Eindrapport Afstudeerproject

HISGIS

Golvenmodel HISWA onder GIS-pakket ARC/INFO

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Voorwoord

Aan het begin van mijn studie Civiele Techniek aan de TU-Delft had ik nog nooit een personal computer aangeraakt, laat staan er mee gewerkt. Mijn ervaring met computers reikte niet verder dan het bedienen van een spelcomputer. Tijdens het eerstejaars-project werd mijn gehele projectgroep door Ir. N. Stuurstraat, onze toenmalige begeleider, verplicht de benodigde verslagen te maken m.b.v. het tekstverwerkingspakket WordPerfect. De eerste kennismaking met de personal computer was een feit. Sindsdien zijn de (personal) computer en civieltechnische computertoepassingen een steeds belangrijkere rol in mijn studie gaan spelen, met als climax mijn huidige afstudeeronderwerp: HISGIS - Golvenmodel HISWA onder GIS-pakket ARC/INFO.

Het afstudeerwerk valt onder de afstudeerrichting Waterbouw met als profilering Civieltechnische Informatica.

Mijn afstudeercommissie bestaat uit:
- prof. dr. ir. P. van der Veer (sectie Civieltechnische Informatica)
- dr. ir. N. Booij (sectie Vloeistofmechanica)
- ir. IJ. G. Haagsma (sectie Civieltechnische Informatica)

Ik wil hen hartelijk danken voor hun enthousiaste begeleiding en de prettige samenwerking tijdens het gehele project. Verder wil ik zeggen dat hun opbouwende kritiek, geleverd tijdens de bijeenkomsten van de afstudeercommissie, mij zeer gestimuleerd en gemotiveerd heeft.

Tevens gaat mijn dank uit naar Robert Kuunders, assistent Geoinformatie op de faculteit der Geodesie van de TU-Delft, voor zijn advies tijdens problemen met de implementatie van HISGIS.

Verder wil ik alle gebruikers van HISWA, die een vragenformulier hebben teruggestuurd, bedanken voor hun medewerking.

Tenslotte wil ik ir. J.H. Andorka Gal (RIKZ - Den Haag) bedanken voor zijn hulp tijdens het testen van HISGIS op één van de werkstations van het Rijks Instituut voor Kust en Zee (RIKZ) te Den Haag.

De succesvolle afronding van dit project is mede te danken aan hun medewerking.

Eric Oschatz

Samenvatting

HISWA is een tweedimensionaal golvenmodel, dat de gebruiker in staat stelt diverse golfgegevens, zoals significante golfhoogte, periode en golfrichting, voor een bepaald modelgebied te bepalen. Op dit moment biedt HISWA al faciliteiten om pre- en post-processing uit te voeren (zij het in beperkte mate). Onder de gebruikers echter is er behoefte aan meer en uitgebreidere mogelijkheden. Door de functionaliteiten op het gebied van weergave en analyse van gegevens, leent een GIS (Geografisch Informatie Systeem) zich uitstekend voor pre- en post-processing doeleinden.

Het doel van het project is het koppelen van HISWA aan een GIS-pakket, en wel op een dusdanige manier dat een gebruikersvriendelijke schil ontstaat, waarbinnen een HISWA berekening kan worden uitgevoerd en tevens van de functionaliteiten van het GIS-pakket gebruik kan worden gemaakt voor pre- en post-processing doeleinden.

Aan de hand van de resultaten van een vragenformulier zijn de eisen en wensen van de huidige HISWA-gebruiker, met betrekking tot bovengenoemde koppeling, geïnventariseerd. Tevens zijn uit deze resultaten conclusies getrokken wat betreft de benodigde functionaliteiten van het te gebruiken GIS-pakket. Er is, voorafgaand aan het afstudeerproject, gekozen voor 's werelds meest gebruikte en veruit bekendste GIS-pakket, ARC/INFO. Uit onderzoek, uitgevoerd tijdens het afstudeerproject, blijkt, dat het pakket over vrijwel alle benodigde functionaliteiten beschikt.

In ARC/INFO's macrotaal AML (ARC/INFO Macro Language) is een volledig menugestuurde applicatie ontwikkeld, genaamd HISGIS. De applicatie HISGIS bestaat uit een viertal delen, te weten het hoofdprogramma, een 'Pre-processing module', een 'Calculation module' en een 'Post-processing module'.

In het hoofdprogramma kunnen de drie modules met behulp van een menu worden aangeroepen.

In de 'Pre-processing module' wordt de gebruiker de mogelijkheid geboden een project te creëren en/of te selecteren, bestaande uit diverse, voor de aansturing van HISWA benodigde commandofiles, waarna het mogelijk is een bepaalde commandofile op te vragen, te bewerken, op te slaan en/of af te drukken. Tevens is het mogelijk afbeeldingen van bestanden met bodemgegevens te maken en het rekenrooster grafisch te definiëren en/of te bewerken.

In de 'Calculation module' kan, na selectie van een bepaalde commandofile, een HISWA berekening worden uitgevoerd.

In de 'Post-processing module' wordt de mogelijkheid geboden tot het bekijken van de resultaten van een bepaalde HISWA berekening in de vorm van tabellen en afbeeldingen. Tevens kunnen de resultaten van verschillende berekeningen met elkaar worden vergeleken.

Met de ontwikkeling van HISGIS is een eerste aanzet gegeven tot het koppelen van HISWA en ARC/INFO, waarbij al aan een groot aantal gebruikerseisen is voldaan, maar nog niet aan alle. Tevens zullen, gezien de groeiende interesse vanuit diverse vakgebieden voor GIS en de toenemende vraag naar applicaties waarin modellen en GIS worden gekoppeld, de wensen van de gebruikers blijven veranderen. Het is daarom onvermijdelijk dat HISGIS regelmatig op diverse gebieden uitgebreid en aan nieuwe of veranderde gebruikerseisen aangepast dient te worden.

Inhoudsopgave

Inleiding

In dit eindrapport wordt een beschrijving gegeven van de gehele ontwikkeling van HISGIS: golvenmodel HISWA onder GIS-pakket ARC/INFO. Tijdens deze ontwikkeling zijn de verschillende fasen van het ontwerpproces doorlopen, wat uiteindelijk heeft geleid tot het eindprodukt. In elk hoofdstuk worden één of meerdere fasen (of delen daarvan) van het ontwerpproces beschreven.

In hoofdstuk 1 wordt een beschrijving gegeven van de werking, de structuur en het gebruik van het golvenmodel HISWA. Vervolgens wordt in hoofdstuk 2 een korte introductie gegeven van GIS en ARC/INFO, waarna in hoofdstuk 3 het eigenlijke probleem aan de orde wordt gesteld. Deze drie hoofdstukken geven een beschrijving van de eerste terreinverkennende systeemfase: de Informatieplanning.

In hoofdstuk 4 wordt een programma van systeemeisen voor HISGIS opgesteld. Hierbij wordt zowel gekeken naar de algemene systeemeisen als naar de eisen gesteld aan pre- en post-processing. Tevens wordt gekeken naar de eisen, gesteld aan het te gebruiken GIS-pakket en de mate waarin ARC/INFO aan deze eisen voldoet. Dit hoofdstuk is het resultaat van de tweede systeemfase: de Definitiestudie.

De volgende drie systeemfasen, te weten het Basisontwerp, het Detailontwerp en de Realisatie en Invoering, worden samengevoegd in de hoofdstukken 5, 6 en 7. In deze hoofdstukken wordt een beschrijving gegeven van respectievelijk de structuur van HISGIS, de lay-out en werking van de menu's van HISGIS en het gebruik van HISGIS.

Vervolgens wordt in hoofdstuk 8 de projectplanning besproken, waarbij wordt ingegaan op de indeling in systeemfasen volgens de ontwerpmethodiek System Development Methodology (SDM) en de tijdsbesteding van het gehele project.

Tenslotte zullen in hoofdstuk 9 de conclusies en aanbevelingen van het project worden besproken.

In dit eindverslag is er van uit gegaan dat de lezers enige kennis hebben op het gebied van de Civiele Techniek en de Civieltechnische Informatica.

Hoofdstuk 1: Beschrijving van het model HISWA

In dit hoofdstuk wordt een korte beschrijving gegeven van de werking en de structuur van het golvenmodel HISWA. Tevens wordt aandacht besteed aan het gebruik van HISWA. Hierbij wordt gekeken naar de belangrijkste functionaliteiten en knelpunten van het model.

1.1 Wat is HISWA ?

Het model HISWA, een afkorting voor HIndcast Shallow water WAves, is een tweedimensionaal golvenmodel, dat is geschreven in de programmeertaal FORTRAN. HISWA is geschikt voor gebruik op een PC (mits voldoende geheugen en een mathematische co-processor aanwezig) en op een werkstation. Het pakket stelt de gebruiker in staat bepaalde gegevens van ondiep water golven, zoals bijv. de significante golfhoogte, de periode en de richting van de golven, voor elke plaats in een bepaald modelgebied te bepalen, rekening houdende met stationaire wind-, bodem- en stromingsgegevens.

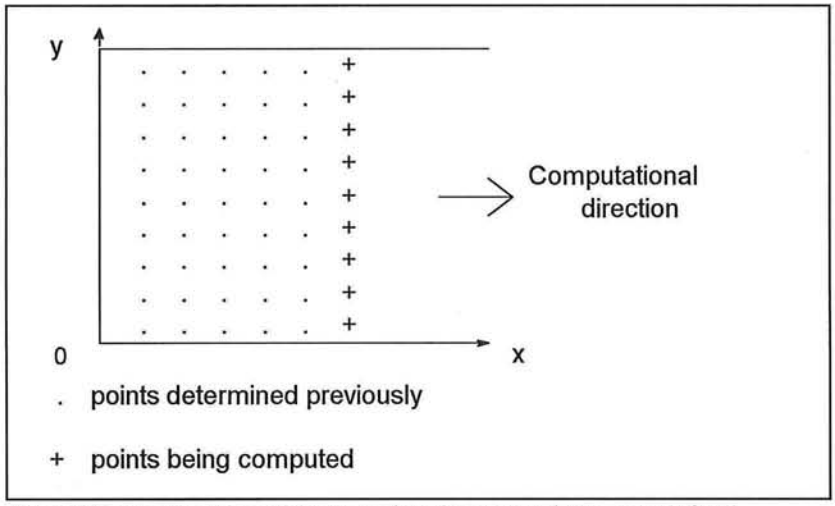
Het golvenmodel wordt in Nederland gebruikt door diverse grote landelijke instellingen, zoals bijv. het Rijks Instituut voor Kust en Zee (RIKZ) te Den Haag en het Waterloopkundig Laboratorium - de Voorst te Emmeloord. Ook in het buitenland bevindt zich een aantal grote gebruikers van HISWA, zoals bijv. het Coastal Research Station Norderney in Duitsland.

1.2 De werking van HISWA

De vergelijkingen, die in HISWA worden gebruikt, zijn partiële differentiaal-vergelijkingen van de eerste orde met de twee horizontale coördinaten (x en y) en de spectrale golfvoortplantingsrichting (θ) als onafhankelijke variabelen. De afhankelijke variabelen zijn de energiedichtheid per golfvoortplantingsrichting en de gemiddelde frequentie per golfvoortplantingsrichting.

Het te berekenen gebied is rechthoekig van vorm met een regelmatig rooster (grid) er overheen gelegd. HISWA kan, wanneer de gebruiker dit wenst, voor het invoergedeelte, het berekeningsgedeelte en het uitvoergedeelte werken met verschillende roosters m.a.w. de oorsprong van het rooster, de richting en de roosterafstand hoeven niet voor de invoer, de berekening en de uitvoer gelijk te zijn. De gegevens van de bodem en de stroming, die nodig zijn voor de berekening, worden bepaald d.m.v. interpolatie van het invoerrooster. Hetzelfde wordt gedaan met het berekeningsrooster, wanneer de gegevens voor de uitvoer nodig zijn.

Het assenstelsel in HISWA bestaat uit een x-as en een y-as, waarbij de x-as is gericht in de golfvoortplantingsrichting en de y-as loodrecht daarop. De berekening begint aan de 'up-wave' zijde bij de lijn in de y-richting met waarde x = 0. Alle punten op deze lijn worden berekend aan de hand van de 'up-wave' randvoorwaarde. Hierna wordt hetzelfde gedaan voor de lijn die precies één roosterafstand verder ligt in de positieve x-richting, maar dan aan de hand van de berekende punten op de voorgaande lijn (in dit geval de lijn x = 0), enzovoort. De oriëntatie van het rekenrooster en de berekeningsrichting is schematisch weergegeven in afbeelding 1.



Afbeelding 1: Roosteroriëntatie en berekeningsrichting van HISWA

Op de 'up-wave' rand van het modelgebied (x = 0), moet de randvoorwaarde door de gebruiker worden ingevoerd. Hierbij moeten voor elk roosterpunt op die rand de golfgegevens gegeven worden. De randen aan de zijkanten van het modelgebied zijn gedeeltelijk terugkaatsend (dit is in te stellen tussen 0 en 100%). Er kan geen golfenergie van buiten het modelgebied over de zijranden het modelgebied binnendringen. De 'down-wave' rand is altijd 100% absorberend, d.w.z. over deze rand kan geen golfenergie in het modelgebied doordringen, noch door weerkaatsing van golven binnen het modelgebied, noch door invloeden van buiten dit gebied.

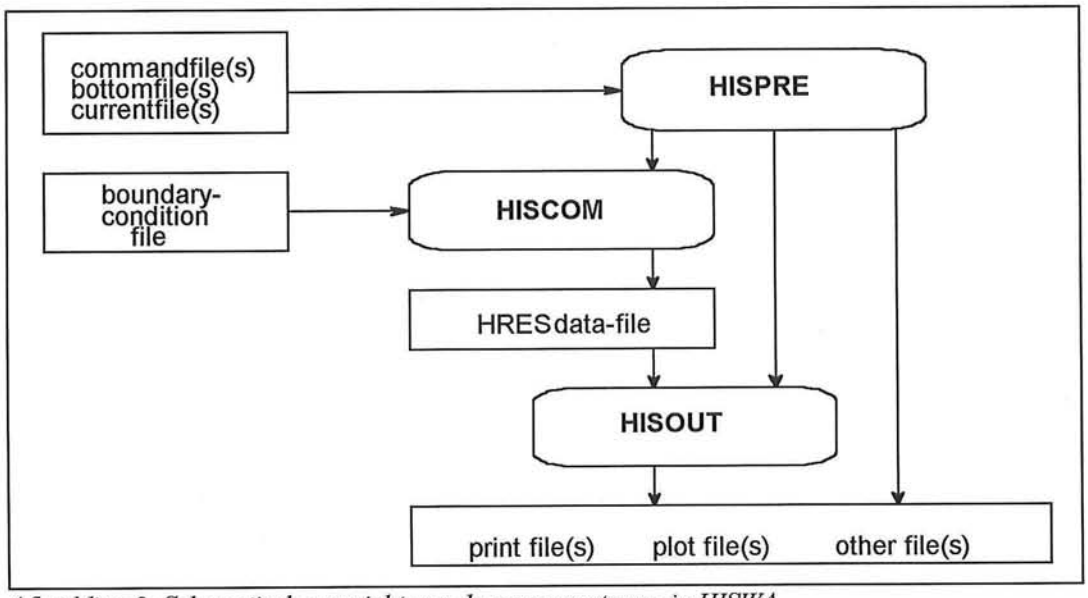
1.3 De structuur van HISWA

Het golvenmodel HISWA is opgebouwd uit onderstaande drie onderdelen:

- HISPRE:
  Dit onderdeel zorgt voor de verwerking van de commando's gegeven in de zogenaamde commandofile. Deze file bevat instructies van de gebruiker naar HISWA in de vorm van ASCII-tekst. Tevens worden in dit onderdeel de bodem- en stromingsfile(s) ingelezen, welke ook in ASCII-formaat zijn. In deze files zijn voor alle punten van het invoerrooster respectievelijk de diepte (z-coördinaat t.o.v. een bepaald referentie wateroppervlak) en de stroming opgeslagen.

- HISCOM:
  Dit onderdeel is het rekengedeelte van HISWA. Het ontvangt de voorbewerkte gegevens van HISPRE, leest de randvoorwaardenfile (indien gewenst) en berekent aan de hand van deze verkregen gegevens de gevraagde golfparameters voor het betreffende gebied. Deze berekeningsresultaten worden in onbewerkte vorm opgeslagen in de HRES-datafile.
- HISOUT:
  Dit onderdeel verzorgt de nabewerking van de berekeningsresultaten. Het leest de onbewerkte gegevens uit de HRES-datafile en kan de gegevens bewerken en sturen naar de printer of de plotter in de vorm van tabellen of afbeeldingen. Tevens kunnen de gegevens worden opgeslagen in de vorm van ASCII-files voor het gebruik in andere programma's of in zichzelf.

De gegevensstroom zoals die plaatsvindt in HISWA is weergegeven in afbeelding 2.



Afbeelding 2: Schematisch overzicht van de gegevensstroom in HISWA

1.4 Het gebruik van HISWA

Om een indruk te krijgen van de ervaringen van de HISWA-gebruikers aangaande het functioneren van HISWA en de eisen en wensen gesteld aan de applicatie HISGIS, is een 'Vragenformulier voor HISWA-gebruikers' gemaakt, dat naar een aantal grote Nederlandse HISWA-gebruikers is gestuurd. Het vragenformulier en de resultaten van dit formulier zijn opgenomen in bijlage 1.

Uit de resultaten van het formulier (bijlage 1 - vraag 1) blijkt dat vrijwel alle HISWA-gebruikers het model draaien op een werkstation of een cluster van werkstations (al dan niet met PC's als terminal).

Wat betreft de belangrijkste pre-processing functionaliteiten van HISWA, is uit de resultaten van het vragenformulier (bijlage 1 - vraag 6 en 7) te concluderen, dat naast de standaard HISWA functionaliteiten, waarvan 'nesting' een belangrijke rol speelt, veel gebruik wordt gemaakt van modelkoppeling. Hierbij moet worden gedacht aan de koppeling van stromingsmodellen, zoals bijv. Waqua of Trisula/Delft 3D, met HISWA.

Verder blijkt uit de resultaten van het vragenformulier (bijlage 1 - vraag 11), dat slechts zeer weinig gebruikers gebruik maken van de post-processing mogelijkheden die HISWA biedt. De meeste gebruikers prefereren een ander losstaand pakket voor de post-processing van de rekenresultaten, zoals bijv. Matlab, ARCVIEW, Tekagx en GPP.

Het belangrijkste knelpunt dat volgt uit de resultaten van het vragenformulier (bijlage 1 - vraag 3), is het feit dat HISWA weinig inzicht geeft in de grootte en de oriëntatie van de verschillende gebruikte roosters. Daarnaast wordt de foutmelding-afhandeling als een ander belangrijk knelpunt gezien.

Tenslotte kiezen de meeste gebruikers niet voor de huidige vorm van editen van de commandofile met behulp van een tekst-editor, maar voor een combinatie tussen een tekst-editor en een invoerscherm (bijlage 1 - vraag 5). Hieruit kan worden geconcludeerd dat de huidige vorm van editen van de commandofile door de meeste gebruikers als niet ideaal wordt ervaren.

Hoofdstuk 2: Beschrijving van GIS en ARC/INFO

In dit hoofdstuk zal een omschrijving worden gegeven van de werking en de mogelijkheden van GIS in het algemeen en het GIS-pakket ARC/INFO in het bijzonder.

2.1 Wat is GIS ?

GIS is een afkorting van Geografisch Informatie Systeem, ook wel ruimtelijk informatie systeem genoemd. Dergelijke systemen beschikken over een uitgebreide database, waarin gegevens zijn opgeslagen die gerelateerd zijn aan kaartmateriaal. GIS biedt de mogelijkheid om deze ruimtelijke gegevens op een eenvoudige manier te verzamelen, te manipuleren, te analyseren en te presenteren. Tevens is het mogelijk verschillende datasets te combineren via overlay operaties, om zo tot nieuwe informatie te komen.

