Broadview Radar Altimetry Toolbox

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BROADVIEW RADAR ALTIMETRY TOOLBOX

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ABSTRACT

The universal altimetry toolbox, BRAT (Broadview Radar Altimetry Toolbox), which can read all previous and current altimetry missions' data, incorporates now the capability to read the upcoming Sentinel-3 L1 and L2 products. ESA endeavoured to develop and supply this capability to support the users of the Sentinel-3 SAR Altimetry Mission.

Index Terms— BRAT, toolbox, altimetry, radar, Sentinel-3

1. INTRODUCTION

BRAT project started in 2005 from the joint efforts of ESA (European Space Agency) and CNES (Centre National d'Etudes Spatiales) and is a collection of tools and tutorial documents designed to facilitate the processing of radar altimetry data.

2. THE TOOLBOX

The toolbox enables users to interact with the most common altimetry data formats. Moreover, BRAT can be used in conjunction with MATLAB/IDL (via reading routines) or in C/C++/Fortran via a programming API, allowing the user to obtain desired data, bypassing the data-formatting hassle. However, BRAT can also be simply used to quickly visualise data or to translate the data in to other formats such as netCDF, ASCII text files, KML (Google Earth) and raster images (JPEG, PNG, etc.).

Several kinds of computations can be done with BRAT, involving combinations of data fields that the user can save for future uses or using the already embedded formulas that include the standard oceanographic altimetry formulas.

The BRAT Graphical User Interface (GUI) is the front-end for the powerful command line tools that are also part of the BRAT suite.

2.1 FUNCTIONALITIES

BRAT consists of several modules operating at different levels of abstraction. These modules can be Graphical User Interface (GUI) applications, command-line tools, and interfaces to existing applications (such as IDL and MATLAB) or application program interfaces (APIs) to programming languages such as C, FORTRAN and Python.

The main BRAT functions are:

- Data Import and Quick Look: basic tools for extracting data from standard formats and generating quick-look images.
- Data Export: output of data to the netCDF binary format, ASCII text files, or GeoTiff + GoogleEarth (KMZ/KML export); raster images (PNG, JPEG, BMP, TIFF, and PNM) of visualisations can be saved.
- Statistics: calculation of statistical parameters from data.
- Combinations: computation of formulas involving combinations of data fields (and saving of those formulas).
- Resampling: over and under-sampling of data; data binning.
- Data Editing: data selection using simple criteria, or a combination of criteria (that can also be saved).
- Exchanges: data editing and combinations can be exchanged between users.
- Data Visualisation: display of results (see Figure 1 and 2), with user-defined preferences. The viewer enables the user to display data stored in the internal format (netCDF).
- Download and periodic synchronization of satellite products with RADS database.

APIs are available with data reading, date and cycle/pass conversion and statistical computation functions for C, FORTRAN, IDL, (only using previous versions of BRAT), MATLAB and Python, allowing the integration of BRAT functionality in custom applications. For the most common

use cases (selection, combinations, visualisations, etc.), command-line tools are available that can be configured by creating parameter files. For beginners, we recommend using the BRAT GUI application, which enables the operator to easily specify the processing parameters required by each tool (and then invoke those tools at the push of a button).

BRAT is provided as Open Source Software, enabling the user community to participate in further development and quality improvement
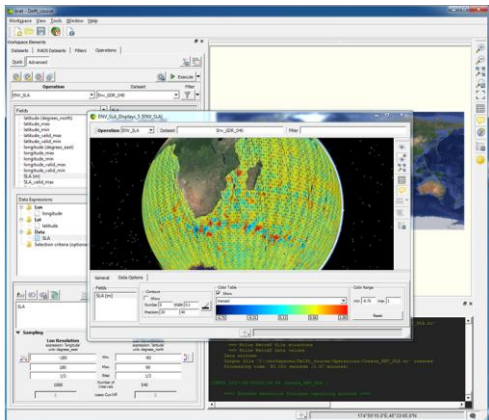

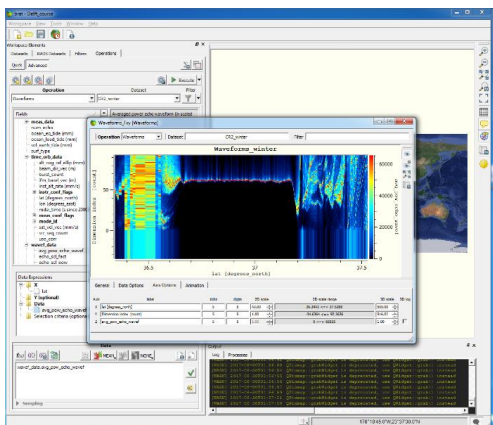*Figure 1 Envisat Sea Level Anomalies shown in BRAT.*

Figure 2 CryoSat-2 Waveforms over the Himalayas shown in BRAT

3. THE TUTORIALS

In the BRAT website, there is a set of different tutorials. The Radar Altimetry Tutorial, which is an update of the existing one at the beginning of the project, contains a strong introduction to altimetry and shows its applications in different fields such as Oceanography, Cryosphere, Geodesy and Hydrology, among others. On the other hand, the SAR altimetry tutorial has been created specifically for the current project in order to make the users aware of the great potential of SAR altimetry, specially coastal and inland applications.

Apart from these two tutorials, the user can find written and video tutorials showing how to use the toolbox and, at the same time, presenting some "use cases" for both conventional and SAR altimetry.

4. THE USER COMMUNITY

One of the main goals of the BRAT consortium is to create a user community around the project. Apart from periodically organizing webinars, workshops and trainings, the project has created a forum on the website (Figure 3 is a snapshot of the main page) where users can discuss on any matter and share their knowledge, and even share their modifications or additional parts of the toolbox's code, which can be downloaded from the website as well.

Moreover, BRAT consortium has created a helpdesk, which is meant to be an interactive channel of communication with users of the toolbox or the tutorials. Some introductory and advanced video tutorials are available in our youtube channel
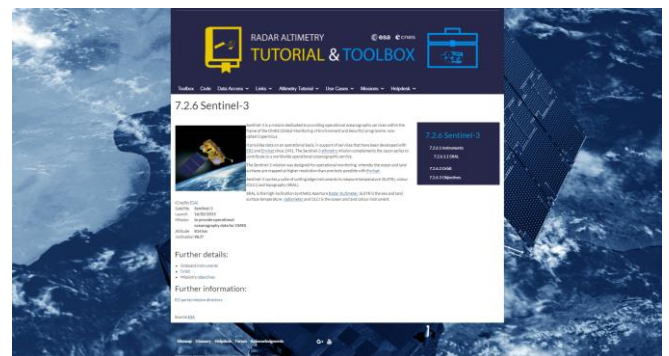

Figure 3 BRAT website with Sentinel-3 information

5. ACKNOWLEDGEMENTS

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If using the tutorial [1], please cite:

Rosmorduc, V., J. Benveniste, E. Bronner, S. Dinardo, O. Lauret, C. Maheu, M. Milagro, N. Picot, A. Ambrozio, R. Escolà, A. Garcia-Mondejar, M. Restano, E. Schrama, M. Terra-Homem, Radar Altimetry Tutorial; J. Benveniste and N. Picot (Editors).

6. REFERENCES

[1] The Radar Altimetry Tutorial, issue 1c, October 2016 -link