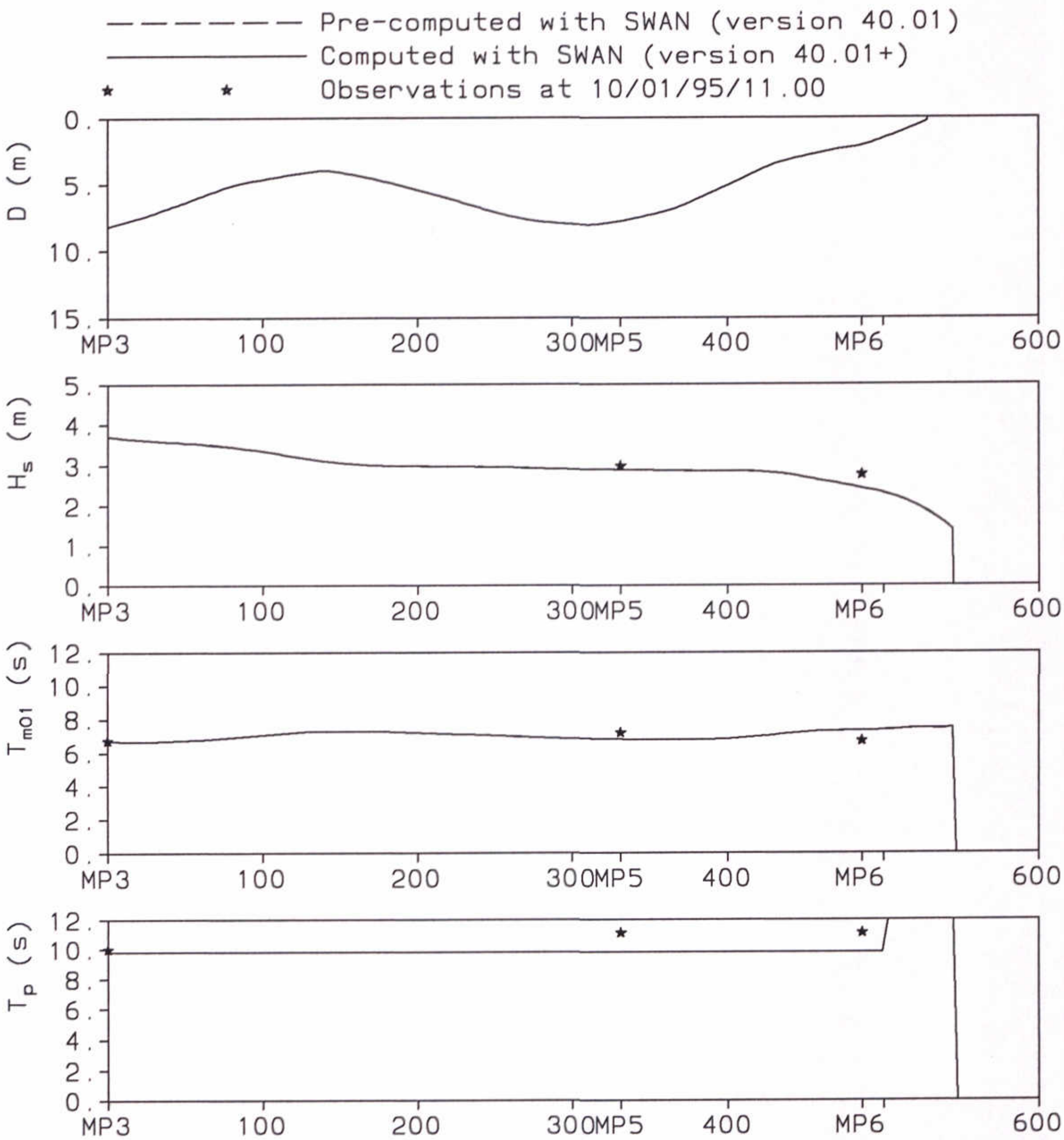
F91pet05 F91i

Petten field case



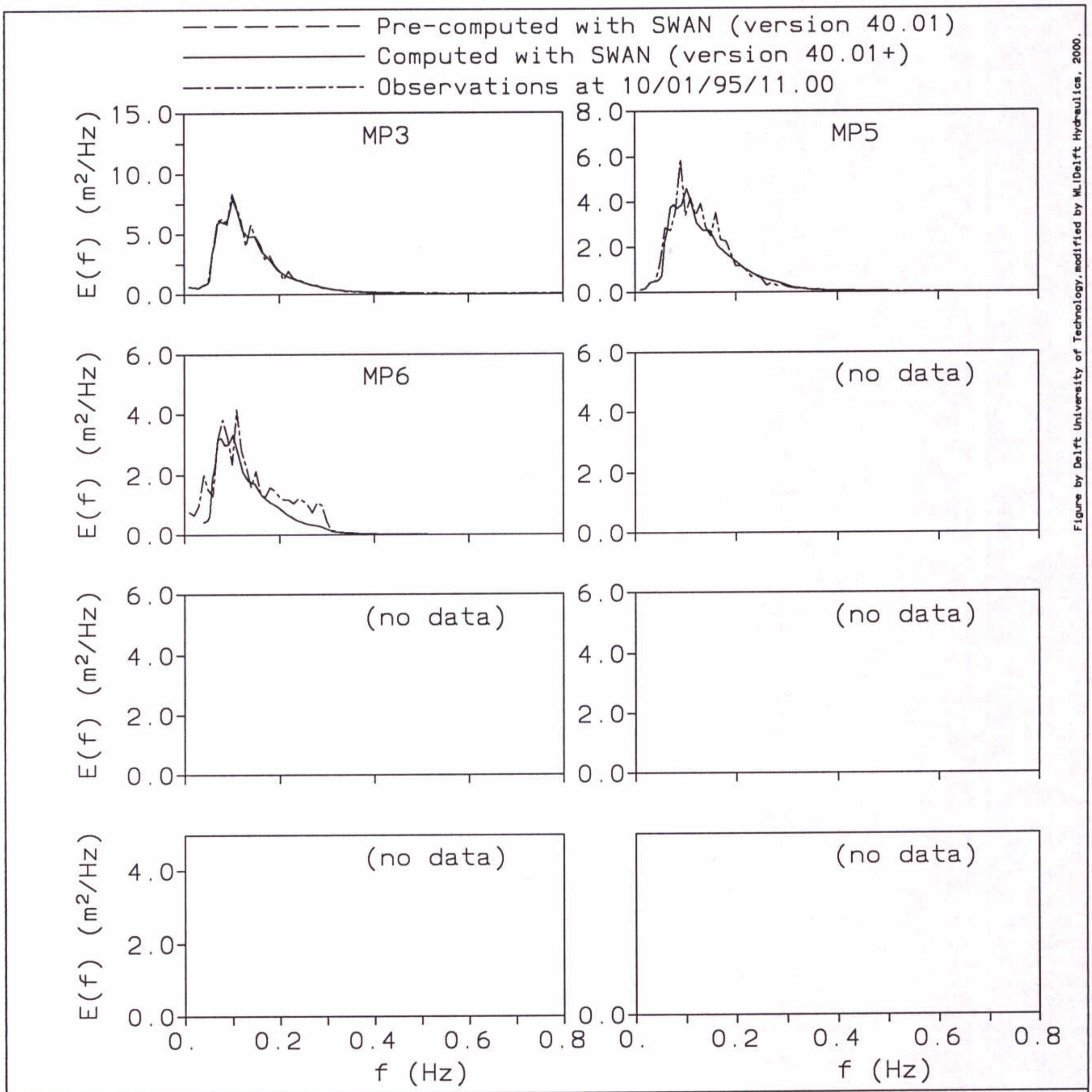
F91pet05 F91j

Petten field case



F91pet06 F91k

Petten field case

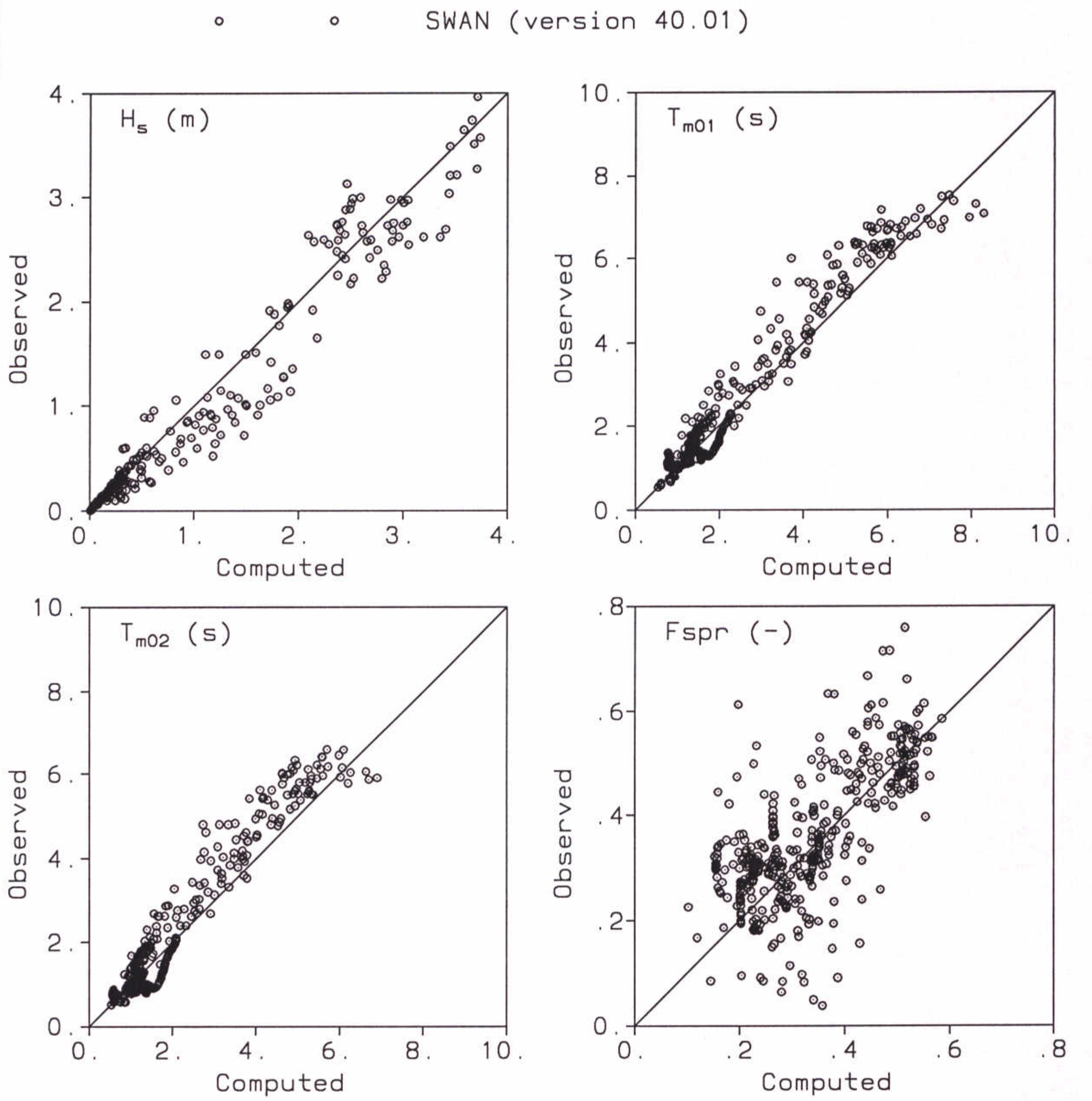


F91pet06 F911

Petten field case

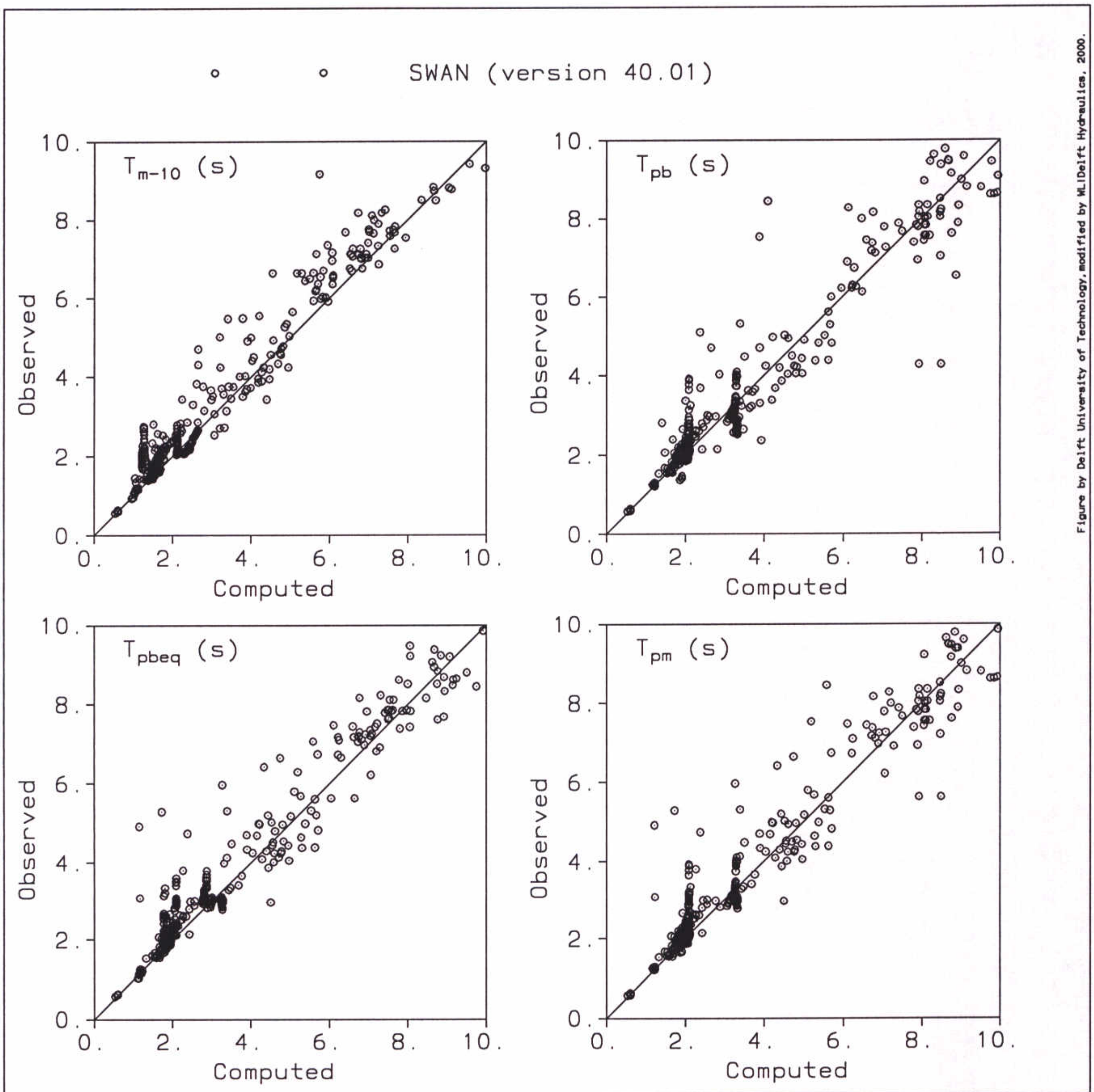
04

Scatter Plots



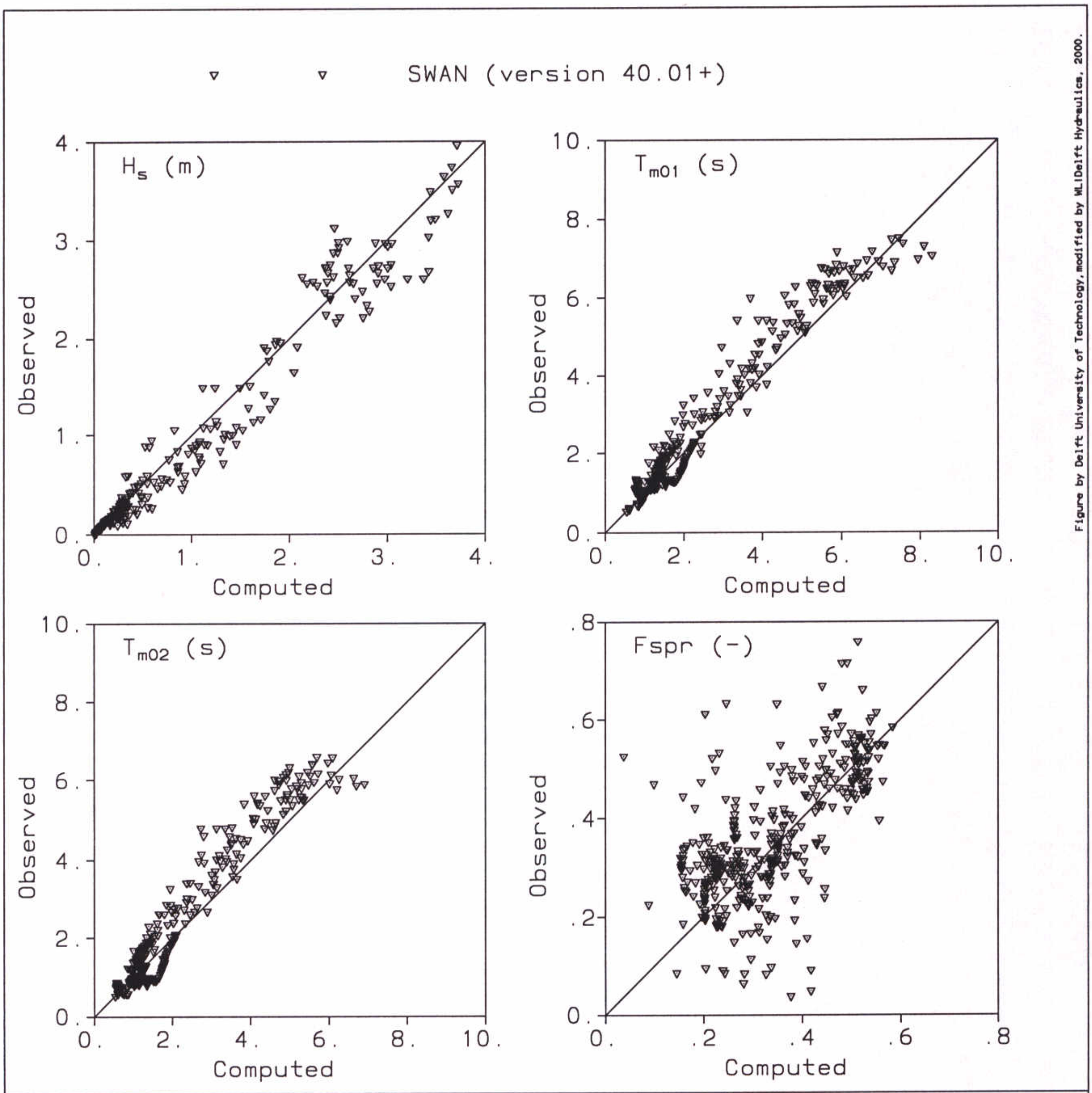
SWAN 40.01 sc01

All field and lab. cases



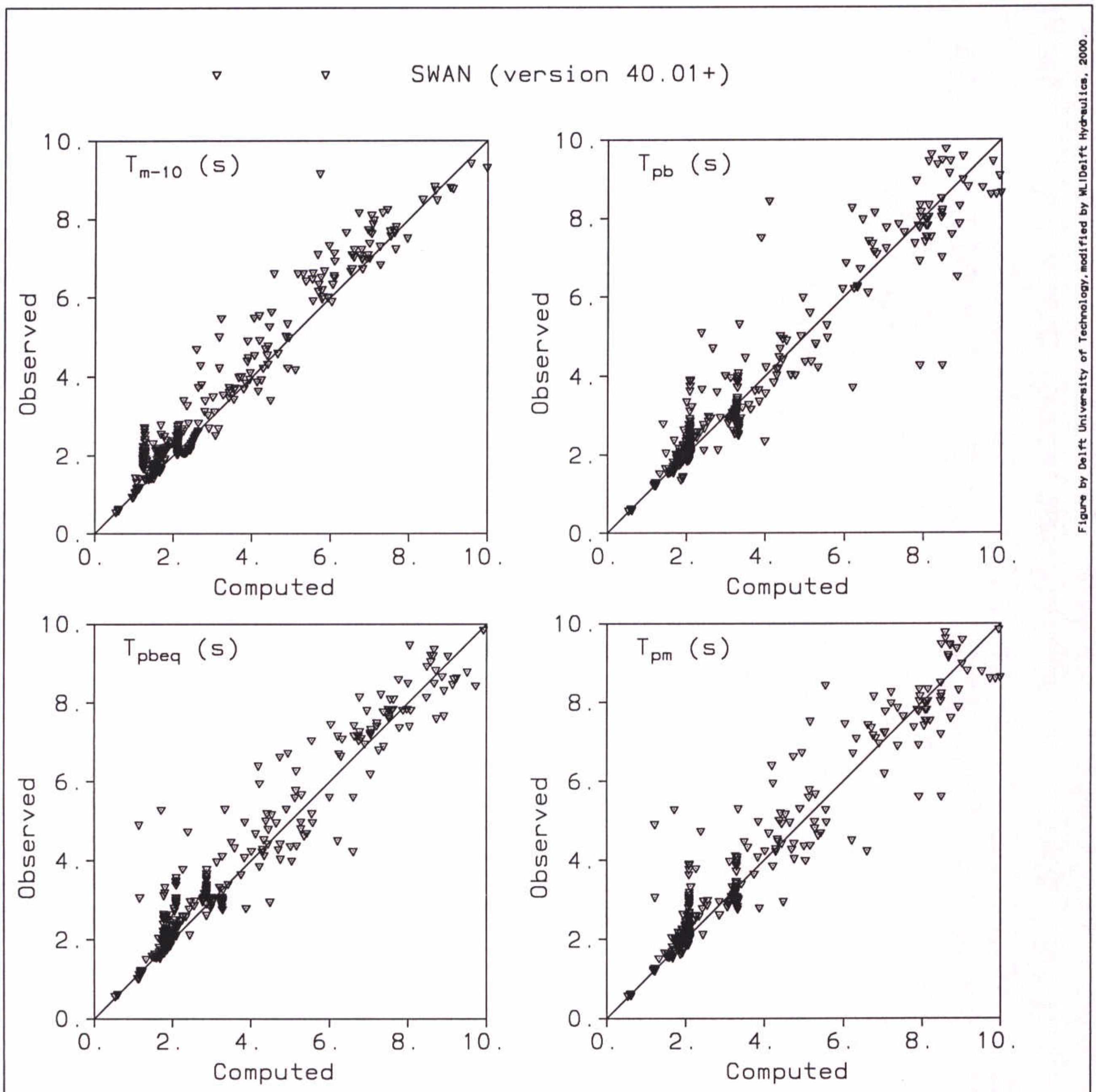
SWAN 40.01 sc02

All field and lab. cases



SWAN 40.01+ sc03

All field and lab. cases



SWAN 40.01+ sc04

All field and lab. cases

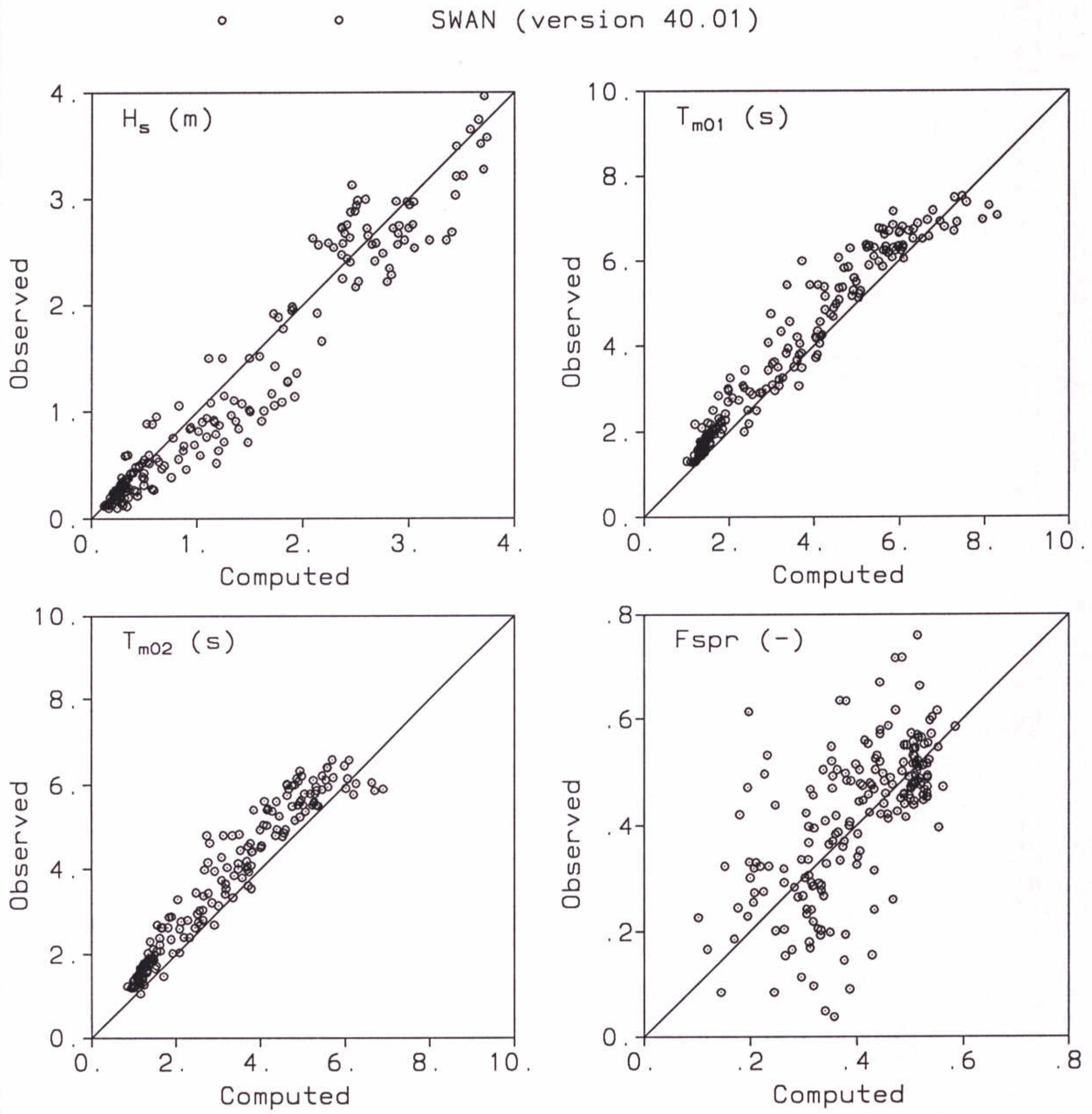
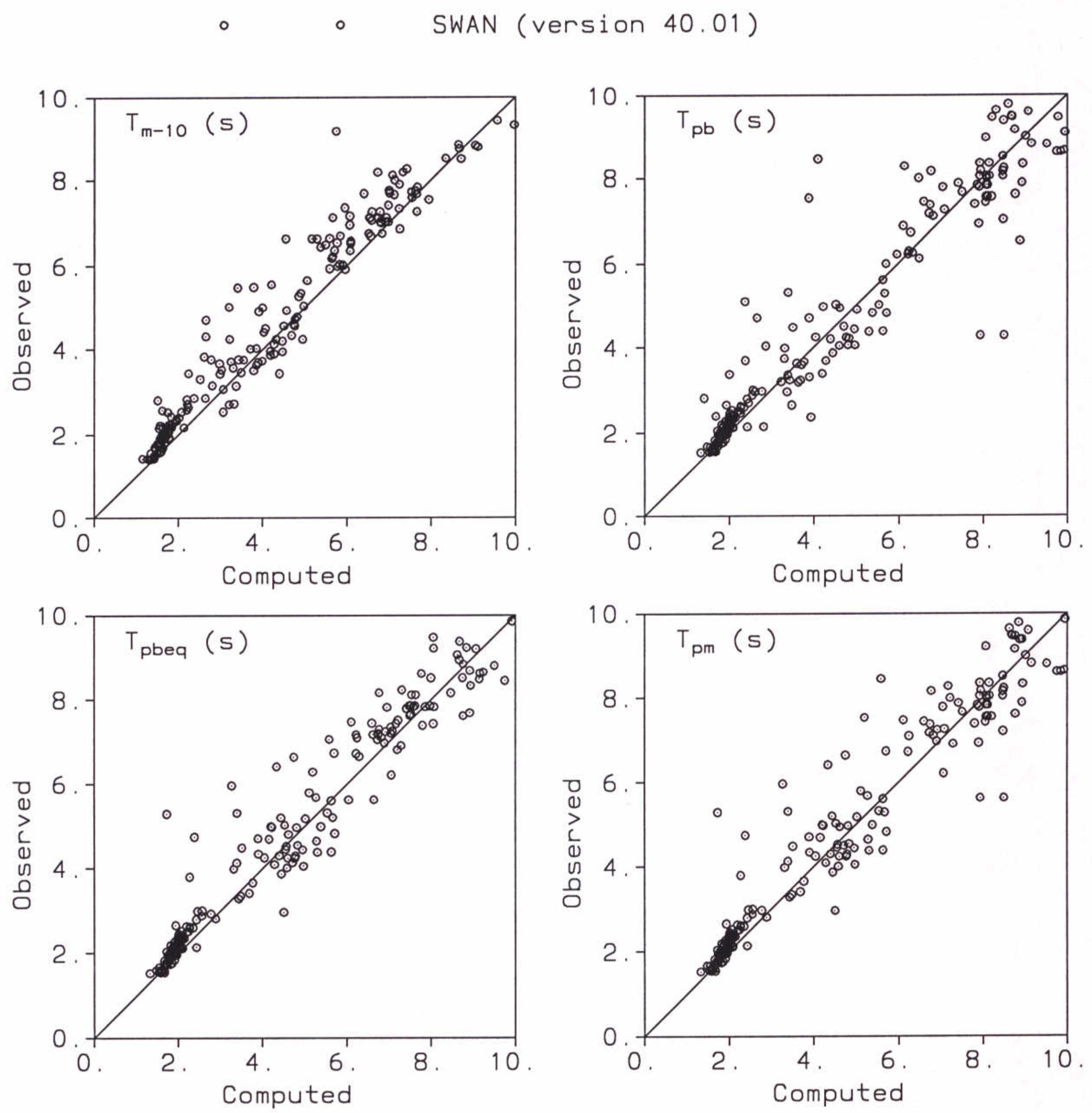


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

SWAN 40.01

All field cases

sc05



SWAN 40.01

sc06

All field cases

Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

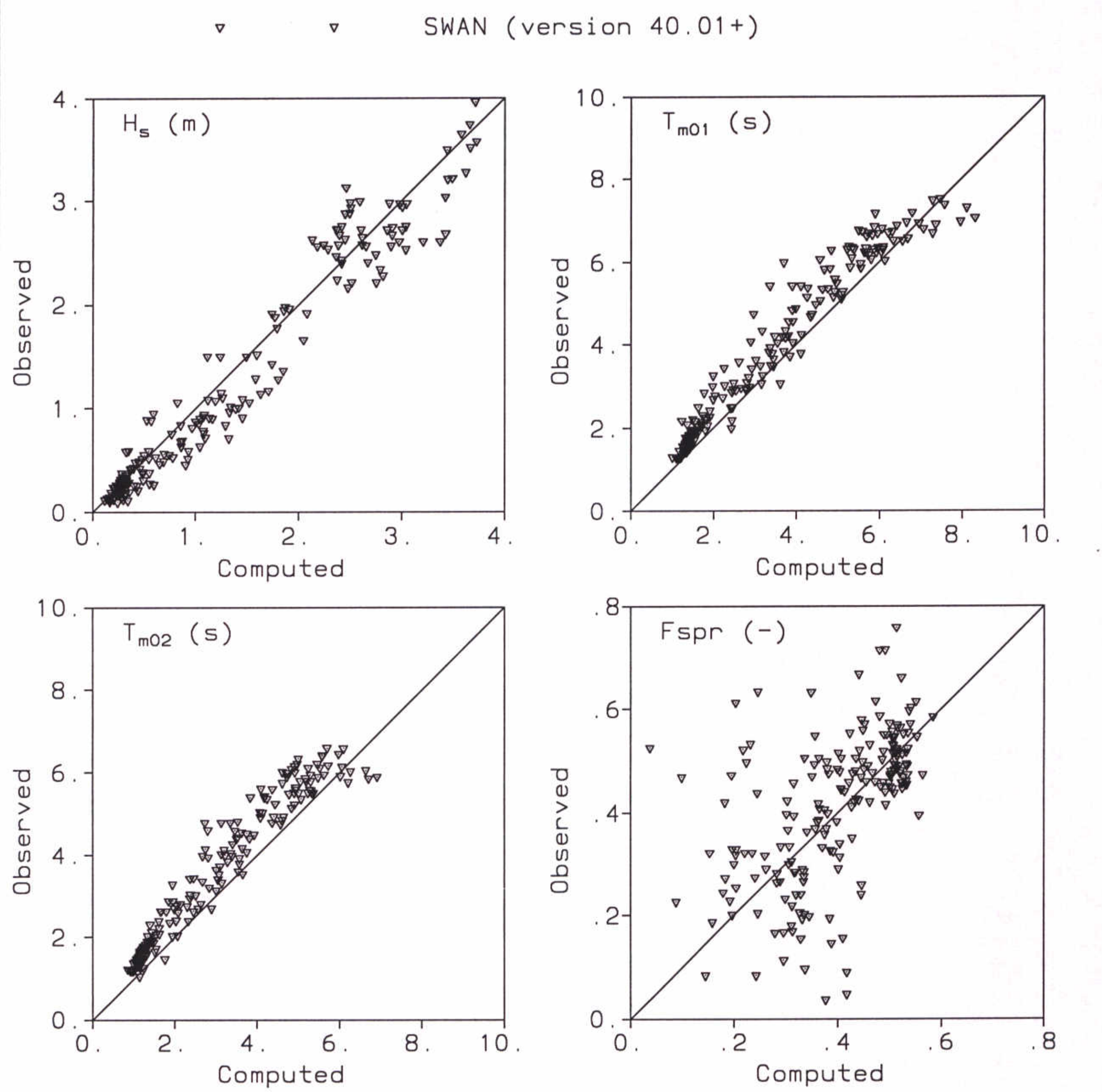
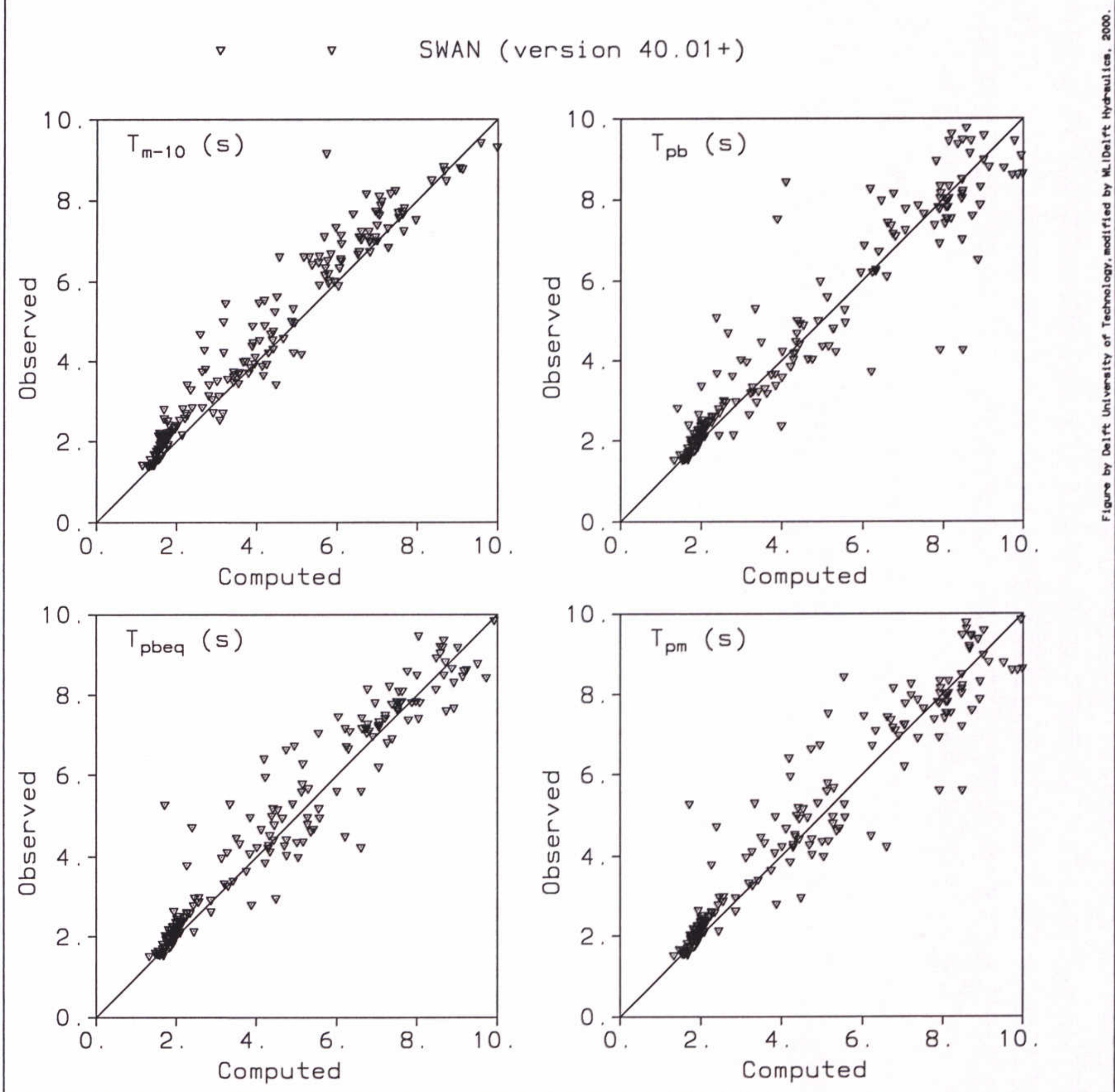


Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.