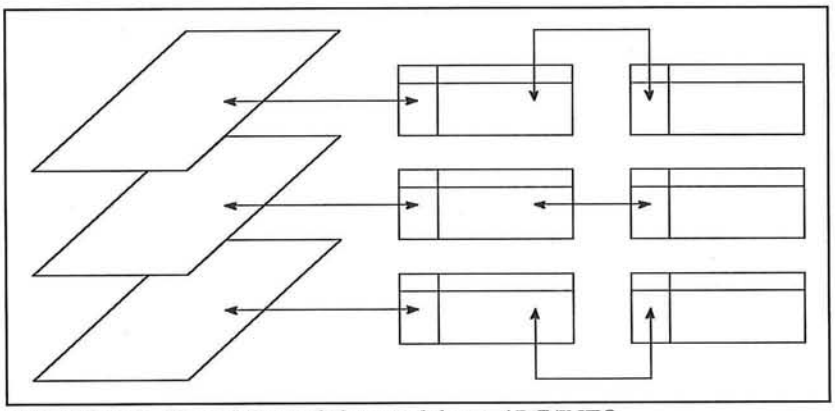
Doordat GIS, vanuit een database, zowel de lokatie-gebonden als de niet lokatie-gebonden kenmerken van geografische objecten kan betrekken in het beantwoorden van vragen, is het uiterst geschikt als beslissingsondersteunend instrument. Het wordt al op grote schaal toegepast in de geodesie, remote sensing, geografie, geologie, bodemkunde, ecologie, planologie en de bosbouw. Maar ook in andere vakdisciplines ontstaat een toenemende interesse voor GIS.

Ook in de Civiele Techniek worden GIS-systemen steeds vaker toegepast. Vooral de combinatie van een GIS-systeem met wiskundige modellen blijkt voor veel vakgebieden binnen de Civiele Techniek een nuttige toepassing, omdat de meeste civieltechnische problemen waarbij modellen een rol spelen, bestaan uit een combinatie van kartografische-, database- en wiskundige modelleringsaspecten.

2.2 Wat is ARC/INFO ?

ARC/INFO, ontwikkeld door het Amerikaanse concern ESRI, is het meest gebruikte GIS-pakket ter wereld. Het pakket telt wereldwijd ruim 6000 gebruikers. Het heeft zijn populariteit onder andere te danken aan het feit dat het een zeer compleet pakket is, met vrijwel alle mogelijkheden die een GIS-pakket zou moeten bieden. Verder is het te gebruiken op vrijwel elke categorie hardware (zowel op PC's als op werkstations), en is in- en uitvoer mogelijk via zeer veel verschillende merken scanners, printers en plotters, maar ook via diverse fileformaten. Tenslotte is er sprake van een goede gebruikersondersteuning, namelijk in de vorm van trainingen, cursussen, 'user-conferences' en een telefoonlijn voor dringende problemen.

De basis van het ARC/INFO pakket is de zogenaamde kartografische database. Deze database bestaat uit een georelationeel en een topologisch datamodel. Het topologische datamodel beschrijft simpele geografische elementen (punten, lijnen en vlakken) en het georelationele data model koppelt aan deze elementen de bijbehorende attributen beschreven in relationele tabellen (zie afbeelding 3).



Afbeelding 3: Georelationeel datamodel van ARC/INFO

De gegevens van het bepaalde gebied worden opgeslagen in diverse lagen (coverages) met elk een eigen kenmerk. Hierbij moet bijvoorbeeld worden gedacht aan een laag (coverage) met daarop slechts lijnen, die ieder voor zich een weg (kenmerk) voorstellen.

ARC/INFO kan werken met verschillende soorten gegevens, zoals afbeeldingen, roosters, vectoren, tabellen en Triangulated Irregular Networks (TIN's). Op deze gegevens kunnen verschillende soorten tools worden gebruikt.

Enkele van de mogelijkheden met het gebruik van deze tools zijn:
- Gegevens invoer en aanpassing (met behulp van o.a. scanners, digitizer tablets, Global Positioning System GPS, keyboard)
- Analyse van gegevens (o.a. overlay operaties, kaart manipulatie, oppervlakte modellering, netwerk analyse)
- Gegevens management
- Produktie van kaarten

ARC/INFO voor werkstations, welke zelf al voorzien is van de belangrijkste applicaties, is nog uitbreidbaar met verscheidene extra applicaties. Hetzelfde geldt voor de PC-versie, waarvoor gezegd dient te worden dat bij deze versie de mogelijkheden van het pakket op zich, de meegeleverde applicaties en de uitbreidingen kleiner zijn dan bij de werkstation-versie.

Wanneer gekeken wordt naar de mogelijkheden die ARC/INFO biedt, kan er worden gesproken van een zeer compleet en all-round GIS-systeem.

Hoofdstuk 3: Waarom koppeling HISWA en GIS ?

In dit hoofdstuk wordt een omschrijving gegeven van het feitelijke probleem, zoals dat naar voren is gekomen uit de resultaten van het 'Vragenformulier voor HISWA-gebruikers' (bijlage 1). Verder zullen in dit hoofdstuk aan de hand van bovengenoemde probleemomschrijving achtereenvolgens de probleemstelling en de doelstelling van dit afstudeerproject worden geformuleerd.

3.1 Probleemomschrijving

Uit de resultaten van het 'Vragenformulier voor HISWA-gebruikers' komt duidelijk naar voren, dat zich tijdens het gebruik van HISWA zowel bij de pre- als bij de post-processing een aantal problemen voordoen.

Het eerste belangrijke punt dat naar voren komt, is het feit dat de meeste gebruikers de huidige manier van HISWA om een commandofile te maken en te bewerken, namelijk met behulp van een tekst-editor, niet ideaal vinden. Hierbij is de gebruiker namelijk genoodzaakt alle benodigde commando's in te typen met de bijbehorende parameters. Dit is, zeker voor onervaren gebruikers, een grote bron van fouten, gezien het feit dat een commandofile bestaat uit een uitgebreide opsomming van commando's en getallen. Slechts zeer ervaren gebruikers zullen in staat zijn zich iets voor te stellen bij de inhoud van een bepaalde commandofile.

Een tweede probleem, dat zich voordoet tijdens het gebruik van HISWA, is dat HISWA, buiten de commando's en getallen in de commandofile, weinig inzicht geeft in de grootte en oriëntatie van de gebruikte roosters. Hierbij moet worden gedacht aan zowel de invoerroosters, die gebruikt worden voor de bodemfile, als de berekenings- en uitvoerroosters. Door dit gebrek aan inzicht levert het correct plaatsen van de verschillende roosters voor de meeste gebruikers veel problemen op.

Het laatste belangrijke punt, dat als een probleem kan worden gezien, is het feit dat HISWA zelf slechts zeer beperkte post-processing faciliteiten biedt. Dit heeft tot gevolg dat vrijwel geen enkele gebruiker op dit moment gebruik maakt van deze faciliteiten. Vrijwel alle gebruikers prefereren de post-processing mogelijkheden die worden geboden door losstaande pakketten, zoals bijv. Matlab, ARCVIEW, Tekagx en GPP.

Uit bovengenoemde opsomming valt te concluderen, dat de pre- en post-processing faciliteiten van HISWA, zeker voor onervaren gebruikers, niet overzichtelijk zijn en dus in veel gevallen snel tot fouten leiden. Veel gebruikers omzeilen deze onoverzichtelijkheid d.m.v. het gebruik van alternatieve pakketten.

3.2 Probleemstelling

Op dit moment ontbreken in HISWA de mogelijkheden tot het uitvoeren van een overzichtelijke pre- en post-processing. Hierdoor wordt, zeker voor onervaren gebruikers, de kans op fouten aanzienlijk groter. Bovendien wordt het model hierdoor minder gebruikersvriendelijk.

3.3 Doelstelling

De doelstelling van dit project is het ontwerpen van een gebruikersvriendelijke schil, waarin het tweedimensionale golvenmodel HISWA en een GIS-pakket worden gekoppeld. Dit koppelen van de twee pakketten moet op een dusdanige manier plaatsvinden dat het GIS-pakket gebruikt kan worden voor zowel de presentatie en manipulatie van de invoer (commandofile en bodemfile) voor HISWA als voor de presentatie van de berekeningsresultaten van HISWA.

Hoofdstuk 4: Systeemeisen HISGIS

In dit hoofdstuk wordt aandacht besteed aan de eisen waaraan de applicatie HISGIS volgens de huidige HISWA-gebruikers moet voldoen: de systeemeisen. Deze zijn opgesteld aan de hand van de resultaten van het 'Vragenformulier voor HISWA-gebruikers' (zie bijlage 1).

Het 'Vragenformulier voor HISWA-gebruikers' is verspreid onder een aantal grote HISWA gebruikers, te weten RIKZ te Den Haag, RIKZ ABW te Haren, WL - de Voorst te Emmeloord en RIZA te Lelystad. De resultaten van de ingevulde formulieren zijn bij elkaar opgeteld en weergegeven in bijlage 1.

De meest voorkomende eisen en wensen, die volgen uit de resultaten van het formulier, zijn bijeengevoegd tot de systeemeisen van HISGIS. Deze systeemeisen zijn zoveel mogelijk nagestreefd tijdens de ontwikkeling van HISGIS. Ze zijn echter niet allemaal uitgewerkt in de applicatie HISGIS, i.v.m. de beperkte tijd die beschikbaar is voor het afstuderen en de beperkingen van ARC/INFO 6.0 (ARC/INFO 7.0 was niet beschikbaar). De niet uitgewerkte systeemeisen zullen terugkomen in de aanbevelingen in hoofdstuk 9.

De systeemeisen worden opgesplitst in vier groepen, te weten algemene systeemeisen, eisen gesteld aan pre-processing, eisen gesteld aan post-processing en eisen gesteld aan het GIS-pakket.

Tenslotte wordt gekeken in hoeverre ARC/INFO voldoet aan de eisen gesteld aan het GIS-pakket, teneinde een beeld te krijgen van de mogelijkheden van de koppeling.

4.1 Algemene systeemeisen

- Het pakket moet draaien op een SUN-werkstation onder ARC/INFO 6.0.
- Het pakket moet een user-interface hebben die qua lay-out overzichtelijk en begrijpelijk is, zelfs zonder het gebruik van de handleiding .
- De user-interface moet, in verband met het internationale gebruik van HISWA, in de Engelse taal zijn.
- Het pakket moet, gezien de beperkte ARC/INFO ervaring van HISWA-gebruikers (zie bijlage 1 - vraag 4), geschikt zijn voor gebruikers zonder enige ARC/INFO kennis.
- Het doorwerken van fouten, gemaakt door de gebruiker, moet zoveel mogelijk voorkomen worden door duidelijke foutmeldingen / waarschuwingen.

- De structuur van het pakket moet dusdanig worden ontworpen dat het eenvoudig uitbreidbaar en onderhoudbaar is.
- Het pakket moet afbeeldingen en tabellen redelijk snel op het scherm laten verschijnen.
- Er moeten zo min mogelijk beperkingen hoeven te worden opgelegd aan de afmetingen van de diverse bestanden, aangaande geheugenproblemen.
- Er moet een duidelijke en goed leesbare engelstalige gebruikers- en beheerders-handleiding worden meegeleverd.

4.2 Eisen gesteld aan pre-processing

Maken en/of bewerken van een commandofile.

- Het maken en/of het bewerken van de commandofile moet kunnen geschieden met behulp van een invoerscherm waarin de HISWA commando's kunnen worden geselecteerd. Bij deze commando's moeten de diverse parameterwaarden kunnen worden ingevoerd (zie bijlage 1 - vraag 5).
- De commando's, de bijbehorende parameterwaarden en de overige gegevens weergegeven op het invoerscherm moeten op een overzichtelijke wijze zijn gerangschikt.
- In het invoerscherm moet een optie voor een geneste berekening zijn opgenomen (zie bijlage 1 - vraag 6).
- In het invoerscherm moet een optie zijn opgenomen voor het gebruik van gegevens en resultaten uit andere modellen, vooral stromingsmodellen (zie bijlage 1 - vraag 6, 7 en 8).
- De randvoorwaarden voor HISWA moeten, indien nodig, kunnen worden ingevoerd m.b.v. een editor.
- De commandofile moet kunnen worden opgeslagen en afgedrukt.

Grafische weergave van de bodemgegevens.

- Het bestand met bodemgegevens moet kunnen worden weergegeven door middel van een afbeelding op het scherm (zie bijlage 1 - vraag 10).
- De afbeelding van de bodemgegevens moet kunnen worden geëxporteerd in de vorm van een point- en/of linecover voor het gebruik in andere pakketten, zoals bijv. ARCVIEW.
- De afbeelding van de bodemgegevens moet kunnen worden afgedrukt.

Grafische weergave en aanpassing van het rekenrooster.

- Er moet m.b.v. de muis op een afbeelding van de bodemgegevens een rechthoekig rekenrooster kunnen worden gedefinieerd (zie bijlage 1 - vraag 10).
- Het rekenrooster moet na plaatsing kunnen worden geroteerd en verplaatst.
- De celgrootte van het rekenrooster moet kunnen worden ingevoerd en/of aangepast.

- Bij de weergave van het rekenrooster moet worden aangegeven in welk deel van het rooster de invloed van de randen (reflectie) merkbaar is.
- De grootte van het uitvoerrooster moet worden bepaald aan de hand van de grootte van het rekenrooster.
- In geval van nesting moet de mogelijkheid worden geboden om twee verschillende roosters op te geven.
- In de afbeelding van de bodem moeten raaien of punten kunnen worden gedefinieerd, waarvoor tijdens de berekening aparte resultaten worden opgeslagen in de vorm van tabellen.
- De afbeelding van de bodem met het gedefinieerde rekenrooster moet kunnen worden afgedrukt.

Bestandsbeheer.

- De verschillende commandofiles, die bij elkaar horen, moeten kunnen worden ondergebracht in een project.
- Bij de naamgeving van de verschillende soorten files moet gelet worden op de logica (bijv. speciale extensie voor outputfiles en nummering in de naam van de files van diverse runs met dezelfde bodemfile).
- De bestanden met bodemgegevens moeten worden omgezet naar ARC/INFO formaat zonder ingrijpen van de gebruiker.
- Na gebruik van de bestanden (commandofiles en bodemfiles) in de ARC/INFO-schil moeten ze worden terug geconverteerd en opgeslagen in een dusdanige vorm dat ze ook zijn te gebruiken in HISWA zonder ARC/INFO.
- Alle gegevens van het invoerscherm, van de bodem, de raaien en de roosters moeten kunnen worden opgeslagen in de commandofile.

4.3 Eisen gesteld aan post-processing

- De gebruiker moet kunnen kiezen uit diverse weergavemogelijkheden van de rekenresultaten: 2D-, 3D-, isolijnen-afbeeldingen, verschilplaatjes tussen de resultaten van diverse runs en tabellen (zie bijlage 1 - vraag 12 en 13).
- Voor de weergave van de berekeningsresultaten moet een keuze kunnen worden gemaakt uit verschillende berekende golfgegevens, zoals bijv. significante golfhoogte, diepte, enz.
- Er moet een mogelijkheid zijn ingebouwd om de berekeningsresultaten van HISWA te kunnen vergelijken met de resultaten van andere bronnen, bijv. een ander golvenmodel of metingen (zie bijlage 1 - vraag 13).
- Met de berekeningsresultaten moeten geografische analyses kunnen worden uitgevoerd (zie bijlage 1 - vraag 13).
- Alle berekeningsresultaten en afbeeldingen moeten kunnen worden afgedrukt.

4.4 Eisen gesteld aan het GIS-pakket

- Veel HISWA-gebruikers moeten al in het bezit zijn van het GIS-pakket, in verband met beperking van de kosten van het gebruik van HISGIS (aanschaf GIS-pakket).
- Het GIS-pakket moet op zijn minst de mogelijkheid bieden om ASCII-data te converteren naar zijn eigen formaat of ASCII-data kunnen gebruiken.
- Het GIS-pakket moet de mogelijkheid bieden om een pakket te ontwikkelen wat voldoet aan bovengenoemde eisen (zie bijlage 1 - vraag 9).
- Het GIS-pakket moet afbeeldingen kunnen maken in vormen zoals hierboven is genoemd (zie bijlage 1 - vraag 9).
- Het is noodzakelijk dat het GIS-pakket beschikt over een eigen programmeertaal, aangezien dit nodig is voor het ontwikkelen van de schil.

4.5 In hoeverre voldoet ARC/INFO aan de gestelde eisen ?

Vrij veel grote landelijke organisaties, waar HISWA gebruikt wordt, zijn al in het bezit van ARC/INFO, al wordt het meestal niet gebruikt in combinatie met HISWA. Vaak is ARC/INFO zelfs niet eens bekend bij de HISWA-gebruikers.

In ARC/INFO bestaat de mogelijkheid een bestand van ASCII-formaat te converteren naar een GRID: een roostervorm bestaande uit vierkantjes waarbij aan elk roosterpunt behalve een x- en y-coördinaat nog een derde waarde wordt toegekend (bijvoorbeeld een bodemdiepte, een golfhoogte, enz.). Dit formaat kan door ARC/INFO worden gelezen. Een GRID biedt de mogelijkheid tot het maken van 2D-, 3D- en isolijnen-afbeeldingen. Tevens kunnen verschillende GRIDs van elkaar worden afgetrokken, waardoor de verschilplaatjes ontstaan.

ARC/INFO beschikt over zijn eigen macrotaal AML (ARC/INFO Macro Language) waarmee verschillende GIS-commando's kunnen worden opgeslagen in een macro. Tevens biedt AML de mogelijkheid tot het bouwen van verschillende soorten menu's. Door het koppelen van de verschillende menu's en macro's kan een applicatie worden gebouwd.

Uit bovengenoemde punten blijkt dat ARC/INFO aan (vrijwel) alle eisen voldoet. Het heeft echter ook beperkingen. De beschikbare versie van ARC/INFO was versie 6.0, waarin een aantal functionaliteiten met betrekking tot GRID ontbreken ten opzichte van de opvolger ARC/INFO 7.0. De belangrijkste extra functionaliteiten die ARC/INFO 7.0 kan toevoegen aan HISGIS zullen worden besproken in de aanbevelingen in hoofdstuk 9.

Hoofdstuk 5: Structuur van HISGIS

In dit hoofdstuk zal aandacht worden besteed aan de structuur van de voor HISGIS benodigde bestanden (bodemfile en userfile) Tevens zal worden gekeken naar de programmastructuur van de applicatie HISGIS als geheel en de structuur van de verschillende AMLs behorende bij het hoofdsysteem en de deelsystemen.

5.1 Structuur van de userfile

Om toegang te krijgen tot HISGIS moet de gebruiker een persoonlijke userfile hebben, met daarin zijn persoonlijke gegevens. Deze userfile moet, om correct te functioneren, voldoen aan bepaalde eisen.

De AML 'user'.aml bestaat uit 14 regels, met daarin de persoonlijke gegevens, directories en het default bodemformaat. De persoonlijke gegevens worden slechts gebruikt voor het controleren van het password en het maken van plotfiles. De directories worden gebruikt tijdens het gehele programma om de diverse 'workspaces' (plaatsen waar HISGIS de benodigde bestanden zoekt) te definiëren. Het 'default' bodemformaat wordt gebruikt in het menu *preinput.menu*, wanneer een nieuwe commandofile moet worden gemaakt.

Een userfile kan er bijvoorbeeld als volgt uit zien:

```
&s .password = hisgis
&s .name = 'Eric Oschatz'
&s .companyname = 'Delft University of Technology'
&s .department = 'Faculty of Civil Engineering'
&s .address = 'Stevinweg 1'
&s .city = '2628 CN  Delft'
&s .country = 'The Netherlands'
&s .phone = '015 - 2787921'
&s .workspace = /usr2/cti/eric
&s .hiswapath = /usr2/cti/eric/hiswa
&s .commandpath = /usr2/cti/eric/command
&s .bottompath = /usr2/cti/eric/bottom
&s .outputpath = /usr2/cti/eric/output
&s .bottomformat = 1
&return
```

De waarden van de variabelen van de userfile kunnen worden aangepast voor eigen gebruik. Er moet echter wel worden voldaan aan het formaat zoals hierboven weergegeven (niets veranderen voor =). Hierbij dient te worden gelet op het plaatsen van 'quotes' (') wanneer een regel spaties bevat (zie bijv. &s .name = 'Eric Oschatz').