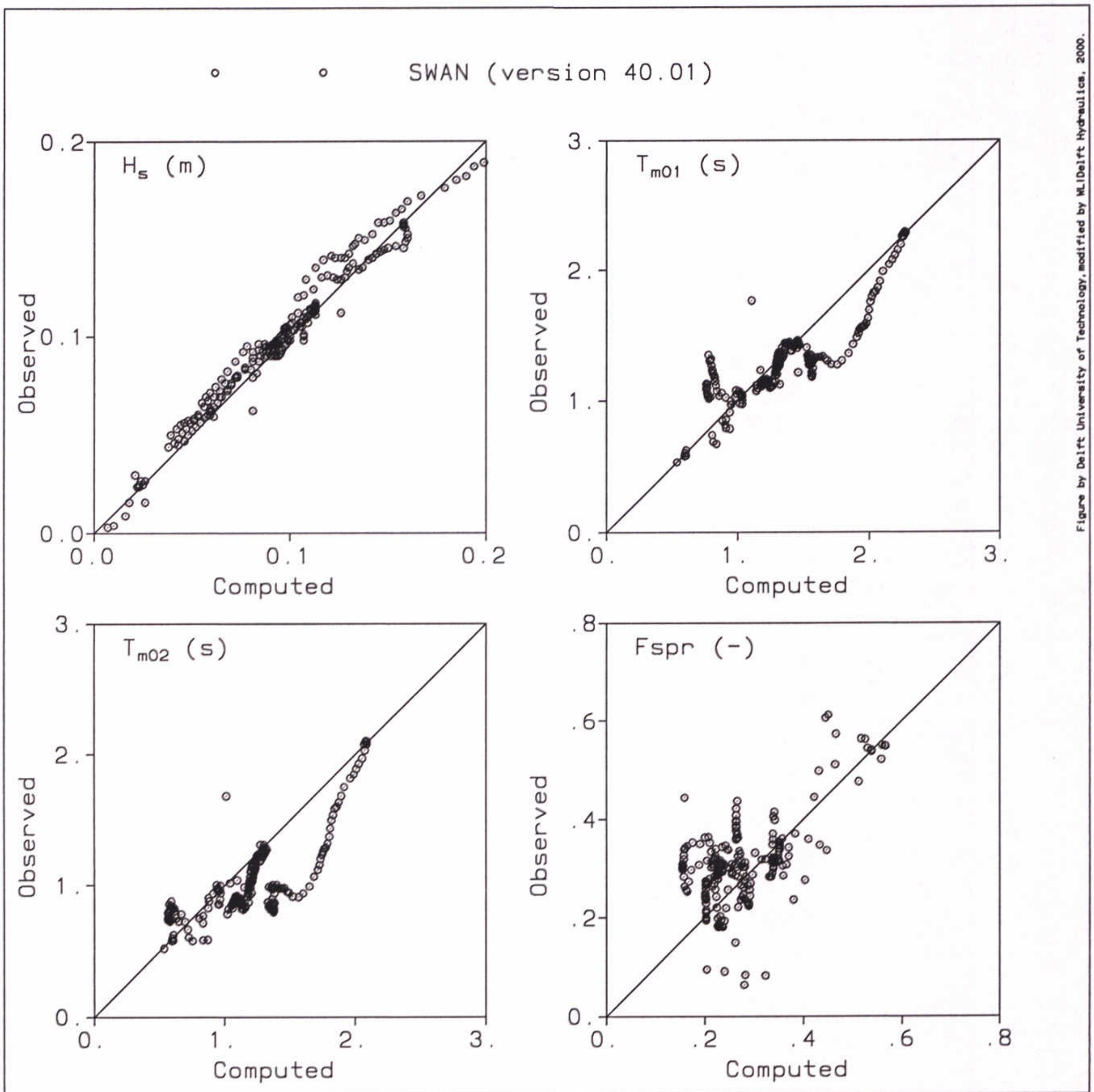
SWAN 40.01+ sc07

All field cases



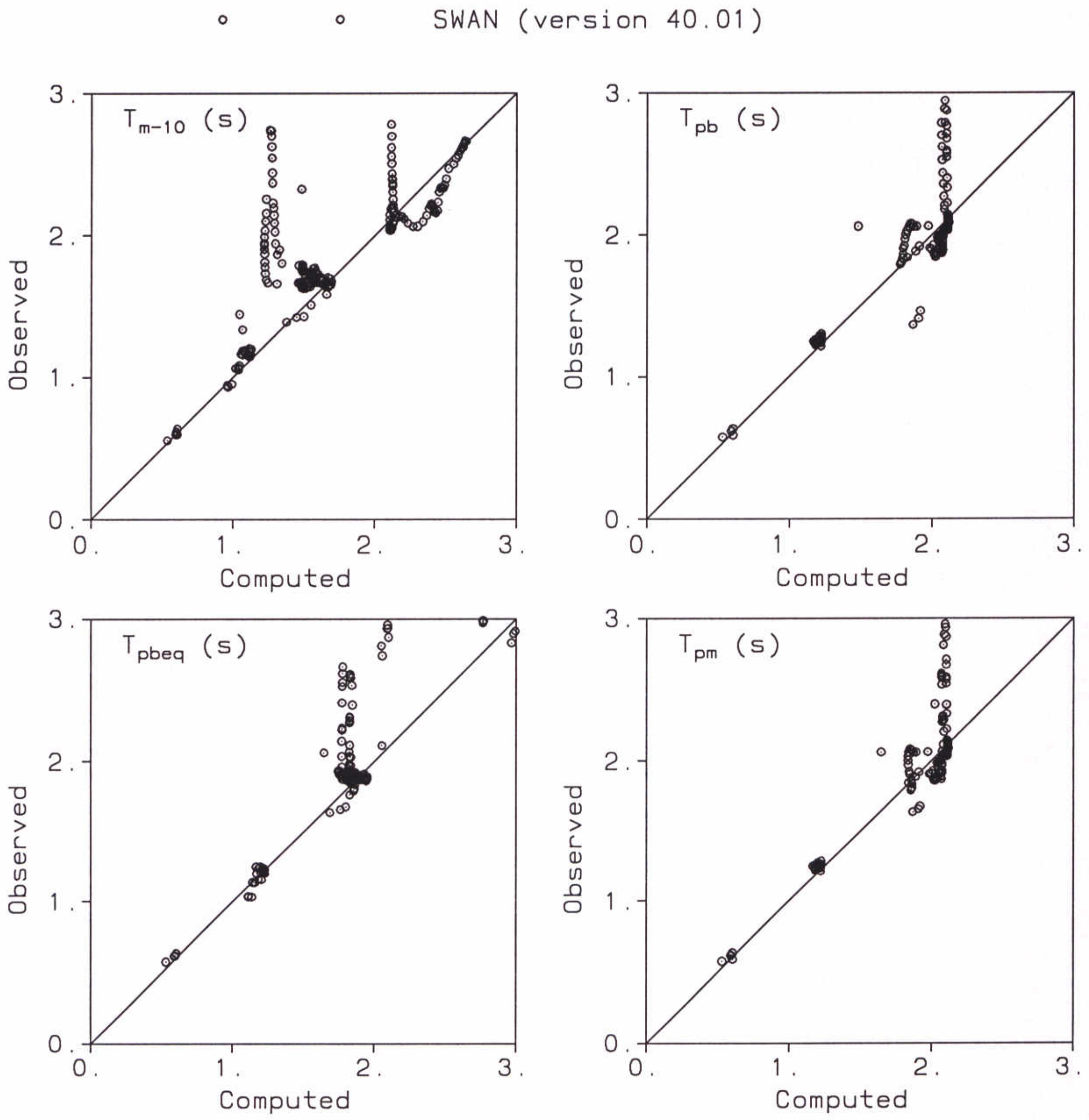
SWAN 40.01+ sc08

All field cases



SWAN 40.01 sc09

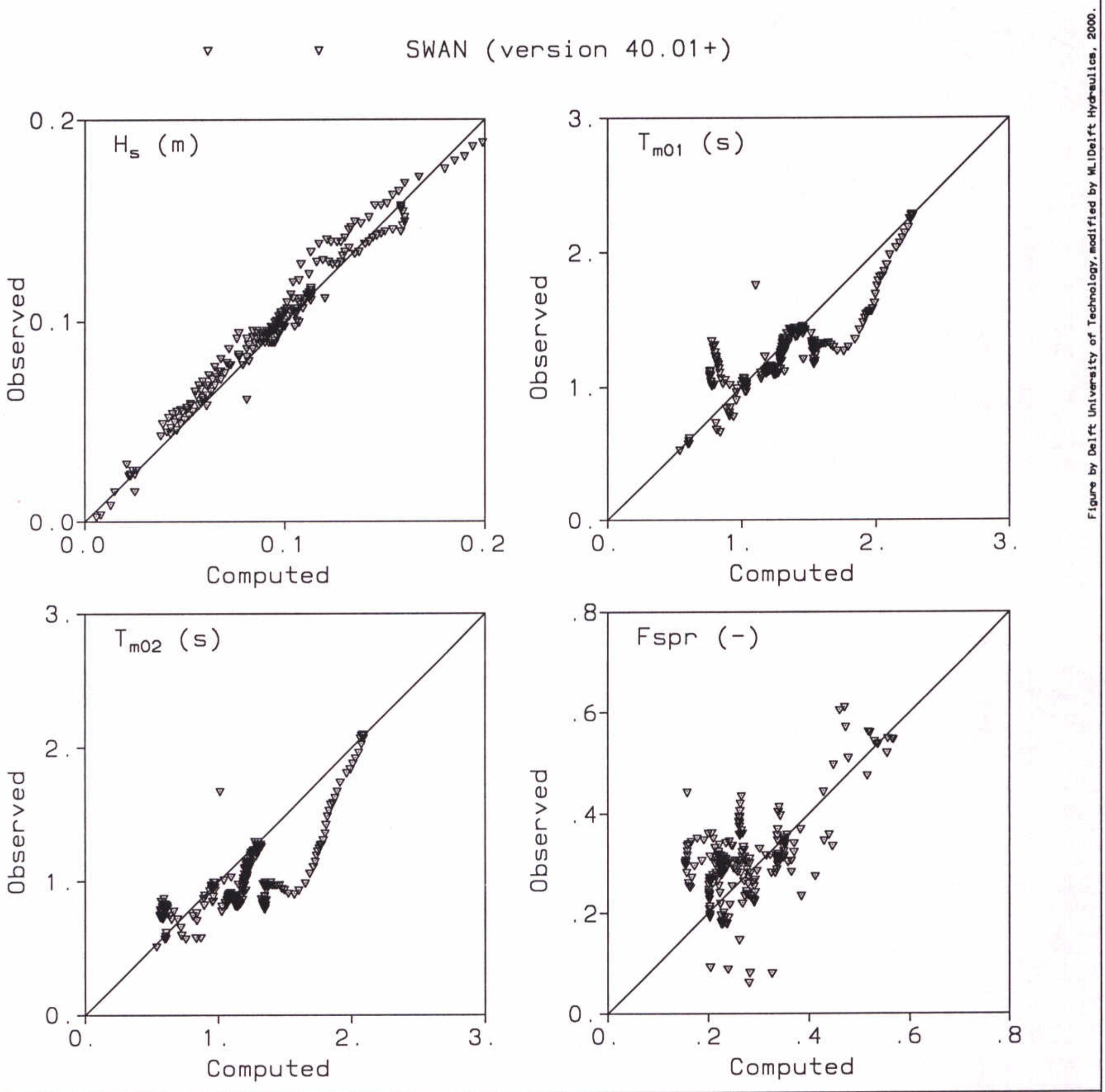
All laboratory cases



SWAN 40.01 sc10

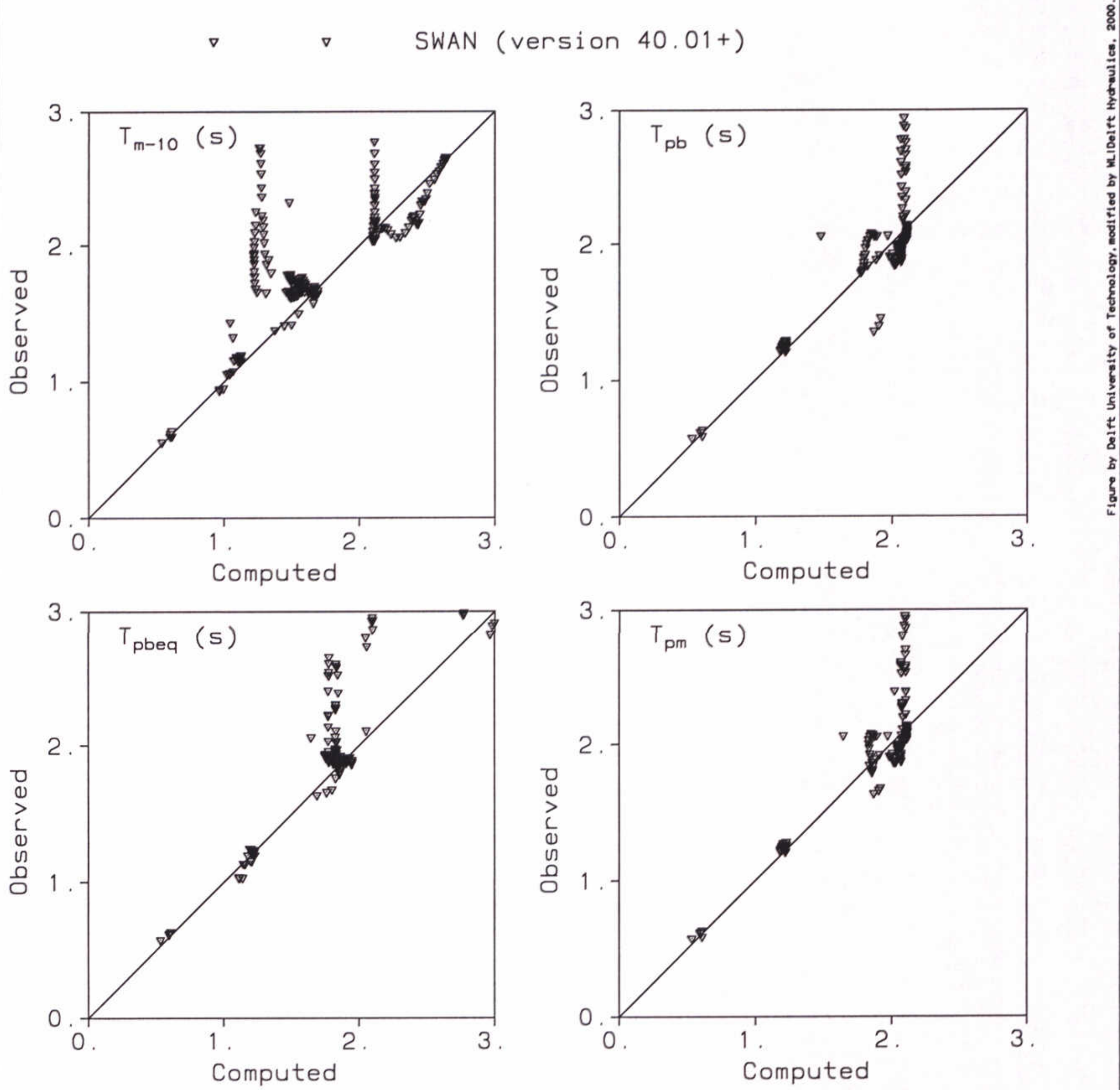
All laboratory cases

Figure by Delft University of Technology, modified by WL|Delft Hydraulics, 2000.



SWAN 40.01+ sc11

All laboratory cases



SWAN 40.01+ sc12

All laboratory cases

05

Statistics (default mode)

Computed statistical parameters for case: f31har01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.137	-0.139	-0.118	-0.118	-0.931	-0.930	-0.951	-0.951	-0.059	-0.063
mae	0.245	0.244	0.502	0.502	0.931	0.930	0.951	0.951	0.121	0.117
rms	0.287	0.285	0.713	0.713	1.131	1.128	1.136	1.135	0.127	0.124
sci	0.162	0.161	0.105	0.105	0.221	0.221	0.252	0.252	0.317	0.309
mpi	0.822	0.823	0.708	0.708	0.454	0.455	0.490	0.491	0.096	0.119
opi	0.090	0.089	0.088	0.088	0.170	0.169	0.181	0.180	0.234	0.228

Computed statistical parameters for case: f31har02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.184	0.183	0.315	0.315	-0.434	-0.436	-0.540	-0.540	-0.052	-0.055
mae	0.219	0.219	0.426	0.426	0.508	0.515	0.548	0.554	0.078	0.080
rms	0.288	0.285	0.457	0.457	0.638	0.647	0.715	0.720	0.088	0.089
sci	0.169	0.167	0.071	0.071	0.134	0.136	0.170	0.171	0.230	0.234
mpi	0.832	0.834	0.850	0.850	0.748	0.745	0.725	0.724	0.404	0.395
opi	0.090	0.089	0.056	0.056	0.096	0.097	0.114	0.114	0.166	0.168

Computed statistical parameters for case: f31har03
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.195	0.193	-0.392	-0.392	-0.513	-0.511	-0.555	-0.558	-0.036	-0.037
mae	0.227	0.226	0.776	0.776	0.540	0.541	0.555	0.558	0.115	0.114
rms	0.327	0.321	1.365	1.365	0.705	0.705	0.735	0.739	0.137	0.136
sci	0.172	0.169	0.171	0.171	0.135	0.135	0.160	0.161	0.372	0.370
mpi	0.819	0.822	-2.254	-2.254	0.632	0.633	0.656	0.654	0.238	0.243
opi	0.092	0.090	0.168	0.168	0.106	0.106	0.116	0.117	0.276	0.275

Computed statistical parameters for case: f31har04
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.276	0.273	0.089	0.089	-0.374	-0.374	-0.434	-0.436	-0.011	-0.013
mae	0.291	0.288	1.316	1.316	0.533	0.539	0.494	0.498	0.125	0.124
rms	0.357	0.351	1.823	1.823	0.670	0.672	0.666	0.668	0.139	0.139
sci	0.184	0.181	0.223	0.223	0.125	0.125	0.142	0.142	0.404	0.404
mpi	0.796	0.800	-2.112	-2.112	0.672	0.670	0.698	0.697	0.406	0.406
opi	0.101	0.099	0.204	0.204	0.097	0.097	0.103	0.103	0.240	0.240

Computed statistical parameters for case: f41lak01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.002	-0.003	-0.219	-0.219	-0.269	-0.269	-0.360	-0.360	-0.016	-0.016
mae	0.031	0.031	0.227	0.227	0.269	0.269	0.360	0.360	0.060	0.060
rms	0.039	0.039	0.253	0.253	0.279	0.279	0.367	0.367	0.063	0.063
sci	0.173	0.173	0.129	0.129	0.175	0.175	0.248	0.248	0.117	0.117
mpi	0.540	0.540	0.527	0.527	0.281	0.281	-0.014	-0.014	0.136	0.137
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.034	-0.034	-0.244	-0.244	-0.358	-0.358	-0.448	-0.447	-0.003	-0.003
mae	0.034	0.034	0.244	0.244	0.358	0.358	0.448	0.447	0.025	0.025
rms	0.036	0.036	0.266	0.266	0.360	0.360	0.450	0.448	0.029	0.029
sci	0.092	0.092	0.108	0.108	0.185	0.185	0.250	0.249	0.061	0.061
mpi	0.794	0.795	0.561	0.561	0.249	0.249	-0.062	-0.058	0.465	0.465
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak03
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.023	-0.023	-0.210	-0.210	-0.411	-0.411	-0.499	-0.499	0.003	0.003
mae	0.049	0.049	0.210	0.210	0.411	0.411	0.499	0.499	0.039	0.039
rms	0.051	0.051	0.238	0.238	0.415	0.415	0.503	0.503	0.049	0.048
sci	0.103	0.103	0.090	0.090	0.194	0.194	0.255	0.255	0.097	0.097
mpi	0.874	0.874	0.760	0.760	0.400	0.400	0.288	0.288	0.802	0.802
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak04
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.011	0.011	-0.078	-0.078	-0.270	-0.270	-0.374	-0.374	-0.134	-0.134
mae	0.034	0.034	0.078	0.078	0.270	0.270	0.374	0.374	0.134	0.134
rms	0.042	0.042	0.114	0.114	0.277	0.277	0.378	0.378	0.135	0.135
sci	0.143	0.143	0.056	0.056	0.162	0.162	0.237	0.237	0.242	0.242
mpi	0.744	0.744	0.813	0.813	0.223	0.223	-0.235	-0.235	-3.452	-3.445
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak05
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.077	0.078	-0.013	-0.013	-0.119	-0.119	-0.223	-0.221	-0.098	-0.099
mae	0.077	0.078	0.067	0.067	0.119	0.119	0.223	0.221	0.098	0.099
rms	0.085	0.085	0.083	0.083	0.122	0.122	0.224	0.223	0.107	0.108
sci	0.484	0.485	0.045	0.045	0.083	0.083	0.163	0.162	0.205	0.205
mpi	0.208	0.206	0.820	0.820	0.592	0.592	0.111	0.119	-1.172	-1.177
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak06
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.017	0.017	-0.310	-0.310	-0.350	-0.350	-0.442	-0.440	-0.091	-0.090
mae	0.025	0.025	0.310	0.310	0.350	0.350	0.442	0.440	0.092	0.091
rms	0.028	0.028	0.330	0.330	0.358	0.358	0.447	0.446	0.109	0.109
sci	0.101	0.102	0.148	0.148	0.202	0.202	0.271	0.270	0.214	0.213
mpi	0.868	0.867	0.625	0.625	0.408	0.408	0.280	0.283	0.239	0.243
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak07
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.022	0.022	-0.108	-0.108	-0.150	-0.148	-0.250	-0.248	0.043	0.044
mae	0.022	0.022	0.164	0.164	0.150	0.148	0.250	0.248	0.059	0.059

rms	0.031	0.031	0.195	0.195	0.165	0.164	0.257	0.255	0.065	0.065
sci	0.240	0.240	0.117	0.117	0.127	0.127	0.210	0.209	0.135	0.135
mpi	0.411	0.411	0.600	0.600	0.322	0.326	0.010	0.015	0.082	0.082
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak08
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.041	-0.041	-0.332	-0.332	-0.399	-0.401	-0.483	-0.483	-0.087	-0.087
mae	0.041	0.041	0.332	0.332	0.399	0.401	0.483	0.483	0.087	0.087
rms	0.049	0.049	0.345	0.345	0.402	0.404	0.485	0.485	0.090	0.090
sci	0.157	0.157	0.152	0.152	0.223	0.224	0.291	0.291	0.183	0.183
mpi	0.632	0.632	0.178	0.178	-0.001	-0.005	-0.359	-0.359	0.150	0.150
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f41lak09
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.009	-0.009	-0.278	-0.250	-0.333	-0.333	-0.424	-0.424	-0.086	-0.086
mae	0.019	0.019	0.278	0.250	0.333	0.333	0.424	0.424	0.086	0.086
rms	0.023	0.023	0.287	0.263	0.339	0.339	0.428	0.428	0.091	0.091
sci	0.072	0.072	0.126	0.115	0.190	0.190	0.258	0.258	0.182	0.182
mpi	0.838	0.838	0.528	0.569	0.174	0.174	-0.177	-0.177	0.176	0.176
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Computed statistical parameters for case: f51fri01
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.082	0.019	1.661	0.915	-0.579	-0.753	-0.812	-0.932	0.050	0.032
mae	0.151	0.096	1.661	0.915	0.579	0.753	0.812	0.932	0.110	0.094
rms	0.170	0.124	2.153	1.027	0.592	0.780	0.823	0.968	0.139	0.125
sci	0.167	0.122	0.469	0.224	0.158	0.209	0.251	0.296	0.465	0.418
mpi	0.880	0.912	0.311	0.671	0.711	0.619	0.527	0.443	0.487	0.539
opi	0.076	0.055	0.300	0.143	0.116	0.153	0.190	0.224	0.270	0.242

Computed statistical parameters for case: f51fri02
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.054	0.058	0.165	-0.327	-0.725	-0.791	-0.871	-0.901	-0.060	-0.006
mae	0.207	0.225	1.448	1.072	0.725	0.791	0.871	0.901	0.224	0.140
rms	0.226	0.253	1.558	1.141	0.794	0.875	0.940	0.979	0.268	0.177
sci	0.181	0.202	0.279	0.204	0.169	0.186	0.221	0.230	0.682	0.450
mpi	0.855	0.838	0.493	0.629	0.552	0.507	0.327	0.299	-0.424	0.060
opi	0.088	0.099	0.192	0.141	0.130	0.144	0.174	0.181	0.574	0.379

Computed statistical parameters for case: f51fri03
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.106	0.223	-0.421	-0.037	-0.880	-0.740	-1.067	-0.895	-0.220	-0.110
mae	0.303	0.436	0.759	0.460	0.951	0.823	1.067	0.910	0.220	0.110
rms	0.347	0.480	0.891	0.533	1.038	0.918	1.177	1.063	0.267	0.129
sci	0.309	0.428	0.146	0.087	0.211	0.186	0.262	0.237	0.564	0.273
mpi	0.854	0.798	0.811	0.887	0.640	0.681	0.505	0.552	-1.017	0.022
opi	0.104	0.144	0.086	0.051	0.141	0.125	0.182	0.165	0.602	0.292

Computed statistical parameters for case: f61wes01

Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.295	0.334	0.877	0.940	-0.413	-0.327	-0.807	-0.754	0.134	0.108
mae	0.295	0.334	0.912	0.975	0.413	0.361	0.807	0.754	0.143	0.116
rms	0.296	0.339	1.012	1.117	0.491	0.455	0.844	0.810	0.192	0.164
sci	0.202	0.231	0.195	0.215	0.118	0.110	0.219	0.210	0.705	0.605
mpi	0.897	0.882	0.735	0.707	-99.999	-99.999	0.692	0.704	-99.999	-99.999
opi	0.070	0.080	0.120	0.132	-99.999	-99.999	0.151	0.145	-99.999	-99.999

Computed statistical parameters for case: f61wes02
Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.386	0.489	-0.491	-0.281	-0.600	-0.477	-0.902	-0.812	0.024	0.021
mae	0.386	0.489	0.931	0.855	0.600	0.532	0.902	0.812	0.070	0.076
rms	0.411	0.536	1.446	1.131	0.710	0.640	0.955	0.893	0.114	0.119
sci	0.260	0.339	0.228	0.178	0.142	0.128	0.202	0.188	0.265	0.279
mpi	0.816	0.760	0.409	0.538	-99.999	-99.999	0.398	0.437	-99.999	-99.999
opi	0.109	0.142	0.188	0.147	-99.999	-99.999	0.173	0.161	-99.999	-99.999

Computed statistical parameters for case: f61wes03
Total number of observation stations : 12
Number of stations at which observations are available : 9
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.092	0.190	-1.057	-0.755	-0.820	-0.688	-1.083	-0.981	0.034	0.031
mae	0.201	0.285	1.462	1.321	0.841	0.728	1.083	0.981	0.079	0.079
rms	0.233	0.330	1.803	1.633	1.008	0.948	1.208	1.149	0.100	0.099
sci	0.154	0.218	0.304	0.275	0.203	0.190	0.256	0.243	0.244	0.242
mpi	0.932	0.904	0.465	0.515	-99.999	-99.999	0.451	0.477	-99.999	-99.999
opi	0.049	0.069	0.213	0.193	-99.999	-99.999	0.184	0.174	-99.999	-99.999

Computed statistical parameters for case: f61wes04
Total number of observation stations : 12
Number of stations at which observations are available : 10
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.066	0.136	0.309	0.447	-0.603	-0.503	-0.911	-0.840	0.042	0.029
mae	0.131	0.191	0.996	1.134	0.603	0.523	0.911	0.840	0.106	0.095
rms	0.171	0.254	1.344	1.461	0.676	0.650	0.956	0.920	0.140	0.136
sci	0.125	0.186	0.267	0.290	0.167	0.161	0.253	0.243	0.423	0.410
mpi	0.947	0.922	0.720	0.695	-99.999	-99.999	0.718	0.728	-99.999	-99.999
opi	0.039	0.057	0.144	0.157	-99.999	-99.999	0.142	0.137	-99.999	-99.999

Computed statistical parameters for case: f61wes05
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.068	-0.074	0.851	0.507	-0.641	-0.608	-1.049	-1.015	-0.028	-0.028
mae	0.227	0.229	1.449	1.105	0.641	0.608	1.049	1.015	0.050	0.047
rms	0.228	0.230	1.545	1.368	0.657	0.618	1.073	1.034	0.052	0.049
sci	0.074	0.075	0.180	0.159	0.109	0.103	0.196	0.189	0.142	0.135
mpi	0.937	0.936	0.379	0.451	-99.999	-99.999	0.583	0.598	-99.999	-99.999
opi	0.032	0.032	0.151	0.134	-99.999	-99.999	0.165	0.158	-99.999	-99.999

Computed statistical parameters for case: f61wes06
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

Hs	Tp	Tm01	Tm02	fspr
[m]	[s]	[s]	[s]	[-]

SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.081	0.083	0.728	0.728	-0.630	-0.633	-0.993	-1.009	0.008	0.011
mae	0.257	0.265	0.728	0.728	0.630	0.633	0.993	1.009	0.051	0.050
rms	0.315	0.324	0.818	0.818	0.695	0.687	1.054	1.062	0.058	0.059
sci	0.106	0.109	0.100	0.100	0.113	0.112	0.189	0.190	0.177	0.179
mpi	0.903	0.900	0.688	0.688	0.687	0.691	0.538	0.534	0.614	0.610
opi	0.045	0.046	0.080	0.080	0.093	0.091	0.163	0.164	0.112	0.113

Computed statistical parameters for case: f61wes07
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.037	0.042	0.426	0.426	-0.613	-0.616	-0.899	-0.909	-0.002	0.003
mae	0.322	0.330	0.500	0.500	0.613	0.616	0.899	0.909	0.077	0.076
rms	0.375	0.387	0.681	0.681	0.732	0.723	0.983	0.983	0.087	0.087
sci	0.130	0.134	0.082	0.082	0.118	0.116	0.174	0.174	0.259	0.259
mpi	0.862	0.858	0.719	0.719	-99.999	-99.999	0.489	0.490	-99.999	-99.999
opi	0.062	0.064	0.066	0.066	-99.999	-99.999	0.151	0.151	-99.999	-99.999

Computed statistical parameters for case: f61wes08
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.008	0.029	0.534	0.534	-0.342	-0.379	-0.671	-0.721	0.019	0.022
mae	0.455	0.473	0.534	0.534	0.363	0.380	0.671	0.721	0.039	0.040
rms	0.505	0.521	0.689	0.689	0.561	0.581	0.784	0.827	0.039	0.041
sci	0.171	0.176	0.084	0.084	0.091	0.094	0.139	0.147	0.127	0.133
mpi	0.804	0.798	0.753	0.753	-99.999	-99.999	0.638	0.618	-99.999	-99.999
opi	0.090	0.093	0.067	0.067	-99.999	-99.999	0.116	0.123	-99.999	-99.999

Computed statistical parameters for case: f61wes09
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.073	0.084	0.224	0.224	-0.580	-0.573	-0.848	-0.841	-0.011	-0.007
mae	0.333	0.346	0.684	0.684	0.580	0.573	0.848	0.841	0.072	0.071
rms	0.357	0.370	0.784	0.784	0.638	0.633	0.890	0.887	0.080	0.081
sci	0.122	0.126	0.095	0.095	0.103	0.102	0.158	0.157	0.221	0.224
mpi	0.828	0.822	0.628	0.628	0.614	0.617	0.477	0.478	0.393	0.384
opi	0.065	0.067	0.084	0.084	0.088	0.087	0.138	0.138	0.156	0.159

Computed statistical parameters for case: f61wes10
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.033	0.026	-0.456	-0.456	-0.486	-0.543	-0.830	-0.910	0.009	0.015
mae	0.289	0.337	1.253	1.253	0.544	0.574	0.830	0.910	0.021	0.023
rms	0.344	0.374	1.589	1.589	0.646	0.693	0.923	1.003	0.021	0.025
sci	0.117	0.127	0.185	0.185	0.107	0.115	0.168	0.182	0.060	0.071
mpi	0.801	0.784	-0.967	-0.967	-99.999	-99.999	0.410	0.358	-99.999	-99.999
opi	0.070	0.076	0.171	0.171	-99.999	-99.999	0.148	0.162	-99.999	-99.999

Computed statistical parameters for case: f61wes11
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.424	0.556	0.310	0.732	-0.419	-0.251	-0.757	-0.635	0.009	0.010
mae	0.424	0.556	0.359	0.773	0.419	0.251	0.757	0.635	0.040	0.056
rms	0.438	0.583	0.437	0.918	0.465	0.349	0.790	0.684	0.053	0.071
sci	0.455	0.605	0.101	0.211	0.120	0.090	0.212	0.184	0.123	0.164

mpi	0.823	0.764	0.867	0.720	-99.999	-99.999	0.605	0.658	-99.999	-99.999
opi	0.130	0.173	0.057	0.119	-99.999	-99.999	0.163	0.141	-99.999	-99.999