Nadat de userfile is aangepast voor eigen gebruik, moet het worden gecodeerd en gekopieerd naar de user-directory. Dit coderen kan worden gedaan in ARC/INFO door het typen van het volgende commando:

&encode & encrypt <naam userfile>

Dit commando levert een file op met dezelfde naam, maar nu met de extensie *.aef*, welke wordt gebruikt door HISGIS.

5.2 Structuur van de bodemfile

Een bodemfile voor HISWA bestaat uit twee delen, te weten een deel met 'heading-lines', welke worden genegeerd door HISWA, en een deel met de eigenlijke data. Voor het gebruik van de bodemfile in HISGIS, worden bepaalde eisen gesteld aan het formaat van de bodemfile.

De eerste regels van de bodemfile moeten er als volgt uitzien:

- regel 1: NCOLS <aantal kolommen van de bodemfile >
- regel 2: NROWS <aantal rijen van de bodemfile >
- regel 3: XLLCORNER 0
- regel 4: YLLCORNER 0
- regel 5: CELLSIZE <celgrootte van de bodemfile >
- regel 6: <leeg>
- regel 7: <begin van de data>
- etc.

De bodemfile begint dus met 6 kopregels voordat de eigenlijke data begint. De eerste regel definieert het aantal kolommen van de bodemfile. De tweede regel definieert het aantal rijen en de vijfde regel de celgrootte van de bodemfile (celgrootte in x-richting = celgrootte in y-richting).

De derde en vierde regel van de bodemfile verdienen enige aandacht. Normaal zou in deze regels de geografische ligging van de oorsprong van de bodemfile zijn gedefinieerd. Dit is echter in deze versie van HISGIS niet nodig, en zelfs niet mogelijk, gezien de beperkingen van ARC/INFO 6.0 (zie paragraaf 7.1).

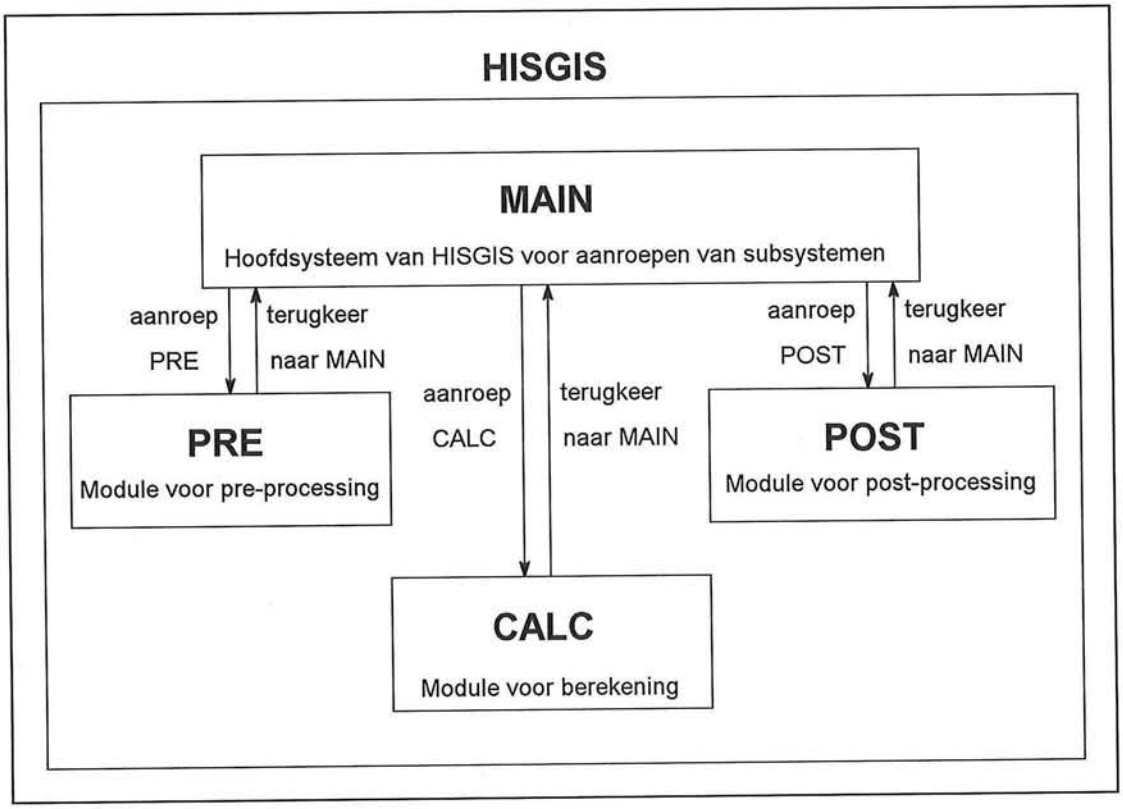
In deze versie van HISGIS moeten deze twee regels allebei de waarde 0 bevatten, waarmee het begin van het GRID wordt gedefinieerd. Dit houdt in dat het coördinatenstelsel van het GRID de oorsprong links onder in de hoek van de bodem heeft. Dit heeft automatisch tot gevolg dat de x- en y-coördinaat, die worden weergegeven op het scherm, de lokale coördinaten zijn.

De reden van het toevoegen van de kopregels is het feit dat ARC/INFO deze regels nodig heeft om de ruwe data van de bodemfile te kunnen converteren naar ARC/INFO formaat: 'GRID'. Een GRID bestaat uit een aantal GRID-punten met een x- en y-coördinaat en nog een derde waarde (in dit geval de bodemdiepte). Doordat de opbouw van een GRID in GRID-punten in grote lijnen overeenkomt met de opbouw van een bodemfile in roosterpunten, is een bodemfile (na toevoeging van de kopregels) probleemloos te converteren naar een GRID. Dit maakt het gebruik van bodemfiles in ARC/INFO mogelijk.

5.3 Programmastructuur van HISGIS als geheel

HISGIS is een applicatie die is opgebouwd uit één hoofdsysteem MAIN en drie deelsystemen, te weten de pre-processing module PRE, de calculation module CALC en de post-processing module POST. Vanuit het hoofdsysteem MAIN kunnen de verschillende deelsystemen worden gestart. Na het afsluiten van een deelsysteem komt de gebruiker automatisch terug in het hoofdsysteem MAIN, waarna opnieuw een deelsysteem kan worden aangeroepen.

De opbouw van HISGIS als geheel kan schematisch worden weergegeven zoals in afbeelding 4.

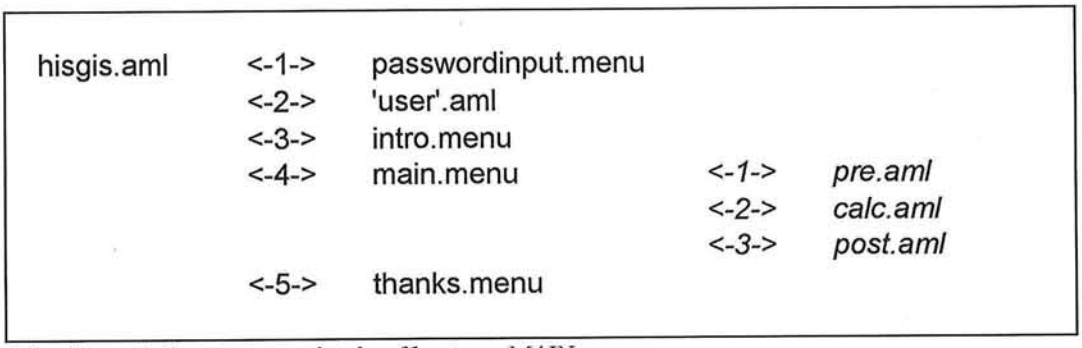


Afbeelding 4: Structuur van de applicatie HISGIS

Door opdeling van HISGIS in één hoofdsysteem en drie deelsystemen functioneren de deelsystemen als onafhankelijke eenheden, met daartussen geen gegevensoverdracht.

5.4 Programmastructuur van het hoofdsysteem MAIN

Het hoofdsysteem MAIN bestaat uit een tweetal AMLs en een viertal menu's. Tezamen vormen zij de basis van de applicatie HISGIS. De structuur van het hoofdsysteem kan weergegeven als in afbeelding 5.



Afbeelding 5: Structuur van het hoofdsysteem MAIN

De AML *hisgis.aml* is de opstart-file van HISGIS. Het is aan te raden deze file te kopiëren naar de home-directory van de verschillende gebruikers.

Allereerst krijgen in *hisgis.aml* een aantal variabelen een waarde toegekend, te weten de paths waar de AMLs zich bevinden (.amlpath), waar de menu's zich bevinden (.menupath), waar de userfiles zich bevinden (.userpath), de voor ARC/INFO benodigde stationsfile voor de definitie van de hardware, de manier van wegschrijven naar een plotfile en de manier van weergave op het scherm (resp. .terminal, .plotfile en .display). Dit deel van de AML *hisgis.aml* kan voor eigen gebruik worden aangepast.

Vervolgens wordt het menu *passwordinput.menu* aangeroepen, waarin de gebruiker zijn/haar eigen gebruikersnaam (de naam van de eigen *'user'.aml* zonder *.aml*) en password moet invoeren, welke staat opgeslagen in de eigen *'user'.aml*. In deze AML zijn naast het password (.password) ook de volledige naam van de gebruiker (.name), de bedrijfsgegevens van de gebruiker (.companyname, .department, .address, .city, country en .phone), de home-directory van de gebruiker (.workspace), de paths waar HISWA te vinden is (.hiswapath) waar de commandofiles moeten worden opgeslagen (.commandpath), waar de bodemfiles zijn opgeslagen (.bottompath), waar de output moet worden opgeslagen (.outputpath) en tenslotte het default bodemformaat (.bottomformat) gedefinieerd. Al deze variabelen kunnen per gebruiker anders zijn. Iedere HISGIS gebruiker heeft daarom zijn eigen userfile.

De hele userfile mag door de gebruiker zelf worden aangepast voor eigen gebruik. De volledige naam en bedrijfsgegevens van de gebruiker worden gebruikt voor het vervaardigen van de plotfiles van de verschillende afbeeldingen (zie paragraaf 5.1).

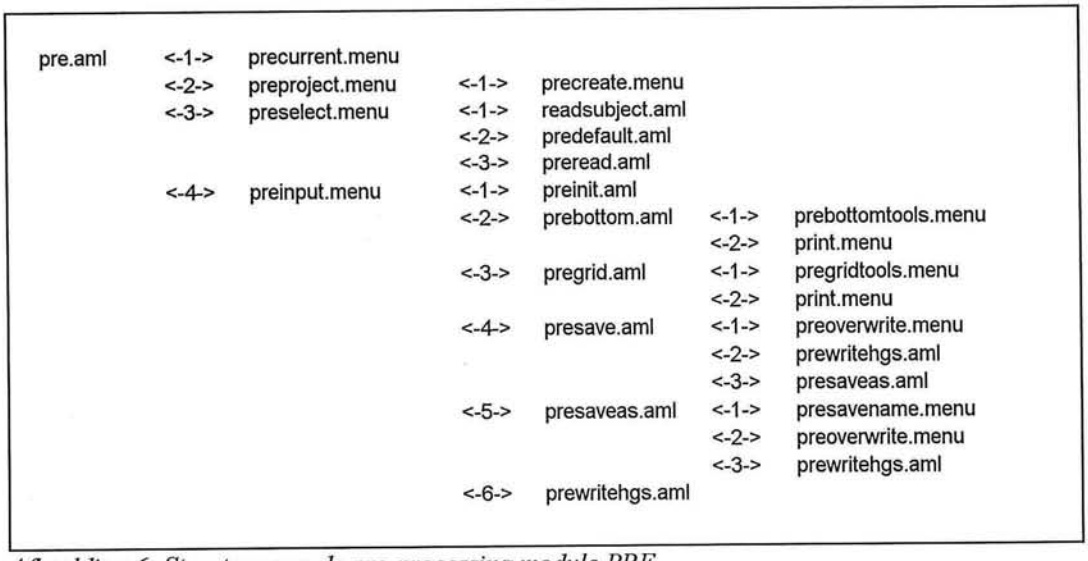
Na afsluiting van het menu *passwordinput.menu* wordt teruggekeerd naar *hisgis.aml*, alwaar de ingevoerde naam en het password worden vergeleken met de naam van de *'user'.aml* en het password (.password) in de *'user'.aml*. Wanneer deze niet overeenkomen, dan keert *hisgis.aml* (tot maximaal twee maal) terug naar het menu *passwordinput.menu*.

Wanneer de naam en het password overeenkomen wordt het introductiescherm *intro.menu* en na afsluiting hiervan het hoofdmenu *main.menu* aangeroepen. In dit hoofdmenu kunnen de AMLs benodigd voor het starten van de verschillende deelsystemen worden aangeroepen, te weten *pre.aml*, *calc.aml* en *post.aml*.

Na afsluiting van het hoofdmenu wordt het afscheidsscherm *thanks.menu* aangeroepen, waarna wordt teruggekeerd naar ARC/INFO.

5.5 Programmastructuur van het deelsysteem PRE

Vanuit het hoofdmenu *main.menu* kan de pre-processing module worden aangeroepen. Deze module bestaat uit een tiental AMLs en een tiental menu's. De structuur van de pre-processing module is weergegeven in afbeelding 6.



Afbeelding 6: Structuur van de pre-processing module PRE

De AML waarmee de pre-processing module vanuit het hoofdmenu wordt aangeroepen is *pre.aml*.

In *pre.aml* wordt allereerst gecontroleerd of al eerder tijdens de huidige HISGIS sessie een commandofile is op gevraagd. Is dat niet het geval, dan wordt het menu *preproject.menu* aangeroepen. Is wel eerder een commandofile opgevraagd, dan wordt het menu *precurrent.menu* aangeroepen, waarin de gebruiker wordt gevraagd een keuze te maken tussen het bewerken/opvragen van de reeds eerder opgevraagde commandofile of het opvragen van een andere commandofile. Wanneer de gebruiker de reeds eerder opgevraagde commandofile wil opvragen, dan wordt teruggekeerd naar *pre.aml* en direct het menu *preinput.menu* aangeroepen, waarin de commandofile kan worden bewerkt. In het geval dat de gebruiker een andere commandofile wil opvragen wordt eveneens teruggekeerd naar *pre.aml*, maar nu wordt verder gegaan met het menu *preproject.menu*.

In het menu *preproject.menu* kan de gebruiker een project selecteren waarvan een commandofile moet worden opgevraagd om te bekijken of te bewerken. Tevens wordt de mogelijkheid geboden een nieuw project te maken met behulp van het menu *precreate.menu*. Dit project wordt zowel in de directory van de commandofiles als in de output-directory gecreëerd.

Na selectie van een project wordt teruggekeerd naar *pre.aml*, alwaar het menu *preselect.menu* wordt aangeroepen, waarin de gebruiker een keuze kan maken uit verschillende commandofiles behorende tot het geselecteerde project. Tevens wordt de mogelijkheid geboden een nieuwe commandofile te maken. Hiervoor worden dan de default waarden van HISWA ingelezen door het aanroepen van de AML *predefault.aml*.

Wanneer de gebruiker een commandofile selecteert, wordt op de achtergrond de AML *readsubject.aml* aangeroepen, waarin de regels van de geselecteerde commandofile worden gelezen totdat het commando 'PROJECT' is gevonden. In deze regel staan drie titels die worden toegekend aan variabelen die in het display-veld van het menu *preselect.menu* worden weergegeven. Op die manier kan de gebruiker zien wat het onderwerp is van de geselecteerde commandofile.

Nadat een commandofile is geselecteerd wordt allereerst de AML met default waarden, *predefault.aml*, aangeroepen. Dit is gedaan om te zorgen dat alle parameters in de commandofile een waarde hebben (ook diegene die niet aangepast kunnen worden in het menu *preinput.menu*, in de Bottom Tools of in de Grid Tools). Vervolgens wordt de AML *preread.aml* aangeroepen, waarin de geselecteerde commandofile wordt ingelezen. Hierna wordt teruggekeerd naar *pre.aml*, alwaar het menu *preinput.menu* wordt aangeroepen.

Wanneer het *preinput.menu* wordt aangeroepen, wordt eerst de AML *preinit.aml* aangeroepen, waarin *preinput.menu* wordt geïnitialiseerd. Deze initialisatie wordt niet uitgevoerd wanneer, na het uitvoeren van button-functionaliteiten, het menu opnieuw wordt aangeroepen. Dit zou verlies van gegevens (veranderingen) tot gevolg hebben.

In het menu *preinput.menu* staan de verschillende HISWA commando's uit de commandofile weergegeven met de bijbehorende parameterwaarden. Deze parameterwaarden kunnen worden aangepast. Tevens kunnen een aantal (niet verplichte) commando's aan/uit worden gezet.

Twee andere belangrijke functionaliteiten van het menu zijn de 'Bottom Tools'- en de 'Grid Tools'-button. Verder kan de commandofile worden afgedrukt en worden opgeslagen onder de bestaande naam of onder een nieuwe naam.

Door de 'Bottom Tools'-button te selecteren wordt de AML *prebottom.aml* gestart. In deze AML wordt allereerst het menu *prebottomtools.menu* aangeroepen, waarin een bodemfile en een presentatie (2D, 3D, isolijnen) kunnen worden gekozen. Wanneer in *prebottomtools.menu* de keuze wordt gemaakt voor een bepaalde presentatievorm van een bodemfile, dan wordt de bodemfile geconverteerd naar een GRID (zie paragraaf 5.2), ARCPLOT gestart en de geselecteerde presentatievorm aangeroepen, waarna de afbeelding op het scherm verschijnt in een speciaal ARCPLOT-display.

Nadat de afbeelding is gemaakt in het display, verschijnt rechts onder in de hoek van het display het menu *print.menu*, waarin kan worden gekozen of de afbeelding moet worden gestuurd naar de printer of naar een plotfile of niet (zie voorbeeld-afbeelding 1 t/m 3, bijlage 2). Hierna wordt, afhankelijk van de keuze, een afdruk gemaakt of teruggekeerd naar het menu *prebottomtools.menu*. De gekozen bodemfile kan in *prebottomtools.menu* al dan niet worden geselecteerd voor de huidige commandofile.

Door de 'Grid Tools'-button te selecteren wordt de AML *pregrid.aml* gestart. In deze AML wordt allereerst een 2D-afbeelding gemaakt van de geselecteerde bodemfile, waarna het rekenrooster wordt berekend en weergegeven. Deze berekening bestaat uit het berekenen van de hoekpunten van het rooster (aan de hand van een tweetal punten, de hoekverdraaiing en de lengte in de x- en y-richting) en de invloed van de dichte randen aan de zijkanten van het rooster. Door weerkaatsing van golven tegen deze dichte randen ontstaan onbetrouwbare rekenresultaten over een hoek van 30 graden t.o.v. beide randen getrokken vanaf de twee up-wave hoekpunten (zie voorbeeld-afbeelding 4, bijlage 2). Vervolgens wordt het menu *pregridtools.menu* aangeroepen, waarin de verschillende waarden (oorsprong, tweede (steun)punt, hoekverdraaiing, lengte in x- en y-richting, aantal cellen) van het rekenrooster kunnen worden bewerkt. Wijzigingen van waarden in dit menu (behalve wijzigingen in het aantal cellen) werken meteen door in de afbeelding, d.w.z. elke keer als een wijziging wordt gemaakt in één van de waarden van het rekenrooster, wordt het rooster opnieuw berekend en getekend.

Wanneer in het menu *pregridtools.menu* wordt gekozen voor het selecteren van het rooster met de waarden zoals weergegeven in datzelfde menu, verschijnt rechts onder in de hoek van het ARCPLOT-display weer het menu *print.menu*, waarin een keuze kan worden gemaakt voor een afdruk naar de printer of naar een file.

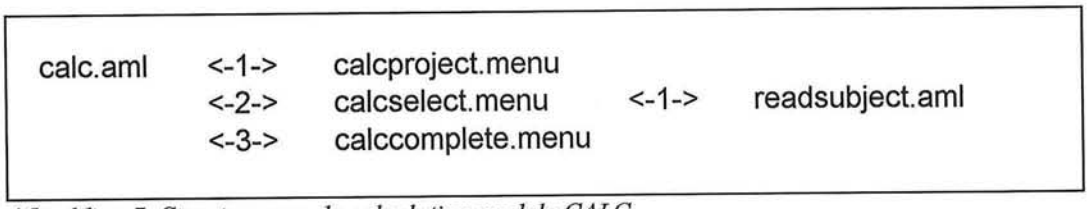
De functionaliteiten van het menu *preinput.menu* m.b.t. het opslaan van de bewerkte commandofile wordt verzorgt door een tweetal AMLs, te weten *presave.aml*, waarin de commandofile wordt opgeslagen onder de huidige naam, en *presaveas.aml*, waarin een nieuwe naam kan worden gegeven aan de commandofile.

De AML *presave.aml* controleert of de huidige filenaam al bestaat. Is dat niet het geval (alleen als een nieuwe commandofile is gemaakt), dan wordt, door het aanroepen van *presaveas.aml*, de mogelijkheid geboden de naam 'untitled' te veranderen. Bestaat de filenaam al, dan wordt het menu *preoverwrite.menu* aangeroepen, waarin de gebruiker kan kiezen of een file moet worden overschreven of niet. In geval van overschrijven, wordt de AML *prewritehgs.aml* aangeroepen, waarin de commandofile wordt weggeschreven. Wanneer de bestaande file niet moet worden overschreven, dan wordt de AML *presaveas.aml* aangeroepen.

In de AML *presaveas.aml* wordt het menu *presavename.menu* aangeroepen, waarin de gebruiker de huidige filenaam kan veranderen. Vervolgens wordt gecontroleerd of de gewijzigde filenaam al bestaat, waarna de file, na aanroep van het menu *preoverwrite.menu*, wordt weggeschreven door het aanroepen van *prewritehgs.aml*.

5.6 Programmastructuur van het deelsysteem CALC

Vanuit het hoofdmenu *main.menu* kan de calculation module CALC worden aangeroepen, waarin een HISWA berekening kan worden uitgevoerd. Deze module bestaat uit een tweetal AMLs en een drietal menu's. De structuur van de calculation module is weergegeven in afbeelding 7.



Afbeelding 7: Structuur van de calculation module CALC

Vanuit het hoofdmenu *main.menu* wordt de calculation module gestart door het aanroepen van de AML *calc.aml*.

In *calc.aml* wordt allereerst het menu *calcproject.menu* aangeroepen, waarin de gebruiker een project kan selecteren waarvan een commandofile moet worden gebruikt voor een HISWA-berekening. Hierna wordt teruggekeerd naar *calc.aml* alwaar het geselecteerde project wordt geopend en het menu *calcselect.menu* wordt aangeroepen, waarin de verschillende commandofiles behorende tot het geselecteerde project zijn weergegeven. De gebruiker kan een commandofile selecteren waarmee een HISWA berekening moet worden uitgevoerd.

Wanneer de gebruiker een commandofile selecteert, wordt op de achtergrond de AML *readsubject.aml* aangeroepen, waarin het onderwerp van de commandofile wordt ingelezen.

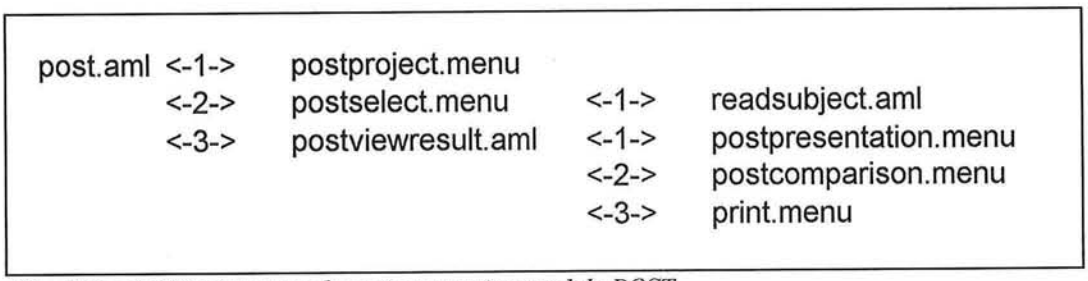
Na selectie wordt teruggekeerd naar *calc.aml*, waarin vervolgens de eigenlijke berekening wordt uitgevoerd. Deze berekening bestaat uit het kopiëren van de geselecteerde commandofile naar een bestand genaamd INPUT, welke zich bevindt in de HISWA directory. Vervolgens worden achtereenvolgens de HISWA-files HISPRE, HISCOM en HISOUT aangeroepen, welke gebruik maken van de 'INPUT'-file als commandofile. Hierna wordt de output-directory van de betreffende commandofile, welke gecreëerd is tijdens het opslaan van de commandofile, opgeschoond. Dit houdt in dat de resultaten van een vorige berekening met dezelfde commandofile komen te vervallen. Tenslotte worden de rekenresultaten en de, door HISWA gemaakte, '.PRT'-file gekopieerd naar de output-directory en wordt gecontroleerd of de berekening correct is uitgevoerd.

Wanneer de berekening correct is uitgevoerd, wordt het menu *calccomplete.menu* aangeroepen. Hierin wordt de gebruiker medegedeeld dat de berekening met succes is voltooid. Indien ernstige fouten zijn opgetreden verschijnt een foutmelding.

Na afsluiting van dit menu keert de gebruiker terug naar het hoofdmenu.

5.7 Programmastructuur van het deelsysteem POST

Vanuit het hoofdmenu *main.menu* kan de post-processing module worden aangeroepen. Deze module bestaat uit een drietal AMLs en een vijftal menu's. De structuur van de post-processing module is weergegeven in afbeelding 8.



Afbeelding 8: Structuur van de post-processing module POST

Vanuit het hoofdmenu *main.menu* wordt de post-processing module gestart door het aanroepen van de AML *post.aml*.

In *post.aml* wordt allereerst het menu *postproject.menu* aangeroepen, waarin de gebruiker een project kan selecteren waarvan een commandofiles moet worden bekeken.

Hierna wordt teruggekeerd naar *post.aml*, alwaar het geselecteerde project wordt geopend en het menu *postselect.menu* wordt aangeroepen, waarin de verschillende commandofiles behorende tot het geselecteerde project zijn weergegeven. De gebruiker kan een commandofile selecteren waarvan de berekeningsresultaten moeten worden bekeken.

Wanneer de gebruiker een commandofile selecteert wordt op de achtergrond de AML *readsubject.aml* aangeroepen, die het onderwerp van de geselecteerde commandofile inleest.

Na selectie wordt teruggekeerd naar *post.aml*, alwaar de AML *postviewresult.aml*, waarin de berekeningsresultaten worden weergegeven, wordt aangeroepen. In deze AML wordt allereerst het menu *postpresentation.menu* aangeroepen, waarin de gewenste parameter en presentatievorm (2D, 3D, isolijnen, vergelijking van verschillende resultaten, tabel) van de berekeningsresultaten kan worden geselecteerd. Na keuze van een parameter en een presentatievorm, wordt de resultatentabel behorende bij de geselecteerde parameter geconverteerd naar een GRID, zodat het kan worden gelezen door ARC/INFO. Vervolgens wordt de geselecteerde presentatievorm aangeroepen.

In het geval van een '2D'-, '3D'- of 'isolijnen'-presentatie wordt een afbeelding van resultaten gemaakt in een speciaal ARCPLOT-display. Nadat de afbeelding is gemaakt in het display, verschijnt het menu *print.menu* rechts onder in de hoek van het display. Hierin kan worden gekozen voor een afdruk naar de printer of naar een file.

In het geval van een 'vergelijking van verschillende resultaten'-presentatie wordt het menu *postcomparison.menu* gestart, waarin een tweede commandofile kan worden geselecteerd, waarvan de resultaten moeten worden vergeleken met de eerder geselecteerde commandofile. Tevens kan in dit menu weer een keuze worden gemaakt uit één van de presentatievormen (2D, 3D of isolijnen). De vergelijking wordt gemaakt door de resultaten van de tweede commandofile in zijn geheel af te trekken van de resultaten van de eerste commandofile. Dit verschil wordt weergegeven in een ARCPLOT-display, waarna ook weer met behulp van menu *print.menu* de mogelijkheid wordt geboden tot het maken van een afdruk.

In het geval van een 'tabel'-presentatie wordt een tekst-editor gestart waarin de tabel behorende bij de geselecteerde parameter wordt weergegeven.

Hoofdstuk 6: Lay-out en werking van de menu's

In dit hoofdstuk wordt aandacht besteed aan de gebruikte methodiek en criteria voor het ontwerp van de lay-out van de verschillende menu's Tevens wordt een overzicht gegeven van de verschillende functionaliteiten, die zijn opgenomen in de menu's, met de bijbehorende werking. Tenslotte wordt een overzicht gegeven van de keuzes die gemaakt zijn tijdens het ontwerp van de lay-out van de menu's, aan de hand van bovengenoemde criteria.

6.1 Ontwerpmethodiek en ontwerpcriteria

Bij het ontwerp van de lay-out van de verschillende menu's is vooral aandacht besteed aan de manier van handelen van de gebruiker en het interpreteren van de menu's door de gebruiker. Het handelen van de gebruiker is vooral van belang voor de plaatsing van de verschillende functionaliteiten op de menu's. Het interpreteren van de menu's door de gebruiker is van belang voor de toevoeging van verduidelijkende teksten bij de functionaliteiten en op de menu's. Deze twee zaken hebben dus grote invloed op de manier van indeling en weergave van het menu. De keuzes, die zijn gemaakt aangaande deze indeling en weergave, zijn beschreven in paragraaf 6.3.

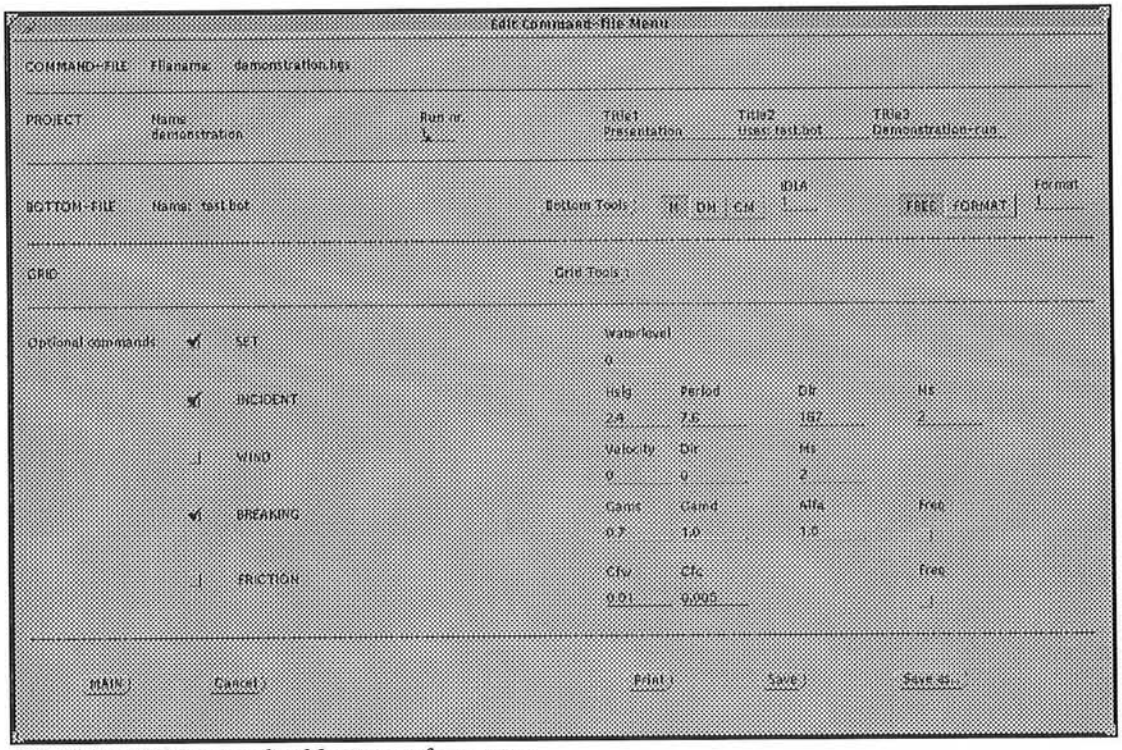
Naast bovengenoemde zaken zijn een aantal ontwerpcriteria gehanteerd, aan de hand waarvan de lay-out van de menu's is opgezet.

Ontwerpcriteria voor de lay-out van de verschillende menu's:

- Duidelijkheid en begrijpelijkheid.
  Dit criterium dient ervoor te zorgen dat de menu's, zelfs zonder gebruik van de handleiding, kunnen worden gebruikt door vrijwel elk type gebruiker (dus ook onervaren gebruikers).
- Gebruikersvriendelijkheid.
  Dit criterium dient ervoor te zorgen dat de applicatie vergevingsgezind is t.o.v. de gebruiker.
- Consistentie.
  Dit criterium dient ervoor te zorgen dat de menu's qua lay-out een dusdanige overeenkomst vertonen dat de gebruiker na enige tijd bepaalde handelingen kan uitvoeren zonder te hoeven zoeken naar de locatie van de benodigde functionaliteiten.

6.2 Overzicht van de verschillende functionaliteiten

Voor de menu's van het hoofdsysteem en de verschillende deelsystemen is gebruik gemaakt van zogenaamde form-menu's. Deze menusoort, bestaande uit AML-commando's, biedt binnen ARC/INFO heel veel mogelijkheden op het gebied van weergave van verschillende soorten functionaliteiten, zoals o.a. buttons, display-velden, invoer-velden (eventueel met scrolling lists), choice-velden, checkboxen en tekst.



Afbeelding 9: Een voorbeeld van een form-menu

Buttons kunnen worden gebruikt voor het aanroepen van bepaalde functionaliteiten. Hierbij kan worden gedacht aan het aanroepen van een AML of een menu. Het gebruik van buttons maakt het mogelijk een menustructuur op te zetten en/of applicaties te bouwen. De buttons kunnen worden geselecteerd door er met de muis (linker muistoets) op te drukken. Tevens is het mogelijk onder de button een help-tekst te hangen, die kan worden aangeroepen door er met de rechter muistoets op te drukken.

Een display-veld is een veld waarin de waarde van een bepaalde variabele wordt weergegeven. Deze waarde kan in het menu niet worden gewijzigd.

Een invoer-veld geeft, net als een display-veld, een waarde van een variabele weer, alleen nu kan deze waarde wel worden aangepast. Een scrolling list zorgt voor een overzicht/lijst van de verschillende keuzemogelijkheden, waaruit met behulp van de muis een selectie kan worden gemaakt.

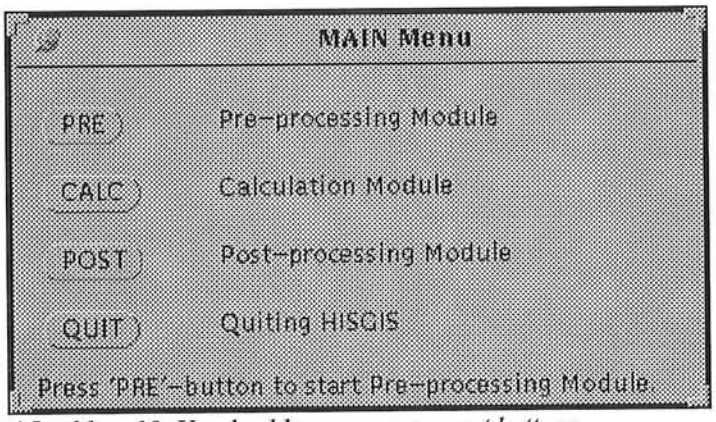
Een choice-veld bestaat uit twee of meer buttons, waarvan er slechts één ingedrukt (= geselecteerd) kan zijn. Wanneer wordt gedrukt op een choice-button, dan wordt op dat moment de selectie van de daarvoor geselecteerde choice-button opgeheven.

Een checkbox is een functionaliteit die bestaat uit een vakje dat gemarkeerd kan worden. Dit kan worden gedaan door met de muis op de checkbox te drukken, waardoor deze wordt aangezet en wordt voorzien van een check-mark (✓). Wanneer er nog een keer op de checkbox wordt gedrukt, wordt deze weer uitgezet en verdwijnt de check-mark.

Tekst biedt de mogelijkheid om de menu's te voorzien van commentaar, uitleg, aanwijzingen, etc. Dit kan ertoe bijdragen dat het menu duidelijker en begrijpelijker wordt.

6.3 Gemaakte keuzes m.b.t. de lay-out en werking van de menu's

Met betrekking tot de lay-out van de verschillende buttons is ervoor gekozen de buttons zoveel mogelijk te voorzien van teksten, waaruit duidelijk de funktie blijkt. Dit is gedaan om ervoor te zorgen dat de gebruiker direct de werking van de button kan voorspellen.



Afbeelding 10: Voorbeeld van een menu met buttons

Verder is elke button voorzien van een help-tekst, waarin een korte uitleg wordt gegeven van de werking van de button. Deze help-tekst dient ervoor de gebruiker, in geval van twijfel over de funktie van de button, zekerheid te verschaffen (zie afbeelding 10).

Bij de plaatsing van de buttons is ernaar gestreefd de veilige (zonder gegevensverlies) en logische (actie waarvoor het menu bedoeld is) buttons steeds rechts onder in het menu te plaatsen. Er is gekozen voor onder in het menu, omdat de meeste gebruikers een muis beweging naar zich toe makkelijker vinden dan een beweging van zich af. De keuze voor rechts in het menu is genomen, omdat de meeste gebruikers hun muis aan de rechter kant naast het toetsenbord hebben staan, waardoor een beweging naar links door het toetsenbord wordt bemoeilijkt. Een beweging naar rechts kan echter wel zonder problemen worden uitgevoerd.

Bij de invoervelden is, in geval van meerdere keuzemogelijkheden voor de gebruiker, gekozen voor een scrolling list, omdat dit de keuze vergemakkelijkt. De gebruiker kan hierdoor slechts een keuze maken uit de mogelijke keuzen, wat de kans op fouten verkleint.

Bij de plaatsing van de verschillende functionaliteiten is ervoor gekozen deze steeds op de zelfde plaats in de menu's te laten terugkomen. Dit is gedaan om ervoor te zorgen dat de gebruiker na een korte periode al weet waar de functionaliteiten zich bevinden op het menu. Dit draagt ertoe bij dat de gebruiker vlot kan werken met de applicatie.

Vrijwel alle menu's zijn voorzien van één of twee buttons ('MAIN'- en 'Cancel'-button) waarmee terug kan worden gegaan in de menustructuur. Dit is gedaan om de vergevingsgezindheid van de applicatie te vergroten; het biedt de gebruiker de mogelijkheid eventuele fouten achteraf te verbeteren.

Voor een beschrijving van de functionaliteiten van de verschillende menu's op zich wordt verwezen naar de gebruikers- of beheerdershandleiding (in dit geval user manual en operator manual).

Hoofdstuk 7: HISGIS in gebruik

In dit hoofdstuk wordt aandacht besteed aan het gebruik van HISGIS. Hierbij wordt gekeken naar de beperkingen van de applicatie en de procedure die is toegepast bij het testen ervan.