Computed statistical parameters for case: f61wes12
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.302	0.442	-0.544	-0.244	-0.814	-0.621	-1.154	-1.005	-0.007	0.005
mae	0.302	0.442	0.619	0.556	0.814	0.621	1.154	1.005	0.060	0.074
rms	0.332	0.481	0.725	0.632	0.882	0.730	1.195	1.062	0.068	0.077
sci	0.316	0.458	0.145	0.126	0.204	0.169	0.288	0.256	0.150	0.170
mpi	0.853	0.788	0.736	0.770	-99.999	-99.999	0.290	0.370	-99.999	-99.999
opi	0.100	0.145	0.094	0.082	-99.999	-99.999	0.244	0.217	-99.999	-99.999

Computed statistical parameters for case: f81nor01
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.038	0.036	-0.599	-0.566	-0.635	-0.645	-0.468	-0.471	-0.188	-0.184
mae	0.205	0.203	1.167	1.134	0.635	0.645	0.498	0.504	0.188	0.184
rms	0.220	0.219	1.410	1.355	0.795	0.803	0.636	0.635	0.214	0.211
sci	0.341	0.339	0.354	0.340	0.266	0.269	0.265	0.264	0.462	0.457
mpi	0.912	0.913	0.791	0.799	0.806	0.804	0.832	0.832	-0.160	-0.146
opi	0.073	0.073	0.153	0.147	0.119	0.121	0.111	0.111	0.423	0.418

Computed statistical parameters for case: f81nor02
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.236	0.234	0.306	0.346	-0.322	-0.324	-0.175	-0.176	-0.150	-0.148
mae	0.236	0.234	0.570	0.574	0.322	0.324	0.175	0.176	0.184	0.185
rms	0.276	0.274	0.898	0.898	0.338	0.339	0.199	0.200	0.210	0.211
sci	0.750	0.746	0.291	0.291	0.142	0.143	0.106	0.106	0.410	0.412
mpi	0.888	0.889	0.838	0.838	0.920	0.919	0.948	0.948	0.007	0.003
opi	0.098	0.098	0.097	0.097	0.054	0.054	0.037	0.037	0.463	0.465

Computed statistical parameters for case: f81nor03
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	0.111	0.109	-0.012	-0.052	-0.681	-0.683	-0.528	-0.532	-0.096	-0.090
mae	0.233	0.231	0.592	0.632	0.681	0.683	0.528	0.532	0.135	0.141
rms	0.264	0.262	0.690	0.712	0.753	0.754	0.582	0.584	0.163	0.166
sci	0.348	0.346	0.173	0.179	0.235	0.235	0.219	0.220	0.399	0.407
mpi	0.904	0.905	0.893	0.890	0.810	0.809	0.844	0.844	0.069	0.051
opi	0.077	0.077	0.075	0.077	0.111	0.111	0.097	0.098	0.345	0.351

Computed statistical parameters for case: f81nor04
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.026	-0.028	3.284	3.284	-0.697	-0.706	-0.467	-0.472	-0.185	-0.182
mae	0.140	0.137	4.169	4.169	0.842	0.829	0.562	0.550	0.213	0.212
rms	0.163	0.161	6.038	6.038	1.080	1.073	0.697	0.687	0.235	0.235
sci	0.424	0.417	1.572	1.572	0.395	0.392	0.339	0.334	0.494	0.495
mpi	0.804	0.807	0.343	0.343	0.635	0.638	0.671	0.676	0.075	0.075
opi	0.141	0.139	0.489	0.489	0.244	0.242	0.220	0.217	0.733	0.734

Computed statistical parameters for case: f91pet01
Total number of observation stations : 3
Number of stations at which observations are available : 3

Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.184	-0.184	-0.480	-0.480	0.238	0.238	-0.108	-0.112	0.086	0.085
mae	0.247	0.248	1.250	1.250	0.238	0.238	0.345	0.340	0.086	0.085
rms	0.308	0.309	1.339	1.339	0.322	0.322	0.361	0.358	0.092	0.092
sci	0.105	0.105	0.119	0.119	0.047	0.047	0.059	0.059	0.382	0.381
mpi	0.758	0.757	0.243	0.243	-10.515	-10.515	0.335	0.341	0.301	0.302
opi	0.076	0.076	0.124	0.124	0.046	0.046	0.064	0.064	0.237	0.236

Computed statistical parameters for case: f91pet02
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.206	-0.207	-1.035	-1.035	-0.014	-0.019	-0.326	-0.326	0.094	0.094
mae	0.219	0.220	1.035	1.035	0.285	0.280	0.424	0.424	0.094	0.094
rms	0.301	0.301	1.247	1.247	0.285	0.281	0.535	0.535	0.107	0.107
sci	0.103	0.103	0.106	0.106	0.041	0.041	0.088	0.088	0.446	0.446
mpi	0.773	0.773	0.355	0.355	-0.670	-0.642	0.075	0.075	0.185	0.186
opi	0.073	0.073	0.116	0.116	0.043	0.042	0.098	0.098	0.272	0.272

Computed statistical parameters for case: f91pet03
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.161	-0.163	4.502	4.502	0.335	0.329	-0.151	-0.151	0.090	0.089
mae	0.240	0.240	4.502	4.502	0.506	0.500	0.737	0.737	0.090	0.089
rms	0.289	0.290	4.773	4.773	0.606	0.599	0.752	0.752	0.123	0.123
sci	0.097	0.097	0.376	0.376	0.082	0.081	0.119	0.119	0.587	0.587
mpi	0.701	0.699	-1.126	-1.126	-0.730	-0.710	0.141	0.141	-0.009	-0.009
opi	0.073	0.074	0.278	0.278	0.086	0.085	0.138	0.138	0.410	0.410

Computed statistical parameters for case: f91pet04
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.059	-0.060	3.807	3.807	0.752	0.742	0.280	0.275	0.085	0.084
mae	0.223	0.223	3.807	3.807	0.752	0.742	0.738	0.733	0.085	0.084
rms	0.231	0.231	3.910	3.910	0.919	0.905	0.789	0.783	0.098	0.098
sci	0.085	0.085	0.292	0.292	0.127	0.125	0.128	0.127	0.431	0.431
mpi	0.854	0.853	-2.096	-2.096	-3.998	-3.922	-0.362	-0.351	0.049	0.050
opi	0.054	0.054	0.227	0.227	0.126	0.124	0.141	0.140	0.295	0.295

Computed statistical parameters for case: f91pet05
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01
bias	-0.187	-0.189	1.760	1.760	0.485	0.480	0.182	0.177	0.078	0.078
mae	0.187	0.189	1.760	1.760	0.517	0.512	0.671	0.665	0.078	0.078
rms	0.242	0.243	1.760	1.760	0.709	0.702	0.695	0.689	0.090	0.090
sci	0.092	0.093	0.141	0.141	0.098	0.097	0.112	0.111	0.387	0.387
mpi	0.508	0.505	-99.999	-99.999	-0.919	-0.900	-0.621	-0.607	0.042	0.043
opi	0.078	0.078	0.123	0.123	0.094	0.093	0.115	0.114	0.274	0.274

Computed statistical parameters for case: f91pet06
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01

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bias  -0.216  -0.217  -1.301  -1.301   0.107   0.102  -0.192  -0.187   0.054   0.054
mae    0.216   0.217   1.301   1.301   0.496   0.491   0.632   0.626   0.060   0.060
rms    0.248   0.249   1.301   1.301   0.507   0.501   0.660   0.654   0.081   0.081
sci    0.087   0.087   0.117   0.117   0.073   0.072   0.108   0.107   0.359   0.360
mpi    0.724   0.723  -0.171  -0.171  -0.526  -0.508   0.017   0.026  -0.034  -0.034
opi    0.067   0.067   0.133   0.133   0.076   0.075   0.122   0.121   0.262   0.262

Computed statistical parameters for case: 121tri01
Total number of observation stations                 :  8
Number of stations at which observations are available  :  8
Number of stations at which precomputed data is available:  8
Number of stations at which computed data is available  :  8
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------
bias  -0.003  -0.003   0.010   0.010  -0.005  -0.004   0.018   0.020   0.017   0.017
mae    0.003   0.003   0.010   0.010   0.199   0.200   0.222   0.224   0.100   0.100
rms    0.004   0.004   0.010   0.010   0.283   0.283   0.309   0.310   0.136   0.136
sci    0.145   0.145   0.005   0.005   0.222   0.222   0.272   0.273   0.535   0.535
mpi   -0.048  -0.048 -99.999 -99.999  -0.089  -0.091  -0.103  -0.107   0.118   0.118
opi    0.164   0.164   0.005   0.005   0.202   0.202   0.242   0.243   0.388   0.388

Computed statistical parameters for case: 131set01
Total number of observation stations                 : 69
Number of stations at which observations are available  : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available  : 69
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------
bias  -0.003  -0.003  -0.070  -0.070  -0.036  -0.036   0.078   0.078  -0.061  -0.061
mae    0.006   0.006   0.136   0.136   0.114   0.114   0.163   0.163   0.086   0.087
rms    0.007   0.007   0.304   0.304   0.162   0.162   0.181   0.180   0.102   0.102
sci    0.060   0.060   0.139   0.139   0.133   0.133   0.187   0.187   0.317   0.318
mpi    0.891   0.890  -0.064  -0.064   0.375   0.376   0.531   0.532  -2.851  -2.859
opi    0.041   0.042   0.148   0.148   0.112   0.112   0.139   0.139   0.291   0.292

Computed statistical parameters for case: 131set02
Total number of observation stations                 : 69
Number of stations at which observations are available  : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available  : 69
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------
bias  -0.008  -0.008  -0.360  -0.353  -0.064  -0.065   0.072   0.071  -0.026  -0.026
mae    0.010   0.010   0.459   0.455   0.126   0.126   0.161   0.161   0.060   0.060
rms    0.011   0.011   0.918   0.907   0.197   0.197   0.184   0.184   0.068   0.068
sci    0.090   0.090   0.372   0.368   0.158   0.158   0.189   0.189   0.231   0.231
mpi    0.886   0.886   0.057   0.068   0.207   0.205   0.529   0.529  -0.312  -0.316
opi    0.054   0.053   0.446   0.440   0.137   0.137   0.144   0.143   0.201   0.202

Computed statistical parameters for case: 131set03
Total number of observation stations                 : 69
Number of stations at which observations are available  : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available  : 69
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------
bias  -0.001  -0.001   0.129   0.119   0.250   0.254   0.387   0.393  -0.023  -0.023
mae    0.002   0.002   0.308   0.316   0.251   0.256   0.389   0.394   0.057   0.056
rms    0.003   0.003   0.372   0.378   0.281   0.286   0.427   0.433   0.068   0.067
sci    0.030   0.029   0.108   0.110   0.181   0.184   0.350   0.355   0.244   0.241
mpi    0.871   0.873   0.082   0.067   0.635   0.629   0.545   0.538   0.247   0.258
opi    0.028   0.027   0.116   0.118   0.125   0.127   0.207   0.210   0.260   0.256

Computed statistical parameters for case: 141cur01
Total number of observation stations                 :  6
Number of stations at which observations are available  :  6
Number of stations at which precomputed data is available:  6
Number of stations at which computed data is available  :  6
            Hs              Tp              Tm01            Tm02            fspr
            [m]             [s]             [s]             [s]             [-]
SWAN  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01  v40.01+ v40.01
-------------------------------------------------------------------------------------
bias   0.004   0.006  -0.208  -0.216   0.001  -0.001   0.011   0.007   0.093   0.095
mae    0.004   0.006   0.208   0.216   0.013   0.014   0.016   0.012   0.093   0.095
rms    0.005   0.007   0.216   0.225   0.015   0.015   0.018   0.015   0.102   0.104
sci    0.517   0.700   0.351   0.365   0.025   0.025   0.032   0.025   0.121   0.124
mpi    0.547   0.386  -1.781  -1.896   0.867   0.863   0.864   0.891   0.229   0.213
opi    0.261   0.354   0.490   0.510   0.029   0.030   0.037   0.030   0.141   0.144
```

Computed statistical parameters for case: 151his01
Total number of observation stations : 26
Number of stations at which observations are available : 26
Number of stations at which precomputed data is available: 26
Number of stations at which computed data is available : 26

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.001	0.000	0.009	0.009	0.028	0.021	0.053	0.046	0.043	0.037
mae	0.004	0.004	0.043	0.043	0.058	0.061	0.082	0.084	0.079	0.080
rms	0.005	0.005	0.065	0.065	0.074	0.076	0.111	0.111	0.106	0.107
sci	0.060	0.059	0.052	0.052	0.078	0.081	0.132	0.132	0.249	0.250
mpi	0.826	0.828	-2.900	-2.900	0.516	0.501	0.389	0.387	0.486	0.483
opi	0.053	0.052	0.053	0.053	0.071	0.073	0.117	0.117	0.184	0.185

Mean of all f31har cases (total number: 4)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.130	0.128	-0.026	-0.026	-0.563	-0.563	-0.620	-0.621	-0.040	-0.042
mae	0.246	0.244	0.755	0.755	0.628	0.631	0.637	0.640	0.110	0.109
rms	0.315	0.311	1.090	1.090	0.786	0.788	0.813	0.815	0.123	0.122
sci	0.172	0.169	0.143	0.143	0.154	0.154	0.181	0.181	0.331	0.329
mpi	0.817	0.820	-0.702	-0.702	0.626	0.626	0.642	0.641	0.286	0.291
opi	0.093	0.092	0.129	0.129	0.117	0.117	0.128	0.129	0.229	0.228

Mean of all f41lak cases (total number: 9)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.002	0.002	-0.199	-0.196	-0.295	-0.295	-0.389	-0.389	-0.052	-0.052
mae	0.037	0.037	0.212	0.209	0.295	0.295	0.389	0.389	0.075	0.075
rms	0.043	0.043	0.235	0.232	0.302	0.302	0.393	0.393	0.082	0.082
sci	0.174	0.174	0.108	0.107	0.171	0.171	0.242	0.242	0.160	0.159
mpi	0.657	0.656	0.601	0.606	0.294	0.294	-0.018	-0.016	-0.286	-0.285
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999

Mean of all f51fri cases (total number: 3)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.081	0.100	0.468	0.183	-0.728	-0.761	-0.917	-0.910	-0.077	-0.028
mae	0.220	0.252	1.289	0.816	0.751	0.789	0.917	0.914	0.185	0.115
rms	0.248	0.286	1.534	0.900	0.808	0.858	0.980	1.003	0.224	0.144
sci	0.219	0.250	0.298	0.172	0.179	0.194	0.245	0.254	0.570	0.380
mpi	0.863	0.849	0.538	0.729	0.634	0.603	0.453	0.431	-0.318	0.207
opi	0.089	0.099	0.193	0.112	0.129	0.140	0.182	0.190	0.482	0.304

Mean of all f61wes cases (total number: 12)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.139	0.195	0.143	0.234	-0.580	-0.518	-0.909	-0.869	0.019	0.018
mae	0.302	0.356	0.869	0.868	0.589	0.533	0.909	0.869	0.067	0.067
rms	0.334	0.394	1.073	1.068	0.680	0.642	0.971	0.943	0.084	0.084
sci	0.186	0.232	0.164	0.167	0.133	0.124	0.204	0.197	0.241	0.239
mpi	0.867	0.843	0.511	0.518	0.651	0.654	0.524	0.538	0.504	0.497
opi	0.072	0.087	0.120	0.119	0.090	0.089	0.162	0.156	0.134	0.136

Mean of all f81nor cases (total number: 4)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.090	0.088	0.745	0.753	-0.584	-0.590	-0.409	-0.413	-0.155	-0.151
mae	0.203	0.201	1.625	1.627	0.620	0.620	0.441	0.441	0.180	0.180
rms	0.231	0.229	2.259	2.251	0.742	0.742	0.529	0.527	0.206	0.206
sci	0.466	0.462	0.598	0.595	0.260	0.260	0.232	0.231	0.441	0.442
mpi	0.877	0.878	0.716	0.717	0.793	0.793	0.824	0.825	-0.003	-0.004
opi	0.097	0.097	0.204	0.203	0.132	0.132	0.116	0.116	0.491	0.492

Mean of all f91pet cases (total number: 6)

Hs	Tp	Tm01	Tm02	fspr
[m]	[s]	[s]	[s]	[-]

SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.169	-0.170	1.209	1.209	0.317	0.312	-0.053	-0.054	0.081	0.081
mae	0.222	0.223	2.276	2.276	0.466	0.461	0.591	0.588	0.082	0.082
rms	0.270	0.271	2.388	2.388	0.558	0.552	0.632	0.628	0.098	0.098
sci	0.095	0.095	0.192	0.192	0.078	0.077	0.102	0.102	0.432	0.432
mpi	0.719	0.718	-0.559	-0.559	-2.893	-2.866	-0.069	-0.062	0.089	0.090
opi	0.070	0.070	0.167	0.167	0.079	0.078	0.113	0.113	0.292	0.292

Mean of all 131set cases (total number: 3)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.004	-0.004	-0.100	-0.101	0.050	0.051	0.179	0.181	-0.037	-0.036
mae	0.006	0.006	0.301	0.302	0.164	0.165	0.238	0.240	0.068	0.067
rms	0.007	0.007	0.531	0.530	0.213	0.215	0.264	0.266	0.079	0.079
sci	0.060	0.060	0.206	0.205	0.158	0.159	0.242	0.244	0.264	0.263
mpi	0.882	0.883	0.025	0.024	0.406	0.403	0.535	0.533	-0.972	-0.972
opi	0.041	0.041	0.236	0.235	0.125	0.125	0.163	0.164	0.251	0.250

Mean of all field cases (total number: 38)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.047	0.066	0.301	0.309	-0.381	-0.366	-0.568	-0.556	-0.020	-0.016
mae	0.204	0.223	1.036	0.998	0.520	0.505	0.658	0.645	0.097	0.091
rms	0.235	0.257	1.245	1.192	0.599	0.590	0.718	0.710	0.114	0.107
sci	0.199	0.216	0.209	0.199	0.153	0.151	0.201	0.199	0.309	0.293
mpi	0.789	0.781	0.282	0.301	-0.208	-0.206	0.340	0.345	-0.030	0.026
opi	0.080	0.087	0.150	0.141	0.107	0.109	0.143	0.141	0.334	0.306

Mean of all laboratory cases (total number: 6)

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.002	-0.001	-0.082	-0.083	0.029	0.028	0.103	0.102	0.007	0.007
mae	0.005	0.005	0.194	0.196	0.127	0.129	0.172	0.173	0.079	0.080
rms	0.006	0.006	0.314	0.315	0.169	0.170	0.205	0.206	0.097	0.097
sci	0.150	0.181	0.171	0.173	0.133	0.134	0.194	0.193	0.283	0.283
mpi	0.662	0.636	-0.921	-0.945	0.419	0.414	0.459	0.462	-0.347	-0.351
opi	0.100	0.115	0.210	0.212	0.113	0.113	0.148	0.147	0.244	0.244

06

Statistics (non default mode)

Computed statistical parameters for case: f31har01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.137	-0.139	-0.115	-0.115	-0.931	-0.930	-0.951	-0.951	-0.061	-0.065	-12.614	-12.580	-3.133	-3.098	-1.392	-1.370	-1.033	-1.024	-0.637	-0.614	-0.178	-0.180	-0.638	-0.612	-0.194	-0.170
mae	0.245	0.244	0.502	0.502	0.931	0.930	0.951	0.951	0.112	0.109	12.614	12.580	3.133	3.098	1.392	1.370	1.033	1.024	0.766	0.743	0.602	0.600	0.708	0.681	0.608	0.579
rms	0.287	0.285	0.712	0.712	1.131	1.128	1.135	1.136	0.121	0.118	13.266	13.222	3.552	3.494	1.745	1.703	1.295	1.281	0.918	0.876	1.076	1.075	0.973	0.921	0.923	0.868
sci	0.162	0.161	0.105	0.105	0.221	0.221	0.252	0.252	0.301	0.295	0.659	0.657	0.360	0.355	0.239	0.234	0.212	0.210	0.131	0.125	0.159	0.159	0.140	0.132	0.129	0.121
mpi	0.822	0.823	0.708	0.708	0.454	0.455	0.490	0.490	0.143	0.158	-1.424	-1.416	-1.728	-1.683	-0.416	-0.382	0.255	0.263	0.463	0.487	0.494	0.495	0.330	0.366	0.340	0.380
opi	0.090	0.089	0.087	0.087	0.169	0.169	0.180	0.180	0.222	0.218	1.623	1.617	0.449	0.442	0.230	0.224	0.180	0.178	0.113	0.108	0.134	0.134	0.121	0.115	0.115	0.108
std	0.272	0.269	0.759	0.759	0.693	0.691	0.671	0.670	0.112	0.107	4.440	4.396	1.809	1.746	1.136	1.093	0.843	0.830	0.714	0.675	1.147	1.145	0.794	0.744	0.974	0.919
d1	0.840	0.841	0.865	0.865	0.657	0.656	0.625	0.624	0.441	0.464	0.186	0.186	0.233	0.235	0.400	0.404	0.616	0.617	0.641	0.648	0.831	0.832	0.657	0.666	0.750	0.759
d2	0.968	0.969	0.971	0.971	0.862	0.862	0.840	0.839	0.689	0.709	0.281	0.282	0.333	0.339	0.679	0.687	0.832	0.834	0.878	0.886	0.929	0.929	0.856	0.867	0.894	0.904
corr	0.961	0.961	0.966	0.966	0.912	0.911	0.896	0.895	0.557	0.601	-0.874	-0.874	-0.046	-0.027	0.745	0.751	0.884	0.884	0.910	0.914	0.917	0.917	0.889	0.897	0.902	0.909
rega	-0.316	-0.307	-1.405	-1.405	-1.275	-1.237	-0.996	-0.966	0.062	0.036	12.593	12.390	7.331	7.107	-1.653	-1.501	-1.704	-1.617	-2.164	-1.985	-1.990	-1.984	-2.528	-2.348	-3.232	-3.040
regb	1.101	1.095	1.190	1.190	1.067	1.060	1.010	1.003	0.694	0.749	-0.253	-0.241	-0.062	-0.035	1.036	1.018	1.110	1.097	1.217	1.195	1.268	1.267	1.271	1.249	1.425	1.401

Computed statistical parameters for case: f31har02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.184	0.183	0.318	0.318	-0.434	-0.435	-0.539	-0.540	-0.051	-0.053	-13.317	-13.300	-3.034	-3.016	-0.829	-0.817	-0.440	-0.436	-0.304	-0.292	0.415	0.414	-0.322	-0.309	0.201	0.213
mae	0.219	0.218	0.426	0.426	0.508	0.515	0.547	0.553	0.077	0.079	13.317	13.300	3.034	3.016	0.829	0.817	0.569	0.579	0.488	0.498	0.474	0.473	0.437	0.449	0.485	0.493
rms	0.288	0.284	0.458	0.458	0.639	0.647	0.714	0.720	0.087	0.088	14.497	14.469	3.418	3.388	0.981	0.979	0.660	0.670	0.530	0.543	0.552	0.551	0.471	0.480	0.571	0.574
sci	0.169	0.167	0.071	0.071	0.134	0.136	0.169	0.171	0.229	0.232	0.691	0.690	0.344	0.341	0.142	0.141	0.116	0.118	0.079	0.081	0.088	0.088	0.070	0.071	0.083	0.083
mpi	0.832	0.834	0.850	0.850	0.748	0.745	0.726	0.724	0.409	0.400	-1.191	-1.187	-2.341	-2.312	0.402	0.403	0.714	0.710	0.761	0.755	0.808	0.808	0.741	0.736	0.680	0.678
opi	0.090	0.089	0.056	0.056	0.096	0.097	0.113	0.114	0.165	0.167	1.753	1.750	0.429	0.425	0.129	0.128	0.092	0.093	0.069	0.070	0.068	0.068	0.061	0.062	0.070	0.071
std	0.239	0.235	0.357	0.357	0.506	0.517	0.506	0.513	0.077	0.076	6.189	6.153	1.700	1.666	0.567	0.584	0.532	0.550	0.469	0.495	0.394	0.393	0.372	0.397	0.577	0.575
d1	0.860	0.860	0.900	0.900	0.817	0.814	0.786	0.784	0.590	0.583	0.236	0.236	0.192	0.193	0.647	0.650	0.795	0.790	0.794	0.788	0.888	0.888	0.804	0.797	0.824	0.820
d2	0.971	0.971	0.990	0.990	0.954	0.953	0.931	0.929	0.814	0.814	0.332	0.333	0.229	0.233	0.882	0.880	0.955	0.954	0.963	0.960	0.985	0.985	0.968	0.966	0.964	0.963
corr	0.966	0.966	0.994	0.994	0.969	0.968	0.960	0.959	0.757	0.765	-0.490	-0.463	-0.375	-0.365	0.924	0.919	0.966	0.964	0.962	0.958	0.989	0.989	0.968	0.963	0.944	0.942
rega	0.225	0.232	0.921	0.921	0.572	0.601	0.430	0.450	0.035	0.025	9.310	9.196	12.368	12.094	-0.177	-0.005	0.671	0.739	0.880	0.999	0.826	0.835	0.295	0.441	-0.199	-0.060
regb	0.976	0.971	0.906	0.906	0.789	0.782	0.770	0.765	0.775	0.795	-0.079	-0.073	-0.549	-0.520	0.906	0.883	0.805	0.794	0.823	0.807	0.935	0.933	0.908	0.888	1.058	1.040

Computed statistical parameters for case: f31har03
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.195	0.193	-0.390	-0.390	-0.513	-0.512	-0.555	-0.557	-0.040	-0.040	-11.796	-11.787	-2.586	-2.576	-0.989	-0.979	-0.630	-0.625	-0.244	-0.236	-0.087	-0.088	-0.430	-0.422	-0.098	-0.094
mae	0.227	0.226	0.777	0.777	0.540	0.543	0.555	0.557	0.113	0.112	11.796	11.787	2.586	2.576	0.989	0.979	0.643	0.648	0.609	0.609	1.174	1.176	0.549	0.551	0.800	0.797
rms	0.327	0.321	1.367	1.367	0.706	0.707	0.736	0.738	0.135	0.134	12.444	12.430	2.846	2.829	1.146	1.133	0.815	0.812	0.671	0.669	1.955	1.959	0.643	0.639	1.260	1.255
sci	0.172	0.169	0.172	0.172	0.135	0.135	0.160	0.160	0.368	0.366	0.632	0.631	0.289	0.288	0.153	0.151	0.129	0.129	0.092	0.092	0.263	0.264	0.089	0.088	0.165	0.165
mpi	0.819	0.822	-2.257	-2.257	0.632	0.632	0.656	0.654	0.247	0.251	-2.184	-2.180	-2.690	-2.667	-0.587	-0.570	0.429	0.431	0.349	0.351	-0.459	-0.462	0.346	0.350	-0.472	-0.467
opi	0.092	0.090	0.168	0.168	0.106	0.107	0.117	0.117	0.273	0.272	1.520	1.518	0.362	0.360	0.152	0.151	0.114	0.114	0.082	0.082	0.251	0.251	0.082	0.082	0.162	0.161
std	0.283	0.278	1.415	1.415	0.523	0.526	0.522	0.524	0.140	0.139	4.281	4.263	1.284	1.262	0.625	0.616	0.559	0.560	0.675	0.677	2.109	2.113	0.516	0.518	1.357	1.352
d1	0.840	0.840	0.228	0.228	0.765	0.763	0.752	0.751	0.581	0.585	0.204	0.204	0.211	0.212	0.370	0.372	0.688	0.684	0.605	0.603	0.356	0.355	0.634	0.630	0.333	0.333
d2	0.957	0.958	0.274	0.274	0.924	0.924	0.911	0.910	0.778	0.781	0.308	0.309	0.291	0.293	0.672	0.673	0.883	0.882	0.855	0.854	0.184	0.182	0.870	0.868	0.236	0.235
corr	0.966	0.967	0.354	0.354	0.928	0.927	0.922	0.921	0.620	0.624	-0.399	-0.382	-0.244	-0.235	0.817	0.812	0.897	0.895	0.769	0.766	-0.031	-0.035	0.853	0.849	0.046	0.040
rega	-0.180	-0.168	-4.747	-4.747	0.239	0.282	0.182	0.213	0.122	0.120	9.027	8.953	9.648	9.512	-2.547	-2.306	-0.058	0.036	1.724	1.824	7.583	7.616	0.484	0.639	7.120	7.180
regb	1.198	1.190	1.547	1.547	0.856	0.848	0.840	0.833	0.560	0.563	-0.057	-0.053	-0.244	-0.229	1.208	1.177	0.909	0.895	0.729	0.717	-0.033	-0.038	0.874	0.854	0.052	0.045

Computed statistical parameters for case: f31har04
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01

bias	0.276	0.273	0.091	0.091	-0.375	-0.374	-0.436	-0.437	-0.011	-0.012	-12.350	-12.342	-2.780	-2.770	-0.933	-0.924	-0.485	-0.479	0.115	0.124	0.321	0.321	-0.242	-0.233	0.310	0.315
mae	0.291	0.288	1.318	1.318	0.533	0.540	0.495	0.500	0.125	0.125	12.350	12.342	2.780	2.770	0.933	0.924	0.676	0.682	0.814	0.814	1.577	1.577	0.647	0.646	1.153	1.148
rms	0.357	0.350	1.825	1.825	0.670	0.674	0.667	0.670	0.139	0.139	12.935	12.923	3.052	3.037	1.217	1.206	0.835	0.835	0.889	0.890	2.362	2.363	0.803	0.799	1.628	1.620
sci	0.184	0.180	0.223	0.223	0.125	0.126	0.142	0.143	0.405	0.405	0.631	0.631	0.295	0.294	0.157	0.155	0.129	0.129	0.118	0.118	0.314	0.314	0.107	0.106	0.210	0.209
mpi	0.796	0.800	-2.116	-2.116	0.672	0.670	0.698	0.696	0.406	0.405	-1.917	-1.914	-1.840	-1.825	-0.654	-0.639	0.461	0.460	0.378	0.377	-0.418	-0.418	0.378	0.381	-0.390	-0.383
opi	0.101	0.099	0.204	0.204	0.097	0.097	0.103	0.103	0.240	0.240	1.518	1.517	0.370	0.368	0.153	0.152	0.111	0.111	0.099	0.099	0.279	0.279	0.095	0.094	0.192	0.191
std	0.245	0.238	1.969	1.969	0.599	0.605	0.546	0.548	0.150	0.150	4.155	4.140	1.362	1.343	0.844	0.837	0.735	0.739	0.952	0.952	2.528	2.528	0.826	0.825	1.727	1.716
d1	0.797	0.799	0.211	0.211	0.758	0.753	0.766	0.762	0.453	0.454	0.199	0.199	0.191	0.192	0.345	0.346	0.649	0.644	0.575	0.573	0.335	0.335	0.581	0.578	0.321	0.322
d2	0.951	0.952	0.154	0.154	0.924	0.922	0.917	0.916	0.658	0.656	0.306	0.307	0.238	0.240	0.537	0.536	0.855	0.852	0.807	0.804	0.215	0.214	0.781	0.779	0.235	0.236
corr	0.971	0.972	-0.111	-0.111	0.901	0.899	0.906	0.906	0.440	0.437	-0.499	-0.491	-0.590	-0.590	0.543	0.534	0.806	0.801	0.689	0.687	-0.270	-0.272	0.654	0.649	-0.305	-0.307
rega	0.026	0.036	10.948	10.948	0.733	0.789	0.461	0.497	0.191	0.191	9.517	9.452	13.533	13.373	0.879	1.109	0.948	1.062	3.242	3.330	10.073	10.084	2.334	2.459	10.597	10.588
regb	1.129	1.122	-0.327	-0.327	0.793	0.783	0.809	0.801	0.412	0.407	-0.067	-0.063	-0.578	-0.562	0.767	0.738	0.779	0.762	0.585	0.575	-0.296	-0.297	0.657	0.642	-0.328	-0.326

Computed statistical parameters for case: f41lak01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.002	-0.003	-0.222	-0.222	-0.266	-0.266	-0.360	-0.360	-0.005	-0.005	-13.823	-13.824	-1.987	-1.987	-0.335	-0.336	-0.226	-0.226	-0.222	-0.222	-0.140	-0.141	-0.140	-0.141	-0.140	-0.141
mae	0.031	0.031	0.230	0.230	0.266	0.266	0.360	0.360	0.054	0.054	13.823	13.824	1.987	1.987	0.335	0.336	0.226	0.226	0.230	0.230	0.160	0.161	0.160	0.161	0.160	0.161
rms	0.039	0.039	0.255	0.255	0.277	0.277	0.367	0.367	0.056	0.056	13.938	13.938	2.031	2.031	0.343	0.343	0.238	0.238	0.255	0.255	0.168	0.168	0.168	0.168	0.168	0.168
sci	0.173	0.173	0.130	0.130	0.174	0.174	0.248	0.247	0.105	0.105	0.892	0.892	0.546	0.546	0.173	0.173	0.136	0.136	0.130	0.130	0.088	0.088	0.088	0.088	0.088	0.088
mpi	0.540	0.540	0.523	0.523	0.286	0.286	-0.014	-0.013	0.223	0.223	-1.391	-1.391	-0.247	-0.247	-0.011	-0.012	0.445	0.446	0.523	0.523	0.657	0.656	0.657	0.656	0.657	0.656
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.042	0.042	0.136	0.136	0.083	0.083	0.080	0.079	0.061	0.061	1.926	1.926	0.454	0.454	0.077	0.077	0.083	0.082	0.136	0.136	0.099	0.099	0.099	0.099	0.099	0.099
d1	0.345	0.344	0.338	0.338	0.208	0.208	0.138	0.138	0.260	0.260	0.080	0.080	0.114	0.114	0.213	0.213	0.280	0.280	0.338	0.338	0.369	0.368	0.369	0.368	0.369	0.368
d2	0.436	0.439	0.555	0.555	0.372	0.373	0.252	0.252	0.497	0.501	0.145	0.145	0.198	0.198	0.409	0.409	0.499	0.499	0.555	0.555	0.689	0.688	0.689	0.688	0.689	0.688
corr	0.021	0.027	0.668	0.668	0.546	0.551	0.418	0.425	0.923	0.899	-0.633	-0.634	-0.446	-0.445	0.771	0.772	0.703	0.705	0.668	0.668	0.736	0.733	0.736	0.733	0.736	0.733
rega	0.220	0.219	0.762	0.762	0.415	0.404	0.464	0.447	0.441	0.440	2.479	2.479	2.269	2.266	0.042	0.043	0.334	0.332	0.762	0.762	0.458	0.464	0.458	0.464	0.458	0.464
regb	0.018	0.023	0.498	0.498	0.572	0.579	0.445	0.456	0.171	0.173	-0.044	-0.044	-0.144	-0.144	0.809	0.809	0.680	0.681	0.498	0.498	0.686	0.683	0.686	0.683	0.686	0.683

Computed statistical parameters for case: f41lak02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.034	-0.034	-0.244	-0.244	-0.358	-0.358	-0.449	-0.448	0.044	0.044	-12.926	-12.926	-2.274	-2.274	-0.516	-0.516	-0.345	-0.345	-0.244	-0.244	-0.251	-0.251	-0.251	-0.251	-0.251	-0.251
mae	0.034	0.034	0.244	0.244	0.358	0.358	0.449	0.448	0.044	0.044	12.926	12.926	2.274	2.274	0.516	0.516	0.345	0.345	0.244	0.244	0.251	0.251	0.251	0.251	0.251	0.251
rms	0.036	0.036	0.266	0.266	0.360	0.360	0.450	0.450	0.050	0.050	13.040	13.039	2.308	2.308	0.521	0.521	0.348	0.348	0.266	0.266	0.261	0.260	0.261	0.260	0.261	0.260
sci	0.091	0.091	0.108	0.108	0.185	0.185	0.250	0.250	0.106	0.105	0.864	0.864	0.530	0.530	0.209	0.209	0.161	0.160	0.108	0.108	0.110	0.109	0.110	0.109	0.110	0.109
mpi	0.796	0.796	0.561	0.561	0.249	0.249	-0.063	-0.062	0.071	0.073	-2.676	-2.675	-4.529	-4.529	0.122	0.123	0.370	0.371	0.561	0.561	0.610	0.610	0.610	0.610	0.610	0.610
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.013	0.013	0.114	0.114	0.045	0.045	0.040	0.040	0.024	0.024	1.857	1.857	0.429	0.429	0.072	0.072	0.054	0.054	0.114	0.114	0.075	0.075	0.075	0.075	0.075	0.075
d1	0.534	0.534	0.368	0.368	0.227	0.227	0.167	0.167	0.319	0.319	0.096	0.096	0.137	0.137	0.218	0.218	0.268	0.268	0.368	0.368	0.390	0.391	0.390	0.391	0.390	0.391
d2	0.820	0.820	0.603	0.603	0.442	0.442	0.333	0.334	0.462	0.461	0.173	0.173	0.238	0.238	0.418	0.418	0.507	0.507	0.603	0.603	0.666	0.667	0.666	0.667	0.666	0.667
corr	0.971	0.971	0.839	0.839	0.978	0.978	0.970	0.972	0.382	0.378	-0.373	-0.372	0.253	0.252	0.974	0.974	0.989	0.989	0.839	0.839	0.988	0.988	0.988	0.988	0.988	0.988
rega	0.052	0.052	-0.529	-0.529	0.205	0.205	0.086	0.084	0.387	0.389	2.611	2.611	1.739	1.741	0.346	0.345	0.325	0.323	-0.529	-0.529	0.577	0.573	0.577	0.573	0.577	0.573
regb	0.781	0.781	1.115	1.115	0.711	0.711	0.704	0.705	0.272	0.266	-0.029	-0.029	0.079	0.079	0.654	0.655	0.691	0.692	1.115	1.115	0.652	0.654	0.652	0.654	0.652	0.654

Computed statistical parameters for case: f41lak03
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.023	-0.023	-0.210	-0.210	-0.410	-0.410	-0.500	-0.500	0.010	0.010	-14.839	-14.839	-3.974	-3.974	-0.883	-0.883	-0.437	-0.437	-0.200	-0.200	-0.315	-0.315	-0.306	-0.306	-0.315	-0.315
mae	0.049	0.049	0.210	0.210	0.410	0.410	0.500	0.500	0.017	0.017	14.839	14.839	3.974	3.974	0.883	0.883	0.437	0.437	0.200	0.200	0.315	0.315	0.306	0.306	0.315	0.315
rms	0.051	0.051	0.237	0.237	0.414	0.414	0.504	0.504	0.018	0.018	15.226	15.226	4.998	4.998	1.050	1.049	0.441	0.441	0.231	0.231	0.321	0.321	0.313	0.313	0.321	0.321
sci	0.103	0.103	0.090	0.090	0.194	0.194	0.255	0.256	0.037	0.037	0.883	0.883	0.799	0.799	0.346	0.346	0.182	0.182	0.088	0.088	0.123	0.123	0.120	0.120	0.123	0.123
mpi	0.874	0.874	0.761	0.761	0.401	0.401	0.287	0.287	0.926	0.925	-0.196	-0.196	0.745	0.745	0.904	0.904	0.562	0.563	0.941	0.941	0.651	0.651	0.929	0.929	0.927	0.927
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.049	0.049	0.119	0.119	0.060	0.060	0.070	0.070	0.016	0.016	3.685	3.685	3.274	3.275	0.613	0.613	0.063	0.063	0.123	0.123	0.065	0.065	0.074	0.074	0.065	0.065
d1	0.577	0.577	0.627	0.627	0.273	0.273	0.216	0.216	0.623	0.621	0.126	0.126	0.336	0.336	0.258	0.258	0.266	0.266	0.648	0.648	0.423	0.423	0.439	0.439	0.423	0.423

	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
d2	0.890	0.890	0.858	0.858	0.541	0.541	0.439	0.439	0.840	0.840	0.213	0.213	0.387	0.387	0.349	0.349	0.516	0.516	0.871	0.871	0.732	0.732	0.751	0.751	0.732	0.732
corr	0.882	0.882	0.937	0.937	0.970	0.970	0.956	0.955	0.783	0.784	-0.672	-0.673	-0.664	-0.664	-0.422	-0.423	0.953	0.953	0.931	0.931	0.984	0.984	0.989	0.989	0.984	0.984
rega	0.160	0.160	-0.358	-0.358	0.012	0.012	0.046	0.047	0.119	0.116	3.052	3.054	2.587	2.588	2.757	2.758	-0.475	-0.476	-0.165	-0.165	0.120	0.122	0.245	0.246	0.120	0.122
regb	0.628	0.628	1.056	1.056	0.802	0.802	0.723	0.723	0.782	0.789	-0.037	-0.038	-0.049	-0.049	-0.199	-0.199	1.015	1.016	0.987	0.987	0.834	0.833	0.789	0.788	0.834	0.833

Computed statistical parameters for case: f41lak04
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	0.011	0.011	-0.079	-0.079	-0.269	-0.269	-0.376	-0.375	-0.044	-0.044	-12.645	-12.645	-1.753	-1.753	-0.293	-0.293	-0.208	-0.208	-0.079	-0.079	-0.093	-0.093	-0.093	-0.093	-0.093	-0.093
mae	0.034	0.034	0.079	0.079	0.269	0.269	0.376	0.375	0.044	0.044	12.645	12.645	1.753	1.753	0.293	0.293	0.208	0.208	0.079	0.079	0.093	0.093	0.093	0.093	0.093	0.093
rms	0.042	0.042	0.116	0.116	0.276	0.275	0.381	0.380	0.046	0.046	12.718	12.718	1.774	1.774	0.300	0.300	0.217	0.216	0.116	0.116	0.108	0.108	0.108	0.108	0.108	0.108
sci	0.144	0.143	0.056	0.056	0.162	0.162	0.239	0.238	0.082	0.082	0.870	0.870	0.486	0.486	0.144	0.144	0.116	0.116	0.056	0.056	0.053	0.053	0.053	0.053	0.053	0.053
mpi	0.743	0.744	0.811	0.811	0.225	0.226	-0.242	-0.241	-0.507	-0.507	-0.287	-0.287	0.714	0.714	-0.175	-0.175	0.426	0.427	0.811	0.811	0.813	0.814	0.813	0.814	0.813	0.814
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.044	0.044	0.093	0.093	0.066	0.067	0.066	0.066	0.014	0.014	1.488	1.488	0.299	0.299	0.071	0.071	0.066	0.066	0.093	0.093	0.059	0.059	0.059	0.059	0.059	0.059
d1	0.382	0.383	0.671	0.671	0.181	0.182	0.113	0.113	0.180	0.180	0.080	0.080	0.074	0.074	0.201	0.201	0.273	0.273	0.671	0.671	0.620	0.621	0.620	0.621	0.620	0.621
d2	0.491	0.493	0.830	0.830	0.387	0.387	0.240	0.240	0.331	0.331	0.146	0.146	0.129	0.129	0.436	0.436	0.550	0.551	0.830	0.830	0.862	0.863	0.862	0.863	0.862	0.863
corr	0.106	0.108	0.787	0.787	0.745	0.744	0.623	0.623	0.597	0.597	-0.814	-0.815	-0.805	-0.805	0.854	0.854	0.832	0.832	0.787	0.787	0.919	0.918	0.919	0.918	0.919	0.918
rega	0.276	0.276	0.412	0.412	-0.091	-0.097	-0.006	-0.009	-0.008	-0.008	3.144	3.148	4.260	4.260	-0.614	-0.614	-0.135	-0.140	0.412	0.412	-0.004	-0.006	-0.004	-0.006	-0.004	-0.006
regb	0.088	0.089	0.761	0.761	0.896	0.899	0.768	0.770	0.936	0.936	-0.080	-0.080	-0.647	-0.647	1.154	1.154	0.961	0.964	0.761	0.761	0.956	0.957	0.956	0.957	0.956	0.957

Computed statistical parameters for case: f41lak05
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	0.077	0.078	-0.012	-0.012	-0.120	-0.120	-0.223	-0.223	-0.004	-0.004	-14.894	-14.894	-2.124	-2.124	-0.193	-0.193	-0.069	-0.069	-0.012	-0.012	0.014	0.013	0.014	0.013	0.014	0.013
mae	0.077	0.078	0.066	0.066	0.120	0.120	0.223	0.223	0.025	0.024	14.894	14.894	2.124	2.124	0.193	0.193	0.069	0.069	0.066	0.066	0.042	0.042	0.042	0.042	0.042	0.042
rms	0.085	0.085	0.082	0.082	0.123	0.123	0.224	0.224	0.033	0.032	15.036	15.036	2.369	2.369	0.246	0.246	0.082	0.083	0.082	0.082	0.054	0.053	0.054	0.053	0.054	0.053
sci	0.484	0.486	0.045	0.045	0.083	0.084	0.163	0.163	0.062	0.062	0.897	0.897	0.605	0.605	0.130	0.130	0.051	0.051	0.045	0.045	0.030	0.030	0.030	0.030	0.030	0.030
mpi	0.208	0.204	0.823	0.823	0.588	0.587	0.112	0.113	0.339	0.345	-0.863	-0.863	0.710	0.710	0.665	0.664	0.724	0.723	0.823	0.823	0.891	0.891	0.891	0.891	0.891	0.891
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.038	0.038	0.089	0.089	0.031	0.030	0.025	0.023	0.036	0.035	2.258	2.258	1.149	1.150	0.167	0.167	0.050	0.051	0.089	0.089	0.057	0.057	0.057	0.057	0.057	0.057
d1	0.161	0.160	0.706	0.706	0.360	0.360	0.169	0.169	0.555	0.568	0.106	0.106	0.287	0.287	0.521	0.520	0.662	0.661	0.706	0.706	0.818	0.817	0.818	0.817	0.818	0.817
d2	0.290	0.289	0.885	0.885	0.615	0.614	0.325	0.325	0.798	0.807	0.189	0.189	0.400	0.400	0.656	0.655	0.857	0.856	0.885	0.885	0.960	0.960	0.960	0.960	0.960	0.960
corr	0.086	0.082	0.785	0.785	0.935	0.938	0.913	0.922	0.672	0.682	0.482	0.483	0.644	0.642	0.848	0.847	0.937	0.936	0.785	0.785	0.929	0.928	0.929	0.928	0.929	0.928
rega	0.229	0.231	0.319	0.319	0.183	0.188	0.061	0.053	0.272	0.262	1.425	1.425	1.519	1.521	0.941	0.944	0.383	0.393	0.319	0.319	0.251	0.258	0.251	0.258	0.251	0.258
regb	0.132	0.127	0.820	0.820	0.795	0.791	0.793	0.799	0.474	0.492	0.027	0.027	0.070	0.069	0.400	0.398	0.723	0.718	0.820	0.820	0.869	0.865	0.869	0.865	0.869	0.865

Computed statistical parameters for case: f41lak06
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	0.017	0.018	-0.310	-0.310	-0.352	-0.351	-0.443	-0.443	0.001	0.002	-13.235	-13.235	-2.413	-2.413	-0.492	-0.492	-0.325	-0.324	-0.310	-0.310	-0.235	-0.235	-0.235	-0.235	-0.235	-0.235
mae	0.025	0.025	0.310	0.310	0.352	0.351	0.443	0.443	0.039	0.039	13.235	13.235	2.413	2.413	0.492	0.492	0.325	0.324	0.310	0.310	0.235	0.235	0.235	0.235	0.235	0.235
rms	0.028	0.028	0.330	0.330	0.359	0.358	0.449	0.448	0.046	0.046	13.519	13.519	2.748	2.748	0.513	0.513	0.337	0.336	0.330	0.330	0.270	0.271	0.270	0.271	0.270	0.271
sci	0.102	0.102	0.148	0.148	0.202	0.202	0.272	0.271	0.090	0.090	0.887	0.887	0.637	0.637	0.225	0.225	0.171	0.171	0.148	0.148	0.125	0.126	0.125	0.126	0.125	0.126
mpi	0.867	0.867	0.625	0.625	0.405	0.407	0.278	0.280	0.680	0.681	-0.283	-0.283	0.806	0.806	0.894	0.894	-0.632	-0.629	0.914	0.914	0.656	0.656	0.917	0.917	0.917	0.917
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.024	0.024	0.124	0.124	0.080	0.079	0.076	0.075	0.050	0.050	2.980	2.980	1.419	1.419	0.158	0.158	0.096	0.096	0.124	0.124	0.144	0.144	0.144	0.144	0.144	0.144
d1	0.642	0.641	0.418	0.418	0.275	0.276	0.199	0.199	0.336	0.340	0.127	0.127	0.281	0.281	0.248	0.248	0.341	0.341	0.418	0.418	0.495	0.495	0.495	0.495	0.495	0.495
d2	0.874	0.872	0.687	0.687	0.491	0.492	0.369	0.370	0.528	0.532	0.219	0.219	0.378	0.378	0.409	0.410	0.575	0.576	0.687	0.687	0.725	0.724	0.725	0.724	0.725	0.724
corr	0.927	0.925	0.961	0.961	0.978	0.978	0.942	0.942	0.554	0.564	0.167	0.168	-0.386	-0.388	0.712	0.711	0.993	0.993	0.961	0.961	0.985	0.985	0.985	0.985	0.985	0.985
rega	0.127	0.127	0.543	0.543	0.472	0.465	0.392	0.384	0.419	0.418	1.941	1.940	2.042	2.043	0.870	0.871	0.580	0.576	0.543	0.543	0.826	0.827	0.826	0.827	0.826	0.827
regb	0.604	0.604	0.618	0.618	0.536	0.541	0.494	0.500	0.184	0.188	0.005	0.005	-0.033	-0.033	0.403	0.403	0.541	0.543	0.618	0.618	0.508	0.507	0.508	0.507	0.508	0.507

Computed statistical parameters for case: f41lak07
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8

Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.022	0.022	-0.109	-0.109	-0.148	-0.148	-0.249	-0.248	0.041	0.042	-14.389	-14.389	-1.687	-1.687	-0.167	-0.167	-0.092	-0.092	-0.083	-0.083	-0.017	-0.017	-0.012	-0.012	-0.022	-0.022
mae	0.022	0.022	0.163	0.163	0.148	0.148	0.249	0.248	0.052	0.052	14.389	14.389	1.687	1.687	0.167	0.167	0.092	0.092	0.136	0.136	0.096	0.096	0.090	0.090	0.100	0.100
rms	0.031	0.031	0.194	0.194	0.164	0.164	0.256	0.255	0.057	0.057	14.467	14.467	1.754	1.754	0.204	0.204	0.126	0.126	0.174	0.174	0.121	0.121	0.107	0.108	0.122	0.122
sci	0.240	0.240	0.116	0.116	0.126	0.126	0.210	0.209	0.118	0.118	0.906	0.906	0.546	0.546	0.126	0.126	0.088	0.088	0.106	0.106	0.077	0.077	0.069	0.069	0.077	0.077
mpi	0.411	0.411	0.602	0.602	0.327	0.328	0.014	0.015	0.199	0.197	-1.393	-1.393	0.344	0.344	-1.813	-1.812	0.498	0.499	0.623	0.623	0.668	0.668	0.700	0.699	0.671	0.670