7.1 Beperkingen van HISGIS

De applicatie HISGIS is ontworpen aan de hand van de in hoofdstuk 4 genoemde systeemeisen. Aangezien voor het afstuderen een beperkte tijd beschikbaar is en tijdens de ontwikkeling slechts ARC/INFO 6.0 beschikbaar was, kan niet aan alle eisen worden voldaan. Dit heeft tot gevolg dat HISGIS een aantal beperkingen heeft, waarvan de belangrijkste als aanbeveling zullen terugkomen in de conclusies en aanbevelingen in hoofdstuk 9.

De beperkingen van de huidige versie van HISGIS (voor zover bekend):

- Het is in deze versie van HISGIS niet mogelijk geneste berekeningen uit te voeren. De buttons en andere functionaliteiten hiervoor ontbreken dan ook op de verschillende menu's.
- Er is slechts een koppeling gemaakt tussen HISWA en ARC/INFO, en dus geen rekening gehouden met andere modellen, zoals bijvoorbeeld stromingsmodellen. Ook hiervoor ontbreken dus alle button en overige functionaliteiten.
- Er is in deze versie van HISGIS in het menu *preinput.menu* slechts een beperkte hoeveelheid HISWA commando's opgenomen. Dit is gedaan om de invoer overzichtelijk te houden. Het brengt echter ook beperkingen met zich mee.
- Het is binnen de huidige versie van HISGIS niet mogelijk bodem-, rooster- of berekeningsgegevens te exporteren in de vorm van een point- of linecover voor het gebruik in andere pakketten, zoals bijv. ARCVIEW (verzoek van Ralf Kaiser - Norderney).
- Bij de conversie van ASCII naar GRID ondersteunt ARC/INFO slechts vierkante gridcellen. De celgrootte in x-richting moet dus altijd gelijk zijn aan de celgrootte in y-richting.
- In ARC/INFO 6.0 ontbreken een aantal GRID-functionaliteiten, die in de opvolger, ARC/INFO 7.0, wel aanwezig zijn. Zo kan ARC/INFO 6.0 bijv. geen GRIDs roteren over een bepaalde hoek of spiegelen om de x-as. Hierdoor kan de huidige versie van HISGIS, die is ontwikkeld met ARC/INFO 6.0, slechts werken met bodemfiles, die op een dusdanige manier zijn georiënteerd dat ze niet meer hoeven te worden geroteerd of gespiegeld om de juiste geografische ligging te krijgen. Dit heeft tot gevolg dat het toekennen van de werkelijke geografische coördinaten geen enkele zin heeft. Er wordt dus gewerkt met lokale coördinaten.

- Er is in deze versie van HISGIS geen mogelijkheid ingebouwd om raaien en punten te definiëren, waarvoor aparte berekeningstabellen worden gemaakt.
- Het is niet mogelijk geografische analyses uit te voeren met de bodemgegevens en berekeningsresultaten.
- Plotfiles, die gemaakt zijn met ARC/INFO 6.0, kunnen alleen worden afgedrukt op een printer die Postscript2 ondersteunt. Hierdoor kan HISGIS slechts rechtstreeks printen wanneer een dergelijke printer is aangesloten.

7.2 Testen van HISGIS

Het testen van HISGIS heeft zowel op het werkstation, waarop het is ontwikkeld, op de TU-Delft als op een werkstation van het RIKZ te Den Haag plaatsgevonden.

Op de universiteit hebben de testen vooral betrekking gehad op het controleren van de werking van de verschillende modules. Deze vorm van testen is al begonnen toen de eerste menu's en AMLs klaar waren.

Hierbij moet bijvoorbeeld worden gedacht aan vragen als:
- Worden de juiste menu's op het juiste moment aangeroepen ?
- Komt de opgeslagen of afgedrukte commandofile overeen met de in het menu *preinput.menu* ingevoerde gegevens ?
- Wordt de bodem correct weergegeven bij gebruik van andere bodemfiles dan diegene die gebruikt zijn tijdens de ontwikkeling van HISGIS ?
- Kan het rekenrooster foutloos over de volle 360 graden worden geroteerd ?
- Kan met de door HISGIS gemaakte commandofiles een HISWA berekening worden uitgevoerd ?
- Worden bij de berekening de bestanden op de juiste plaats weggeschreven ?
- Worden de berekeningstabellen op een correcte manier weergegeven in de post-processing module ?

Tijdens deze vorm van testen, die al in een vroeg stadium is begonnen, kwamen steeds nieuwe problemen aan het licht. Er mag dan ook niet worden gesteld dat HISGIS op dit moment foutloos is, ondanks het feit dat alle problemen, die zich tijdens het testen voordeden, zijn opgelost. Er zullen zich tijdens het gebruik ongetwijfeld nog meer (kleine) problemen voordoen.

Het testen van HISGIS op het werkstation van het RIKZ te Den Haag had tot doel het controleren van de flexibiliteit van de applicatie. Dit is bekeken door HISGIS te installeren en uit te proberen met bestanden van het RIKZ. Hieruit bleek dat de lay-out van de menu's niet geheel platform onafhankelijk was. Dit had tot gevolg dat een aantal functionaliteiten op de menu's ten opzichte van elkaar waren verschoven. Verder zijn nog enkele kleine foutjes uit de applicatie gehaald. Echte grote problemen traden hierbij niet op.

Hoofdstuk 8: Projectplanning

In dit hoofdstuk wordt een beeld gegeven van de projectplanning. Hierbij worden achtereenvolgens de indeling in systeemfasen volgens System Development Methodology (SDM) en de tijdsbesteding van het gehele project besproken. Bij dit laatste punt zal tevens worden gekeken in hoeverre de uiteindelijke tijdsbesteding overeenkomt met de tijdsbesteding zoals deze in de planning was voorgesteld.

8.1 Indeling in systeemfasen volgens SDM

Om het totale afstudeerproject overzichtelijk, controleerbaar en beheersbaar te houden, moet een indeling worden gemaakt in verschillende systeemfasen. In het geval van dit project is een indeling gemaakt in de volgende systeemfasen met bijbehorende inhoud, mijlpaal en geschatte tijdsduur.

Systeemfasen	Inhoud systeemfase	Mijlpaal	Duur fase
Informatieplanning	Plannen voor een nieuw informatie-systeem: – Doel van het project – Globaal programma van eisen (randvoorwaarden, uitgangspunten) – Werkwijze – Tijdsplanning	Werkplan	5 weken
Definitiestudie	– Programma van eisen uitbreiden en aanpassen – Systeemeisen en systeemgrenzen opstellen – Totaalplan te ontwerpen systeem opstellen – AML	Rapport Definitiestudie	2 weken
Basisontwerp	– Systeemeisen verfijnen – Decompositie: opdelen in subsys-temen met daartussen minimale gegevensoverdracht – AML	Rapport Basisontwerp	2 weken
Detailontwerp	– Logisch en fysiek ontwerp van de subsystemen – AML	Rapport Detailontwerp	5 weken
Realisatie en invoering	– Implementatie in AML – Testen – Afronden documentatie – Operationeel maken	Handleidingen en eindrapport	13 weken
Gebruik en beheer	Dit onderdeel is in dit project niet van toepassing.	n.v.t.	n.v.t.

Bij deze indeling in systeemfasen is gebruik gemaakt van de ontwerpmethodiek System Development Methodology. Deze methodiek splitst de totale systeemcyclus op in een aantal systeemfasen, waarbij in elke systeemfase één of meerdere delen van de totale systeemcyclus wordt afgewerkt. Na voltooiing van elke systeemfase moeten de vorderingen schriftelijk worden gerapporteerd in een afsluitend rapport: een mijlpaal. Deze mijlpaal moet worden goedgekeurd door de begeleidende commissie, waarna kan worden doorgegaan met de volgende fase. Mocht een systeemfase niet worden goedgekeurd door de commissie, dan moet de gehele fase worden overgedaan. Door deze gang van zaken is deze ontwerpmethodiek uitermate geschikt om de kwaliteit en de voortgang van het project te bewaken.

8.2 Tijdsbesteding

Aan het begin van het project is voor elk van de systeemfasen, genoemd in de vorige paragraaf, een benodigde tijdsduur geschat. Dit leverde een totale netto projectduur (= totale tijd - vakanties - witte weken - tentamenperiodes) op van 27 weken.

De geschatte tijdsduur voor de verschillende systeemfasen bleek, zeker aan het begin van het project, behoorlijk goed overeen te komen met de werkelijk benodigde tijd voor elke systeemfase. Alleen tijdens de laatste systeemfase, 'Realisatie en Invoering', traden enkele vertragingen op door problemen tijdens de implementatie van HISGIS in AML.

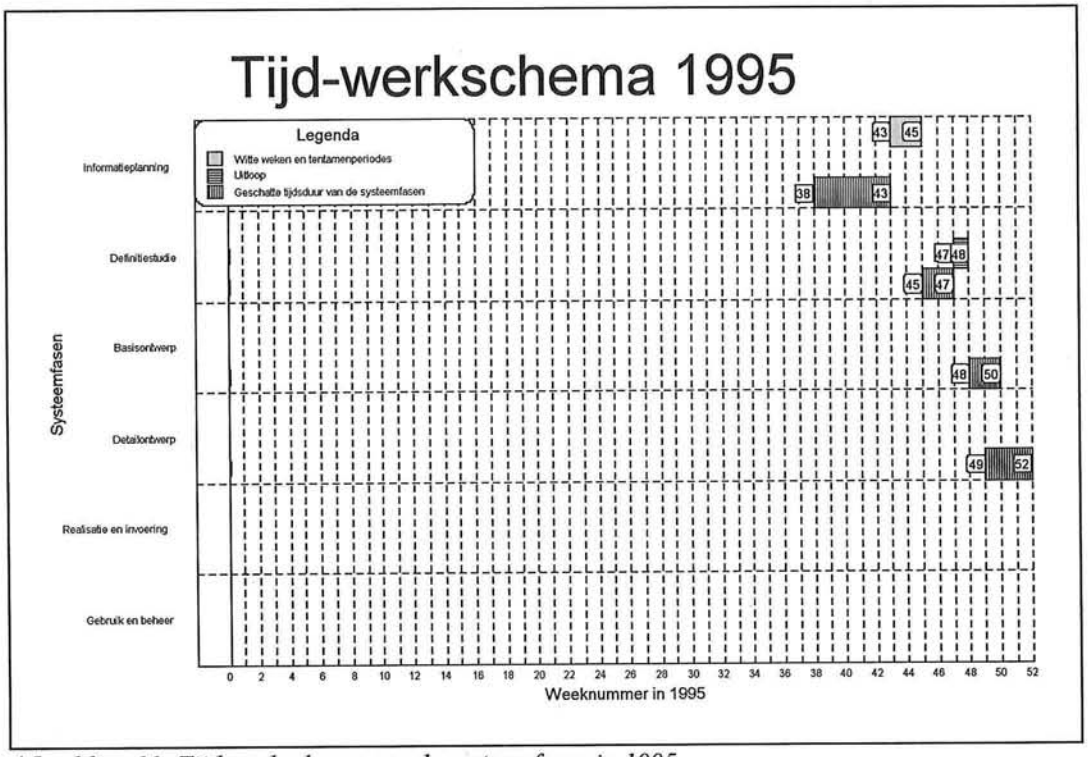
Om een indruk te krijgen van de totale duur van het afstudeerproject zijn, per systeemfase de geschatte tijdsduur, de werkelijk benodigde tijdsduur en de tijdwinst/uitloop bij elkaar gezet in een tabel.

	Geschatte tijdsduur	**Benodigde tijdsduur**	**Tijdwinst (-) / Uitloop (+)**
Informatieplanning	5 weken	5 weken	0 weken
Definitiestudie	2 weken	3 weken	+ 1 week
Basisontwerp	2 weken	2 weken	0 weken
Detailontwerp	5 weken	4 weken	- 1 week
Realisatie en invoering	13 weken	20 weken	+ 7 weken
Totalen	**27 weken**	**34 weken**	**+ 7 weken**

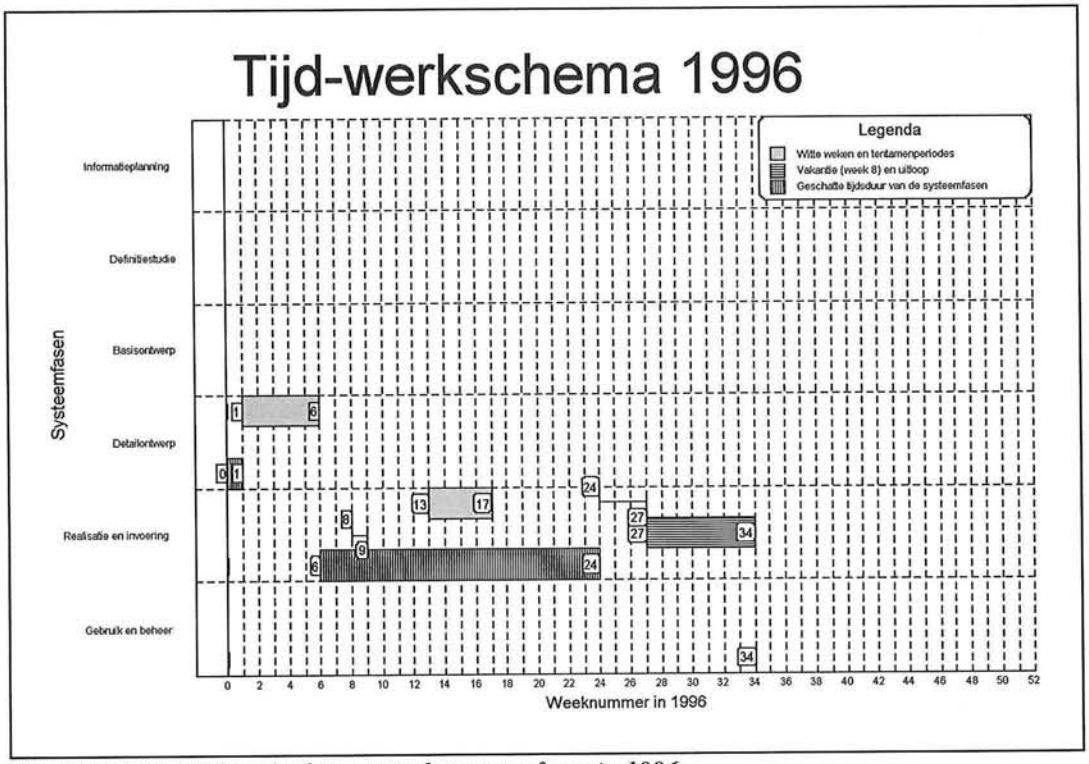
Aangezien de fase van het Basisontwerp en het Detailontwerp elkaar gedurende een week hebben overlapt, levert dit een totale netto projectduur op van 33 weken. De netto uitloop wordt daardoor 6 weken.

De uiteindelijke afronding van het project zal plaatsvinden op 20 augustus 1996.

Wanneer we alle bovenstaande gegevens tezamen met de vakanties, witte weken, tentamenperiodes en tijdwinsten/uitlopen uitzetten in een grafiek levert dit de volgende twee grafieken op de volgende bladzijde op.



Afbeelding 11: Tijd-werkschema van de systeemfasen in 1995



Afbeelding 12: Tijd-werkschema van de systeemfasen in 1996

Hoofdstuk 9: Conclusies en aanbevelingen

Tijdens de ontwikkeling van de applicatie HISGIS is naar voren gekomen dat de macrotaal van ARC/INFO, AML, een goede taal is om een applicatie mee te bouwen. Alle ARC/INFO commando's kunnen in AMLs worden verwerkt.

Aangezien in de, bij de ontwikkeling van HISGIS gebruikte, versie van ARC/INFO (ARC/INFO 6.0) bepaalde GRID-functionaliteiten ontbraken, die in de opvolger (ARC/INFO 7.0) aan het pakket zijn toegevoegd, zijn in HISGIS enige beperkingen aan bepaalde functionaliteiten gesteld.

Tevens heeft de beperkte tijd, die beschikbaar is voor het afstuderen ertoe bijgedragen dat bepaalde functionaliteiten niet konden worden ingebouwd.

De belangrijkste punten, die aan de huidige versie van HISGIS zouden kunnen worden veranderd/toegevoegd, zijn:
- Het inbouwen van nesting-functionaliteiten.
- Het maken van een koppeling met een stromingsmodel.
- Het mogelijk maken van roteren en spiegelen van bodemfiles binnen de applicatie, waardoor gewerkt kan worden met geografische coördinaten.
- Het inbouwen van geografische analyses op zowel de bodem als de berekenings-resultaten.

Verder dient gezegd te worden dat HISGIS is ontwikkeld aan de hand van systeemeisen geformuleerd door gebruikers van HISWA. Deze eisen zullen, gezien de toenemende interesse voor GIS en GIS-applicaties, in de loop van de tijd enigszins veranderen en worden aangescherpt/uitgebreid.

Bovengenoemde zaken hebben tot gevolg dat de ontwikkeling van HISGIS nog lang niet klaar is. Er is echter een eerste aanzet gegeven tot het ontwikkelen van een gebruikersvriendelijke applicatie waarin verschillende soorten modellen (zowel stromings- als golvenmodellen) zijn gekoppeld.

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Bijlage 1: Het vragenformulier en de resultaten

Naam: .....

Kamernummer: .....

Instelling: .....

Telefoonnummer: .....

Inleiding

Dit vragenformulier is gemaakt in het kader van het afstudeerproject HISGIS aan de faculteit der Civiele Techniek van de Technische Universiteit te Delft. Tijdens dit project is het de bedoeling een schil te ontwerpen waarin het tweedimensionale golvenmodel HISWA en het GIS-pakket ARC/INFO worden gekoppeld. Dit koppelen moet op een dusdanige manier plaatsvinden dat het GIS-pakket kan worden gebruikt voor presentatie, pre- en post-processing.

GIS is een afkorting van Geografisch Informatie Systeem, ook wel ruimtelijk informatie systeem genoemd. Zo'n systeem beschikt over een uitgebreide database, waarin gegevens zijn opgeslagen die gerelateerd zijn aan kaartmateriaal. Het biedt de mogelijkheid om deze ruimtelijke gegevens op een eenvoudige manier te verzamelen, te manipuleren, te analyseren en te presenteren. Tevens is het mogelijk diverse verschillende datasets te combineren, via overlay operaties (het over elkaar heen leggen van verschillende soorten ruimtelijke gegevens), om zo tot nieuwe informatie te komen.

Met behulp van dit vragenformulier probeer ik de eisen en de wensen te achterhalen die de huidige gebruiker van HISWA zou stellen aan een dergelijk systeem. Deze gegevens worden gebruikt om de systeemeisen op te stellen, waarna ik zelf bekijk in hoeverre de gestelde eisen realiseerbaar zijn binnen de gestelde tijd van het afstudeerproject.

Algemene vragen

1. Op wat voor soort hardware gebruikt U HISWA nu ?

   8 maal ***Werkstation gekoppeld met PC's.***

1b. Wat is de funktie van deze koppeling ? Welke gegevens staan opgeslagen op het werkstation en welke op de PC ?

3 maal	***Alles op cluster.***		
5 maal	***Werkstation:***	-	***HISWA-programmatuur***
		-	***Uitvoerprogrammatuur***
	PC:	-	***Invoer***
		-	***Uitvoer***

2. Vindt U het een pré als de combinatie van HISWA en GIS op een PC draait ?

   4 maal ***Ja, ik zou graag zien dat het op een PC draait.***
   4 maal ***Nee, ik werk liever op een werkstation.***
   0 maal ***Geen voorkeur.***

3. Wat zijn Uw ervaringen met HISWA ? Waar treden problemen op ? Wat zou U aan het pakket graag veranderd zien ?

   8 maal ***Roosters (oriëntatie, grootte t.o.v. bodemfile).***
   1 maal ***Bij de invoer lastig de hoek van de wind en uitvoer te bepalen.***
   4 maal ***Foutmeldingen kunnen beter worden afgehandeld.***

4. Heeft U ervaring met GIS-systemen ?

   0 maal ***Ik werk regelmatig met een Geografisch Informatie Systeem.***
   1 maal ***Ik heb wel eens met een Geografisch Informatie Systeem gewerkt.***
   7 maal ***Ik heb er nog nooit mee gewerkt.***

4b. Waar heeft U GIS voor gebruikt en welk pakket gebruikt U ?