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.023	0.023	0.174	0.174	0.076	0.076	0.064	0.064	0.042	0.042	1.615	1.615	0.517	0.517	0.125	0.125	0.093	0.093	0.166	0.166	0.129	0.130	0.115	0.115	0.129	0.129
d1	0.388	0.388	0.021	0.021	0.092	0.092	0.070	0.070	0.214	0.216	0.078	0.078	0.165	0.165	0.152	0.152	0.106	0.106	0.237	0.237	0.256	0.255	0.210	0.209	0.192	0.191
d2	0.407	0.407	0.011	0.011	0.146	0.146	0.124	0.125	0.302	0.307	0.143	0.143	0.266	0.266	0.190	0.190	0.110	0.110	0.274	0.274	0.373	0.373	0.396	0.397	0.365	0.365
corr	0.011	0.011	-0.491	-0.491	0.282	0.286	0.094	0.100	-0.883	-0.883	-0.393	-0.393	-0.508	-0.508	-0.324	-0.323	0.355	0.355	-0.057	-0.057	0.080	0.081	0.404	0.406	0.065	0.066
rega	0.149	0.149	5.593	5.593	-0.492	-0.519	0.623	0.598	0.663	0.659	2.036	2.037	1.933	1.933	2.927	2.922	-1.657	-1.666	1.862	1.862	1.245	1.240	-1.368	-1.390	1.284	1.280
regb	0.012	0.012	-2.409	-2.409	1.265	1.286	0.284	0.306	-0.291	-0.283	-0.028	-0.028	-0.127	-0.127	-0.919	-0.916	2.102	2.108	-0.182	-0.182	0.196	0.200	1.866	1.881	0.171	0.174

Computed statistical parameters for case: f41lak08
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.041	-0.041	-0.333	-0.333	-0.400	-0.400	-0.482	-0.482	0.018	0.018	-12.493	-12.493	-1.973	-1.973	-0.501	-0.501	-0.379	-0.379	-0.333	-0.333	-0.305	-0.305	-0.305	-0.305	-0.305	-0.305
mae	0.041	0.041	0.333	0.333	0.400	0.400	0.482	0.482	0.022	0.022	12.493	12.493	1.973	1.973	0.501	0.501	0.379	0.379	0.333	0.333	0.305	0.305	0.305	0.305	0.305	0.305
rms	0.049	0.049	0.347	0.347	0.403	0.403	0.484	0.484	0.026	0.026	12.554	12.554	1.997	1.996	0.508	0.508	0.384	0.384	0.347	0.347	0.315	0.315	0.315	0.315	0.315	0.315
sci	0.157	0.157	0.152	0.152	0.224	0.224	0.290	0.290	0.052	0.052	0.870	0.870	0.521	0.521	0.224	0.224	0.192	0.192	0.152	0.152	0.143	0.143	0.143	0.143	0.143	0.143
mpi	0.632	0.632	0.176	0.176	-0.003	-0.002	-0.356	-0.355	0.758	0.757	-2.660	-2.660	-4.369	-4.369	-0.108	-0.107	0.150	0.151	0.370	0.370	0.429	0.430	0.355	0.355	0.355	0.355
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.028	0.028	0.104	0.104	0.054	0.054	0.048	0.048	0.019	0.019	1.342	1.342	0.332	0.331	0.091	0.091	0.067	0.067	0.104	0.104	0.086	0.086	0.086	0.086	0.086	0.086
d1	0.420	0.420	0.262	0.262	0.163	0.163	0.120	0.121	0.437	0.435	0.078	0.078	0.114	0.114	0.189	0.189	0.204	0.204	0.262	0.262	0.293	0.293	0.293	0.293	0.293	0.293
d2	0.593	0.593	0.470	0.470	0.313	0.313	0.235	0.235	0.584	0.585	0.143	0.143	0.206	0.206	0.350	0.351	0.380	0.380	0.470	0.470	0.515	0.515	0.515	0.515	0.515	0.515
corr	0.885	0.885	0.794	0.794	0.970	0.971	0.958	0.961	0.903	0.894	-0.031	-0.031	0.619	0.621	0.987	0.987	0.984	0.984	0.794	0.794	0.979	0.979	0.979	0.979	0.979	0.979
rega	0.171	0.171	0.787	0.787	0.485	0.485	0.373	0.370	0.411	0.410	1.964	1.964	1.368	1.367	0.753	0.751	0.627	0.624	0.787	0.787	0.814	0.811	0.814	0.811	0.814	0.811
regb	0.321	0.321	0.507	0.507	0.508	0.509	0.488	0.489	0.196	0.200	-0.002	-0.002	0.129	0.129	0.446	0.447	0.497	0.498	0.507	0.507	0.493	0.494	0.493	0.494	0.493	0.494

Computed statistical parameters for case: f41lak09
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.009	-0.009	-0.278	-0.251	-0.331	-0.331	-0.425	-0.425	0.007	0.007	-12.380	-12.379	-1.841	-1.841	-0.399	-0.399	-0.294	-0.294	-0.278	-0.251	-0.196	-0.196	-0.196	-0.196	-0.196	-0.196
mae	0.019	0.019	0.278	0.251	0.331	0.331	0.425	0.425	0.028	0.028	12.380	12.379	1.841	1.841	0.399	0.399	0.294	0.294	0.278	0.251	0.196	0.196	0.196	0.196	0.196	0.196
rms	0.023	0.023	0.288	0.263	0.336	0.336	0.428	0.428	0.030	0.030	12.488	12.487	1.859	1.859	0.405	0.404	0.301	0.301	0.288	0.263	0.207	0.207	0.207	0.207	0.207	0.207
sci	0.072	0.072	0.127	0.116	0.188	0.188	0.258	0.258	0.059	0.059	0.868	0.868	0.493	0.493	0.182	0.182	0.152	0.152	0.127	0.116	0.095	0.095	0.095	0.095	0.095	0.095
mpi	0.838	0.838	0.527	0.569	0.180	0.180	-0.178	-0.178	0.732	0.732	-1.433	-1.433	-1.650	-1.650	0.017	0.018	0.338	0.338	0.527	0.569	0.647	0.647	0.647	0.647	0.647	0.647
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.022	0.022	0.080	0.085	0.064	0.064	0.060	0.060	0.031	0.031	1.769	1.769	0.282	0.282	0.072	0.072	0.068	0.068	0.080	0.085	0.070	0.070	0.070	0.070	0.070	0.070
d1	0.578	0.578	0.298	0.320	0.213	0.213	0.155	0.155	0.162	0.162	0.091	0.091	0.091	0.091	0.204	0.204	0.259	0.259	0.298	0.320	0.387	0.387	0.387	0.387	0.387	0.387
d2	0.842	0.842	0.563	0.607	0.408	0.408	0.303	0.303	0.263	0.263	0.164	0.164	0.160	0.160	0.399	0.400	0.486	0.486	0.563	0.607	0.675	0.675	0.675	0.675	0.675	0.675
corr	0.920	0.920	0.875	0.858	0.922	0.922	0.897	0.897	-0.321	-0.321	-0.795	-0.794	-0.252	-0.252	0.929	0.930	0.947	0.947	0.875	0.858	0.973	0.973	0.973	0.973	0.973	0.973
rega	0.154	0.154	0.313	0.307	0.479	0.481	0.378	0.378	0.569	0.569	2.706	2.706	2.338	2.338	0.510	0.507	0.549	0.549	0.313	0.307	0.613	0.613	0.613	0.613	0.613	0.613
regb	0.479	0.479	0.740	0.755	0.547	0.545	0.517	0.517	-0.123	-0.123	-0.049	-0.049	-0.109	-0.109	0.591	0.593	0.573	0.573	0.740	0.755	0.626	0.626	0.626	0.626	0.626	0.626

Computed statistical parameters for case: f51fri01
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.080	0.016	1.623	0.215	-0.535	-0.699	-0.725	-0.831	0.038	0.010	-26.892	-26.925	-6.150	-6.369	-0.531	-0.856	-0.242	-0.528	0.500	0.033	0.325	-0.311	0.083	-0.337	0.025	-0.395
mae	0.150	0.094	1.623	0.274	0.535	0.699	0.725	0.831	0.110	0.098	26.892	26.925	6.150	6.369	0.775	0.856	0.439	0.528	1.047	0.580	0.834	0.360	1.009	0.583	1.067	0.641
rms	0.168	0.122	2.214	0.335	0.553	0.721	0.736	0.862	0.137	0.121	36.246	36.114	8.903	8.936	1.016	1.045	0.470	0.542	1.385	0.789	1.181	0.403	1.149	0.770	1.174	0.805
sci	0.165	0.120	0.483	0.073	0.148	0.193	0.225	0.263	0.459	0.406	1.071	1.067	0.729	0.732	0.178	0.183	0.105	0.121	0.260	0.148	0.243	0.083	0.216	0.145	0.219	0.150

mpi	0.881	0.914	0.291	0.893	0.730	0.648	0.577	0.504	0.494	0.552	-0.034	-0.030	-0.230	-0.235	0.185	0.162	0.779	0.745	0.420	0.670	0.586	0.859	0.471	0.645	0.461	0.631
opi	0.075	0.054	0.309	0.047	0.108	0.141	0.169	0.198	0.273	0.241	4.966	4.948	1.286	1.291	0.156	0.161	0.079	0.091	0.193	0.110	0.175	0.060	0.170	0.114	0.174	0.119
std	0.165	0.136	1.684	0.287	0.160	0.198	0.137	0.255	0.147	0.135	27.171	26.909	7.197	7.008	0.968	0.670	0.450	0.136	1.444	0.881	1.270	0.287	1.282	0.774	1.312	0.784
d1	0.873	0.925	0.611	0.922	0.771	0.720	0.621	0.589	0.564	0.644	0.433	0.433	0.413	0.404	0.583	0.607	0.820	0.807	0.671	0.801	0.770	0.904	0.647	0.801	0.634	0.787
d2	0.981	0.991	0.724	0.992	0.947	0.920	0.865	0.832	0.743	0.825	0.452	0.454	0.363	0.365	0.786	0.803	0.968	0.963	0.831	0.941	0.903	0.989	0.860	0.939	0.859	0.936
corr	0.993	0.990	0.673	0.996	0.994	0.990	0.992	0.978	0.750	0.764	-0.776	-0.942	-0.945	-0.993	0.818	0.974	0.954	0.998	0.733	0.896	0.828	0.995	0.746	0.909	0.741	0.908
rega	0.279	0.148	2.902	-0.284	-0.334	-0.807	-0.794	-1.118	0.230	0.163	8.190	7.832	9.150	8.560	-2.701	-4.369	0.038	-0.778	1.091	-0.095	1.642	0.121	0.944	-0.394	1.124	-0.197
regb	0.805	0.871	0.721	1.109	0.946	1.029	1.021	1.087	0.356	0.488	-0.037	-0.027	-0.253	-0.223	1.380	1.616	0.937	1.056	0.889	1.024	0.729	0.911	0.838	1.011	0.795	0.963

Computed statistical parameters for case: f51fri02
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.051	0.055	0.243	-0.225	-0.660	-0.734	-0.700	-0.739	-0.090	-0.034	-26.150	-26.460	-9.169	-9.547	-1.751	-2.084	-0.568	-0.768	0.460	-0.528	-0.338	-0.702	-0.311	-0.886	-0.338	-0.913
mae	0.204	0.223	1.369	0.969	0.660	0.734	0.700	0.739	0.238	0.151	26.150	26.460	9.205	9.576	1.867	2.087	0.568	0.768	1.419	1.033	0.574	0.702	0.838	0.886	0.864	0.913
rms	0.225	0.252	1.479	1.060	0.722	0.813	0.770	0.820	0.276	0.175	35.439	35.654	14.930	15.343	3.172	3.474	0.784	0.957	1.603	1.242	0.695	0.798	1.148	1.181	1.156	1.188
sci	0.179	0.201	0.264	0.189	0.154	0.173	0.181	0.193	0.702	0.445	1.055	1.061	0.949	0.976	0.425	0.466	0.144	0.176	0.272	0.211	0.120	0.138	0.192	0.198	0.193	0.198
mpi	0.856	0.839	0.519	0.655	0.593	0.542	0.449	0.413	-0.465	0.071	-0.056	-0.062	-0.101	-0.131	-0.308	-0.433	0.583	0.491	0.419	0.550	0.704	0.660	0.436	0.420	0.433	0.418
opi	0.088	0.098	0.182	0.131	0.118	0.133	0.141	0.150	0.603	0.382	4.235	4.260	1.886	1.938	0.427	0.468	0.114	0.140	0.198	0.153	0.093	0.107	0.154	0.158	0.155	0.159
std	0.245	0.274	1.631	1.158	0.328	0.391	0.359	0.399	0.291	0.191	26.741	26.717	13.174	13.428	2.957	3.108	0.604	0.638	1.717	1.257	0.679	0.425	1.235	0.872	1.236	0.850
d1	0.858	0.846	0.627	0.724	0.714	0.693	0.645	0.632	0.014	0.131	0.446	0.443	0.488	0.478	0.473	0.461	0.770	0.714	0.548	0.710	0.824	0.807	0.709	0.744	0.704	0.739
d2	0.979	0.973	0.849	0.918	0.924	0.905	0.884	0.868	0.011	0.325	0.457	0.455	0.389	0.390	0.535	0.510	0.926	0.895	0.774	0.884	0.962	0.955	0.865	0.889	0.866	0.889
corr	0.978	0.969	0.852	0.972	0.986	0.976	0.981	0.970	-0.484	0.260	-0.670	-0.865	-0.283	-0.498	0.213	0.113	0.952	0.948	0.702	0.970	0.952	0.997	0.803	0.960	0.802	0.959
rega	0.296	0.313	-2.559	-3.768	-1.383	-1.440	-1.695	-1.657	0.435	0.341	8.915	8.599	7.229	7.228	4.599	4.798	-1.595	-1.846	-0.471	-4.935	-0.855	-1.904	-0.577	-3.117	-0.456	-2.962
regb	0.805	0.794	1.501	1.634	1.154	1.150	1.234	1.216	-0.339	0.046	-0.044	-0.043	-0.043	-0.067	0.149	0.077	1.189	1.198	1.158	1.747	1.089	1.208	1.045	1.374	1.020	1.342

Computed statistical parameters for case: f51fri03
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.100	0.218	0.101	0.487	-0.790	-0.669	-0.864	-0.721	-0.240	-0.125	-27.086	-28.305	-11.576	-12.424	-3.539	-3.899	-0.822	-0.852	-1.478	-2.022	-0.467	-0.320	-3.175	-3.916	-3.255	-3.996
mae	0.299	0.432	0.719	0.717	0.915	0.782	0.910	0.819	0.240	0.125	27.086	28.305	11.576	12.424	4.027	3.899	1.185	0.960	3.040	3.183	0.902	0.530	4.119	4.126	4.198	4.206
rms	0.345	0.478	0.875	0.887	0.975	0.863	1.020	0.929	0.292	0.146	36.150	37.763	21.364	22.306	7.295	7.507	1.307	1.134	4.999	5.621	0.924	0.604	7.521	8.142	7.525	8.145
sci	0.307	0.426	0.143	0.145	0.198	0.175	0.227	0.207	0.617	0.309	1.014	1.059	1.127	1.177	0.751	0.773	0.221	0.192	0.580	0.652	0.152	0.099	0.777	0.841	0.771	0.835
mpi	0.855	0.799	0.815	0.812	0.662	0.700	0.570	0.609	-1.208	-0.106	-0.059	-0.106	-0.082	-0.130	-0.254	-0.290	0.567	0.624	-0.062	-0.194	0.771	0.850	-0.162	-0.258	-0.162	-0.257
opi	0.104	0.144	0.084	0.085	0.132	0.117	0.156	0.141	0.675	0.338	3.510	3.667	2.185	2.281	0.796	0.819	0.156	0.135	0.512	0.576	0.096	0.063	0.799	0.865	0.782	0.846
std	0.369	0.475	0.971	0.829	0.640	0.611	0.607	0.654	0.186	0.085	26.767	27.948	20.074	20.712	7.132	7.171	1.136	0.837	5.339	5.863	0.891	0.573	7.623	7.980	7.586	7.935
d1	0.799	0.698	0.878	0.870	0.707	0.743	0.654	0.675	0.265	0.409	0.411	0.400	0.546	0.529	0.489	0.527	0.673	0.741	0.496	0.549	0.816	0.891	0.485	0.528	0.479	0.522
d2	0.953	0.905	0.979	0.977	0.908	0.923	0.860	0.874	0.363	0.676	0.420	0.399	0.412	0.402	0.439	0.452	0.879	0.911	0.509	0.520	0.967	0.985	0.437	0.436	0.444	0.442
corr	0.936	0.886	0.988	0.979	0.936	0.943	0.916	0.899	0.014	0.772	-0.360	-0.751	-0.156	-0.353	-0.087	-0.079	0.859	0.923	0.163	0.089	0.953	0.985	-0.001	-0.123	0.014	-0.106
rega	0.365	0.574	-1.467	-0.375	-0.214	0.096	-0.454	-0.015	0.226	0.098	10.037	10.558	7.792	7.556	6.498	6.123	-0.255	-0.617	6.371	6.067	0.142	0.383	6.504	6.196	6.457	6.138
regb	0.764	0.683	1.257	1.141	0.883	0.845	0.909	0.843	0.014	0.528	-0.041	-0.090	-0.022	-0.054	-0.034	-0.032	0.904	0.960	0.090	0.062	0.900	0.884	0.000	-0.045	0.005	-0.039

Computed statistical parameters for case: f61wes01
Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.293	0.331	0.497	0.647	-0.377	-0.286	-0.727	-0.664	0.118	0.091	-3.291	-2.597	-0.614	-0.155	-0.142	0.141	-0.136	0.030	-0.003	0.146	0.149	0.278	-0.278	-0.149	-0.341	-0.212
mae	0.293	0.331	0.626	0.683	0.377	0.334	0.727	0.664	0.131	0.103	3.291	3.479	0.640	0.881	0.292	0.454	0.272	0.354	0.737	0.635	0.436	0.540	0.455	0.370	0.518	0.433
rms	0.294	0.336	0.686	0.810	0.457	0.422	0.766	0.721	0.173	0.149	4.671	4.702	0.829	0.962	0.362	0.517	0.328	0.384	0.832	0.753	0.491	0.610	0.526	0.432	0.583	0.501
sci	0.200	0.229	0.132	0.156	0.110	0.102	0.199	0.187	0.636	0.548	0.479	0.482	0.128	0.148	0.067	0.095	0.069	0.081	0.146	0.132	0.096	0.119	0.095	0.078	0.104	0.089
mpi	0.898	0.883	0.820	0.788	-99.999	-99.999	0.721	0.737	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.069	0.079	0.081	0.096	-99.999	-99.999	0.137	0.129	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.027	0.059	0.511	0.527	0.280	0.335	0.258	0.305	0.137	0.128	3.580	4.233	0.602	1.026	0.359	0.537	0.323	0.413	0.899	0.798	0.506	0.587	0.482	0.438	0.511	0.491
d1	0.847	0.824	0.846	0.826	0.858	0.871	0.693	0.714	0.452	0.518	0.591	0.527	0.830	0.734	0.911	0.849	0.910	0.877	0.794	0.815	0.886	0.854	0.866	0.887	0.851	0.871
d2	0.980	0.974	0.975	0.963	0.972	0.975	0.904	0.910	0.537	0.609	0.678	0.602	0.955	0.923	0.989	0.974	0.989	0.984	0.951	0.957	0.985	0.975	0.978	0.984	0.974	0.979
corr	1.000	0.999	0.979	0.973	0.983	0.978	0.983	0.978	0.351	0.490	0.937	0.880	0.977	0.945	0.982	0.966	0.982	0.974	0.969	0.962	0.977	0.972	0.982	0.978	0.973	0.968
rega	0.308	0.372	0.244	0.771	-0.099	0.196	-0.346	-0.148	0.362	0.306	3.221	5.162	0.629	2.394	0.063	1.146	0.069	0.651	-2.296	-1.583	0.700	1.099	-1.161	-0.661	-0.889	-0.400
regb	0.989	0.972	1.049	0.976	0.933	0.884	0.901	0.866	0.101	0.207	0.333	0.205	0.808	0.607	0.962	0.814	0.957	0.869	1.403	1.304	0.892	0.840	1.159	1.092	1.098	1.034

Computed statistical parameters for case: f61wes02
Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.379	0.482	-0.128	0.023	-0.498	-0.375	-0.650	-0.558	-0.004	-0.005	-3.382	-3.153	-1.044	-0.833	-0.494	-0.305	-0.412	-0.250	0.078	0.228	-0.177	0.011	-0.284	-0.096	-0.284	-0.096
mae	0.379	0.482	1.059	1.059	0.534	0.489	0.650	0.587	0.079	0.085	3.382	3.240	1.124	0.997	0.595	0.569	0.515	0.501	0.853	0.853	0.672	0.635	0.779	0.742	0.779	0.742
rms	0.405	0.530	1.409	1.306	0.635	0.579	0.732	0.682	0.112	0.121	3.849	3.682	1.273	1.092	0.777	0.652	0.649	0.570	1.006	0.973	0.778	0.759	0.953	0.848	0.953	0.848
sci	0.256	0.335	0.222	0.206	0.127	0.115	0.154	0.144	0.261	0.281	0.396	0.379	0.181	0.155	0.128	0.107	0.117	0.103	0.164	0.159	0.132	0.129	0.159	0.141	0.159	0.141
mpi	0.819	0.763	0.424	0.466	-99.999	-99.999	0.538	0.570	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.107	0.140	0.183	0.170	-99.999	-99.999	0.131	0.122	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.153	0.237	1.516	1.410	0.425	0.477	0.363	0.425	0.121	0.130	1.986	2.053	0.786	0.762	0.649	0.623	0.541	0.553	1.083	1.022	0.818	0.820	0.982	0.910	0.982	0.910
d1	0.759	0.690	0.674	0.659	0.725	0.730	0.622	0.638	0.407	0.321	0.433	0.435	0.639	0.658	0.780	0.774	0.778	0.768	0.720	0.705	0.747	0.744	0.718	0.713	0.718	0.713
d2	0.948	0.911	0.817	0.830	0.903	0.910	0.839	0.847	0.442	0.274	0.632	0.638	0.857	0.882	0.924	0.940	0.929	0.939	0.897	0.898	0.922	0.920	0.888	0.902	0.888	0.902
corr	0.987	0.971	0.666	0.705	0.940	0.931	0.948	0.932	0.374	0.174	0.878	0.891	0.930	0.957	0.923	0.943	0.929	0.937	0.808	0.824	0.878	0.884	0.822	0.857	0.822	0.857
rega	0.449	0.662	2.549	2.671	0.624	1.087	0.495	0.920	0.366	0.397	2.152	2.717	1.003	1.528	0.942	1.434	0.814	1.297	1.486	1.777	1.497	1.956	1.762	2.076	1.762	2.076
regb	0.956	0.886	0.578	0.582	0.776	0.708	0.758	0.688	0.138	0.059	0.431	0.396	0.709	0.664	0.764	0.714	0.778	0.720	0.771	0.748	0.716	0.670	0.659	0.639	0.659	0.639

Computed statistical parameters for case: f61wes03
Total number of observation stations : 12
Number of stations at which observations are available : 9
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.084	0.183	-0.687	-0.365	-0.705	-0.573	-0.823	-0.721	0.008	0.004	-7.319	-7.084	-1.931	-1.714	-0.793	-0.597	-0.647	-0.479	-0.579	-0.256	-0.472	-0.270	-0.511	-0.308	-0.581	-0.378
mae	0.197	0.281	1.147	1.223	0.735	0.660	0.823	0.727	0.068	0.069	7.319	7.105	1.931	1.767	0.885	0.766	0.747	0.659	1.083	1.098	0.731	0.740	0.870	0.891	0.839	0.821
rms	0.230	0.325	1.523	1.508	0.910	0.862	0.980	0.937	0.091	0.091	10.188	10.081	2.581	2.461	1.088	0.993	0.906	0.845	1.348	1.317	0.932	0.912	1.063	1.041	1.035	0.996
sci	0.152	0.215	0.257	0.254	0.183	0.173	0.207	0.198	0.221	0.223	0.760	0.752	0.338	0.323	0.179	0.164	0.166	0.155	0.232	0.226	0.161	0.157	0.182	0.178	0.175	0.169
mpi	0.933	0.905	0.548	0.552	-99.999	-99.999	0.554	0.574	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.048	0.068	0.164	0.162	-99.999	-99.999	0.146	0.140	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.229	0.288	1.453	1.565	0.614	0.688	0.570	0.640	0.096	0.097	7.577	7.668	1.832	1.887	0.797	0.848	0.677	0.744	1.302	1.381	0.859	0.932	0.997	1.063	0.916	0.985
d1	0.865	0.796	0.633	0.563	0.663	0.676	0.599	0.623	0.600	0.571	0.444	0.451	0.520	0.536	0.697	0.719	0.702	0.718	0.622	0.568	0.731	0.707	0.689	0.658	0.702	0.687
d2	0.982	0.962	0.778	0.740	0.841	0.840	0.789	0.784	0.786	0.755	0.481	0.475	0.661	0.658	0.870	0.878	0.881	0.884	0.802	0.773	0.898	0.891	0.870	0.860	0.878	0.874
corr	0.969	0.948	0.669	0.570	0.869	0.820	0.858	0.807	0.666	0.659	0.204	0.154	0.596	0.546	0.893	0.856	0.893	0.852	0.720	0.627	0.883	0.833	0.830	0.780	0.860	0.812
rega	0.083	0.284	0.816	2.140	-0.417	0.250	-0.382	0.230	0.227	0.248	5.311	5.779	1.363	2.221	-1.266	-0.388	-0.833	-0.063	-0.108	1.332	-1.285	-0.341	-0.609	0.275	-0.973	-0.073
regb	1.001	0.933	0.746	0.578	0.942	0.834	0.907	0.799	0.466	0.406	0.058	0.041	0.568	0.484	1.078	0.965	1.034	0.924	0.919	0.727	1.140	1.012	1.017	0.900	1.066	0.948

Computed statistical parameters for case: f61wes04
Total number of observation stations : 12
Number of stations at which observations are available : 10
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.064	0.134	0.188	0.236	-0.582	-0.481	-0.864	-0.792	0.037	0.025	-6.935	-6.382	-1.528	-1.158	-0.381	-0.135	-0.372	-0.209	0.022	0.040	-0.240	-0.106	-0.153	-0.018	-0.306	-0.171
mae	0.131	0.191	0.987	0.940	0.582	0.507	0.864	0.792	0.114	0.103	7.011	6.889	1.565	1.518	0.409	0.392	0.372	0.355	0.293	0.327	0.588	0.749	0.289	0.314	0.442	0.467
rms	0.171	0.253	1.328	1.320	0.655	0.631	0.904	0.870	0.147	0.138	12.939	12.906	2.895	2.874	0.515	0.508	0.483	0.486	0.421	0.435	0.904	0.979	0.456	0.384	0.624	0.579
sci	0.125	0.186	0.264	0.262	0.162	0.156	0.239	0.230	0.442	0.417	0.991	0.988	0.414	0.411	0.099	0.097	0.106	0.106	0.080	0.083	0.180	0.195	0.089	0.075	0.118	0.109
mpi	0.947	0.922	0.723	0.725	-99.999	-99.999	0.733	0.743	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.039	0.057	0.143	0.142	-99.999	-99.999	0.133	0.128	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.168	0.228	1.394	1.378	0.317	0.433	0.283	0.381	0.150	0.144	11.586	11.898	2.608	2.790	0.368	0.520	0.326	0.465	0.446	0.460	0.925	1.032	0.456	0.407	0.577	0.587
d1	0.917	0.875	0.751	0.760	0.781	0.801	0.658	0.677	0.374	0.392	0.538	0.529	0.682	0.667	0.884	0.880	0.880	0.878	0.919	0.907	0.845	0.795	0.921	0.911	0.887	0.876
d2	0.992	0.981	0.912	0.913	0.948	0.949	0.886	0.888	0.479	0.489	0.447	0.416	0.694	0.655	0.981	0.980	0.979	0.977	0.989	0.988	0.951	0.940	0.987	0.990	0.978	0.980
corr	0.990	0.981	0.843	0.846	0.982	0.965	0.983	0.967	0.243	0.300	-0.008	-0.188	0.499	0.391	0.983	0.967	0.985	0.970	0.981	0.978	0.928	0.910	0.979	0.981	0.967	0.966
rega	0.196	0.314	1.211	1.270	-0.153	0.147	-0.430	-0.191	0.324	0.306	6.147	7.135	2.774	3.916	-0.222	0.449	-0.024	0.418	-0.258	-0.100	0.921	1.261	-0.334	-0.027	0.038	0.349
regb	0.904	0.868	0.797	0.795	0.894	0.845	0.885	0.841	0.136	0.155	-0.002	-0.035	0.385	0.275	0.970	0.888	0.924	0.863	1.054	1.027	0.769	0.728	1.035	1.002	0.935	0.902

Computed statistical parameters for case: f61wes05
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01

bias	-0.069	-0.076	0.361	0.361	-0.623	-0.587	-0.978	-0.950	-0.038	-0.037	-13.892	-13.854	-2.311	-2.272	-0.347	-0.307	-0.293	-0.252	0.334	0.363	0.020	0.043	0.536	0.561	0.550	0.554
mae	0.225	0.227	0.573	0.573	0.623	0.587	0.978	0.950	0.042	0.039	13.892	13.854	2.311	2.272	0.569	0.536	0.293	0.252	0.425	0.425	0.872	0.809	0.536	0.561	0.895	0.863
rms	0.227	0.228	0.706	0.706	0.647	0.605	1.026	0.990	0.049	0.047	15.538	15.501	2.727	2.686	0.611	0.567	0.377	0.328	0.534	0.548	0.984	0.914	0.598	0.613	0.957	0.925
sci	0.074	0.074	0.082	0.082	0.107	0.100	0.188	0.181	0.135	0.130	0.651	0.650	0.239	0.236	0.073	0.067	0.053	0.046	0.064	0.066	0.122	0.113	0.076	0.078	0.118	0.114
mpi	0.937	0.937	0.716	0.716	-99.999	-99.999	0.602	0.615	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.032	0.032	0.069	0.069	-99.999	-99.999	0.158	0.151	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.264	0.264	0.743	0.743	0.216	0.182	0.380	0.340	0.038	0.035	8.523	8.515	1.773	1.754	0.616	0.584	0.290	0.258	0.510	0.503	1.204	1.118	0.326	0.304	0.959	0.907
d1	0.794	0.793	0.817	0.817	0.439	0.454	0.296	0.302	0.477	0.500	0.277	0.277	0.246	0.249	0.634	0.661	0.784	0.811	0.782	0.783	0.675	0.701	0.752	0.742	0.640	0.653
d2	0.962	0.962	0.952	0.952	0.720	0.747	0.460	0.480	0.664	0.688	0.368	0.369	0.233	0.237	0.886	0.902	0.941	0.955	0.927	0.924	0.882	0.898	0.924	0.921	0.855	0.863
corr	0.943	0.943	0.965	0.965	0.978	0.987	0.795	0.857	0.810	0.884	-0.931	-0.922	-0.206	-0.180	0.854	0.871	0.952	0.963	0.982	0.984	0.804	0.830	0.986	0.989	0.820	0.839
rega	0.502	0.475	-1.868	-1.868	0.984	0.782	2.164	1.851	0.160	0.155	13.117	13.127	11.720	11.425	0.292	0.144	0.108	-0.031	3.106	3.120	0.178	0.017	1.962	1.942	2.705	2.696
regb	0.814	0.821	1.260	1.260	0.733	0.773	0.426	0.488	0.455	0.469	-0.132	-0.131	-0.231	-0.202	0.924	0.946	0.944	0.969	0.667	0.668	0.980	1.003	0.818	0.824	0.733	0.735

Computed statistical parameters for case: f61wes06
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.080	0.082	0.731	0.731	-0.611	-0.613	-0.928	-0.942	0.000	0.003	-10.379	-10.378	-1.870	-1.865	-0.396	-0.388	-0.338	-0.331	-0.100	-0.092	-0.021	-0.009	-0.022	-0.014	0.000	0.005
mae	0.255	0.263	0.731	0.731	0.611	0.613	0.928	0.942	0.045	0.045	10.379	10.378	1.870	1.865	0.396	0.388	0.338	0.331	0.271	0.265	0.863	0.825	0.390	0.376	0.829	0.811
rms	0.312	0.322	0.821	0.821	0.691	0.682	1.028	1.030	0.049	0.049	11.724	11.713	2.071	2.053	0.578	0.548	0.470	0.443	0.274	0.269	1.050	1.010	0.432	0.431	0.886	0.865
sci	0.105	0.108	0.100	0.100	0.113	0.111	0.184	0.184	0.149	0.150	0.580	0.580	0.191	0.189	0.069	0.065	0.065	0.062	0.033	0.032	0.130	0.125	0.054	0.053	0.107	0.105
mpi	0.904	0.901	0.686	0.686	0.689	0.693	0.549	0.548	0.677	0.674	-0.058	-0.057	-0.055	-0.046	0.628	0.648	0.758	0.772	0.865	0.868	0.486	0.506	0.762	0.763	0.498	0.510
opi	0.045	0.046	0.080	0.080	0.092	0.091	0.159	0.159	0.096	0.096	1.128	1.125	0.208	0.206	0.062	0.058	0.054	0.051	0.027	0.026	0.106	0.102	0.044	0.043	0.090	0.087
std	0.370	0.381	0.458	0.458	0.395	0.365	0.541	0.511	0.060	0.060	6.680	6.653	1.090	1.053	0.516	0.473	0.399	0.360	0.312	0.310	1.286	1.237	0.529	0.527	1.085	1.060
d1	0.729	0.723	0.805	0.805	0.480	0.479	0.316	0.313	0.328	0.323	0.363	0.363	0.479	0.480	0.776	0.779	0.767	0.770	0.884	0.887	0.651	0.670	0.813	0.821	0.652	0.662
d2	0.906	0.902	0.953	0.953	0.705	0.717	0.435	0.446	0.504	0.493	0.501	0.502	0.722	0.727	0.919	0.927	0.916	0.925	0.988	0.989	0.844	0.857	0.962	0.963	0.877	0.884
corr	0.837	0.827	0.981	0.981	0.901	0.924	0.524	0.606	0.279	0.239	0.999	0.997	0.981	0.986	0.926	0.938	0.926	0.940	0.988	0.989	0.732	0.752	0.971	0.976	0.812	0.825
rega	0.805	0.817	1.223	1.223	2.041	1.864	3.276	3.038	0.273	0.288	6.939	6.871	3.292	3.147	1.464	1.259	1.234	1.046	-1.143	-1.178	1.690	1.525	-2.589	-2.751	-0.606	-0.770
regb	0.756	0.753	0.940	0.940	0.568	0.596	0.247	0.288	0.170	0.132	0.143	0.146	0.524	0.538	0.779	0.804	0.781	0.809	1.125	1.130	0.789	0.811	1.319	1.340	1.073	1.094

Computed statistical parameters for case: f61wes07
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.036	0.041	0.623	0.623	-0.596	-0.597	-0.843	-0.854	-0.009	-0.003	-10.801	-10.796	-1.968	-1.960	-0.543	-0.533	-0.430	-0.420	0.082	0.089	-0.229	-0.224	-0.179	-0.193	-0.373	-0.387
mae	0.320	0.328	0.623	0.623	0.596	0.597	0.843	0.854	0.071	0.070	10.801	10.796	1.968	1.960	0.543	0.533	0.430	0.420	0.688	0.681	0.730	0.697	0.655	0.666	0.849	0.861
rms	0.373	0.385	0.733	0.733	0.730	0.719	0.965	0.965	0.079	0.078	10.943	10.934	2.138	2.120	0.764	0.738	0.625	0.600	0.786	0.783	0.927	0.874	0.667	0.688	0.863	0.870
sci	0.129	0.133	0.088	0.088	0.117	0.116	0.170	0.170	0.237	0.233	0.535	0.535	0.198	0.196	0.090	0.087	0.086	0.082	0.093	0.092	0.113	0.106	0.080	0.083	0.101	0.102
mpi	0.863	0.859	0.697	0.697	-99.999	-99.999	0.499	0.499	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.062	0.063	0.072	0.072	-99.999	-99.999	0.147	0.148	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.455	0.468	0.474	0.474	0.515	0.491	0.575	0.551	0.096	0.095	2.158	2.127	1.026	0.990	0.658	0.624	0.556	0.524	0.957	0.953	1.100	1.035	0.787	0.809	0.953	0.954
d1	0.657	0.648	0.825	0.825	0.528	0.528	0.390	0.386	0.327	0.309	0.151	0.151	0.371	0.372	0.677	0.681	0.713	0.718	0.723	0.726	0.693	0.711	0.667	0.668	0.581	0.584
d2	0.862	0.853	0.959	0.959	0.740	0.751	0.550	0.560	0.470	0.435	0.267	0.268	0.614	0.621	0.852	0.863	0.865	0.877	0.911	0.911	0.874	0.891	0.906	0.904	0.861	0.865
corr	0.766	0.752	0.978	0.978	0.824	0.843	0.573	0.622	0.300	0.328	0.605	0.624	0.815	0.829	0.864	0.879	0.873	0.888	0.926	0.929	0.787	0.816	0.917	0.926	0.814	0.827
rega	0.990	1.018	0.483	0.483	2.311	2.125	3.138	2.898	0.292	0.299	5.332	5.046	3.439	3.182	2.143	1.897	1.945	1.740	-3.843	-3.886	2.057	1.660	-3.584	-4.070	-0.617	-1.041
regb	0.670	0.662	1.017	1.017	0.533	0.563	0.297	0.337	0.100	0.097	0.211	0.225	0.500	0.524	0.683	0.713	0.674	0.704	1.462	1.468	0.723	0.771	1.409	1.466	1.029	1.077

Computed statistical parameters for case: f61wes08
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.007	0.027	0.731	0.731	-0.323	-0.356	-0.593	-0.636	0.009	0.012	-10.957	-10.977	-1.817	-1.837	-0.222	-0.243	-0.108	-0.131	1.044	0.689	0.125	0.105	0.365	0.434	0.123	0.192
mae	0.453	0.471	0.731	0.731	0.350	0.369	0.593	0.636	0.028	0.029	10.957	10.977	1.817	1.837	0.547	0.563	0.461	0.437	1.044	0.784	0.933	0.897	0.804	0.692	0.930	0.819
rms	0.503	0.519	0.821	0.821	0.562	0.582	0.754	0.792	0.029	0.030	11.480	11.490	2.194	2.198	0.722	0.712	0.552	0.546	1.106	0.976	0.988	0.973	0.876	0.819	0.987	0.880
sci	0.171	0.176	0.100	0.100	0.091	0.094	0.134	0.141	0.093	0.096	0.547	0.547	0.200	0.200	0.086	0.084	0.077	0.076	0.133	0.117	0.121	0.119	0.107	0.100	0.117	0.104
mpi	0.805	0.798	0.705	0.705	-99.999	-99.999	0.651	0.634	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.090	0.092	0.080	0.080	-99.999	-99.999	0.111	0.117	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.617	0.635	0.458	0.458	0.564	0.563	0.572	0.578	0.034	0.033	4.196	4.157	1.507	1.477	0.841	0.819	0.663	0.649	0.447	0.847	1.200	1.184	0.975	0.850	1.199	1.052
d1	0.528	0.504	0.805	0.805	0.727	0.716	0.492	0.474	0.543	0.494	0.238	0.238	0.430	0.427	0.674	0.670	0.702	0.721	0.575	0.634	0.634	0.655	0.545	0.635	0.497	0.586
d2	0.742	0.721	0.953	0.953	0.842	0.837	0.681	0.669	0.806	0.774	0.369	0.369	0.588	0.594	0.854	0.864	0.893	0.898	0.802	0.793	0.862	0.872	0.760	0.816	0.736	0.814

corr	0.549	0.521	0.981	0.981	0.789	0.789	0.653	0.645	0.696	0.668	0.423	0.451	0.594	0.614	0.785	0.798	0.824	0.833	0.963	0.793	0.771	0.781	0.658	0.756	0.599	0.705
rega	1.430	1.528	1.223	1.223	1.925	1.825	2.398	2.336	0.080	0.111	8.470	8.234	5.734	5.394	2.998	2.659	2.105	1.875	-0.174	2.000	2.964	2.626	3.196	2.085	4.453	3.501
regb	0.518	0.492	0.940	0.940	0.635	0.646	0.468	0.472	0.773	0.681	0.075	0.085	0.313	0.342	0.618	0.656	0.693	0.722	1.146	0.843	0.653	0.692	0.654	0.798	0.487	0.608

Computed statistical parameters for case: f61wes09
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	0.072	0.083	-0.085	-0.085	-0.558	-0.547	-0.760	-0.757	-0.021	-0.016	-7.037	-7.019	-1.560	-1.539	-0.528	-0.507	-0.431	-0.411	0.138	0.135	-0.202	-0.138	0.045	0.108	-0.252	-0.190
mae	0.331	0.344	0.374	0.374	0.558	0.547	0.760	0.757	0.065	0.065	7.037	7.019	1.560	1.539	0.528	0.507	0.431	0.411	0.247	0.250	0.472	0.410	0.398	0.337	0.470	0.409
rms	0.354	0.368	0.435	0.435	0.629	0.620	0.834	0.835	0.074	0.075	7.906	7.877	1.838	1.809	0.698	0.671	0.539	0.517	0.341	0.342	0.616	0.513	0.468	0.417	0.615	0.513
sci	0.121	0.125	0.053	0.053	0.101	0.100	0.148	0.148	0.204	0.207	0.483	0.482	0.181	0.178	0.084	0.081	0.075	0.072	0.041	0.041	0.075	0.063	0.058	0.051	0.073	0.061
mpi	0.829	0.823	0.793	0.793	0.620	0.625	0.509	0.509	0.439	0.430	-0.182	-0.178	-0.300	-0.280	0.429	0.452	0.635	0.650	0.727	0.727	0.644	0.703	0.658	0.695	0.534	0.612
opi	0.064	0.067	0.047	0.047	0.086	0.085	0.128	0.128	0.147	0.149	0.812	0.808	0.197	0.193	0.079	0.076	0.066	0.063	0.037	0.037	0.066	0.055	0.050	0.045	0.066	0.055
std	0.425	0.439	0.523	0.523	0.357	0.359	0.422	0.431	0.087	0.090	4.411	4.379	1.191	1.165	0.559	0.538	0.398	0.384	0.382	0.385	0.712	0.605	0.570	0.494	0.688	0.584
d1	0.626	0.610	0.887	0.887	0.576	0.586	0.424	0.425	0.453	0.435	0.338	0.339	0.433	0.436	0.651	0.663	0.704	0.716	0.880	0.879	0.797	0.829	0.757	0.802	0.729	0.773
d2	0.867	0.857	0.985	0.985	0.826	0.832	0.672	0.673	0.718	0.696	0.467	0.469	0.623	0.632	0.857	0.867	0.899	0.907	0.975	0.975	0.941	0.961	0.926	0.944	0.900	0.933
corr	0.773	0.760	0.981	0.981	0.926	0.923	0.816	0.807	1.000	0.999	0.692	0.707	0.720	0.734	0.887	0.895	0.938	0.941	0.968	0.968	0.910	0.937	0.869	0.910	0.850	0.894
rega	0.642	0.680	1.112	1.112	1.065	1.010	1.179	1.109	0.225	0.238	7.559	7.463	4.605	4.410	1.795	1.603	1.181	1.069	-0.767	-0.804	1.572	1.287	0.264	-0.289	1.847	1.388
regb	0.806	0.796	0.854	0.854	0.738	0.749	0.656	0.669	0.319	0.296	0.107	0.114	0.393	0.414	0.720	0.746	0.777	0.795	1.108	1.112	0.783	0.826	0.973	1.049	0.751	0.813

Computed statistical parameters for case: f61wes10
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	-0.033	0.026	-0.455	-0.455	-0.482	-0.538	-0.803	-0.881	0.006	0.012	-6.866	-6.891	-1.124	-1.151	-0.228	-0.258	-0.237	-0.274	0.456	0.428	0.098	0.099	0.355	0.354	0.140	0.139
mae	0.288	0.337	1.254	1.254	0.543	0.577	0.803	0.881	0.019	0.022	6.866	6.891	1.124	1.151	0.503	0.532	0.512	0.542	0.797	0.826	0.645	0.667	0.491	0.570	0.603	0.627
rms	0.344	0.374	1.589	1.589	0.643	0.693	0.905	0.981	0.019	0.023	7.401	7.402	1.214	1.223	0.523	0.543	0.527	0.554	0.823	0.842	0.728	0.749	0.660	0.703	0.713	0.729
sci	0.117	0.127	0.185	0.185	0.107	0.115	0.165	0.178	0.054	0.066	0.466	0.466	0.128	0.129	0.067	0.069	0.076	0.080	0.101	0.103	0.093	0.096	0.085	0.090	0.089	0.091
mpi	0.801	0.784	-0.967	-0.967	-99.999	-99.999	0.421	0.372	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.070	0.076	0.171	0.171	-99.999	-99.999	0.145	0.157	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.420	0.457	1.865	1.865	0.522	0.535	0.511	0.531	0.022	0.024	3.384	3.309	0.562	0.504	0.577	0.585	0.576	0.589	0.839	0.888	0.884	0.910	0.682	0.744	0.856	0.876
d1	0.603	0.536	0.287	0.287	0.454	0.439	0.321	0.301	0.818	0.788	0.306	0.305	0.402	0.397	0.543	0.538	0.507	0.495	0.394	0.386	0.667	0.668	0.633	0.598	0.612	0.616
d2	0.794	0.766	0.363	0.363	0.722	0.706	0.569	0.545	0.968	0.951	0.453	0.456	0.663	0.673	0.825	0.831	0.808	0.806	0.609	0.608	0.871	0.874	0.762	0.760	0.798	0.809
corr	0.759	0.731	0.500	0.500	0.696	0.700	0.612	0.601	0.968	0.968	0.998	1.000	0.894	0.907	0.738	0.756	0.721	0.736	0.994	0.994	0.763	0.775	0.704	0.721	0.626	0.646
rega	-1.061	-1.020	-11.924	-11.924	0.846	0.560	0.857	0.710	0.085	0.106	6.808	6.482	3.004	2.255	1.999	1.268	1.312	0.760	-19.515	-20.717	1.483	0.890	0.114	-0.980	3.419	2.743
regb	1.349	1.355	2.336	2.336	0.779	0.817	0.698	0.711	0.775	0.733	0.140	0.159	0.566	0.642	0.716	0.806	0.776	0.851	3.443	3.586	0.823	0.899	1.031	1.171	0.590	0.674

Computed statistical parameters for case: f61wes11
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

SWAN	Hs [m] v40.01+	v40.01	Tp [s] v40.01+	v40.01	Tm01 [s] v40.01+	v40.01	Tm02 [s] v40.01+	v40.01	fspr [-] v40.01+	v40.01	Tm-4-3 [s] v40.01+	v40.01	Tm-3-2 [s] v40.01+	v40.01	Tm-2-1 [s] v40.01+	v40.01	Tm-10 [s] v40.01+	v40.01	Tpeq [s] v40.01+	v40.01	Tpb [s] v40.01+	v40.01	Tpbeq [s] v40.01+	v40.01	Tpm [s] v40.01+	v40.01
bias	0.416	0.548	0.537	0.864	-0.305	-0.135	-0.529	-0.400	-0.018	-0.016	-2.356	-2.039	-0.539	-0.248	-0.120	0.142	-0.123	0.101	0.408	0.735	0.298	0.595	0.186	0.484	0.186	0.484
mae	0.416	0.548	0.537	0.864	0.305	0.142	0.529	0.400	0.052	0.067	2.369	2.115	0.561	0.394	0.185	0.180	0.165	0.189	0.420	0.735	0.338	0.595	0.328	0.484	0.328	0.484
rms	0.431	0.577	0.612	0.976	0.342	0.220	0.554	0.432	0.063	0.083	2.920	2.641	0.708	0.454	0.250	0.221	0.211	0.204	0.477	0.804	0.408	0.682	0.406	0.609	0.406	0.609
sci	0.448	0.599	0.141	0.225	0.088	0.057	0.149	0.116	0.145	0.191	0.394	0.356	0.133	0.085	0.055	0.048	0.050	0.049	0.107	0.180	0.095	0.159	0.092	0.138	0.092	0.138
mpi	0.825	0.767	0.813	0.702	-99.999	-99.999	0.723	0.784	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.128	0.171	0.080	0.127	-99.999	-99.999	0.114	0.089	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.123	0.198	0.320	0.496	0.169	0.190	0.181	0.179	0.066	0.090	1.889	1.837	0.503	0.416	0.240	0.186	0.188	0.194	0.271	0.357	0.306	0.364	0.395	0.405	0.395	0.405
d1	0.427	0.357	0.519	0.400	0.583	0.806	0.363	0.440	0.352	0.153	0.447	0.467	0.601	0.709	0.820	0.838	0.804	0.792	0.635	0.486	0.648	0.511	0.676	0.595	0.676	0.595
d2	0.683	0.579	0.766	0.587	0.819	0.924	0.615	0.714	0.565	0.225	0.589	0.618	0.814	0.919	0.950	0.966	0.946	0.958	0.857	0.714	0.850	0.734	0.865	0.789	0.865	0.789
corr	0.993	0.971	0.880	0.744	0.914	0.936	0.867	0.909	0.604	0.012	0.885	0.905	0.951	0.974	0.938	0.961	0.930	0.950	0.917	0.877	0.863	0.884	0.802	0.838	0.802	0.838
rega	0.027	-0.014	0.361	0.982	-0.283	-0.921	-0.343	-0.928	0.315	0.417	3.307	3.468	1.818	1.706	0.826	0.451	0.185	-0.378	0.651	0.734	0.462	-0.293	1.269	0.638	1.269	0.638
regb	1.404	1.583	1.040	0.973	0.994	1.203	0.950	1.142	0.236	0.006	0.237	0.258	0.557	0.633	0.793	0.933	0.926	1.114	0.946	1.000	0.962	1.207	0.754	0.965	0.754	0.965

Computed statistical parameters for case: f61wes12
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.293	0.433	-0.027	0.236	-0.695	-0.500	-0.919	-0.767	-0.029	-0.017	-2.461	-2.133	-0.937	-0.637	-0.548	-0.272	-0.537	-0.292	0.118	0.381	-0.193	0.098	-0.209	0.082	-0.247	0.044
mae	0.293	0.433	0.412	0.571	0.695	0.500	0.919	0.767	0.055	0.071	2.461	2.133	0.937	0.637	0.548	0.350	0.537	0.351	0.510	0.668	0.467	0.534	0.476	0.471	0.484	0.479
rms	0.325	0.474	0.472	0.687	0.756	0.605	0.955	0.817	0.075	0.083	2.721	2.424	0.974	0.692	0.629	0.455	0.632	0.489	0.575	0.825	0.541	0.628	0.536	0.588	0.546	0.588
sci	0.309	0.452	0.094	0.137	0.175	0.140	0.230	0.197	0.166	0.182	0.362	0.322	0.170	0.121	0.125	0.090	0.136	0.105	0.118	0.170	0.110	0.128	0.109	0.120	0.110	0.119
mpi	0.857	0.791	0.828	0.750	-99.999	-99.999	0.433	0.515	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
opi	0.098	0.143	0.061	0.089	-99.999	-99.999	0.194	0.166	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.154	0.212	0.517	0.707	0.325	0.373	0.283	0.308	0.076	0.089	1.272	1.261	0.292	0.296	0.339	0.399	0.365	0.430	0.617	0.801	0.553	0.679	0.540	0.638	0.533	0.642
d1	0.541	0.437	0.540	0.507	0.305	0.404	0.227	0.261	0.512	0.384	0.377	0.411	0.441	0.537	0.499	0.662	0.450	0.604	0.485	0.466	0.534	0.499	0.496	0.532	0.490	0.526
d2	0.794	0.673	0.817	0.716	0.524	0.605	0.415	0.465	0.716	0.667	0.579	0.616	0.727	0.821	0.746	0.850	0.666	0.764	0.741	0.636	0.760	0.711	0.737	0.728	0.738	0.733
corr	0.965	0.953	0.732	0.632	0.746	0.740	0.752	0.760	0.728	0.515	0.937	0.923	0.945	0.938	0.860	0.853	0.782	0.773	0.584	0.477	0.687	0.622	0.722	0.711	0.730	0.700
rega	-0.102	-0.134	-0.545	-0.489	-0.409	-0.730	-0.498	-0.795	0.269	0.306	2.327	2.577	0.239	0.128	-0.733	-1.073	-0.624	-0.986	0.817	1.153	-0.301	-0.172	-1.615	-2.092	-1.593	-1.874
regb	1.376	1.540	1.104	1.145	0.934	1.053	0.898	1.007	0.341	0.288	0.364	0.374	0.795	0.867	1.037	1.159	1.019	1.149	0.856	0.841	1.022	1.055	1.286	1.443	1.272	1.388

Computed statistical parameters for case: f81nor01
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.038	0.036	-0.600	-0.567	-0.636	-0.645	-0.467	-0.472	-0.190	-0.184	-16.829	-16.963	-8.119	-8.353	-1.921	-2.060	-0.732	-0.775	0.054	-0.287	-0.279	-0.309	-0.806	-1.013	-0.699	-0.907
mae	0.205	0.203	1.166	1.133	0.636	0.645	0.497	0.505	0.190	0.184	16.829	16.963	8.119	8.353	1.921	2.060	0.759	0.787	1.214	1.043	0.836	0.848	1.501	1.285	1.394	1.179
rms	0.220	0.219	1.410	1.355	0.795	0.804	0.635	0.637	0.210	0.203	18.965	19.020	10.483	10.457	2.339	2.379	0.912	0.961	1.466	1.358	1.028	1.035	1.837	1.770	1.771	1.702
sci	0.341	0.339	0.354	0.340	0.266	0.269	0.264	0.265	0.453	0.439	0.766	0.768	0.737	0.735	0.373	0.379	0.235	0.248	0.299	0.277	0.274	0.276	0.331	0.319	0.319	0.307
mpi	0.912	0.913	0.791	0.799	0.806	0.804	0.832	0.831	-0.138	-0.103	-0.129	-0.132	-0.382	-0.379	0.112	0.097	0.784	0.772	0.704	0.726	0.807	0.806	0.502	0.520	0.520	0.538
opi	0.073	0.073	0.153	0.147	0.119	0.121	0.111	0.111	0.416	0.403	2.081	2.087	1.207	1.204	0.286	0.290	0.121	0.127	0.172	0.159	0.122	0.123	0.213	0.206	0.206	0.198
std	0.238	0.237	1.397	1.348	0.523	0.525	0.471	0.469	0.096	0.093	9.578	9.425	7.264	6.893	1.463	1.302	0.596	0.623	1.605	1.454	1.084	1.082	1.808	1.589	1.782	1.577
d1	0.820	0.822	0.749	0.755	0.767	0.765	0.786	0.783	0.473	0.476	0.293	0.292	0.355	0.349	0.490	0.473	0.756	0.751	0.661	0.733	0.791	0.789	0.546	0.635	0.592	0.675
d2	0.981	0.981	0.939	0.944	0.940	0.939	0.949	0.949	0.710	0.716	0.387	0.386	0.386	0.407	0.662	0.681	0.941	0.936	0.895	0.919	0.959	0.959	0.765	0.806	0.801	0.835
corr	0.977	0.977	0.908	0.915	0.970	0.969	0.979	0.978	0.907	0.920	-0.640	-0.531	-0.657	-0.383	0.715	0.787	0.967	0.962	0.838	0.866	0.928	0.929	0.659	0.748	0.695	0.773
rega	0.152	0.148	0.142	0.170	-0.084	-0.106	0.070	0.057	-0.015	-0.009	9.941	9.366	8.902	7.564	-0.320	-1.176	-0.110	-0.183	1.895	1.087	0.222	0.188	1.460	0.607	1.033	0.185
regb	0.824	0.827	0.814	0.815	0.816	0.820	0.776	0.780	0.619	0.620	-0.082	-0.064	-0.197	-0.119	0.745	0.859	0.840	0.847	0.625	0.720	0.866	0.868	0.592	0.708	0.688	0.803

Computed statistical parameters for case: f81nor02
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.237	0.235	0.304	0.344	-0.322	-0.326	-0.174	-0.177	-0.110	-0.107	-24.449	-24.739	-9.881	-9.978	-1.630	-1.658	-0.495	-0.504	-0.022	0.019	0.218	0.216	-0.340	-0.340	-0.306	-0.308
mae	0.237	0.235	0.572	0.574	0.322	0.326	0.174	0.177	0.132	0.132	24.449	24.739	9.881	9.978	1.630	1.658	0.495	0.504	0.377	0.337	0.664	0.662	0.442	0.438	0.408	0.406
rms	0.276	0.275	0.900	0.900	0.338	0.341	0.198	0.200	0.155	0.154	25.919	26.191	10.830	10.905	1.727	1.750	0.561	0.567	0.410	0.371	1.022	1.022	0.505	0.500	0.462	0.460
sci	0.752	0.747	0.291	0.292	0.142	0.144	0.105	0.106	0.302	0.301	0.894	0.903	0.807	0.812	0.374	0.379	0.185	0.187	0.119	0.107	0.338	0.338	0.142	0.141	0.130	0.130
mpi	0.888	0.889	0.838	0.838	0.920	0.919	0.949	0.948	0.268	0.270	-0.319	-0.333	-0.954	-0.968	0.582	0.576	0.880	0.878	0.925	0.932	0.810	0.810	0.905	0.906	0.913	0.913
opi	0.098	0.098	0.097	0.097	0.054	0.054	0.037	0.038	0.340	0.339	2.790	2.820	1.241	1.249	0.213	0.216	0.076	0.077	0.044	0.040	0.124	0.124	0.061	0.061	0.056	0.056
std	0.156	0.156	0.928	0.911	0.112	0.110	0.103	0.103	0.119	0.122	9.426	9.419	4.858	4.819	0.626	0.614	0.288	0.283	0.449	0.405	1.094	1.095	0.409	0.402	0.379	0.374
d1	0.567	0.570	0.815	0.812	0.819	0.818	0.873	0.871	0.525	0.521	0.194	0.192	0.235	0.233	0.588	0.584	0.808	0.805	0.903	0.912	0.771	0.772	0.889	0.890	0.899	0.899
d2	0.905	0.906	0.959	0.959	0.975	0.975	0.987	0.986	0.766	0.763	0.274	0.272	0.348	0.349	0.831	0.829	0.967	0.966	0.994	0.995	0.938	0.938	0.990	0.990	0.992	0.992
corr	0.989	0.989	0.992	0.992	0.995	0.996	0.994	0.994	0.885	0.874	-0.869	-0.818	-0.212	-0.177	0.961	0.962	0.988	0.988	0.992	0.994	0.985	0.986	0.992	0.992	0.992	0.992
rega	0.114	0.112	-1.010	-0.947	-0.299	-0.314	-0.110	-0.118	0.155	0.163	13.330	12.853	5.356	4.983	-1.078	-1.144	-0.235	-0.259	-0.322	-0.269	-1.494	-1.500	-0.072	-0.080	-0.139	-0.144
regb	1.333	1.334	1.425	1.418	0.990	0.995	0.966	0.969	0.482	0.472	-0.303	-0.297	-0.135	-0.115	0.880	0.888	0.914	0.919	1.087	1.083	1.567	1.568	0.924	0.927	0.953	0.954

Computed statistical parameters for case: f81nor03
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.111	0.109	-0.011	-0.052	-0.681	-0.682	-0.529	-0.529	-0.079	-0.074	-16.801	-16.978	-6.185	-6.321	-1.555	-1.606	-0.824	-0.836	-0.225	-0.555	-0.497	-0.501	-0.263	-0.532	-0.119	-0.390
mae	0.233	0.232	0.595	0.635	0.681	0.682	0.529	0.529	0.142	0.144	16.801	16.978	6.185	6.321	1.555	1.606	0.824	0.836	0.792	1.122	0.643	0.645	0.848	1.047	0.707	0.909
rms	0.264	0.263	0.692	0.715	0.754	0.753	0.583	0.582	0.167	0.172	18.538	18.734	6.606	6.752	1.653	1.718	0.967	0.982	0.955	1.564	0.919	0.923	1.035	1.346	0.975	1.301
sci	0.349	0.347	0.174	0.179	0.235	0.235	0.220	0.219	0.411	0.422	0.783	0.791	0.580	0.592	0.299	0.311	0.243	0.247	0.202	0.330	0.226	0.227	0.220	0.286	0.205	0.273
mpi	0.904	0.905	0.893	0.889	0.809	0.810	0.844	0.844	0.041	0.014	-0.272	-0.286	-1.786	-1.847	0.520	0.501	0.768	0.765	0.834	0.728	0.831	0.830	0.785	0.720	0.797	0.730

opi	0.077	0.077	0.075	0.077	0.111	0.111	0.098	0.097	0.355	0.365	2.019	2.041	0.752	0.768	0.199	0.207	0.126	0.128	0.103	0.169	0.101	0.102	0.114	0.148	0.108	0.144
std	0.263	0.262	0.758	0.781	0.353	0.350	0.269	0.266	0.162	0.170	8.585	8.677	2.543	2.601	0.613	0.667	0.555	0.564	1.017	1.602	0.847	0.850	1.097	1.354	1.060	1.360
d1	0.771	0.772	0.839	0.830	0.715	0.715	0.734	0.734	0.516	0.509	0.273	0.271	0.124	0.122	0.583	0.576	0.723	0.720	0.785	0.708	0.840	0.839	0.760	0.724	0.815	0.778
d2	0.965	0.965	0.980	0.978	0.927	0.928	0.938	0.939	0.707	0.687	0.365	0.361	0.161	0.157	0.831	0.822	0.922	0.920	0.948	0.868	0.964	0.964	0.935	0.900	0.954	0.924
corr	0.941	0.942	0.964	0.963	0.977	0.977	0.980	0.981	0.549	0.494	-0.675	-0.692	-0.314	-0.271	0.951	0.943	0.961	0.959	0.921	0.781	0.951	0.951	0.901	0.838	0.914	0.863
rega	0.157	0.155	-0.256	-0.329	-0.308	-0.319	-0.274	-0.278	0.163	0.186	9.980	10.076	10.847	10.222	-1.193	-1.324	-0.246	-0.280	0.871	1.060	-0.543	-0.548	1.005	0.711	0.565	0.262
regb	0.939	0.940	1.061	1.070	0.884	0.887	0.904	0.905	0.405	0.362	-0.131	-0.143	-0.494	-0.451	0.934	0.949	0.855	0.860	0.769	0.659	1.011	1.012	0.730	0.736	0.857	0.863

Computed statistical parameters for case: f81nor04
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.026	-0.028	3.277	3.277	-0.696	-0.708	-0.466	-0.474	-0.145	-0.145	-15.797	-15.937	-7.269	-7.337	-1.384	-1.420	-0.728	-0.746	0.357	0.414	3.167	3.153	-0.041	-0.065	1.560	1.539
mae	0.139	0.137	4.166	4.166	0.842	0.829	0.561	0.552	0.194	0.196	15.797	15.937	7.269	7.337	1.773	1.788	1.259	1.246	1.968	2.023	3.872	3.859	1.645	1.631	2.089	2.080
rms	0.163	0.161	6.032	6.032	1.081	1.072	0.696	0.689	0.222	0.225	18.332	18.426	9.017	8.936	1.975	1.971	1.609	1.597	2.809	2.849	6.114	6.088	2.357	2.335	3.191	3.167
sci	0.423	0.417	1.570	1.570	0.395	0.392	0.338	0.335	0.467	0.473	0.693	0.697	0.603	0.598	0.306	0.305	0.416	0.413	0.478	0.485	1.537	1.531	0.386	0.382	0.522	0.519
mpi	0.804	0.807	0.343	0.343	0.635	0.638	0.672	0.675	0.126	0.116	-0.190	-0.196	-0.688	-0.673	0.590	0.591	0.664	0.666	0.541	0.534	0.314	0.317	0.572	0.576	0.538	0.541
opi	0.141	0.139	0.489	0.489	0.244	0.242	0.220	0.218	0.699	0.708	1.455	1.463	0.780	0.773	0.200	0.200	0.222	0.220	0.263	0.267	0.521	0.519	0.211	0.209	0.272	0.270
std	0.176	0.174	5.547	5.547	0.905	0.882	0.566	0.548	0.185	0.189	10.188	10.131	5.846	5.589	1.543	1.497	1.572	1.547	3.052	3.088	5.728	5.705	2.581	2.557	3.049	3.033
d1	0.699	0.706	0.444	0.444	0.600	0.609	0.598	0.608	0.386	0.378	0.301	0.299	0.355	0.353	0.638	0.636	0.620	0.624	0.678	0.673	0.511	0.511	0.716	0.718	0.717	0.718
d2	0.911	0.914	0.537	0.537	0.788	0.793	0.799	0.805	0.559	0.545	0.371	0.369	0.458	0.474	0.866	0.867	0.826	0.829	0.838	0.834	0.568	0.570	0.870	0.872	0.843	0.845
corr	0.929	0.931	0.342	0.342	0.895	0.909	0.907	0.921	0.424	0.395	-0.588	-0.468	0.064	0.154	0.868	0.876	0.831	0.840	0.722	0.717	0.348	0.352	0.771	0.774	0.827	0.828
rega	0.134	0.130	4.887	4.887	0.676	0.642	0.519	0.489	0.188	0.199	15.230	14.588	6.982	5.901	0.023	-0.065	1.135	1.098	1.861	1.931	5.146	5.118	1.171	1.143	0.497	0.475
regb	0.583	0.590	0.581	0.581	0.498	0.506	0.521	0.531	0.300	0.278	-0.174	-0.155	0.047	0.115	0.782	0.790	0.519	0.524	0.744	0.742	0.502	0.506	0.802	0.802	1.174	1.174

Computed statistical parameters for case: f91pet01
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.184	-0.184	-0.474	-0.474	0.237	0.234	-0.110	-0.113	0.091	0.090	-1.126	-1.126	-0.586	-0.588	-0.100	-0.103	0.228	0.226	1.119	1.118	0.520	0.518	1.093	1.092	0.704	0.703
mae	0.247	0.248	1.250	1.250	0.237	0.234	0.339	0.337	0.091	0.090	1.126	1.126	0.586	0.588	0.216	0.218	0.228	0.226	1.119	1.118	0.773	0.774	1.093	1.092	0.704	0.703
rms	0.308	0.309	1.337	1.337	0.321	0.316	0.357	0.355	0.096	0.096	1.235	1.236	0.709	0.710	0.238	0.240	0.229	0.226	1.254	1.254	0.932	0.931	1.133	1.133	0.985	0.985
sci	0.105	0.105	0.119	0.119	0.046	0.046	0.059	0.058	0.398	0.397	0.086	0.086	0.057	0.057	0.023	0.023	0.026	0.026	0.118	0.118	0.093	0.092	0.117	0.117	0.098	0.098
mpi	0.758	0.757	0.244	0.244	-10.463	-10.312	0.342	0.345	0.271	0.273	0.241	0.241	0.335	0.334	0.523	0.518	-0.237	-0.223	-0.404	-0.404	0.013	0.013	-0.583	-0.582	-0.044	-0.044
opi	0.076	0.076	0.124	0.124	0.046	0.046	0.064	0.063	0.248	0.247	0.096	0.096	0.061	0.061	0.023	0.023	0.026	0.026	0.108	0.108	0.091	0.091	0.107	0.107	0.093	0.093
std	0.349	0.350	1.768	1.768	0.305	0.301	0.480	0.477	0.045	0.045	0.717	0.718	0.562	0.564	0.305	0.308	0.019	0.016	0.801	0.802	1.094	1.095	0.424	0.426	0.974	0.976
d1	0.028	0.028	0.275	0.275	0.046	0.047	0.000	0.000	0.282	0.283	0.372	0.372	0.490	0.490	0.610	0.606	0.412	0.415	0.361	0.361	0.471	0.470	0.336	0.336	0.572	0.573
d2	0.036	0.036	0.399	0.399	0.007	0.007	0.000	0.000	0.422	0.421	0.530	0.529	0.629	0.628	0.821	0.817	0.711	0.713	0.487	0.487	0.599	0.598	0.536	0.536	0.650	0.649
corr	1.000	1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
rega	*******	*******	10.776	10.776	132.706	130.824	29.700	29.479	0.304	0.307	9.745	9.756	8.179	8.199	5.816	5.854	-0.501	-0.372	10.656	10.664	8.794	8.798	6.350	6.367	8.075	8.084
regb	71.429	71.715	0.000	0.000	-17.783	-17.522	-3.885	-3.849	0.113	0.099	0.240	0.240	0.296	0.294	0.439	0.435	1.084	1.069	0.103	0.102	0.178	0.178	0.457	0.455	0.268	0.267

Computed statistical parameters for case: f91pet02
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

	Hs [m]		Tp [s]		Tm01 [s]		Tm02 [s]		fspr [-]		Tm-4-3 [s]		Tm-3-2 [s]		Tm-2-1 [s]		Tm-10 [s]		Tpeq [s]		Tpb [s]		Tpbeq [s]		Tpm [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.206	-0.207	-1.030	-1.030	-0.021	-0.025	-0.325	-0.327	0.094	0.093	-1.557	-1.558	-1.053	-1.054	-0.528	-0.530	-0.116	-0.119	-0.187	-0.188	0.100	0.101	0.026	0.023	-0.286	-0.286
mae	0.219	0.220	1.030	1.030	0.282	0.279	0.424	0.421	0.094	0.093	1.557	1.558	1.053	1.054	0.528	0.530	0.116	0.119	0.625	0.626	0.756	0.757	0.033	0.036	0.370	0.370
rms	0.301	0.301	1.242	1.242	0.282	0.280	0.534	0.533	0.104	0.104	1.717	1.718	1.170	1.172	0.580	0.582	0.125	0.127	0.653	0.654	0.763	0.764	0.042	0.043	0.468	0.468
sci	0.103	0.103	0.105	0.105	0.041	0.041	0.088	0.088	0.435	0.434	0.120	0.120	0.094	0.094	0.055	0.055	0.015	0.015	0.061	0.061	0.076	0.076	0.004	0.004	0.045	0.045
mpi	0.773	0.773	0.358	0.358	-0.652	-0.639	0.077	0.078	0.205	0.206	0.174	0.174	0.221	0.220	0.294	0.291	0.490	0.483	0.326	0.324	0.183	0.183	0.880	0.879	0.429	0.429
opi	0.073	0.073	0.115	0.115	0.042	0.042	0.098	0.098	0.271	0.270	0.138	0.138	0.105	0.105	0.059	0.059	0.015	0.015	0.064	0.064	0.078	0.078	0.004	0.004	0.047	0.047
std	0.310	0.310	0.982	0.982	0.398	0.395	0.599	0.595	0.064	0.064	1.024	1.025	0.723	0.724	0.340	0.343	0.066	0.062	0.885	0.886	1.070	1.071	0.047	0.050	0.523	0.523
d1	0.300	0.300	0.403	0.403	0.000	0.000	0.096	0.106	0.331	0.332	0.365	0.365	0.393	0.393	0.434	0.433	0.590	0.575	0.281	0.281	0.274	0.274	0.897	0.888	0.538	0.537
d2	0.356	0.356	0.481	0.481	0.000	0.000	0.044	0.048	0.450	0.448	0.513	0.512	0.549	0.548	0.625	0.623	0.833	0.826	0.440	0.439	0.469	0.468	0.983	0.982	0.668	0.668
corr	1.000	1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
rega	-13.813	-13.844	10.776	10.776	24.167	23.948	17.515	17.408	0.326	0.328	10.031	10.039	8.297	8.314	5.727	5.778	-3.555	-3.340	9.585	9.599	8.499	8.505	1.903	2.042	7.192	7.203
regb	5.660	5.670	0.000	0.000	-2.519	-2.487	-1.941	-1.924	0.032	0.022	0.192	0.192	0.250	0.248	0.406	0.401	1.398	1.373	0.086	0.084	0.159	0.158	0.813	0.799	0.279	0.278

Computed statistical parameters for case: f91pet03

Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.162	-0.163	4.483	4.483	0.313	0.309	-0.159	-0.162	0.094	0.094	-0.851	-0.851	-0.374	-0.375	0.181	0.179	0.512	0.509	2.773	2.771	1.399	1.397	1.288	1.285	0.984	0.981
mae	0.240	0.240	4.483	4.483	0.502	0.499	0.735	0.733	0.094	0.094	0.851	0.851	0.605	0.604	0.314	0.316	0.512	0.509	2.773	2.771	1.399	1.397	1.288	1.285	0.984	0.981
rms	0.290	0.290	4.756	4.756	0.592	0.586	0.752	0.750	0.129	0.129	1.132	1.132	0.711	0.711	0.362	0.363	0.523	0.519	3.006	3.004	1.504	1.503	1.448	1.444	1.046	1.043
sci	0.097	0.097	0.375	0.375	0.080	0.079	0.119	0.119	0.615	0.615	0.065	0.065	0.047	0.047	0.029	0.029	0.053	0.053	0.268	0.268	0.130	0.130	0.119	0.119	0.084	0.084
mpi	0.700	0.699	-1.119	-1.119	-0.688	-0.673	0.141	0.143	-0.058	-0.058	0.212	0.211	0.358	0.357	0.451	0.450	-1.112	-1.095	0.062	0.062	-0.565	-0.564	-2.696	-2.686	-1.434	-1.425
opi	0.073	0.074	0.277	0.277	0.084	0.083	0.138	0.138	0.429	0.429	0.070	0.070	0.049	0.049	0.029	0.029	0.053	0.053	0.222	0.222	0.127	0.127	0.111	0.111	0.080	0.080
std	0.339	0.339	2.245	2.245	0.710	0.705	1.039	1.036	0.124	0.125	1.055	1.056	0.855	0.855	0.444	0.447	0.149	0.144	1.643	1.640	0.781	0.783	0.936	0.932	0.506	0.501
d1	0.000	0.000	0.261	0.261	0.000	0.000	0.000	0.000	0.504	0.505	0.509	0.509	0.485	0.485	0.632	0.629	0.318	0.320	0.238	0.238	0.373	0.374	0.225	0.225	0.065	0.065
d2	0.000	0.000	0.386	0.386	0.000	0.000	0.000	0.000	0.539	0.537	0.577	0.576	0.643	0.643	0.827	0.826	0.600	0.602	0.322	0.322	0.553	0.553	0.262	0.263	0.080	0.080
corr	-1.000	-1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	-1.000	1.000	1.000	-1.000	-1.000	-1.000	-1.000
rega	54.938	54.949	17.182	17.182	41.327	41.040	17.276	17.213	0.287	0.288	13.777	13.786	11.161	11.160	6.994	7.036	-3.829	-3.687	17.788	17.767	9.057	9.077	22.885	22.784	65.812	65.294
regb	-17.462	-17.462	0.000	0.000	-4.547	-4.508	-1.758	-1.749	0.079	0.073	0.155	0.155	0.244	0.244	0.462	0.458	1.441	1.426	-0.340	-0.339	0.338	0.336	-0.775	-0.767	-4.219	-4.175

Computed statistical parameters for case: f91pet04
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.060	-0.061	3.789	3.789	0.727	0.720	0.268	0.262	0.089	0.089	-1.404	-1.404	-0.727	-0.728	0.096	0.093	0.728	0.722	5.436	5.436	2.114	2.112	0.920	0.918	0.920	0.918
mae	0.223	0.223	3.789	3.789	0.727	0.720	0.738	0.732	0.089	0.089	1.404	1.404	0.727	0.728	0.227	0.230	0.728	0.722	5.436	5.436	2.114	2.112	0.920	0.918	0.920	0.918
rms	0.231	0.231	3.893	3.893	0.897	0.888	0.785	0.778	0.105	0.105	1.560	1.560	0.899	0.901	0.246	0.248	0.749	0.742	5.458	5.458	2.116	2.114	1.083	1.079	1.083	1.079
sci	0.085	0.085	0.291	0.291	0.124	0.123	0.127	0.126	0.461	0.461	0.090	0.090	0.059	0.059	0.020	0.020	0.077	0.076	0.465	0.465	0.191	0.191	0.088	0.088	0.088	0.088
mpi	0.853	0.853	-2.082	-2.082	-3.881	-3.828	-0.356	-0.342	-0.017	-0.017	0.141	0.140	0.257	0.255	0.485	0.482	-1.248	-1.225	-1.111	-1.111	-0.101	-0.099	-0.358	-0.353	-0.358	-0.353
opi	0.054	0.054	0.227	0.227	0.123	0.122	0.141	0.140	0.310	0.310	0.100	0.100	0.063	0.063	0.020	0.020	0.075	0.074	0.318	0.318	0.165	0.164	0.084	0.084	0.084	0.084
std	0.315	0.315	1.263	1.263	0.743	0.734	1.044	1.036	0.078	0.078	0.962	0.962	0.747	0.749	0.320	0.325	0.250	0.243	0.684	0.684	0.121	0.116	0.807	0.802	0.807	0.802
d1	0.239	0.239	0.191	0.191	0.178	0.180	0.000	0.000	0.395	0.395	0.364	0.364	0.484	0.483	0.640	0.633	0.113	0.114	0.082	0.082	0.065	0.065	0.268	0.269	0.268	0.269
d2	0.404	0.403	0.309	0.309	0.124	0.126	0.000	0.000	0.494	0.494	0.501	0.501	0.598	0.596	0.851	0.846	0.249	0.250	0.150	0.150	0.134	0.134	0.283	0.285	0.283	0.285
corr	1.000	1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-99.999	-99.999	1.000	1.000	-1.000	-1.000	-1.000	-1.000
rega	-17.333	-17.335	17.182	17.182	24.731	24.428	16.972	16.830	0.304	0.304	13.307	13.295	11.092	11.124	6.769	6.868	-17.808	-17.229	17.182	17.182	-4.274	-4.013	21.668	21.540	21.668	21.540
regb	7.371	7.371	0.000	0.000	-2.326	-2.285	-1.705	-1.683	0.052	0.052	0.151	0.152	0.225	0.222	0.471	0.463	2.903	2.844	0.000	0.000	1.578	1.554	-0.693	-0.682	-0.693	-0.682

Computed statistical parameters for case: f91pet05
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.188	-0.189	1.765	1.765	0.476	0.473	0.178	0.174	0.082	0.082	-1.191	-1.192	-0.610	-0.611	-0.033	-0.035	0.404	0.400	1.427	1.425	0.770	0.769	-0.182	-0.184	0.231	0.231
mae	0.188	0.189	1.765	1.765	0.516	0.512	0.666	0.661	0.082	0.082	1.191	1.192	0.610	0.611	0.104	0.107	0.404	0.400	1.427	1.425	0.770	0.769	0.182	0.184	0.486	0.486
rms	0.242	0.244	1.765	1.765	0.702	0.696	0.689	0.684	0.096	0.096	1.404	1.404	0.764	0.766	0.109	0.113	0.480	0.476	1.440	1.437	0.863	0.863	0.196	0.198	0.538	0.538
sci	0.093	0.093	0.141	0.141	0.097	0.096	0.111	0.110	0.412	0.412	0.090	0.090	0.056	0.056	0.009	0.010	0.051	0.051	0.127	0.127	0.078	0.078	0.017	0.017	0.045	0.045
mpi	0.506	0.503	-99.999	-99.999	-0.900	-0.885	-0.608	-0.595	-0.019	-0.019	0.171	0.170	0.272	0.270	0.695	0.687	-0.821	-0.803	-0.209	-0.207	-2.536	-2.535	0.716	0.714	0.221	0.221
opi	0.078	0.079	0.124	0.124	0.093	0.093	0.114	0.113	0.283	0.283	0.099	0.099	0.059	0.059	0.010	0.010	0.050	0.049	0.114	0.114	0.071	0.071	0.017	0.017	0.044	0.044
std	0.216	0.217	0.000	0.000	0.730	0.723	0.941	0.935	0.069	0.069	1.051	1.051	0.651	0.653	0.148	0.151	0.368	0.363	0.269	0.266	0.552	0.552	0.105	0.102	0.688	0.688
d1	0.155	0.154	0.000	0.000	0.310	0.313	0.000	0.000	0.388	0.388	0.423	0.423	0.501	0.501	0.775	0.768	0.120	0.121	0.024	0.024	0.209	0.210	0.467	0.464	0.000	0.000
d2	0.306	0.305	0.000	0.000	0.204	0.207	0.000	0.000	0.492	0.492	0.539	0.539	0.616	0.615	0.945	0.941	0.086	0.088	0.052	0.052	0.428	0.428	0.689	0.689	0.000	0.000
corr	1.000	1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	-1.000
rega	-11.787	-11.827	-99.999	-99.999	14.210	14.086	11.657	11.576	0.301	0.301	12.037	12.046	9.675	9.706	4.247	4.346	44.663	43.960	-60.923	-60.308	-20.393	-20.422	5.333	5.175	36.451	36.451
regb	5.435	5.449	-99.999	-99.999	-0.897	-0.881	-0.846	-0.834	0.058	0.058	0.148	0.148	0.250	0.248	0.632	0.623	-3.736	-3.664	6.507	6.449	2.912	2.914	0.536	0.549	-2.050	-2.050

Computed statistical parameters for case: f91pet06
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.217	-0.217	-1.297	-1.297	0.100	0.097	-0.194	-0.196	0.057	0.057	-1.549	-1.549	-0.929	-0.930	-0.323	-0.325	0.072	0.069	0.585	0.534	0.522	0.518	1.103	1.327	1.103	1.327

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
mae	0.217	0.217	1.297	1.297	0.492	0.489	0.629	0.627	0.057	0.057	1.549	1.549	0.929	0.930	0.323	0.325	0.263	0.260	0.585	0.534	0.522	0.518	1.103	1.327	1.103	1.327
rms	0.248	0.249	1.297	1.297	0.502	0.499	0.659	0.657	0.080	0.080	1.815	1.815	1.075	1.077	0.340	0.342	0.273	0.269	0.609	0.546	0.560	0.554	1.107	1.334	1.107	1.334
sci	0.087	0.087	0.117	0.117	0.072	0.072	0.108	0.108	0.357	0.357	0.117	0.117	0.081	0.081	0.031	0.031	0.031	0.031	0.055	0.049	0.059	0.058	0.116	0.140	0.116	0.140
mpi	0.724	0.723	-0.167	-0.167	-0.510	-0.500	0.020	0.023	-0.026	-0.026	0.151	0.151	0.280	0.278	0.555	0.552	-0.077	-0.063	0.452	0.508	-4.644	-4.585	-10.157	-12.440	-10.157	-12.440
opi	0.067	0.067	0.132	0.132	0.075	0.075	0.122	0.121	0.266	0.266	0.133	0.133	0.090	0.090	0.033	0.033	0.032	0.031	0.053	0.048	0.058	0.057	0.105	0.126	0.105	0.126