   1 maal ***Bewerken van de bodemfile met ARC/INFO.***
   1 maal ***Gegevens uit GIS - grid (25 m) vanuit lodingen.***

Pre-processing

5. Vindt U het noodzakelijk dat binnen de schil een mogelijkheid wordt geboden om de commandofile aan te passen ?

0 maal	***Ja, ik zou het liefst zien dat er een ingebouwde editor in de schil zit, waarmee ik de commandofile zelf in zijn geheel kan aanpassen.***
1 maal	***Ja, het liefst heb ik dat ik de gegevens kan invoeren in een invoerscherm en dat de computer de commandofile voor mij aanmaakt, zodat ik zelf geen commando's hoef te gebruiken.***
7 maal	***Anders, te weten combinatie van bovenstaande.***
0 maal	***Nee, niet nodig.***

6. Van welke van onderstaande opties maakt U dikwijls gebruik in combinatie met HISWA ?

7 maal	***Nesting binnen HISWA.***
8 maal	***Gebruik van stromingsgegevens in HISWA, berekend met een stromingsmodel.***
4 maal	***Koppeling met een ander model, te weten Delft 3D, Trisula, PHAROS (WL-modellen voor op werkstation).***

7. Vind U het belangrijk dat binnen de te ontwikkelen schil een koppeling bestaat met een ander model / andere modellen, bijvoorbeeld een stromingsmodel ?

7 maal	***Ja, graag een koppeling met Waqua (3 maal), Trisula/Delft 3D (4 maal).***
0 maal	***Nee, niet nodig.***
1 maal	***Geen ervaring.***

8. Maakt U gebruik van pakketten voor de pre-processing van de gegevens voor HISWA ?

7 maal	***Ja, voor de bodemgegevens, te weten ARC/INFO (1 maal), Bodkar (2 maal), Autocad/Quicksurf (4 maal).***
6 maal	***Ja, voor stromingsgegevens, te weten Waqua (2 maal), Quicksurf (4 maal).***
0 maal	***Ja, voor windgegevens, te weten.***
1 maal	***Nee, ik gebruik geen pakketten voor pre-processing.***

9. Wat vindt U dat een GIS-systeem minimaal moet kunnen, wanneer U het wil gebruiken voor pre-processing ?

3 maal	***Roosters.***
1 maal	***Overzicht van de invoer.***
4 maal	***Interpolatie onregelmatige gegevens naar een HISWA rooster (bodem en stroming).***

10. Aan wat voor soort pre-processing zou U de meeste behoefte hebben ? Wat vindt U de belangrijkste functionaliteit(en) wanneer een GIS aan HISWA wordt gekoppeld voor pre-processing ?

0 maal	***Weergave van bodemgegevens in tabelvorm.***
8 maal	***Grafische keuze van het rekenrooster.***
8 maal	***Aanpassen van de bodemdiepte en de bodemruwheid.***
7 maal	***Het maken van afbeeldingen van de bodem (voor gebruik in presentaties en rapporten).***

Post-processing

11. Maakt U gebruik van pakketten voor de post-processing van de resultaten van HISWA ?

7 maal	***Ja, te weten Matlab (2), ARCVIEW (1), DP (2), hisplot (1), Tekagx (4 maal), GPP - WL pakketten (4 maal).***
0 maal	***Nee, ik gebruik geen pakketten voor post-processing.***

12. Wat vindt U dat een GIS-systeem minimaal moet kunnen, wanneer U het wil gebruiken voor post-processing ?

2 maal	***Zoals HISWA maar dan mooier.***
1 maal	***Isolijnen.***
1 maal	***Verschilplaatjes van verschillende runs.***
1 maal	***Raaien.***
1 maal	***Tabellen.***

13. Aan wat voor soort post-processing zou U de meeste behoefte hebben ? Wat vindt U de belangrijkste functionaliteit(en) wanneer een GIS aan HISWA wordt gekoppeld voor post-processing ?

5 maal	***Weergave van modelresultaten in tabelvorm.***
3 maal	***Vergelijking van modelresultaten met andere bronnen.***
8 maal	***Presentatie van modelresultaten voor controle van de berekening.***
8 maal	***Presentatie van modelresultaten voor gebruik in presentaties en rapporten.***
3 maal	***Geografische analyses (bijv. historische veranderingen).***

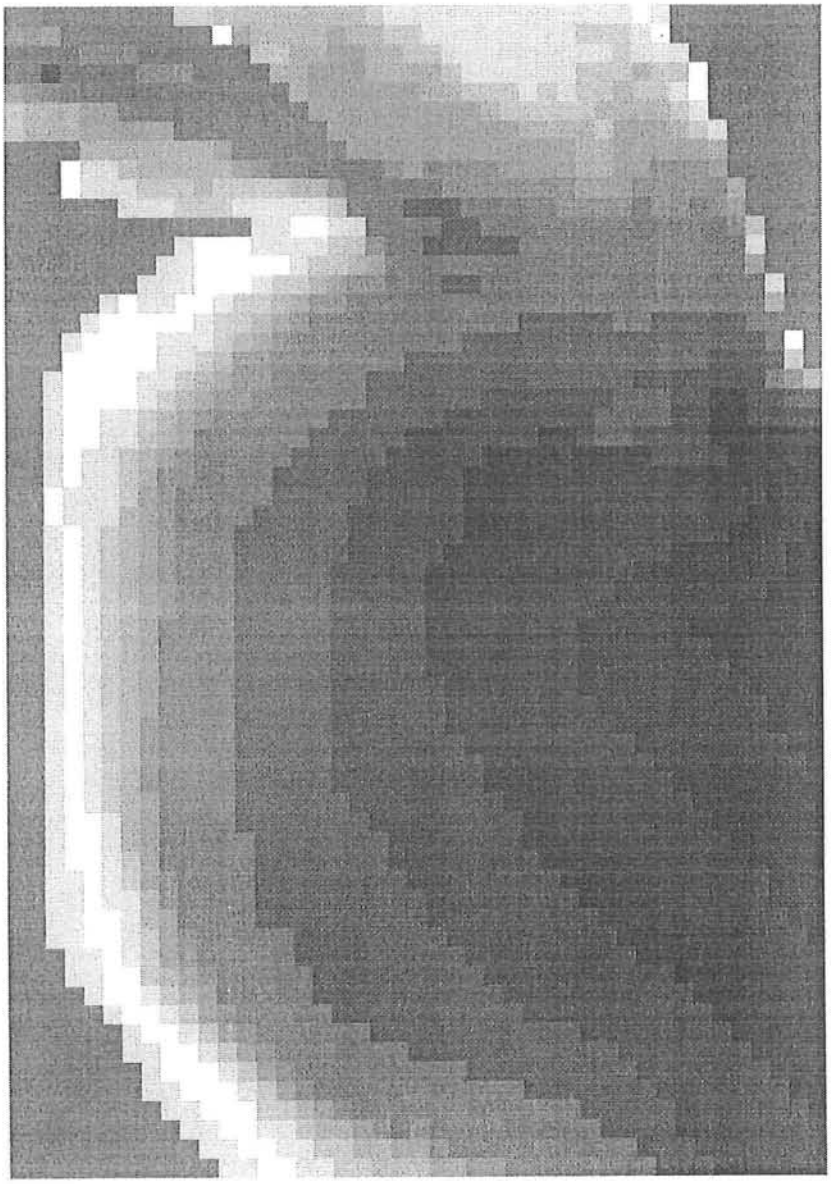
Bedankt voor Uw medewerking. Ik zal proberen U op de hoogte te houden van de vorderingen van dit afstudeerproject.

Bijlage 2: Voorbeeld-afbeeldingen HISGIS

HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

2d – representation



Delft University of Technology
Faculty of Civil Engineering
Stevinweg 1
2628 CN Delft
The Netherlands
Tel. 015 – 2787921

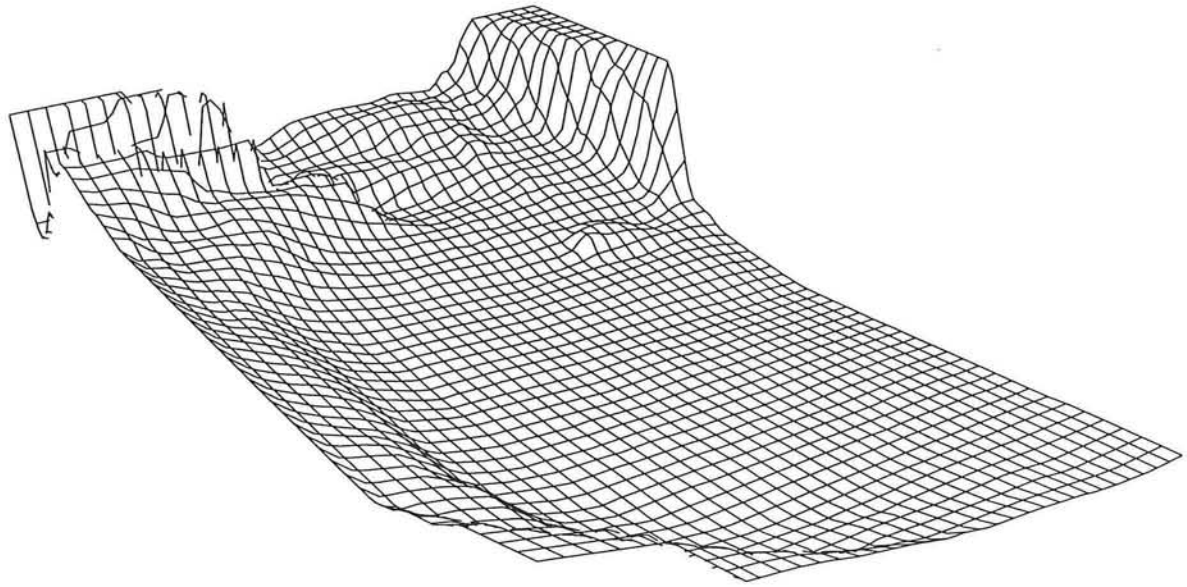
Created by:

Eric Oschatz
August 16, 1996
1:46 PM

HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

3d – representation



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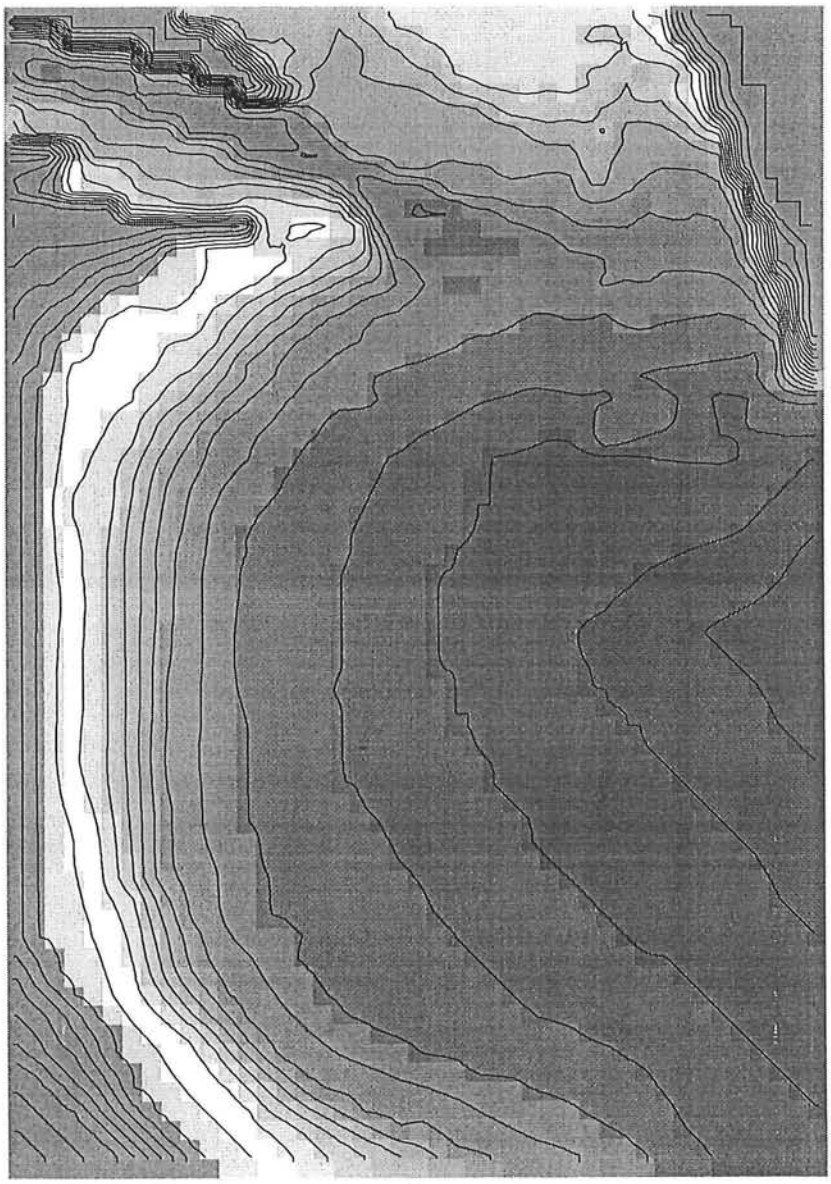
HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

isolines – representation 1 isoline / 1 meter(s) bottomdepth



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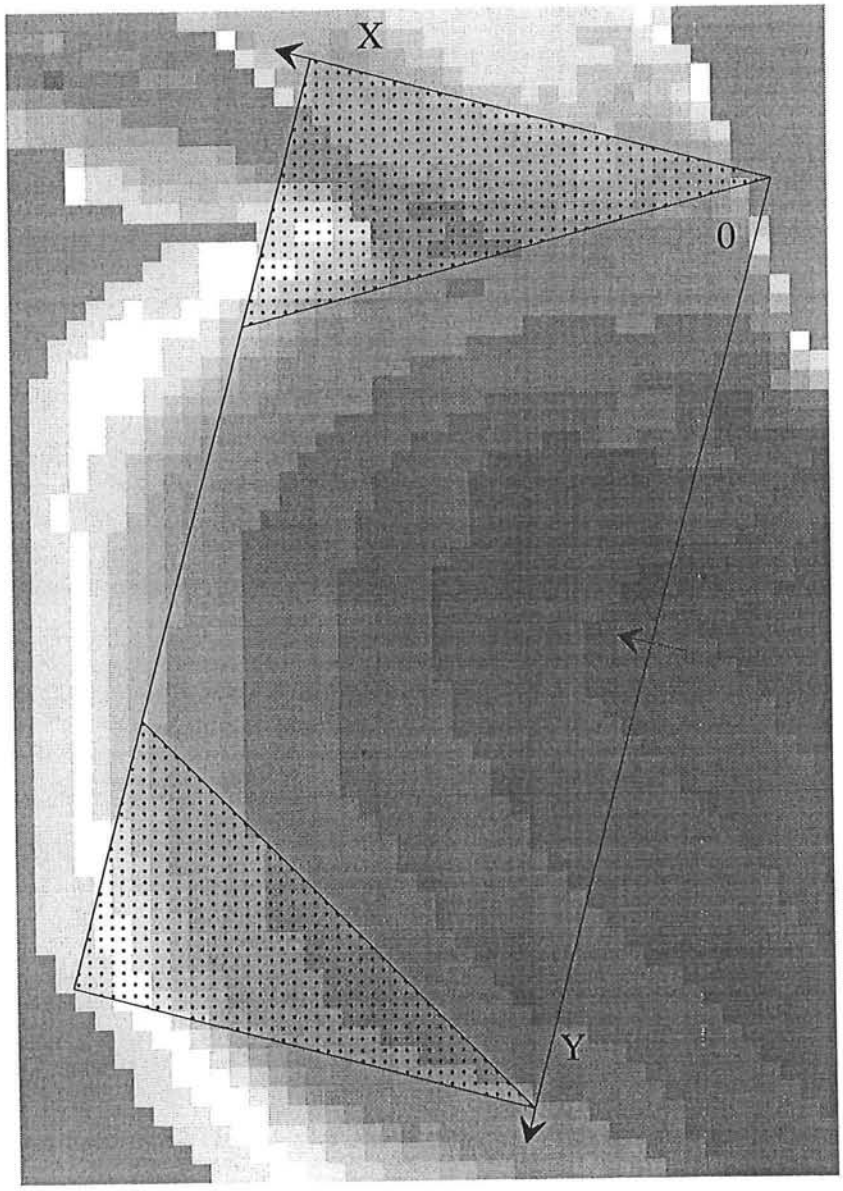
HISGIS – GRID PRESENTATION

Bottomfile: test.bot

2d – representation



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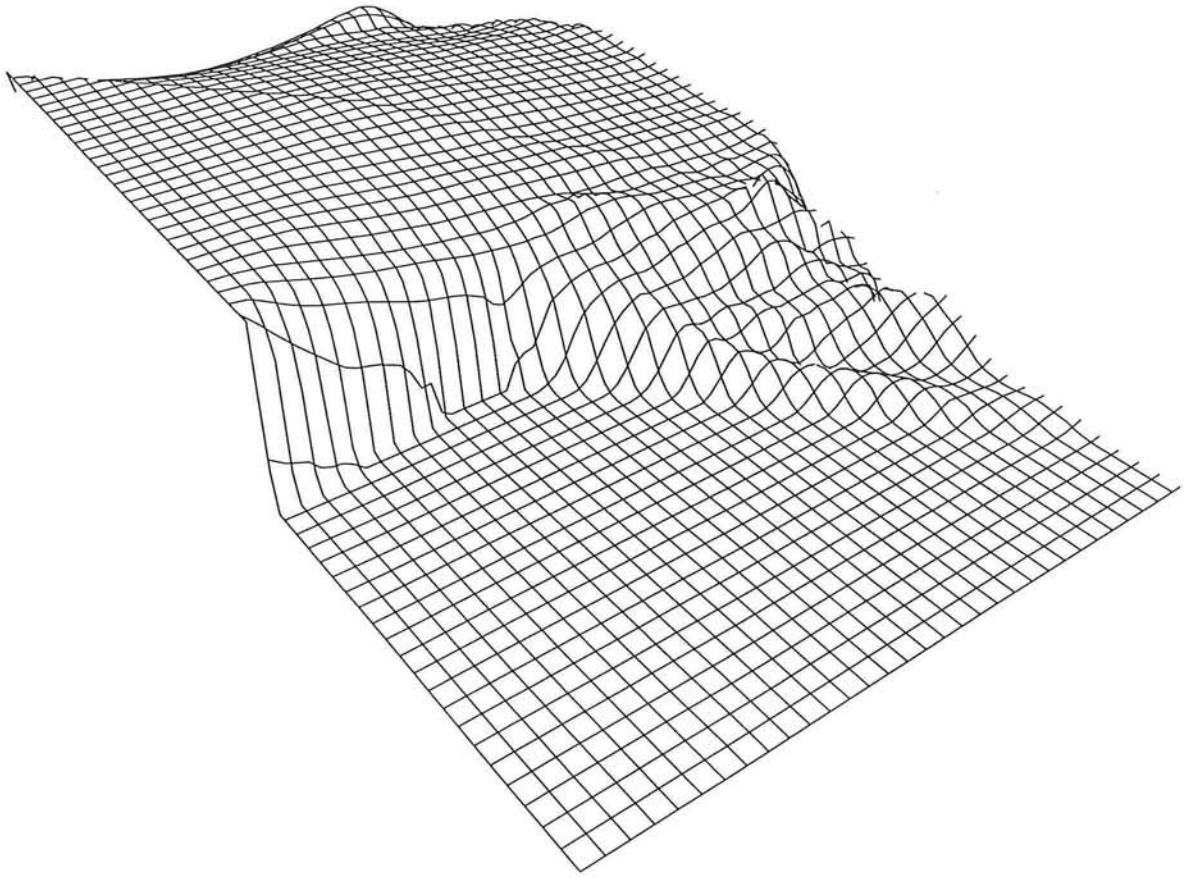
HISGIS – RESULT PRESENTATION