std	0.172	0.173	0.000	0.000	0.696	0.692	0.890	0.886	0.079	0.079	1.336	1.336	0.765	0.767	0.148	0.151	0.372	0.368	0.235	0.163	0.287	0.281	0.136	0.183	0.136	0.183
d1	0.364	0.364	0.000	0.000	0.000	0.000	0.000	0.000	0.504	0.504	0.420	0.420	0.447	0.446	0.509	0.507	0.000	0.000	0.000	0.000	0.157	0.159	0.081	0.068	0.081	0.068
d2	0.621	0.621	0.000	0.000	0.000	0.000	0.000	0.000	0.517	0.517	0.540	0.540	0.596	0.595	0.762	0.759	0.000	0.000	0.000	0.000	0.338	0.341	0.149	0.146	0.149	0.146
corr	1.000	1.000	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	-1.000	-99.999	-99.999	1.000	1.000	1.000	1.000	1.000	1.000
rega	-3.395	-3.408	-99.999	-99.999	14.263	14.174	11.914	11.853	0.273	0.273	11.517	11.517	8.662	8.687	3.129	3.191	82.438	81.600	-99.999	-99.999	-19.371	-18.947	10.504	-11.377	10.504	-11.377
regb	2.110	2.114	-99.999	-99.999	-1.041	-1.029	-0.989	-0.979	0.034	0.034	0.156	0.156	0.279	0.277	0.686	0.680	-8.228	-8.123	-99.999	-99.999	3.082	3.036	0.015	2.328	0.015	2.328

Computed statistical parameters for case: 121tri01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.003	-0.003	0.008	0.008	-0.004	-0.004	0.021	0.021	0.016	0.017	-6.427	-6.427	-1.909	-1.909	-0.339	-0.339	-0.064	-0.064	-0.060	-0.060	0.121	0.121	-0.013	-0.013	0.040	0.040
mae	0.003	0.003	0.008	0.008	0.200	0.201	0.224	0.224	0.100	0.100	6.657	6.658	1.909	1.909	0.339	0.339	0.124	0.124	0.151	0.151	0.295	0.295	0.109	0.109	0.164	0.164
rms	0.004	0.004	0.008	0.008	0.284	0.284	0.310	0.310	0.136	0.136	7.114	7.114	2.103	2.103	0.348	0.348	0.222	0.222	0.186	0.186	0.386	0.386	0.170	0.170	0.221	0.221
sci	0.145	0.145	0.004	0.004	0.223	0.223	0.273	0.272	0.536	0.535	0.747	0.748	0.518	0.518	0.166	0.166	0.143	0.143	0.102	0.102	0.226	0.226	0.095	0.095	0.122	0.122
mpi	-0.048	-0.048	-99.999	-99.999	-0.095	-0.095	-0.105	-0.104	0.116	0.117	-0.983	-0.983	-0.378	-0.379	-0.485	-0.484	-0.280	-0.280	-0.198	-0.198	-0.381	-0.379	-0.161	-0.161	-0.493	-0.492
opi	0.164	0.164	0.004	0.004	0.203	0.203	0.242	0.242	0.387	0.387	2.440	2.441	0.989	0.989	0.192	0.192	0.139	0.139	0.102	0.102	0.211	0.211	0.093	0.093	0.120	0.120
std	0.003	0.003	0.000	0.000	0.307	0.307	0.334	0.334	0.146	0.145	3.295	3.295	0.954	0.954	0.084	0.084	0.230	0.230	0.190	0.190	0.396	0.396	0.184	0.184	0.235	0.235
d1	0.400	0.400	0.000	0.000	0.322	0.320	0.260	0.259	0.456	0.455	0.234	0.234	0.289	0.289	0.199	0.199	0.489	0.488	0.321	0.321	0.326	0.326	0.415	0.415	0.253	0.253
d2	0.419	0.419	0.000	0.000	0.273	0.272	0.190	0.190	0.525	0.525	0.369	0.369	0.412	0.412	0.347	0.347	0.413	0.411	0.425	0.425	0.259	0.260	0.375	0.375	0.162	0.162
corr	-0.180	-0.180	-99.999	-99.999	-0.247	-0.247	-0.380	-0.379	0.245	0.247	0.505	0.507	0.855	0.855	0.610	0.610	-0.140	-0.142	0.056	0.056	-0.579	-0.578	-0.137	-0.137	-0.692	-0.690
rega	0.027	0.027	-99.999	-99.999	1.434	1.435	1.350	1.349	0.235	0.236	2.924	2.924	1.928	1.929	0.623	0.628	1.637	1.639	1.705	1.705	2.369	2.367	1.914	1.914	2.608	2.606
regb	-0.143	-0.143	-99.999	-99.999	-0.129	-0.129	-0.169	-0.168	0.135	0.136	0.017	0.017	0.054	0.054	0.540	0.538	-0.091	-0.093	0.034	0.034	-0.318	-0.316	-0.077	-0.077	-0.417	-0.416

Computed statistical parameters for case: 131set01
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.003	-0.003	-0.071	-0.071	-0.035	-0.036	0.078	0.078	-0.068	-0.068	-1.118	-1.119	-0.821	-0.822	-0.505	-0.505	-0.245	-0.245	-0.171	-0.171	-0.059	-0.059	-0.180	-0.180	-0.071	-0.071
mae	0.006	0.006	0.133	0.133	0.115	0.114	0.164	0.163	0.080	0.080	1.119	1.120	0.823	0.823	0.508	0.508	0.249	0.250	0.177	0.177	0.126	0.126	0.195	0.195	0.138	0.137
rms	0.007	0.007	0.303	0.303	0.162	0.162	0.181	0.181	0.099	0.100	1.270	1.271	0.993	0.993	0.660	0.660	0.358	0.358	0.418	0.418	0.244	0.244	0.388	0.388	0.284	0.284
sci	0.060	0.060	0.139	0.139	0.133	0.133	0.188	0.187	0.310	0.310	0.349	0.349	0.337	0.337	0.286	0.286	0.207	0.207	0.207	0.207	0.113	0.113	0.192	0.192	0.131	0.131
mpi	0.891	0.890	-0.059	-0.059	0.376	0.377	0.530	0.532	-2.756	-2.766	0.171	0.170	0.079	0.079	-0.118	-0.118	-1.400	-1.402	-0.216	-0.216	0.184	0.184	-0.134	-0.134	0.157	0.157
opi	0.041	0.042	0.147	0.147	0.112	0.112	0.139	0.139	0.288	0.289	0.549	0.550	0.482	0.482	0.354	0.354	0.215	0.215	0.214	0.214	0.120	0.120	0.201	0.201	0.140	0.140
std	0.006	0.006	0.297	0.297	0.159	0.159	0.165	0.164	0.073	0.073	0.607	0.607	0.562	0.562	0.428	0.428	0.263	0.263	0.384	0.384	0.239	0.239	0.346	0.346	0.277	0.277
d1	0.910	0.910	0.338	0.338	0.620	0.621	0.614	0.614	0.278	0.278	0.337	0.337	0.357	0.357	0.353	0.353	0.258	0.258	0.467	0.467	0.431	0.431	0.493	0.493	0.454	0.454
d2	0.991	0.991	0.145	0.145	0.795	0.795	0.842	0.844	0.377	0.376	0.472	0.472	0.445	0.445	0.373	0.372	0.214	0.215	0.219	0.219	0.278	0.278	0.308	0.308	0.267	0.267
corr	0.992	0.992	-0.294	-0.294	0.792	0.793	0.810	0.811	0.433	0.431	0.983	0.983	0.973	0.972	-0.864	-0.864	-0.691	-0.690	-0.385	-0.384	0.322	0.322	-0.422	-0.420	0.292	0.293
rega	-0.014	-0.014	2.237	2.237	-0.581	-0.585	-0.127	-0.130	-0.179	-0.178	1.940	1.941	1.951	1.951	2.068	2.069	2.839	2.837	2.035	2.035	2.033	2.032	1.979	1.979	2.046	2.046
regb	1.106	1.107	-0.055	-0.055	1.449	1.452	1.213	1.215	1.347	1.344	0.160	0.160	0.059	0.059	-0.116	-0.117	-0.787	-0.786	-0.091	-0.091	0.030	0.030	-0.069	-0.069	0.024	0.024

Computed statistical parameters for case: 131set02
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.008	-0.008	-0.360	-0.353	-0.064	-0.064	0.071	0.071	-0.039	-0.038	-1.540	-1.541	-1.253	-1.253	-0.813	-0.813	-0.385	-0.385	-0.416	-0.415	-0.203	-0.203	-0.391	-0.391	-0.320	-0.320
mae	0.010	0.010	0.457	0.453	0.126	0.126	0.161	0.161	0.052	0.052	1.541	1.541	1.253	1.253	0.813	0.813	0.385	0.385	0.481	0.481	0.331	0.331	0.397	0.397	0.402	0.402
rms	0.011	0.011	0.916	0.906	0.197	0.197	0.183	0.183	0.059	0.059	1.665	1.666	1.420	1.420	1.001	1.001	0.543	0.544	0.787	0.787	0.556	0.556	0.577	0.578	0.622	0.622
sci	0.090	0.090	0.371	0.367	0.158	0.158	0.189	0.189	0.199	0.199	0.398	0.398	0.413	0.413	0.380	0.380	0.291	0.291	0.329	0.329	0.252	0.252	0.253	0.253	0.267	0.267
mpi	0.886	0.886	0.058	0.069	0.206	0.205	0.530	0.530	-0.131	-0.132	0.187	0.187	0.109	0.109	-0.018	-0.018	-0.533	-0.535	0.084	0.084	0.198	0.198	0.202	0.201	0.220	0.220
opi	0.054	0.053	0.444	0.439	0.137	0.137	0.143	0.143	0.174	0.174	0.720	0.720	0.700	0.700	0.548	0.548	0.331	0.331	0.414	0.414	0.314	0.314	0.312	0.312	0.336	0.336
std	0.008	0.008	0.849	0.841	0.188	0.188	0.170	0.170	0.044	0.045	0.638	0.638	0.674	0.674	0.588	0.589	0.386	0.386	0.672	0.673	0.522	0.522	0.428	0.428	0.538	0.538
d1	0.880	0.880	0.545	0.545	0.511	0.510	0.569	0.569	0.469	0.469	0.295	0.295	0.333	0.333	0.353	0.353	0.348	0.348	0.548	0.548	0.447	0.447	0.522	0.522	0.488	0.488
d2	0.986	0.986	0.352	0.356	0.587	0.587	0.796	0.796	0.692	0.691	0.452	0.452	0.455	0.455	0.416	0.416	0.308	0.307	0.500	0.499	0.370	0.369	0.545	0.545	0.467	0.467
corr	0.988	0.988	-0.380	-0.204	0.458	0.459	0.718	0.719	0.639	0.635	0.968	0.968	0.986	0.986	-0.601	-0.607	-0.827	-0.826	0.568	0.566	0.374	0.372	0.855	0.854	0.513	0.512

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
rega	-0.015	-0.015	2.166	2.145	0.195	0.191	0.009	0.008	0.017	0.019	1.800	1.801	1.824	1.825	1.871	1.872	2.119	2.120	1.712	1.717	1.838	1.838	1.449	1.450	1.810	1.810
regb	1.061	1.060	-0.024	-0.013	0.792	0.795	1.063	1.064	0.811	0.806	0.201	0.201	0.104	0.104	-0.020	-0.020	-0.339	-0.340	0.109	0.107	0.074	0.074	0.193	0.193	0.086	0.086

Computed statistical parameters for case: 131set03
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.001	-0.001	0.129	0.119	0.248	0.254	0.387	0.392	-0.023	-0.022	-0.343	-0.344	-0.285	-0.285	-0.185	-0.184	0.003	0.006	0.493	0.495	0.234	0.232	-0.096	-0.103	0.119	0.117
mae	0.002	0.002	0.308	0.316	0.250	0.255	0.388	0.394	0.056	0.055	0.372	0.373	0.311	0.312	0.235	0.234	0.147	0.144	0.515	0.517	0.360	0.360	0.304	0.311	0.246	0.246
rms	0.003	0.003	0.372	0.378	0.280	0.285	0.427	0.433	0.068	0.067	0.492	0.493	0.442	0.443	0.356	0.355	0.203	0.200	0.565	0.567	0.425	0.425	0.351	0.359	0.297	0.298
sci	0.030	0.029	0.108	0.110	0.180	0.184	0.350	0.355	0.243	0.240	0.121	0.121	0.122	0.122	0.117	0.117	0.088	0.087	0.188	0.189	0.140	0.140	0.113	0.116	0.095	0.095
mpi	0.871	0.873	0.082	0.067	0.637	0.630	0.545	0.539	0.250	0.261	0.254	0.251	0.118	0.116	-0.283	-0.280	0.444	0.452	-0.752	-0.760	-0.005	-0.005	0.046	0.026	0.336	0.334
opi	0.028	0.027	0.116	0.118	0.125	0.127	0.208	0.210	0.258	0.254	0.137	0.137	0.134	0.134	0.120	0.120	0.078	0.077	0.170	0.170	0.147	0.147	0.119	0.121	0.101	0.101
std	0.003	0.003	0.351	0.361	0.129	0.130	0.181	0.184	0.065	0.064	0.355	0.356	0.341	0.342	0.307	0.306	0.204	0.201	0.278	0.280	0.357	0.359	0.340	0.346	0.274	0.276
d1	0.928	0.929	0.381	0.369	0.542	0.531	0.476	0.473	0.289	0.291	0.454	0.453	0.451	0.451	0.386	0.387	0.591	0.595	0.234	0.234	0.250	0.247	0.147	0.144	0.219	0.214
d2	0.995	0.995	0.492	0.478	0.827	0.821	0.751	0.746	0.442	0.448	0.530	0.528	0.453	0.452	0.334	0.335	0.732	0.736	0.407	0.405	0.418	0.413	0.178	0.172	0.410	0.402
corr	0.992	0.993	0.105	0.076	0.941	0.944	0.952	0.954	0.276	0.307	0.977	0.976	0.608	0.583	-0.365	-0.361	0.495	0.502	0.209	0.192	0.044	0.015	-0.435	-0.440	0.251	0.223
rega	-0.002	-0.002	3.300	3.358	0.657	0.682	0.856	0.875	0.231	0.229	3.173	3.183	3.204	3.211	3.218	3.212	1.218	1.225	3.221	3.244	3.236	3.248	4.356	4.407	3.093	3.109
regb	1.009	1.008	0.079	0.059	0.736	0.724	0.616	0.605	0.094	0.102	0.134	0.132	0.037	0.034	-0.121	-0.119	0.470	0.469	0.090	0.083	0.007	0.003	-0.436	-0.454	0.053	0.047

Computed statistical parameters for case: 141cur01
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.004	0.006	-0.036	-0.036	0.002	-0.001	0.013	0.009	0.087	0.089	-0.017	-0.021	-0.013	-0.017	-0.010	-0.013	-0.005	-0.009	-0.044	-0.044	-0.018	-0.022	-0.027	-0.031	-0.018	-0.022
mae	0.004	0.006	0.037	0.037	0.011	0.012	0.018	0.016	0.087	0.089	0.020	0.022	0.018	0.020	0.015	0.017	0.013	0.014	0.044	0.044	0.026	0.028	0.027	0.031	0.026	0.028
rms	0.005	0.006	0.041	0.041	0.014	0.014	0.019	0.017	0.095	0.098	0.022	0.025	0.020	0.022	0.017	0.020	0.015	0.017	0.044	0.044	0.027	0.030	0.028	0.032	0.027	0.030
sci	0.517	0.667	0.067	0.067	0.023	0.023	0.033	0.029	0.114	0.117	0.036	0.041	0.032	0.036	0.029	0.032	0.025	0.028	0.071	0.071	0.045	0.049	0.046	0.052	0.045	0.049
mpi	0.547	0.415	0.470	0.470	0.876	0.875	0.857	0.873	0.276	0.255	0.718	0.679	0.757	0.723	0.796	0.770	0.839	0.821	0.550	0.550	0.544	0.508	0.630	0.584	0.544	0.508
opi	0.261	0.337	0.075	0.075	0.027	0.027	0.038	0.033	0.132	0.136	0.041	0.046	0.036	0.042	0.033	0.037	0.029	0.032	0.080	0.080	0.051	0.055	0.052	0.059	0.051	0.055
std	0.004	0.003	0.022	0.022	0.015	0.015	0.016	0.016	0.045	0.047	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.015	0.007	0.007	0.023	0.022	0.009	0.008	0.023	0.022
d1	0.618	0.515	0.345	0.345	0.756	0.723	0.672	0.698	0.259	0.254	0.466	0.438	0.517	0.466	0.576	0.526	0.649	0.620	0.320	0.320	0.328	0.326	0.375	0.345	0.328	0.326
d2	0.844	0.774	0.665	0.665	0.939	0.938	0.904	0.922	0.389	0.380	0.823	0.788	0.856	0.820	0.886	0.858	0.918	0.899	0.685	0.685	0.711	0.689	0.769	0.732	0.711	0.689
corr	0.878	0.915	0.792	0.792	0.891	0.888	0.915	0.915	0.190	0.164	0.843	0.848	0.840	0.844	0.850	0.849	0.864	0.864	0.995	0.995	0.686	0.701	0.986	0.986	0.686	0.701
rega	0.003	0.005	-0.062	-0.062	0.117	0.121	0.171	0.173	0.774	0.790	0.043	0.049	0.049	0.055	0.048	0.053	0.077	0.081	-0.172	-0.172	0.040	0.033	-0.202	-0.195	0.040	0.033
regb	1.042	1.080	1.043	1.043	0.805	0.792	0.727	0.716	0.178	0.162	0.904	0.888	0.898	0.882	0.905	0.891	0.863	0.850	1.206	1.206	0.904	0.910	1.283	1.266	0.904	0.910

Computed statistical parameters for case: 151his01
Total number of observation stations : 26
Number of stations at which observations are available : 26
Number of stations at which precomputed data is available: 26
Number of stations at which computed data is available : 26

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.001	0.000	-0.024	-0.024	0.028	0.022	0.055	0.048	0.033	0.028	-24.339	-24.341	-6.821	-6.824	-0.747	-0.751	-0.066	-0.071	-0.141	-0.141	-0.041	-0.043	-0.221	-0.224	-0.257	-0.259
mae	0.004	0.004	0.026	0.026	0.053	0.056	0.068	0.070	0.080	0.081	24.339	24.341	6.821	6.824	0.747	0.751	0.074	0.078	0.195	0.195	0.041	0.044	0.256	0.257	0.257	0.260
rms	0.005	0.005	0.029	0.029	0.069	0.071	0.101	0.100	0.106	0.107	24.433	24.436	7.371	7.373	1.008	1.010	0.111	0.114	0.583	0.583	0.045	0.049	0.846	0.846	0.829	0.829
sci	0.060	0.059	0.023	0.023	0.073	0.075	0.119	0.119	0.247	0.249	0.953	0.953	0.914	0.914	0.527	0.527	0.097	0.099	0.438	0.438	0.036	0.039	0.599	0.599	0.565	0.565
mpi	0.826	0.830	-0.743	-0.743	0.546	0.535	0.446	0.448	0.489	0.484	-9.360	-9.361	-0.922	-0.923	-0.238	-0.240	-0.034	-0.058	-0.033	-0.033	-0.387	-0.481	-0.021	-0.020	-0.004	-0.004
opi	0.053	0.052	0.024	0.024	0.066	0.068	0.106	0.105	0.186	0.187	19.209	19.210	5.983	5.985	0.850	0.851	0.099	0.101	0.480	0.480	0.037	0.040	0.690	0.690	0.677	0.676
std	0.005	0.005	0.017	0.017	0.065	0.069	0.086	0.090	0.103	0.105	2.195	2.196	2.852	2.851	0.691	0.689	0.091	0.091	0.578	0.578	0.021	0.023	0.834	0.832	0.805	0.804
d1	0.871	0.874	0.178	0.178	0.700	0.678	0.672	0.657	0.631	0.624	0.069	0.069	0.247	0.247	0.359	0.358	0.466	0.455	0.546	0.546	0.271	0.260	0.597	0.597	0.611	0.608
d2	0.980	0.981	0.321	0.321	0.875	0.865	0.798	0.793	0.815	0.811	0.128	0.128	0.360	0.360	0.379	0.380	0.633	0.627	0.207	0.208	0.412	0.391	0.208	0.210	0.232	0.234
corr	0.969	0.973	0.000	0.000	0.932	0.904	0.867	0.845	0.893	0.865	0.562	0.513	0.803	0.740	-0.038	0.042	0.571	0.574	-0.199	-0.191	0.306	0.290	-0.229	-0.193	0.084	0.137
rega	-0.009	-0.011	1.214	1.214	0.464	0.477	0.497	0.508	0.273	0.269	1.043	1.052	1.201	1.196	1.169	1.161	0.784	0.776	1.209	1.208	0.973	0.916	1.205	1.200	1.210	1.205
regb	1.085	1.120	0.000	0.000	0.537	0.517	0.476	0.455	0.440	0.436	0.011	0.010	0.005	0.006	-0.001	0.001	0.256	0.259	-0.013	-0.013	0.190	0.234	-0.010	-0.008	0.001	0.003

Mean of all f31har cases (total number: 4)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01

	Hs v40.01+	Hs v40.01	Tp v40.01+	Tp v40.01	Tm01 v40.01+	Tm01 v40.01	Tm02 v40.01+	Tm02 v40.01	fspr v40.01+	fspr v40.01	Tm-4-3 v40.01+	Tm-4-3 v40.01	Tm-3-2 v40.01+	Tm-3-2 v40.01	Tm-2-1 v40.01+	Tm-2-1 v40.01	Tm-10 v40.01+	Tm-10 v40.01	Tpeq v40.01+	Tpeq v40.01	Tpb v40.01+	Tpb v40.01	Tpbeq v40.01+	Tpbeq v40.01	Tpm v40.01+	Tpm v40.01
bias	0.129	0.127	-0.024	-0.024	-0.563	-0.563	-0.620	-0.621	-0.041	-0.043	-12.519	-12.502	-2.883	-2.865	-1.036	-1.023	-0.647	-0.641	-0.268	-0.254	0.118	0.117	-0.408	-0.394	0.055	0.066
mae	0.245	0.244	0.756	0.756	0.628	0.632	0.637	0.640	0.106	0.106	12.519	12.502	2.883	2.865	1.036	1.023	0.730	0.734	0.669	0.666	0.957	0.957	0.585	0.582	0.762	0.754
rms	0.314	0.310	1.091	1.091	0.786	0.789	0.813	0.816	0.121	0.120	13.286	13.261	3.217	3.187	1.272	1.255	0.901	0.900	0.752	0.745	1.486	1.487	0.723	0.710	1.095	1.079
sci	0.172	0.169	0.143	0.143	0.154	0.154	0.181	0.182	0.326	0.325	0.653	0.652	0.322	0.319	0.173	0.170	0.147	0.146	0.105	0.104	0.206	0.206	0.101	0.099	0.147	0.145
mpi	0.817	0.820	-0.704	-0.704	0.626	0.625	0.642	0.641	0.301	0.304	-1.679	-1.674	-2.150	-2.122	-0.314	-0.297	0.465	0.466	0.488	0.493	0.106	0.106	0.449	0.458	0.039	0.052
opi	0.093	0.092	0.129	0.129	0.117	0.118	0.128	0.129	0.225	0.224	1.604	1.601	0.402	0.399	0.166	0.164	0.124	0.124	0.091	0.090	0.183	0.183	0.090	0.088	0.135	0.133
std	0.260	0.255	1.125	1.125	0.580	0.585	0.561	0.564	0.120	0.118	4.766	4.738	1.539	1.504	0.793	0.782	0.667	0.670	0.703	0.700	1.544	1.545	0.627	0.621	1.159	1.141
d1	0.834	0.835	0.551	0.551	0.749	0.746	0.732	0.730	0.516	0.522	0.206	0.206	0.207	0.208	0.441	0.443	0.687	0.684	0.654	0.653	0.603	0.602	0.669	0.668	0.557	0.559
d2	0.962	0.962	0.597	0.597	0.916	0.915	0.900	0.899	0.735	0.740	0.307	0.308	0.273	0.276	0.693	0.694	0.881	0.881	0.876	0.876	0.578	0.578	0.869	0.870	0.582	0.585
corr	0.966	0.966	0.551	0.551	0.927	0.926	0.921	0.920	0.593	0.607	-0.565	-0.552	-0.314	-0.304	0.757	0.754	0.888	0.886	0.833	0.831	0.401	0.400	0.841	0.840	0.397	0.396
rega	-0.061	-0.052	1.429	1.429	0.067	0.109	0.019	0.049	0.103	0.093	10.112	9.998	10.720	10.521	-0.874	-0.676	-0.036	0.055	0.921	1.042	4.123	4.138	0.146	0.298	3.571	3.667
regb	1.101	1.094	0.829	0.829	0.876	0.868	0.857	0.850	0.610	0.628	-0.114	-0.107	-0.358	-0.337	0.979	0.954	0.901	0.887	0.839	0.823	0.469	0.466	0.928	0.908	0.552	0.540

Mean of all f41lak cases (total number: 9)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.002	0.002	-0.200	-0.197	-0.295	-0.295	-0.390	-0.389	0.008	0.008	-13.514	-13.514	-2.225	-2.225	-0.420	-0.420	-0.264	-0.264	-0.196	-0.193	-0.171	-0.171	-0.169	-0.169	-0.172	-0.172
mae	0.037	0.037	0.212	0.209	0.295	0.295	0.390	0.389	0.036	0.036	13.514	13.514	2.225	2.225	0.420	0.420	0.264	0.264	0.208	0.205	0.188	0.188	0.186	0.187	0.189	0.189
rms	0.043	0.043	0.235	0.232	0.301	0.301	0.394	0.393	0.040	0.040	13.665	13.665	2.427	2.426	0.454	0.454	0.275	0.275	0.232	0.229	0.203	0.203	0.200	0.200	0.203	0.203
sci	0.174	0.174	0.108	0.107	0.171	0.171	0.243	0.242	0.079	0.079	0.882	0.882	0.574	0.574	0.195	0.195	0.139	0.139	0.107	0.105	0.094	0.094	0.093	0.093	0.094	0.094
mpi	0.657	0.656	0.601	0.605	0.295	0.296	-0.018	-0.017	0.380	0.381	-1.242	-1.242	-0.831	-0.831	0.055	0.055	0.320	0.321	0.677	0.682	0.669	0.669	0.724	0.724	0.721	0.721
opi	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999	-99.999
std	0.031	0.032	0.115	0.115	0.062	0.062	0.059	0.058	0.033	0.032	2.102	2.102	0.906	0.906	0.161	0.161	0.071	0.071	0.114	0.115	0.087	0.087	0.086	0.087	0.087	0.087
d1	0.447	0.447	0.412	0.415	0.221	0.222	0.150	0.150	0.343	0.345	0.096	0.096	0.178	0.178	0.245	0.245	0.295	0.295	0.438	0.441	0.450	0.450	0.447	0.447	0.443	0.443
d2	0.627	0.627	0.607	0.612	0.413	0.413	0.291	0.291	0.512	0.514	0.170	0.170	0.262	0.262	0.402	0.402	0.498	0.498	0.638	0.642	0.689	0.689	0.693	0.693	0.688	0.688
corr	0.534	0.534	0.684	0.682	0.814	0.815	0.752	0.755	0.401	0.399	-0.340	-0.340	-0.172	-0.172	0.592	0.592	0.855	0.855	0.732	0.730	0.841	0.841	0.878	0.878	0.840	0.839
rega	0.171	0.171	0.871	0.871	0.185	0.180	0.269	0.261	0.364	0.362	2.373	2.374	2.228	2.229	0.948	0.947	0.059	0.057	0.478	0.478	0.544	0.545	0.268	0.266	0.549	0.549
regb	0.340	0.341	0.412	0.413	0.737	0.740	0.579	0.585	0.289	0.293	-0.026	-0.026	-0.093	-0.093	0.371	0.371	0.865	0.866	0.652	0.653	0.647	0.646	0.827	0.828	0.644	0.644

Mean of all f51fri cases (total number: 3)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.077	0.097	0.656	0.159	-0.661	-0.700	-0.763	-0.764	-0.098	-0.050	-26.709	-27.230	-8.965	-9.447	-1.940	-2.280	-0.544	-0.716	-0.172	-0.839	-0.160	-0.444	-1.134	-1.713	-1.189	-1.768
mae	0.218	0.249	1.237	0.653	0.703	0.738	0.778	0.796	0.196	0.125	26.709	27.230	8.977	9.456	2.223	2.281	0.731	0.752	1.836	1.599	0.770	0.530	1.988	1.865	2.043	1.920
rms	0.246	0.284	1.522	0.761	0.750	0.799	0.842	0.870	0.235	0.147	35.945	36.510	15.065	15.528	3.828	4.009	0.854	0.878	2.662	2.551	0.933	0.602	3.273	3.364	3.285	3.379
sci	0.217	0.249	0.297	0.136	0.167	0.180	0.211	0.221	0.593	0.387	1.047	1.063	0.935	0.961	0.452	0.474	0.157	0.163	0.371	0.337	0.172	0.107	0.395	0.395	0.394	0.394
mpi	0.864	0.850	0.541	0.787	0.662	0.630	0.532	0.509	-0.393	0.173	-0.049	-0.066	-0.138	-0.165	-0.126	-0.187	0.643	0.620	0.259	0.342	0.687	0.790	0.248	0.269	0.244	0.264
opi	0.089	0.099	0.192	0.088	0.120	0.131	0.155	0.163	0.517	0.320	4.237	4.292	1.786	1.837	0.460	0.483	0.116	0.122	0.301	0.280	0.121	0.077	0.374	0.379	0.370	0.375
std	0.260	0.295	1.429	0.758	0.376	0.400	0.368	0.436	0.208	0.137	26.893	27.191	13.482	13.716	3.686	3.650	0.730	0.537	2.833	2.667	0.947	0.428	3.380	3.209	3.378	3.190
d1	0.843	0.823	0.705	0.839	0.731	0.719	0.640	0.632	0.281	0.395	0.430	0.425	0.482	0.470	0.515	0.532	0.754	0.754	0.572	0.687	0.803	0.867	0.614	0.691	0.605	0.683
d2	0.971	0.956	0.851	0.962	0.926	0.916	0.869	0.858	0.372	0.609	0.443	0.436	0.388	0.386	0.587	0.588	0.925	0.923	0.705	0.781	0.944	0.977	0.720	0.754	0.723	0.756
corr	0.969	0.948	0.837	0.983	0.972	0.970	0.963	0.949	0.093	0.599	-0.602	-0.853	-0.462	-0.615	0.315	0.336	0.922	0.956	0.532	0.652	0.911	0.992	0.516	0.582	0.519	0.587
rega	0.313	0.345	-0.375	-1.476	-0.644	-0.717	-0.981	-0.930	0.297	0.201	9.047	8.997	8.057	7.781	2.799	2.184	-0.604	-1.080	2.330	0.345	0.310	-0.467	2.290	0.895	2.375	0.993
regb	0.791	0.783	1.159	1.294	0.994	1.008	1.055	1.049	0.010	0.354	-0.041	-0.054	-0.106	-0.114	0.498	0.554	1.010	1.071	0.712	0.944	0.906	1.001	0.627	0.780	0.607	0.755

Mean of all f61wes cases (total number: 12)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.135	0.191	0.191	0.296	-0.530	-0.466	-0.785	-0.743	0.005	0.004	-7.140	-6.942	-1.437	-1.281	-0.395	-0.272	-0.339	-0.243	0.166	0.241	-0.070	0.040	-0.012	0.104	-0.115	-0.001
mae	0.299	0.353	0.755	0.802	0.542	0.493	0.785	0.746	0.064	0.064	7.147	7.073	1.451	1.402	0.500	0.481	0.423	0.400	0.614	0.629	0.645	0.675	0.539	0.540	0.664	0.651
rms	0.331	0.391	0.928	0.976	0.638	0.602	0.867	0.838	0.080	0.081	8.523	8.446	1.787	1.719	0.627	0.594	0.525	0.497	0.710	0.739	0.779	0.800	0.637	0.631	0.764	0.742
sci	0.184	0.230	0.143	0.154	0.123	0.115	0.181	0.173	0.229	0.227	0.554	0.545	0.208	0.198	0.093	0.088	0.090	0.085	0.109	0.117	0.119	0.126	0.099	0.099	0.114	0.112
mpi	0.868	0.844	0.566	0.551	0.654	0.659	0.578	0.592	0.558	0.552	-0.120	-0.118	-0.178	-0.163	0.529	0.550	0.696	0.711	0.796	0.797	0.565	0.604	0.710	0.729	0.516	0.561
opi	0.071	0.086	0.102	0.109	0.089	0.088	0.142	0.136	0.121	0.123	0.970	0.966	0.202	0.200	0.070	0.067	0.060	0.057	0.032	0.032	0.086	0.078	0.047	0.044	0.078	0.071
std	0.284	0.322	0.853	0.884	0.392	0.416	0.412	0.432	0.082	0.085	4.770	4.841	1.148	1.177	0.543	0.561	0.442	0.464	0.672	0.725	0.863	0.875	0.643	0.632	0.804	0.788
d1	0.691	0.649	0.699	0.678	0.593	0.624	0.450	0.463	0.470	0.432	0.375	0.374	0.506	0.517	0.712	0.726	0.725	0.739	0.701	0.687	0.709	0.695	0.711	0.714	0.670	0.678
d2	0.876	0.845	0.853	0.826	0.797	0.816	0.651	0.665	0.638	0.588	0.486	0.483	0.679	0.695	0.888	0.904	0.893	0.906	0.871	0.847	0.887	0.877	0.880	0.880	0.862	0.869
corr	0.878	0.863	0.846	0.821	0.879	0.878	0.780	0.791	0.585	0.520	0.552	0.535	0.725	0.720	0.886	0.890	0.895	0.896	0.900	0.867	0.832	0.833	0.853	0.869	0.806	0.823
rega	0.356	0.415	-0.426	-0.201	0.703	0.683	0.959	0.919	0.248	0.265	5.891	6.172	3.302	3.476	0.859	0.904	0.623	0.617	-1.837	-1.513	0.995	0.960	-0.110	-0.321	0.901	0.769
regb	0.962	0.972	1.055	1.033	0.788	0.806	0.674	0.692	0.334	0.294	0.164	0.153	0.491	0.482	0.837	0.845	0.857	0.874	1.242	1.205	0.854	0.876	1.010	1.057	0.871	0.906

Mean of all f81nor cases (total number: 4)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01

bias	0.090	0.088	0.742	0.751	-0.584	-0.590	-0.409	-0.413	-0.131	-0.128	-18.469	-18.654	-7.863	-7.997	-1.623	-1.686	-0.695	-0.715	0.041	-0.102	0.652	0.640	-0.363	-0.488	0.109	-0.017
mae	0.203	0.202	1.625	1.627	0.620	0.620	0.440	0.441	0.165	0.164	18.469	18.654	7.863	7.997	1.720	1.778	0.834	0.843	1.088	1.131	1.504	1.504	1.109	1.100	1.150	1.143
rms	0.231	0.229	2.258	2.250	0.742	0.742	0.528	0.527	0.189	0.189	20.438	20.593	9.234	9.263	1.924	1.955	1.012	1.027	1.410	1.535	2.271	2.267	1.434	1.488	1.600	1.658
sci	0.466	0.463	0.597	0.595	0.260	0.260	0.232	0.232	0.408	0.409	0.784	0.790	0.682	0.684	0.338	0.344	0.270	0.274	0.274	0.300	0.594	0.593	0.270	0.282	0.294	0.307
mpi	0.877	0.878	0.716	0.717	0.792	0.793	0.824	0.825	0.074	0.075	-0.228	-0.237	-0.953	-0.967	0.451	0.441	0.774	0.770	0.751	0.730	0.690	0.690	0.691	0.680	0.692	0.681
opi	0.097	0.097	0.204	0.203	0.132	0.132	0.116	0.116	0.453	0.454	2.087	2.103	0.995	0.999	0.224	0.228	0.136	0.138	0.146	0.159	0.217	0.217	0.150	0.156	0.160	0.167
std	0.208	0.207	2.158	2.147	0.473	0.467	0.352	0.346	0.140	0.143	9.444	9.413	5.128	4.975	1.061	1.020	0.753	0.755	1.531	1.637	2.188	2.183	1.474	1.476	1.567	1.586
d1	0.714	0.718	0.712	0.710	0.725	0.727	0.748	0.749	0.475	0.471	0.265	0.263	0.267	0.264	0.575	0.567	0.727	0.725	0.757	0.757	0.728	0.728	0.728	0.742	0.756	0.767
d2	0.940	0.942	0.854	0.854	0.907	0.909	0.918	0.920	0.686	0.678	0.349	0.347	0.338	0.347	0.797	0.800	0.914	0.913	0.919	0.904	0.857	0.858	0.890	0.892	0.897	0.899
corr	0.959	0.960	0.801	0.803	0.959	0.963	0.965	0.969	0.691	0.671	-0.693	-0.627	-0.280	-0.169	0.874	0.892	0.937	0.937	0.868	0.839	0.803	0.804	0.831	0.838	0.857	0.864
rega	0.139	0.136	0.941	0.945	-0.004	-0.024	0.051	0.038	0.123	0.135	12.120	11.721	8.022	7.168	-0.642	-0.927	0.136	0.094	1.076	0.952	0.833	0.814	0.891	0.595	0.489	0.195
regb	0.920	0.923	0.970	0.971	0.797	0.802	0.792	0.796	0.452	0.433	-0.172	-0.164	-0.195	-0.143	0.835	0.872	0.782	0.787	0.806	0.801	0.987	0.988	0.762	0.793	0.918	0.949

Mean of all f91pet cases (total number: 6)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.170	-0.170	1.206	1.206	0.305	0.301	-0.057	-0.061	0.084	0.084	-1.280	-1.280	-0.713	-0.714	-0.118	-0.120	0.305	0.301	1.859	1.849	0.904	0.903	0.708	0.744	0.609	0.646
mae	0.222	0.223	2.269	2.269	0.459	0.455	0.589	0.585	0.084	0.084	1.280	1.280	0.752	0.753	0.285	0.288	0.375	0.373	1.994	1.985	1.056	1.055	0.770	0.807	0.761	0.798
rms	0.270	0.271	2.382	2.382	0.549	0.544	0.629	0.626	0.101	0.101	1.477	1.477	0.888	0.889	0.313	0.315	0.397	0.393	2.070	2.059	1.123	1.121	0.835	0.872	0.871	0.908
sci	0.095	0.095	0.191	0.191	0.077	0.076	0.102	0.101	0.446	0.446	0.095	0.095	0.065	0.066	0.028	0.028	0.042	0.042	0.182	0.181	0.104	0.104	0.077	0.081	0.079	0.083
mpi	0.719	0.718	-0.553	-0.553	-2.849	-2.806	-0.064	-0.058	0.059	0.060	0.182	0.181	0.287	0.286	0.501	0.497	-0.501	-0.488	-0.147	-0.138	-1.275	-1.265	-2.033	-2.411	-1.890	-2.268
opi	0.070	0.070	0.166	0.166	0.077	0.077	0.113	0.112	0.301	0.301	0.106	0.106	0.071	0.071	0.029	0.029	0.042	0.041	0.146	0.146	0.098	0.098	0.071	0.075	0.076	0.079
std	0.284	0.284	1.043	1.043	0.597	0.592	0.832	0.827	0.076	0.077	1.024	1.025	0.717	0.719	0.284	0.288	0.204	0.199	0.753	0.740	0.651	0.649	0.409	0.416	0.606	0.612
d1	0.181	0.181	0.188	0.188	0.089	0.090	0.016	0.018	0.401	0.401	0.409	0.409	0.467	0.466	0.600	0.596	0.259	0.257	0.164	0.164	0.258	0.258	0.379	0.375	0.254	0.252
d2	0.287	0.287	0.262	0.262	0.056	0.057	0.007	0.008	0.486	0.485	0.533	0.533	0.605	0.604	0.805	0.802	0.413	0.413	0.242	0.242	0.420	0.420	0.484	0.484	0.305	0.305
corr	0.667	0.667	-99.999	-99.999	-1.000	-1.000	-1.000	-1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.333	0.333	0.500	0.500	1.000	1.000	0.333	0.333	0.000	0.000
rega	-32.693	-32.808	13.979	13.979	41.901	41.417	17.506	17.393	0.299	0.300	11.736	11.740	9.511	9.532	5.447	5.512	16.902	16.822	-1.143	-1.019	-2.948	-2.834	11.440	7.755	24.950	21.199
regb	12.424	12.476	0.000	0.000	-4.852	-4.785	-1.854	-1.836	0.061	0.056	0.174	0.174	0.257	0.256	0.516	0.510	-0.856	-0.846	1.271	1.259	1.375	1.363	0.059	0.447	-1.067	-0.672

Mean of all 131set cases (total number: 3)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	-0.004	-0.004	-0.100	-0.102	0.050	0.051	0.179	0.180	-0.043	-0.043	-1.001	-1.001	-0.786	-0.787	-0.501	-0.501	-0.209	-0.208	-0.032	-0.031	-0.009	-0.010	-0.222	-0.225	-0.090	-0.091
mae	0.006	0.006	0.299	0.301	0.163	0.165	0.238	0.239	0.063	0.063	1.011	1.011	0.796	0.796	0.518	0.518	0.260	0.260	0.391	0.392	0.273	0.272	0.298	0.301	0.262	0.262
rms	0.007	0.007	0.530	0.529	0.213	0.215	0.264	0.266	0.075	0.075	1.142	1.143	0.952	0.952	0.672	0.672	0.368	0.367	0.590	0.591	0.408	0.408	0.439	0.441	0.401	0.401
sci	0.060	0.060	0.206	0.205	0.157	0.158	0.242	0.243	0.251	0.250	0.289	0.290	0.291	0.291	0.261	0.261	0.195	0.195	0.241	0.242	0.169	0.169	0.186	0.187	0.164	0.164
mpi	0.882	0.883	0.027	0.025	0.406	0.404	0.535	0.534	-0.879	-0.879	0.204	0.203	0.102	0.101	-0.140	-0.139	-0.496	-0.495	-0.294	-0.297	0.126	0.126	0.038	0.031	0.238	0.237
opi	0.041	0.041	0.236	0.235	0.124	0.125	0.163	0.164	0.240	0.239	0.469	0.469	0.439	0.439	0.341	0.341	0.208	0.208	0.266	0.266	0.194	0.194	0.211	0.211	0.192	0.192
std	0.006	0.006	0.499	0.500	0.159	0.159	0.172	0.173	0.061	0.061	0.533	0.534	0.525	0.526	0.441	0.441	0.284	0.284	0.445	0.446	0.372	0.373	0.371	0.373	0.363	0.364
d1	0.906	0.906	0.421	0.417	0.558	0.554	0.553	0.552	0.346	0.346	0.362	0.362	0.380	0.380	0.364	0.364	0.399	0.400	0.417	0.416	0.376	0.375	0.387	0.386	0.387	0.385
d2	0.991	0.991	0.330	0.326	0.736	0.734	0.797	0.795	0.504	0.505	0.485	0.484	0.451	0.451	0.374	0.374	0.418	0.419	0.376	0.375	0.355	0.354	0.344	0.342	0.381	0.379
corr	0.991	0.991	-0.189	-0.141	0.730	0.732	0.827	0.828	0.449	0.458	0.976	0.976	0.856	0.847	-0.610	-0.610	-0.341	-0.338	0.130	0.125	0.247	0.237	-0.001	-0.002	0.352	0.343
rega	-0.010	-0.010	2.568	2.580	0.090	0.096	0.246	0.251	0.023	0.023	2.305	2.308	2.326	2.329	2.386	2.384	2.059	2.061	2.323	2.332	2.369	2.373	2.595	2.612	2.316	2.322
regb	1.059	1.058	0.000	-0.003	0.992	0.990	0.964	0.961	0.751	0.751	0.165	0.164	0.067	0.066	-0.086	-0.085	-0.219	-0.219	0.036	0.033	0.037	0.036	-0.104	-0.110	0.054	0.052

Mean of all field cases (total number: 38)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tp [s] v40.01+	Tp [s] v40.01	Tm01 [s] v40.01+	Tm01 [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01	fspr [-] v40.01+	fspr [-] v40.01	Tm-4-3 [s] v40.01+	Tm-4-3 [s] v40.01	Tm-3-2 [s] v40.01+	Tm-3-2 [s] v40.01	Tm-2-1 [s] v40.01+	Tm-2-1 [s] v40.01	Tm-10 [s] v40.01+	Tm-10 [s] v40.01	Tpeq [s] v40.01+	Tpeq [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01
bias	0.046	0.064	0.331	0.326	-0.362	-0.346	-0.518	-0.506	-0.009	-0.005	-11.028	-11.024	-2.932	-2.933	-0.676	-0.669	-0.306	-0.291	0.262	0.219	0.148	0.159	-0.103	-0.118	-0.058	-0.074
mae	0.203	0.222	0.995	0.964	0.501	0.488	0.608	0.597	0.086	0.080	11.030	11.066	2.944	2.978	0.768	0.772	0.478	0.473	0.888	0.876	0.735	0.725	0.671	0.666	0.737	0.728
rms	0.234	0.256	1.197	1.151	0.580	0.571	0.674	0.667	0.102	0.095	12.549	12.583	3.779	3.794	0.993	0.999	0.562	0.556	1.044	1.054	0.940	0.920	0.866	0.881	0.970	0.980
sci	0.199	0.215	0.202	0.193	0.148	0.147	0.191	0.189	0.285	0.268	0.633	0.632	0.392	0.390	0.170	0.170	0.124	0.123	0.158	0.160	0.174	0.171	0.136	0.137	0.148	0.149
mpi	0.790	0.781	0.300	0.317	-0.195	-0.189	0.364	0.368	0.186	0.247	-0.647	-0.649	-0.676	-0.676	0.169	0.164	0.291	0.293	0.448	0.458	0.170	0.186	0.037	-0.040	-0.006	-0.081
opi	0.079	0.086	0.143	0.134	0.105	0.107	0.132	0.130	0.332	0.301	1.581	1.592	0.620	0.628	0.171	0.175	0.093	0.093	0.147	0.146	0.143	0.135	0.137	0.140	0.153	0.155
std	0.212	0.226	0.919	0.875	0.373	0.382	0.400	0.411	0.089	0.085	5.785	5.825	2.456	2.465	0.741	0.739	0.396	0.387	0.817	0.830	0.863	0.826	0.776	0.760	0.924	0.905
d1	0.582	0.568	0.537	0.541	0.467	0.476	0.386	0.390	0.419	0.417	0.289	0.288	0.364	0.366	0.525	0.530	0.548	0.552	0.545	0.550	0.575	0.575	0.586	0.593	0.542	0.552
d2	0.747	0.737	0.674	0.676	0.623	0.629	0.536	0.539	0.578	0.581	0.382	0.380	0.467	0.473	0.706	0.711	0.727	0.731	0.709	0.707	0.735	0.735	0.761	0.764	0.696	0.701
corr	0.788	0.782	0.757	0.761	0.588	0.588	0.541	0.544	0.580	0.598	0.072	0.055	0.247	0.246	0.774	0.779	0.802	0.806	0.772	0.767	0.819	0.825	0.747	0.757	0.626	0.638
rega	-4.976	-4.972	1.861	1.845	6.838	6.750	3.061	3.034	0.259	0.256	7.330	7.361	5.681	5.607	1.417	1.384	2.842	2.795	-0.229	-0.269	0.524	0.469	2.125	1.351	4.969	4.205
regb	2.621	2.632	0.751	0.756	-0.088	-0.070	0.314	0.323	0.296	0.311	0.040	0.037	0.107	0.111	0.664	0.671	0.597	0.608	0.968	0.972	0.865	0.877	0.751	0.841	0.462	0.549

Mean of all laboratory cases (total number: 6)

Hs [m]	Tp [s]	Tm01 [s]	Tm02 [s]	fspr [-]	Tm-4-3 [s]	Tm-3-2 [s]	Tm-2-1 [s]	Tm-10 [s]	Tpeq [s]	Tpb [s]	Tpbeq [s]	Tpm [s]

SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.002	-0.001	-0.059	-0.059	0.029	0.028	0.104	0.103	0.001	0.001	-5.631	-5.632	-1.850	-1.852
mae	0.005	0.005	0.161	0.162	0.126	0.127	0.171	0.171	0.076	0.076	5.675	5.676	1.856	1.857
rms	0.006	0.006	0.278	0.278	0.168	0.169	0.204	0.204	0.094	0.094	5.833	5.834	2.058	2.059
sci	0.150	0.175	0.119	0.118	0.132	0.133	0.192	0.192	0.275	0.275	0.434	0.435	0.389	0.390
mpi	0.662	0.641	-0.038	-0.039	0.424	0.421	0.467	0.470	-0.293	-0.297	-1.502	-1.510	-0.040	-0.046
opi	0.100	0.112	0.135	0.134	0.112	0.112	0.146	0.145	0.237	0.238	3.849	3.851	1.387	1.389
std	0.005	0.005	0.256	0.256	0.144	0.145	0.159	0.160	0.079	0.080	1.184	1.185	0.900	0.900
d1	0.768	0.751	0.298	0.296	0.575	0.564	0.544	0.545	0.397	0.395	0.309	0.304	0.366	0.357
d2	0.869	0.858	0.329	0.328	0.716	0.713	0.714	0.715	0.540	0.538	0.462	0.456	0.497	0.491
corr	0.773	0.780	0.045	0.074	0.628	0.624	0.647	0.644	0.446	0.441	0.806	0.799	0.844	0.830
rega	-0.002	-0.002	1.771	1.779	0.381	0.387	0.459	0.464	0.225	0.227	1.821	1.825	1.693	1.694
regb	0.860	0.872	0.209	0.207	0.698	0.692	0.654	0.648	0.501	0.498	0.238	0.235	0.193	0.190

SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.433	-0.434	-0.127	-0.128	-0.057	-0.056	0.006	0.004	-0.155	-0.157	-0.084	-0.086
mae	0.443	0.444	0.165	0.166	0.260	0.261	0.197	0.197	0.214	0.217	0.206	0.206
rms	0.565	0.566	0.242	0.242	0.430	0.431	0.281	0.282	0.394	0.395	0.380	0.381
sci	0.251	0.252	0.142	0.143	0.223	0.223	0.136	0.137	0.216	0.218	0.204	0.205
mpi	-0.058	-0.062	-0.161	-0.167	-0.094	-0.095	0.026	0.004	0.094	0.083	0.127	0.121
opi	0.350	0.350	0.148	0.149	0.243	0.243	0.147	0.148	0.244	0.246	0.237	0.238
std	0.352	0.352	0.198	0.198	0.352	0.352	0.260	0.260	0.357	0.357	0.359	0.359
d1	0.371	0.362	0.467	0.461	0.406	0.406	0.342	0.339	0.425	0.419	0.392	0.391
d2	0.456	0.451	0.536	0.532	0.407	0.407	0.408	0.400	0.397	0.390	0.375	0.370
corr	-0.068	-0.055	0.045	0.047	0.207	0.206	0.192	0.187	0.103	0.108	0.189	0.196
rega	1.500	1.499	1.446	1.446	1.618	1.623	1.748	1.739	1.784	1.793	1.801	1.802
regb	0.198	0.196	0.062	0.060	0.222	0.221	0.148	0.156	0.148	0.142	0.108	0.109

07

Statistics (RIKZ mode)

Computed statistical parameters for case: f31har01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.137	-0.139	-0.194	-0.170	-0.178	-0.180	-0.638	-0.612	-0.951	-0.951
std	0.272	0.269	0.974	0.919	1.147	1.145	0.794	0.744	0.671	0.670
rms	0.287	0.285	0.923	0.868	1.076	1.075	0.973	0.921	1.135	1.136
sci	0.162	0.161	0.129	0.121	0.159	0.159	0.140	0.132	0.252	0.252

Computed statistical parameters for case: f31har02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.184	0.183	0.201	0.213	0.415	0.414	-0.322	-0.309	-0.539	-0.540
std	0.239	0.235	0.577	0.575	0.394	0.393	0.372	0.397	0.506	0.513
rms	0.288	0.284	0.571	0.574	0.552	0.551	0.471	0.480	0.714	0.720
sci	0.169	0.167	0.083	0.083	0.088	0.088	0.070	0.071	0.169	0.171

Computed statistical parameters for case: f31har03
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.195	0.193	-0.098	-0.094	-0.087	-0.088	-0.430	-0.422	-0.555	-0.557
std	0.283	0.278	1.357	1.352	2.109	2.113	0.516	0.518	0.522	0.524
rms	0.327	0.321	1.260	1.255	1.955	1.959	0.643	0.639	0.736	0.738
sci	0.172	0.169	0.165	0.165	0.263	0.264	0.089	0.088	0.160	0.160

Computed statistical parameters for case: f31har04
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.276	0.273	0.310	0.315	0.321	0.321	-0.242	-0.233	-0.436	-0.437
std	0.245	0.238	1.727	1.716	2.528	2.528	0.826	0.825	0.546	0.548
rms	0.357	0.350	1.628	1.620	2.362	2.363	0.803	0.799	0.667	0.670
sci	0.184	0.180	0.210	0.209	0.314	0.314	0.107	0.106	0.142	0.143

Computed statistical parameters for case: f41lak01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.002	-0.003	-0.140	-0.141	-0.140	-0.141	-0.140	-0.141	-0.360	-0.360
std	0.042	0.042	0.099	0.099	0.099	0.099	0.099	0.099	0.080	0.079
rms	0.039	0.039	0.168	0.168	0.168	0.168	0.168	0.168	0.367	0.367
sci	0.173	0.173	0.088	0.088	0.088	0.088	0.088	0.088	0.248	0.247

Computed statistical parameters for case: f41lak02
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.034	-0.034	-0.251	-0.251	-0.251	-0.251	-0.251	-0.251	-0.449	-0.448
std	0.013	0.013	0.075	0.075	0.075	0.075	0.075	0.075	0.040	0.040
rms	0.036	0.036	0.261	0.260	0.261	0.260	0.261	0.260	0.450	0.450
sci	0.091	0.091	0.110	0.109	0.110	0.109	0.110	0.109	0.250	0.250

Computed statistical parameters for case: f41lak03

Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.023	-0.023	-0.315	-0.315	-0.315	-0.315	-0.306	-0.306	-0.500	-0.500
std	0.049	0.049	0.065	0.065	0.065	0.065	0.074	0.074	0.070	0.070
rms	0.051	0.051	0.321	0.321	0.321	0.321	0.313	0.313	0.504	0.504
sci	0.103	0.103	0.123	0.123	0.123	0.123	0.120	0.120	0.255	0.256

Computed statistical parameters for case: f41lak04
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.011	0.011	-0.093	-0.093	-0.093	-0.093	-0.093	-0.093	-0.376	-0.375
std	0.044	0.044	0.059	0.059	0.059	0.059	0.059	0.059	0.066	0.066
rms	0.042	0.042	0.108	0.108	0.108	0.108	0.108	0.108	0.381	0.380
sci	0.144	0.143	0.053	0.053	0.053	0.053	0.053	0.053	0.239	0.238

Computed statistical parameters for case: f41lak05
Total number of observation stations : 8
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.077	0.078	0.014	0.013	0.014	0.013	0.014	0.013	-0.223	-0.223
std	0.038	0.038	0.057	0.057	0.057	0.057	0.057	0.057	0.025	0.023
rms	0.085	0.085	0.054	0.053	0.054	0.053	0.054	0.053	0.224	0.224
sci	0.484	0.486	0.030	0.030	0.030	0.030	0.030	0.030	0.163	0.163

Computed statistical parameters for case: f41lak06
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.017	0.018	-0.235	-0.235	-0.235	-0.235	-0.235	-0.235	-0.443	-0.443
std	0.024	0.024	0.144	0.144	0.144	0.144	0.144	0.144	0.076	0.075
rms	0.028	0.028	0.270	0.271	0.270	0.271	0.270	0.271	0.449	0.448
sci	0.102	0.102	0.125	0.126	0.125	0.126	0.125	0.126	0.272	0.271

Computed statistical parameters for case: f41lak07
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.022	0.022	-0.022	-0.022	-0.017	-0.017	-0.012	-0.012	-0.249	-0.248
std	0.023	0.023	0.129	0.129	0.129	0.130	0.115	0.115	0.064	0.064
rms	0.031	0.031	0.122	0.122	0.121	0.121	0.107	0.108	0.256	0.255
sci	0.240	0.240	0.077	0.077	0.077	0.077	0.069	0.069	0.210	0.209

Computed statistical parameters for case: f41lak08
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.041	-0.041	-0.305	-0.305	-0.305	-0.305	-0.305	-0.305	-0.482	-0.482
std	0.028	0.028	0.086	0.086	0.086	0.086	0.086	0.086	0.048	0.048
rms	0.049	0.049	0.315	0.315	0.315	0.315	0.315	0.315	0.484	0.484
sci	0.157	0.157	0.143	0.143	0.143	0.143	0.143	0.143	0.290	0.290

Computed statistical parameters for case: f41lak09
Total number of observation stations : 8
Number of stations at which observations are available : 8

Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.009	-0.009	-0.196	-0.196	-0.196	-0.196	-0.196	-0.196	-0.425	-0.425
std	0.022	0.022	0.070	0.070	0.070	0.070	0.070	0.070	0.060	0.060
rms	0.023	0.023	0.207	0.207	0.207	0.207	0.207	0.207	0.428	0.428
sci	0.072	0.072	0.095	0.095	0.095	0.095	0.095	0.095	0.258	0.258

Computed statistical parameters for case: f51fri01
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.080	0.016	0.025	-0.395	0.325	-0.311	0.083	-0.337	-0.725	-0.831
std	0.165	0.136	1.312	0.784	1.270	0.287	1.282	0.774	0.137	0.255
rms	0.168	0.122	1.174	0.805	1.181	0.403	1.149	0.770	0.736	0.862
sci	0.165	0.120	0.219	0.150	0.243	0.083	0.216	0.145	0.225	0.263

Computed statistical parameters for case: f51fri02
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.051	0.055	-0.338	-0.913	-0.338	-0.702	-0.311	-0.886	-0.700	-0.739
std	0.245	0.274	1.236	0.850	0.679	0.425	1.235	0.872	0.359	0.399
rms	0.225	0.252	1.156	1.188	0.695	0.798	1.148	1.181	0.770	0.820
sci	0.179	0.201	0.193	0.198	0.120	0.138	0.192	0.198	0.181	0.193

Computed statistical parameters for case: f51fri03
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.100	0.218	-3.255	-3.996	-0.467	-0.320	-3.175	-3.916	-0.864	-0.721
std	0.369	0.475	7.586	7.935	0.891	0.573	7.623	7.980	0.607	0.654
rms	0.345	0.478	7.525	8.145	0.924	0.604	7.521	8.142	1.020	0.929
sci	0.307	0.426	0.771	0.835	0.152	0.099	0.777	0.841	0.227	0.207

Computed statistical parameters for case: f61wes01
Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.293	0.331	-0.341	-0.212	0.149	0.278	-0.278	-0.149	-0.727	-0.664
std	0.027	0.059	0.511	0.491	0.506	0.587	0.482	0.438	0.258	0.305
rms	0.294	0.336	0.583	0.501	0.491	0.610	0.526	0.432	0.766	0.721
sci	0.200	0.229	0.104	0.089	0.096	0.119	0.095	0.078	0.199	0.187

Computed statistical parameters for case: f61wes02
Total number of observation stations : 12
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.379	0.482	-0.284	-0.096	-0.177	0.011	-0.284	-0.096	-0.650	-0.558
std	0.153	0.237	0.982	0.910	0.818	0.820	0.982	0.910	0.363	0.425
rms	0.405	0.530	0.953	0.848	0.778	0.759	0.953	0.848	0.732	0.682
sci	0.256	0.335	0.159	0.141	0.132	0.129	0.159	0.141	0.154	0.144

Computed statistical parameters for case: f61wes03
Total number of observation stations : 12
Number of stations at which observations are available : 9
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.084	0.183	-0.581	-0.378	-0.472	-0.270	-0.511	-0.308	-0.823	-0.721
std	0.229	0.288	0.916	0.985	0.859	0.932	0.997	1.063	0.570	0.640
rms	0.230	0.325	1.035	0.996	0.932	0.912	1.063	1.041	0.980	0.937
sci	0.152	0.215	0.175	0.169	0.161	0.157	0.182	0.178	0.207	0.198

Computed statistical parameters for case: f61wes04
Total number of observation stations : 12
Number of stations at which observations are available : 10
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.064	0.134	-0.306	-0.171	-0.240	-0.106	-0.153	-0.018	-0.864	-0.792
std	0.168	0.228	0.577	0.587	0.925	1.032	0.456	0.407	0.283	0.381
rms	0.171	0.253	0.624	0.579	0.904	0.979	0.456	0.384	0.904	0.870
sci	0.125	0.186	0.118	0.109	0.180	0.195	0.089	0.075	0.239	0.230

Computed statistical parameters for case: f61wes05
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.069	-0.076	0.550	0.554	0.020	0.043	0.536	0.561	-0.978	-0.950
std	0.264	0.264	0.959	0.907	1.204	1.118	0.326	0.304	0.380	0.340
rms	0.227	0.228	0.957	0.925	0.984	0.914	0.598	0.613	1.026	0.990
sci	0.074	0.074	0.118	0.114	0.122	0.113	0.076	0.078	0.188	0.181

Computed statistical parameters for case: f61wes06
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.080	0.082	0.000	0.005	-0.021	-0.009	-0.022	-0.014	-0.928	-0.942
std	0.370	0.381	1.085	1.060	1.286	1.237	0.529	0.527	0.541	0.511
rms	0.312	0.322	0.886	0.865	1.050	1.010	0.432	0.431	1.028	1.030
sci	0.105	0.108	0.107	0.105	0.130	0.125	0.054	0.053	0.184	0.184

Computed statistical parameters for case: f61wes07
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.036	0.041	-0.373	-0.387	-0.229	-0.224	-0.179	-0.193	-0.843	-0.854
std	0.455	0.468	0.953	0.954	1.100	1.035	0.787	0.809	0.575	0.551
rms	0.373	0.385	0.863	0.870	0.927	0.874	0.667	0.688	0.965	0.965
sci	0.129	0.133	0.101	0.102	0.113	0.106	0.080	0.083	0.170	0.170

Computed statistical parameters for case: f61wes08
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.007	0.027	0.123	0.192	0.125	0.105	0.365	0.434	-0.593	-0.636
std	0.617	0.635	1.199	1.052	1.200	1.184	0.975	0.850	0.572	0.578
rms	0.503	0.519	0.987	0.880	0.988	0.973	0.876	0.819	0.754	0.792
sci	0.171	0.176	0.117	0.104	0.121	0.119	0.107	0.100	0.134	0.141

Computed statistical parameters for case: f61wes09
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	

SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.072	0.083	-0.252	-0.190	-0.202	-0.138	0.045	0.108	-0.760	-0.757
std	0.425	0.439	0.688	0.584	0.712	0.605	0.570	0.494	0.422	0.431
rms	0.354	0.368	0.615	0.513	0.616	0.513	0.468	0.417	0.834	0.835
sci	0.121	0.125	0.073	0.061	0.075	0.063	0.058	0.051	0.148	0.148

Computed statistical parameters for case: f61wes10
Total number of observation stations : 12
Number of stations at which observations are available : 5
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.033	0.026	0.140	0.139	0.098	0.099	0.355	0.354	-0.803	-0.881
std	0.420	0.457	0.856	0.876	0.884	0.910	0.682	0.744	0.511	0.531
rms	0.344	0.374	0.713	0.729	0.728	0.749	0.660	0.703	0.905	0.981
sci	0.117	0.127	0.089	0.091	0.093	0.096	0.085	0.090	0.165	0.178

Computed statistical parameters for case: f61wes11
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.416	0.548	0.186	0.484	0.298	0.595	0.186	0.484	-0.529	-0.400
std	0.123	0.198	0.395	0.405	0.306	0.364	0.395	0.405	0.181	0.179
rms	0.431	0.577	0.406	0.609	0.408	0.682	0.406	0.609	0.554	0.432
sci	0.448	0.599	0.092	0.138	0.095	0.159	0.092	0.138	0.149	0.116

Computed statistical parameters for case: f61wes12
Total number of observation stations : 12
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 11
Number of stations at which computed data is available : 11

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.293	0.433	-0.247	0.044	-0.193	0.098	-0.209	0.082	-0.919	-0.767
std	0.154	0.212	0.533	0.642	0.553	0.679	0.540	0.638	0.283	0.308
rms	0.325	0.474	0.546	0.588	0.541	0.628	0.536	0.588	0.955	0.817
sci	0.309	0.452	0.110	0.119	0.110	0.128	0.109	0.120	0.230	0.197

Computed statistical parameters for case: f81nor01
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.038	0.036	-0.699	-0.907	-0.279	-0.309	-0.806	-1.013	-0.467	-0.472
std	0.238	0.237	1.782	1.577	1.084	1.082	1.808	1.589	0.471	0.469
rms	0.220	0.219	1.771	1.702	1.028	1.035	1.837	1.770	0.635	0.637
sci	0.341	0.339	0.319	0.307	0.274	0.276	0.331	0.319	0.264	0.265

Computed statistical parameters for case: f81nor02
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.237	0.235	-0.306	-0.308	0.218	0.216	-0.340	-0.340	-0.174	-0.177
std	0.156	0.156	0.379	0.374	1.094	1.095	0.409	0.402	0.103	0.103
rms	0.276	0.275	0.462	0.460	1.022	1.022	0.505	0.500	0.198	0.200
sci	0.752	0.747	0.130	0.130	0.338	0.338	0.142	0.141	0.105	0.106

Computed statistical parameters for case: f81nor03
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01

bias	0.111	0.109	-0.119	-0.390	-0.497	-0.501	-0.263	-0.532	-0.529	-0.529
std	0.263	0.262	1.060	1.360	0.847	0.850	1.097	1.354	0.269	0.266
rms	0.264	0.263	0.975	1.301	0.919	0.923	1.035	1.346	0.583	0.582
sci	0.349	0.347	0.205	0.273	0.226	0.227	0.220	0.286	0.220	0.219

Computed statistical parameters for case: f81nor04
Total number of observation stations : 9
Number of stations at which observations are available : 7
Number of stations at which precomputed data is available: 9
Number of stations at which computed data is available : 9

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.026	-0.028	1.560	1.539	3.167	3.153	-0.041	-0.065	-0.466	-0.474
std	0.176	0.174	3.049	3.033	5.728	5.705	2.581	2.557	0.566	0.548
rms	0.163	0.161	3.191	3.167	6.114	6.088	2.357	2.335	0.696	0.689
sci	0.423	0.417	0.522	0.519	1.537	1.531	0.386	0.382	0.338	0.335

Computed statistical parameters for case: f91pet01
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.184	-0.184	0.704	0.703	0.520	0.518	1.093	1.092	-0.110	-0.113
std	0.349	0.350	0.974	0.976	1.094	1.095	0.424	0.426	0.480	0.477
rms	0.308	0.309	0.985	0.985	0.932	0.931	1.133	1.133	0.357	0.355
sci	0.105	0.105	0.098	0.098	0.093	0.092	0.117	0.117	0.059	0.058

Computed statistical parameters for case: f91pet02
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.206	-0.207	-0.286	-0.286	0.100	0.101	0.026	0.023	-0.325	-0.327
std	0.310	0.310	0.523	0.523	1.070	1.071	0.047	0.050	0.599	0.595
rms	0.301	0.301	0.468	0.468	0.763	0.764	0.042	0.043	0.534	0.533
sci	0.103	0.103	0.045	0.045	0.076	0.076	0.004	0.004	0.088	0.088

Computed statistical parameters for case: f91pet03
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.162	-0.163	0.984	0.981	1.399	1.397	1.288	1.285	-0.159	-0.162
std	0.339	0.339	0.506	0.501	0.781	0.783	0.936	0.932	1.039	1.036
rms	0.290	0.290	1.046	1.043	1.504	1.503	1.448	1.444	0.752	0.750
sci	0.097	0.097	0.084	0.084	0.130	0.130	0.119	0.119	0.119	0.119

Computed statistical parameters for case: f91pet04
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.060	-0.061	0.920	0.918	2.114	2.112	0.920	0.918	0.268	0.262
std	0.315	0.315	0.807	0.802	0.121	0.116	0.807	0.802	1.044	1.036
rms	0.231	0.231	1.083	1.079	2.116	2.114	1.083	1.079	0.785	0.778
sci	0.085	0.085	0.088	0.088	0.191	0.191	0.088	0.088	0.127	0.126

Computed statistical parameters for case: f91pet05
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.188	-0.189	0.231	0.231	0.770	0.769	-0.182	-0.184	0.178	0.174
std	0.216	0.217	0.688	0.688	0.552	0.552	0.105	0.102	0.941	0.935

rms	0.242	0.244	0.538	0.538	0.863	0.863	0.196	0.198	0.689	0.684
sci	0.093	0.093	0.045	0.045	0.078	0.078	0.017	0.017	0.111	0.110

Computed statistical parameters for case: f91pet06
Total number of observation stations : 3
Number of stations at which observations are available : 3
Number of stations at which precomputed data is available: 3
Number of stations at which computed data is available : 3

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.217	-0.217	1.103	1.327	0.522	0.518	1.103	1.327	-0.194	-0.196
std	0.172	0.173	0.136	0.183	0.287	0.281	0.136	0.183	0.890	0.886
rms	0.248	0.249	1.107	1.334	0.560	0.554	1.107	1.334	0.659	0.657
sci	0.087	0.087	0.116	0.140	0.059	0.058	0.116	0.140	0.108	0.108

Computed statistical parameters for case: l21tri01
Total number of observation stations : 8
Number of stations at which observations are available : 8
Number of stations at which precomputed data is available: 8
Number of stations at which computed data is available : 8

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.003	-0.003	0.040	0.040	0.121	0.121	-0.013	-0.013	0.021	0.021
std	0.003	0.003	0.235	0.235	0.396	0.396	0.184	0.184	0.334	0.334
rms	0.004	0.004	0.221	0.221	0.386	0.386	0.170	0.170	0.310	0.310
sci	0.145	0.145	0.122	0.122	0.226	0.226	0.095	0.095	0.273	0.272

Computed statistical parameters for case: l31set01
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.003	-0.003	-0.071	-0.071	-0.059	-0.059	-0.180	-0.180	0.078	0.078
std	0.006	0.006	0.277	0.277	0.239	0.239	0.346	0.346	0.165	0.164
rms	0.007	0.007	0.284	0.284	0.244	0.244	0.388	0.388	0.181	0.181
sci	0.060	0.060	0.131	0.131	0.113	0.113	0.192	0.192	0.188	0.187

Computed statistical parameters for case: l31set02
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.008	-0.008	-0.320	-0.320	-0.203	-0.203	-0.391	-0.391	0.071	0.071
std	0.008	0.008	0.538	0.538	0.522	0.522	0.428	0.428	0.170	0.170
rms	0.011	0.011	0.622	0.622	0.556	0.556	0.577	0.578	0.183	0.183
sci	0.090	0.090	0.267	0.267	0.252	0.252	0.253	0.253	0.189	0.189

Computed statistical parameters for case: l31set03
Total number of observation stations : 69
Number of stations at which observations are available : 68
Number of stations at which precomputed data is available: 69
Number of stations at which computed data is available : 69

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.001	-0.001	0.119	0.117	0.234	0.232	-0.096	-0.103	0.387	0.392
std	0.003	0.003	0.274	0.276	0.357	0.359	0.340	0.346	0.181	0.184
rms	0.003	0.003	0.297	0.298	0.425	0.425	0.351	0.359	0.427	0.433
sci	0.030	0.029	0.095	0.095	0.140	0.140	0.113	0.116	0.350	0.355

Computed statistical parameters for case: l41cur01
Total number of observation stations : 6
Number of stations at which observations are available : 6
Number of stations at which precomputed data is available: 6
Number of stations at which computed data is available : 6

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	0.004	0.006	-0.018	-0.022	-0.018	-0.022	-0.027	-0.031	0.013	0.009
std	0.004	0.003	0.023	0.022	0.023	0.022	0.009	0.008	0.016	0.016
rms	0.005	0.006	0.027	0.030	0.027	0.030	0.028	0.032	0.019	0.017
sci	0.517	0.667	0.045	0.049	0.045	0.049	0.046	0.052	0.033	0.029

Computed statistical parameters for case: 151his01
Total number of observation stations : 26
Number of stations at which observations are available : 26
Number of stations at which precomputed data is available: 26
Number of stations at which computed data is available : 26

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.001	0.000	-0.257	-0.259	-0.041	-0.043	-0.221	-0.224	0.055	0.048
std	0.005	0.005	0.805	0.804	0.021	0.023	0.834	0.832	0.086	0.090
rms	0.005	0.005	0.829	0.829	0.045	0.049	0.846	0.846	0.101	0.100
sci	0.060	0.059	0.565	0.565	0.036	0.039	0.599	0.599	0.119	0.119

Mean of all f31har cases (total number: 4)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.129	0.127	0.055	0.066	0.118	0.117	-0.408	-0.394	-0.620	-0.621
std	0.260	0.255	1.159	1.141	1.544	1.545	0.627	0.621	0.561	0.564
rms	0.314	0.310	1.095	1.079	1.486	1.487	0.723	0.710	0.813	0.816
sci	0.172	0.169	0.147	0.145	0.206	0.206	0.101	0.099	0.181	0.182

Mean of all f41lak cases (total number: 9)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.002	0.002	-0.172	-0.172	-0.171	-0.171	-0.169	-0.169	-0.390	-0.389
std	0.031	0.032	0.087	0.087	0.087	0.087	0.086	0.087	0.059	0.058
rms	0.043	0.043	0.203	0.203	0.203	0.203	0.200	0.200	0.394	0.393
sci	0.174	0.174	0.094	0.094	0.094	0.094	0.093	0.093	0.243	0.242

Mean of all f51fri cases (total number: 3)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.077	0.097	-1.189	-1.768	-0.160	-0.444	-1.134	-1.713	-0.763	-0.764
std	0.260	0.295	3.378	3.190	0.947	0.428	3.380	3.209	0.368	0.436
rms	0.246	0.284	3.285	3.379	0.933	0.602	3.273	3.364	0.842	0.870
sci	0.217	0.249	0.394	0.394	0.172	0.107	0.395	0.395	0.211	0.221

Mean of all f61wes cases (total number: 12)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.135	0.191	-0.115	-0.001	-0.070	0.040	-0.012	0.104	-0.785	-0.743
std	0.284	0.322	0.804	0.788	0.863	0.875	0.643	0.632	0.412	0.432
rms	0.331	0.391	0.764	0.742	0.779	0.800	0.637	0.631	0.867	0.838
sci	0.184	0.230	0.114	0.112	0.119	0.126	0.099	0.099	0.181	0.173

Mean of all f81nor cases (total number: 4)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	0.090	0.088	0.109	-0.017	0.652	0.640	-0.363	-0.488	-0.409	-0.413
std	0.208	0.207	1.567	1.586	2.188	2.183	1.474	1.476	0.352	0.346
rms	0.231	0.229	1.600	1.658	2.271	2.267	1.434	1.488	0.528	0.527
sci	0.466	0.463	0.294	0.307	0.594	0.593	0.270	0.282	0.232	0.232

Mean of all f91pet cases (total number: 6)

	Hs [m]		Tpm [s]		Tpb [s]		Tpbeq [s]		Tm02 [s]	
SWAN	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01	v40.01+	v40.01
bias	-0.170	-0.170	0.609	0.646	0.904	0.903	0.708	0.744	-0.057	-0.061
std	0.284	0.284	0.606	0.612	0.651	0.649	0.409	0.416	0.832	0.827
rms	0.270	0.271	0.871	0.908	1.123	1.121	0.835	0.872	0.629	0.626
sci	0.095	0.095	0.079	0.083	0.104	0.104	0.077	0.081	0.102	0.101

Mean of all 131set cases (total number: 3)

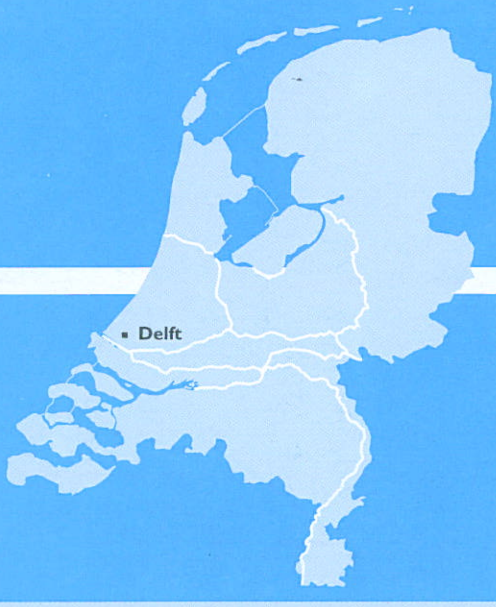
SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.004	-0.004	-0.090	-0.091	-0.009	-0.010	-0.222	-0.225	0.179	0.180
std	0.006	0.006	0.363	0.364	0.372	0.373	0.371	0.373	0.172	0.173
rms	0.007	0.007	0.401	0.401	0.408	0.408	0.439	0.441	0.264	0.266
sci	0.060	0.060	0.164	0.164	0.169	0.169	0.186	0.187	0.242	0.243

Mean of all field cases (total number: 38)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	0.046	0.064	-0.058	-0.074	0.148	0.159	-0.103	-0.118	-0.518	-0.506
std	0.212	0.226	0.924	0.905	0.863	0.826	0.776	0.760	0.400	0.411
rms	0.234	0.256	0.970	0.980	0.940	0.920	0.866	0.881	0.674	0.667
sci	0.199	0.215	0.148	0.149	0.174	0.171	0.136	0.137	0.191	0.189

Mean of all laboratory cases (total number: 6)

SWAN	Hs [m] v40.01+	Hs [m] v40.01	Tpm [s] v40.01+	Tpm [s] v40.01	Tpb [s] v40.01+	Tpb [s] v40.01	Tpbeq [s] v40.01+	Tpbeq [s] v40.01	Tm02 [s] v40.01+	Tm02 [s] v40.01
bias	-0.002	-0.001	-0.084	-0.086	0.006	0.004	-0.155	-0.157	0.104	0.103
std	0.005	0.005	0.359	0.359	0.260	0.260	0.357	0.357	0.159	0.160
rms	0.006	0.006	0.380	0.381	0.281	0.282	0.394	0.395	0.204	0.204
sci	0.150	0.175	0.204	0.205	0.136	0.137	0.216	0.218	0.192	0.192



WL | Delft Hydraulics

Rotterdamseweg 185
postbus 177
2600 MH Delft
telefoon 015 285 85 85
telefax 015 285 85 82
e-mail info@wldelft.nl
internet www.wldelft.nl

Rotterdamseweg 185
p.o. box 177
2600 MH Delft
The Netherlands
telephone +31 15 285 85 85
telefax +31 15 285 85 82
e-mail info@wldelft.nl
internet www.wldelft.nl