Resultfile: demonstration Parameter: hsign

3d – representation



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Eric Oschatz
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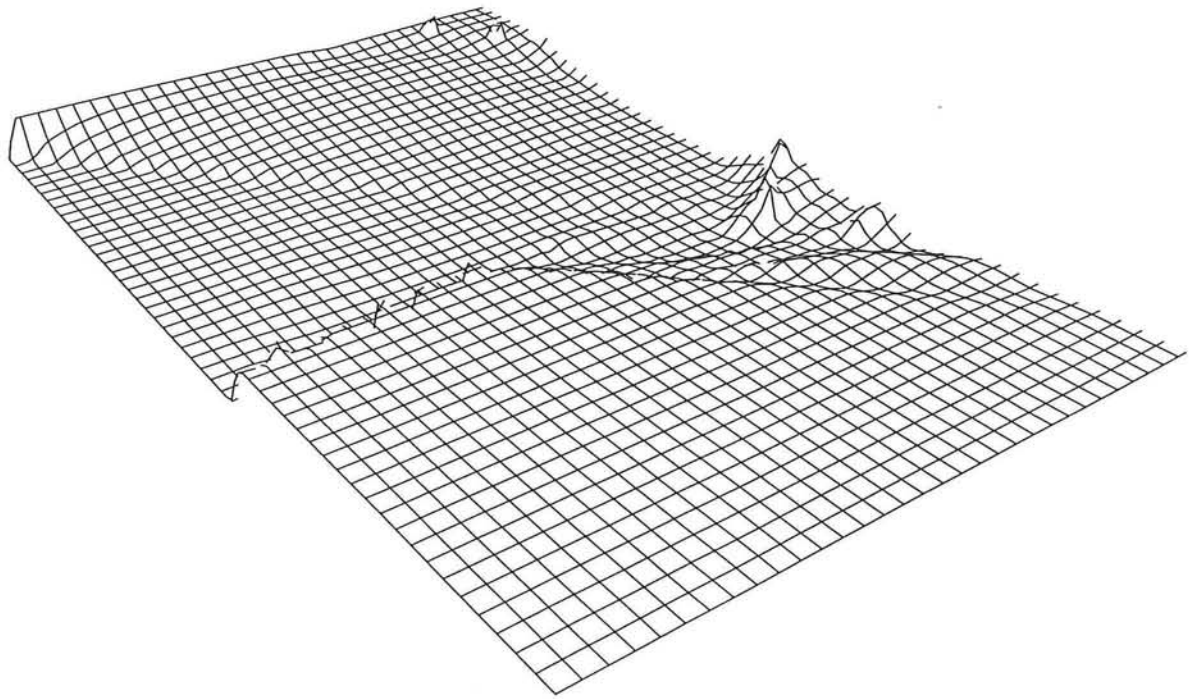
2:01 PM

HISGIS – RESULT PRESENTATION

Resultfile: demonstration Parameter: hsign

Comparison with comparison



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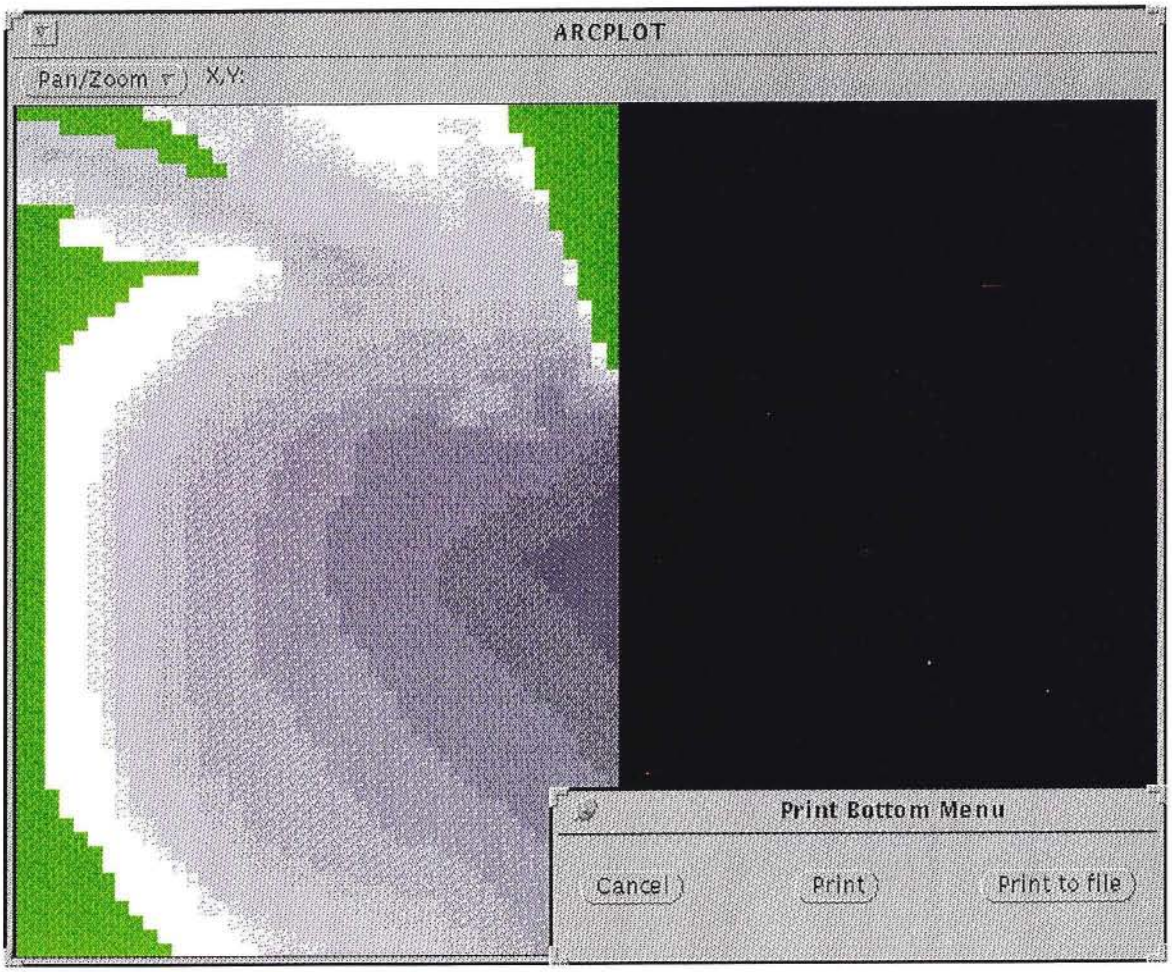
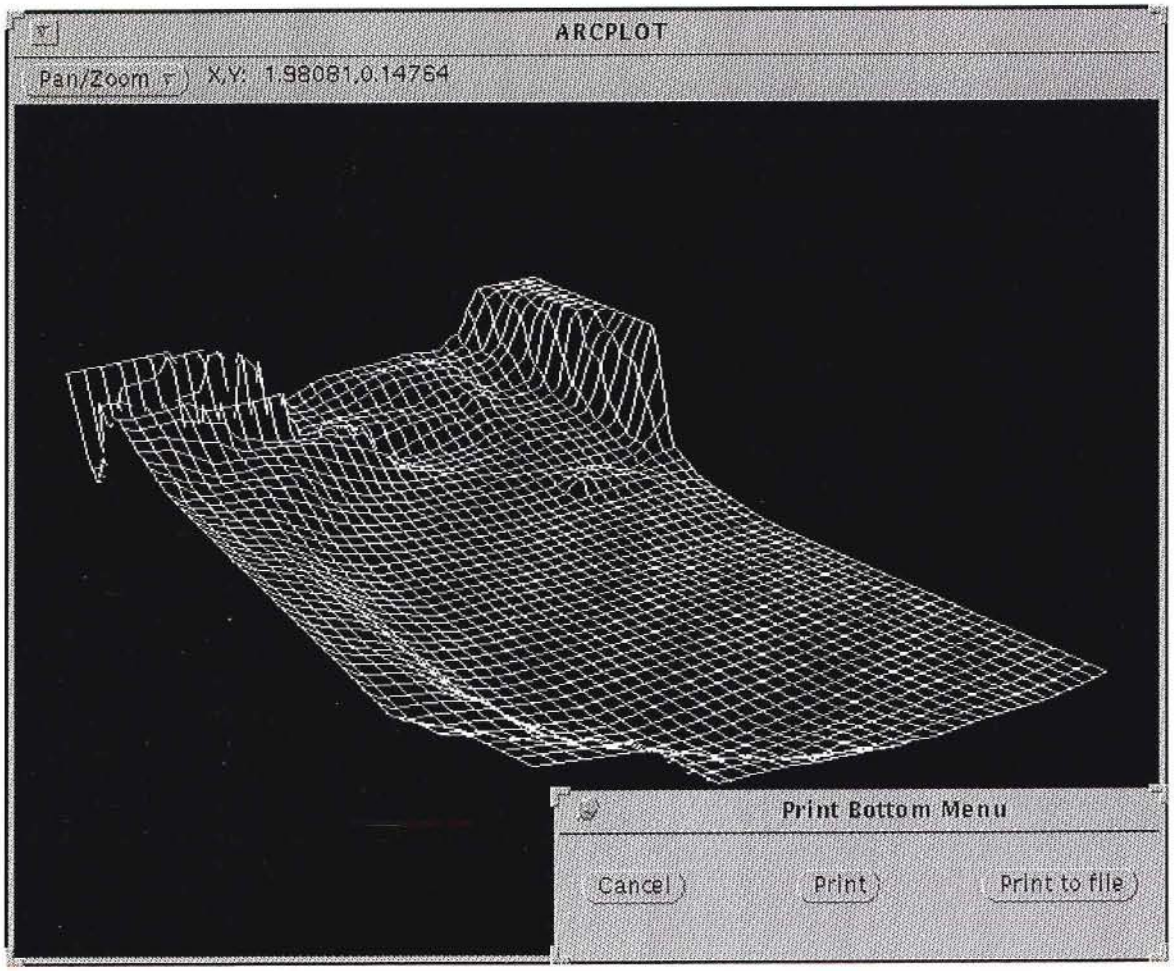
Eric Oschatz
August 16, 1996
2:04 PM

Appendix 3: Examples of the ARCPLOT-display

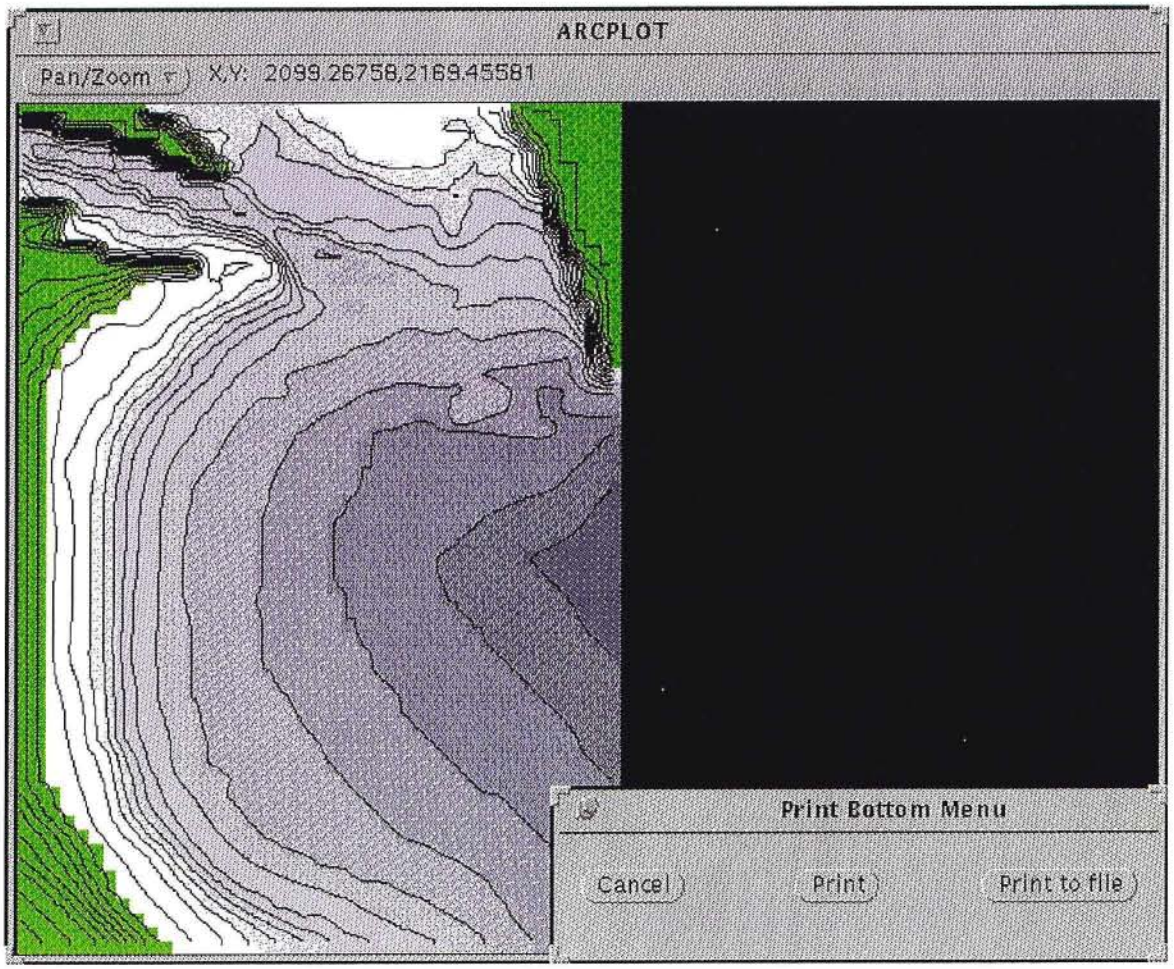
1. 2D-view picture of the bottomfile



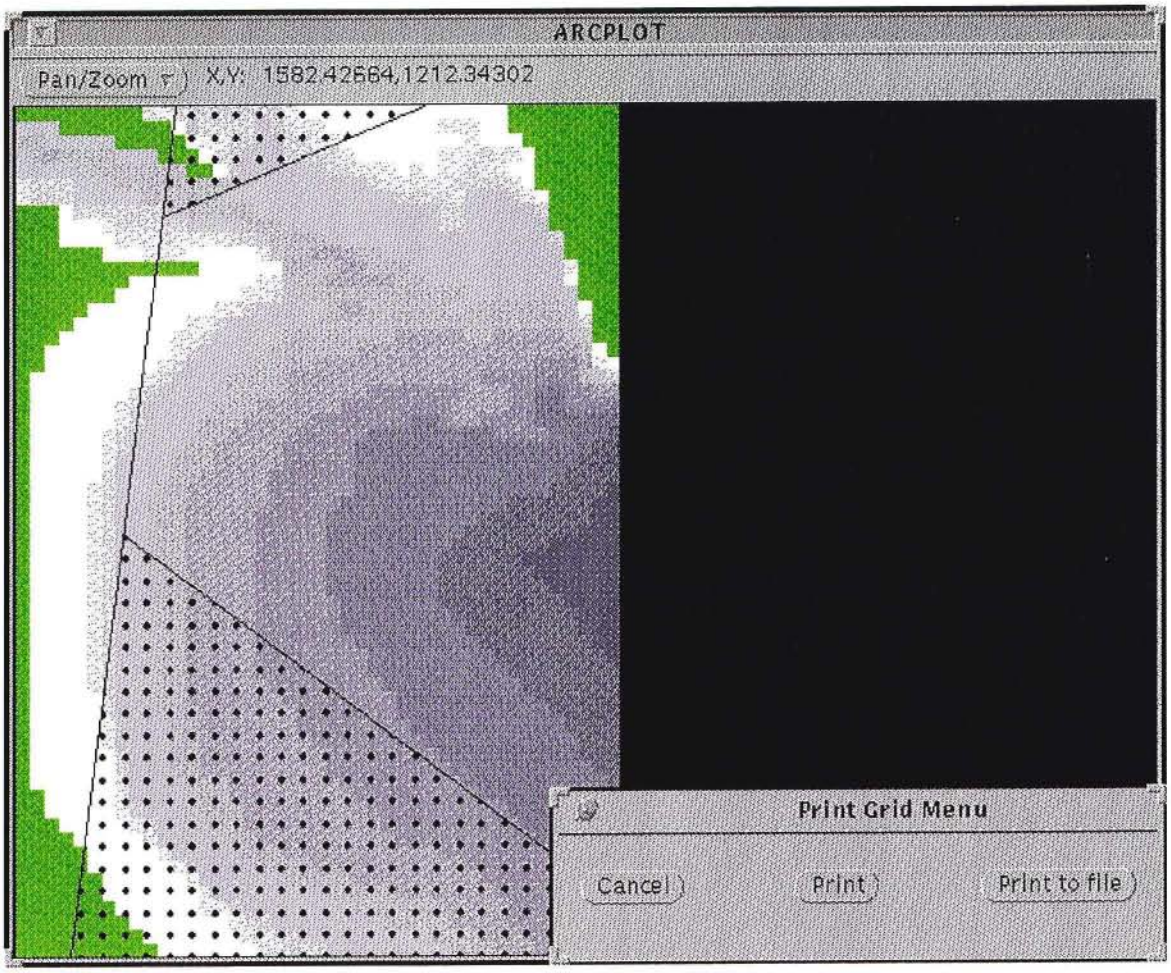
2. 3D-view picture of the bottomfile



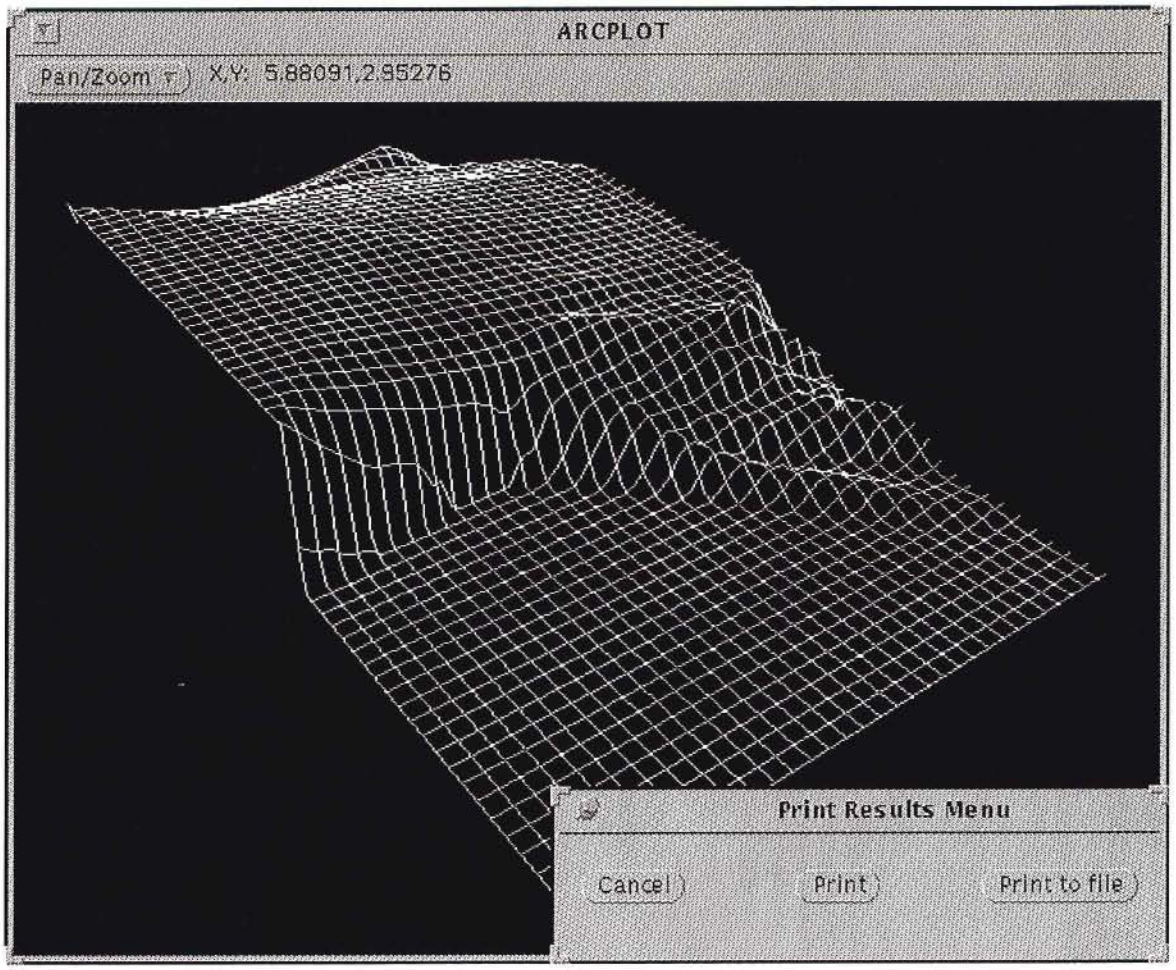
3. Isolines picture of the bottomfile



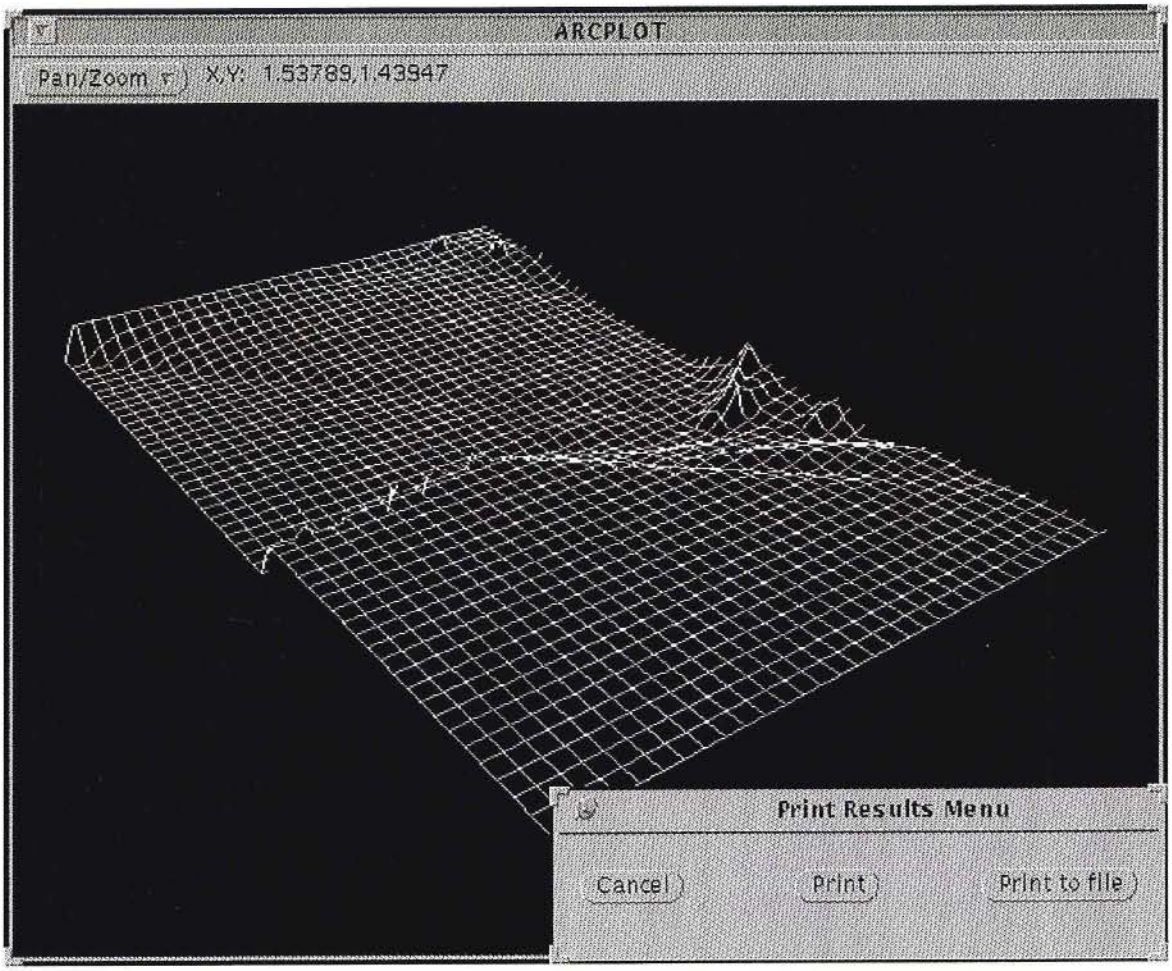
4. 2D-view picture of the bottomfile with computational grid



5. 3D-view of the calculation results of parameter Hsign



6. 3D-view picture of the comparison results



Appendix 4: Examples of the plotfiles

HISGIS

User Manual

Version 1.0

August 1996

Developed by: **Eric Oschatz**
By order of: **Delft University of Technology**
Faculty of Civil Engineering

Preface

The application HISGIS has been developed in 1996 within the scope of finishing my study of Civil Engineering at Delft University of Technology (DUT). HISGIS sets (one of) the first step(s) in the direction of integrating several models in one system. HISGIS is the integration of the two dimensional wavemodel HISWA and the GIS ARC/INFO. It can be used by both regular (experienced) HISWA users and (inexperienced) students, because of the easy-to-understand user-interface.

This manual is a guided tour around the most important functionalities of HISGIS. These functionalities are discussed step by step, by working with the example *demonstration.hgs* (on the HISGIS disk). Every user can follow the example on his own system, if HISGIS is installed correctly (see appendix 1).

In the manual a few symbols are used:

suggests you to do a mouse action

suggests you to type something on the keyboard.

Behind the symbol the mouse action, keyboard action or the text you have to type in is given.

Good luck with HISGIS.

Eric Oschatz

If you might have any suggestions concerning HISWA or HISGIS, please contact:

Dr. Ir. N. Booij
Delft University of Technology
Faculty of Civil Engineering
Telephone: xx31 - 15 - 2786938.

The meaning of the logo: The reflection of the sunset in a fairly calm sea.

Contents

Chapter 1: Introduction

The application HISGIS has been developed in 1996 by order of the Delft University of Technology, faculty of Civil Engineering. It is an application meant to join the two-dimensional wavemodel HISWA and the GIS package ARC/INFO.

1.1 Why HISGIS ?

During the use of HISWA three major problems arise. The first problem concerns difficulties creating/editing a command-file for HISWA, because of the amount of different commands and parameters (especially for inexperienced users). The second problem is lack of insight, given by HISWA, in the orientation and location of both the bottom-file and the computational grid. The last problem is lack of post-processing possibilities offered by HISWA. Hardly any user uses the post-processing possibilities given by HISWA at the moment.

The conclusion of the above mentioned problems is that, at the moment, a user-friendly and surveyable way to do the pre- and post-processing is missing in HISWA.

The objective of the development of HISGIS is to create a user-friendly application in which HISWA and ARC/INFO are joined, in order to simplify and enlarge the pre- and post-processing possibilities.

1.2 HISGIS functionalities in short

HISGIS enables the you to create projects containing different command-files with the same subject. The command-files can be edited, saved, printed and used for a HISWA calculation. Furthermore the bottom-file can be selected and displayed in 2D, 3D and isolines and the computational grid can be edited graphically. Concerning the post-processing, HISGIS enables the you to look at the calculation results in 2D, 3D, isolines, comparison and tables and create/print pictures of these results.

1.3 Limitations of HISGIS

The current version of HISGIS offers a lot of functionalities concerning the pre- and post-processing of HISWA. However, there are some limitations, which will probably be solved in later versions of the application. So, always try to use the latest version of HISGIS.

The (known) limitations of the current version of HISGIS:

- It is not built to perform nested calculations.
- It does not have any built-in current functionalities.
- It supports only a limited number of HISWA commands. Only the most necessary commands are used in HISGIS. Therefore it can only read command-files created by HISGIS itself.
- It is not able to export the bottom-, grid- and calculationresults to point- or linecovers for use in other programs, e.g. ARCVIEW.
- It only supports square gridcells (length in x- and y-direction are equal).
- It only supports correctly oriented bottom-files. This means that the bottom-files should not have to be transformed (mirrored or rotated) within the application to get the correct geographic orientation, because HISGIS can not do such transformations.
- It does not support the definition of points, lines or windows for value viewing/editing or other analysis purposes.
- Performing a geographical analysis on bottom-data and calculationresults is not supported by HISGIS.
- Plotfiles made by HISGIS can only be printed on a printer which supports PostScript2 format.

1.4 Minimum system requirements

In order to let the application HISGIS operate correctly on your system, it has to meet certain requirements.

First of all your system has to be a UNIX system containing 'OpenWindows'/ 'XWindows', HISWA and ARC/INFO, at least version 6.0. The requirement concerning 'OpenWindows'/'XWindows' is set because the user-interface is built to work in a Windows environment. The requirement concerning HISWA is a logical one, because HISWA is used for performing calculations. The requirement concerning the version of ARC/INFO is set because the application has been developed using the AML of ARC/INFO 6.0. If an earlier version of ARC/INFO is used, it might give problems with certain functionalities of HISGIS (especially the GRID commands).

The second requirement concerns the printer connected to your system. If you want to use the 'Print'-button of HISGIS, which sends a picture directly to the printer, your printer has to support PostScript2. If it does not support PostScript2, you will get an error message out of it.

Finally, for the ones who have to install HISGIS by themselves, all files used by HISGIS have to be installed in a correct way and in the directories as mentioned in appendix 1.

Chapter 2: Getting started with HISGIS

In this chapter attention is paid to the first important issues concerning the use of HISGIS. First of all, the structure of HISGIS and the data-structure of the bottom-file, which are to be used in HISGIS, are discussed. Further, an explanation is given on how to handle the different functionalities on a menu.

2.1 Structure of the application HISGIS

HISGIS is an application which consists of a main system MAIN and three subsystems, namely the pre-processing module PRE, the calculation module CALC and the post-processing module POST. From the main system MAIN the different subsystems can be started. After closing one of the subsystem you automatically return to the main system.

The structure of HISGIS can be schematised like in figure 1.

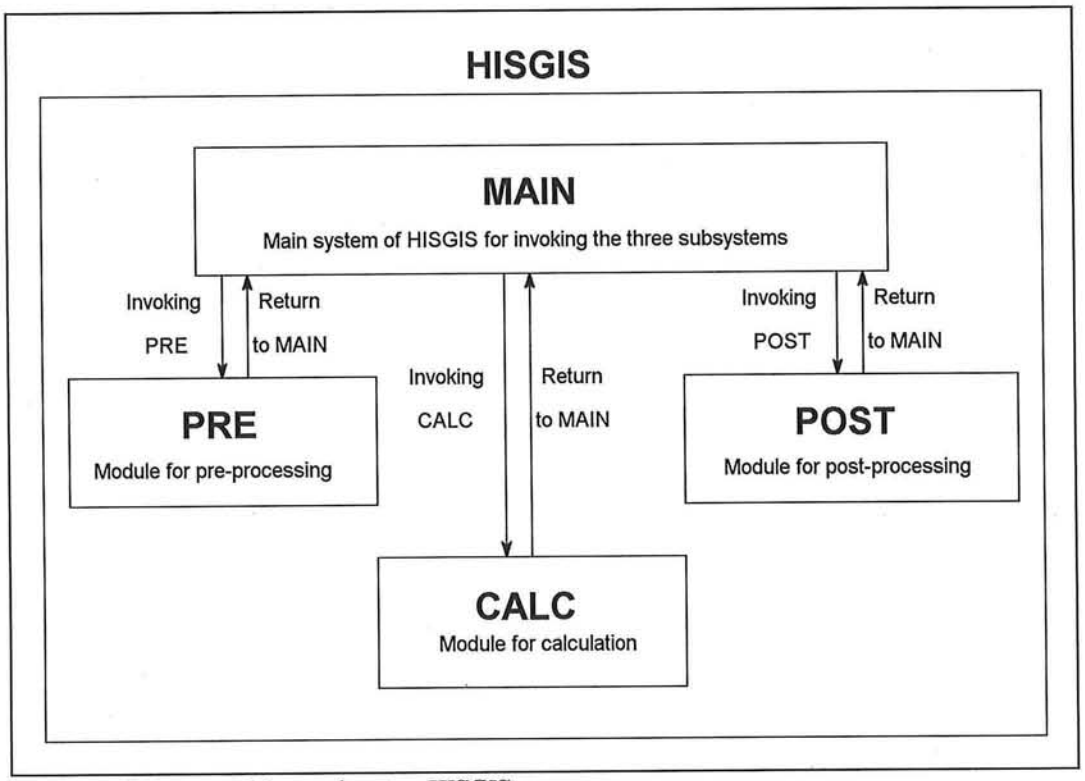


Figure 1: Structure of the application HISGIS

The three subsystems can operate totally independent of each other.

2.2 Data-structure of the bottom-file

A bottom-file which can be used for a HISWA calculation consists of two parts: the heading lines, which are neglected by HISWA, and the actual data. For use of the bottom-file in HISGIS the heading lines have to have a certain format.

- line 1: NCOLS <number of columns of the bottom-file>
- line 2: NROWS <number of rows of the bottom-file>
- line 3: XLLCORNER 0
- line 4: YLLCORNER 0
- line 5: CELLSIZE <cellsize of the bottom-file>
- line 6: <empty line>
- line 7: <start of the actual data>
- etc.

The heading thus consists of 6 lines before the data starts. The first line declares the number of columns of the bottom-file. The second line declares the number of rows. The fifth line declares the cellsize of the bottom-file (the cells must be square).

The third and fourth line need some attention. Normally in these lines the geographic location of the origin of the bottom-file is entered, which is not possible in HISGIS version 1.0 (see paragraph 1.3: limitations of HISGIS).

In HISGIS version 1.0 these lines should both always have the value 0, to define the start of the input grid. This means that the co-ordinate system in the input grid has its origin in the lower left corner of the bottom-file. The x- and y-co-ordinates you will see on top of your ARCPLOT-display will be local co-ordinates.

The reason for adding these lines to the bottom-file is that ARC/INFO needs those lines to transform the raw bottom-file to an ARC/INFO format: 'GRID'. A GRID consists of a number of gridpoints all having a x- and y-co-ordinate and a third value, which in this case is the bottomdepth at that certain point.

The HISGIS-disk contains a simple bottom-file called *test.bot*, in which the heading lines are already set to correct values. This bottom-file will be used in the example, discussed in this manual.

2.3 Menu handling

On a menu several functionalities are possible, e.g. buttons, input-fields (with scrolling lists), checkboxes, sliders and choices. All the mentioned functionalities are reviewed below.

Button
A button can be selected by pressing on it with the left mouse button.
The help-message belonging to the button can be invoked by pressing the right mouse button, while aiming on the concerning button in the menu.

Input-field (with scrolling list)
An input-field can be edited by selecting it with the mouse and typing the new value in it. The scrolling list can be useful when editing an input-field, because it gives an overview of the possibilities, from which the you can select one.

Checkbox
The checkbox can be selected by pressing on it with the left mouse button. The checkbox will then be marked with a checkmark (✓).

Slider
A slider can be edited by simply typing the text in the input-field belonging to the slider or by sliding the slider-button to the right value. This sliding can either be done by keeping the left mouse button pressed on the slider-button and pulling it to the right value or by pressing next to the slider button at the side you want the button to go to. Every time you release the mouse button, the slider button moves one step.

Choice
A choice can be edited by pressing on the wanted choice with the left mouse button. The other options on the choice will be released.

Chapter 3: The main system MAIN

In this chapter a start is made with HISGIS. This chapter, together with the next three chapters, is a guided tour around the functionalities of HISGIS.

3.1 Structure of the main system MAIN

The main system MAIN consists of four menus. The menu-structure of the main system can be schematised like in figure 2.

<-1->	Password Menu		
<-2->	HISGIS		
<-3->	MAIN Menu	<-1->	*Pre-processing module*
		<-2->	*Calculation module*
		<-3->	*Post-processing module*
<-4 ->	Thanks		

Figure 2: Menu-structure of the main system MAIN

3.2 Starting the application

When the application HISGIS is started, the menus of the main system are invoked. HISGIS can be started once you are in the ARC/INFO environment and in your home-directory, where the AML *hisgis.aml* is copied to (see appendix 1).

This is how to start the application:

⌨ *&r hisgis [enter]*

After starting the application, the Password Menu will be displayed.

3.3 Password Menu

In the Password Menu you have to enter your personal username (which equals the name of your user-file without the extension *.aef*) and password. The username will be displayed in the menu. The password will not be displayed in the menu, but will be replaced by asterisks (*). This way the password can not be copied by someone else.

The Password Menu is displayed in figure 3.

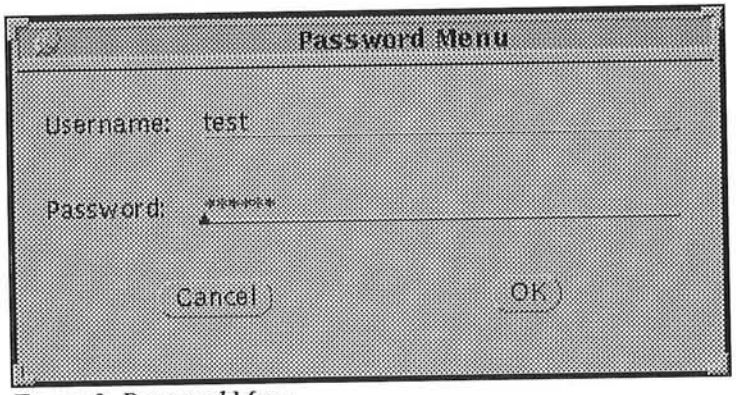


Figure 3: Password Menu

The menu consists of two input-fields and two buttons, namely a 'Cancel'-button and an 'OK'-button.

The 'Cancel'-button enables you to return to ARC/INFO without having to enter a username or password.

By pressing the 'OK'-button you accept the entered username and password.

This is how to enter the username and password:

- press the right mouse button on the 'OK'-button. The help-message is displayed in the lower left corner.
- select the line behind 'Username:'
- *test [enter]*
- *hisgis*
- select the 'OK'-button.

After the selection, the menu HISGIS will be displayed.

3.4 Menu HISGIS

The menu HISGIS is the introduction screen of HISGIS.

The menu consists of a few lines of text and an 'OK'-button. By pressing the 'OK'-button the MAIN Menu is invoked.

The menu HISGIS is displayed in figure 4.

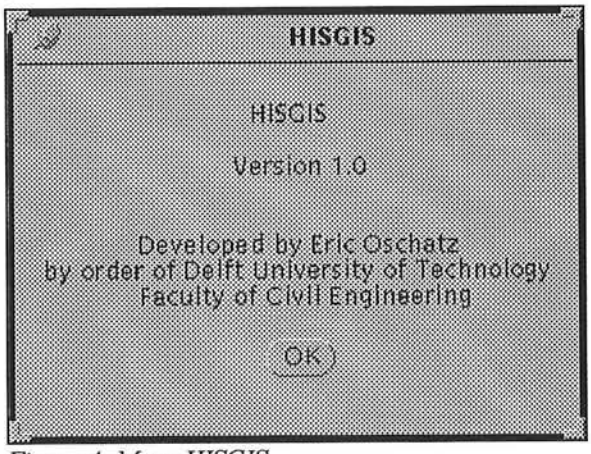


Figure 4: Menu HISGIS

This is how to close the introduction screen:

- select the 'OK'-button.

After the selection, the MAIN Menu will be displayed.

3.5 MAIN Menu

From the MAIN Menu the different subsystems PRE, CALC en POST can be invoked. After closing one of the subsystems you automatically returns to this menu.

The MAIN Menu is displayed in figure 5.

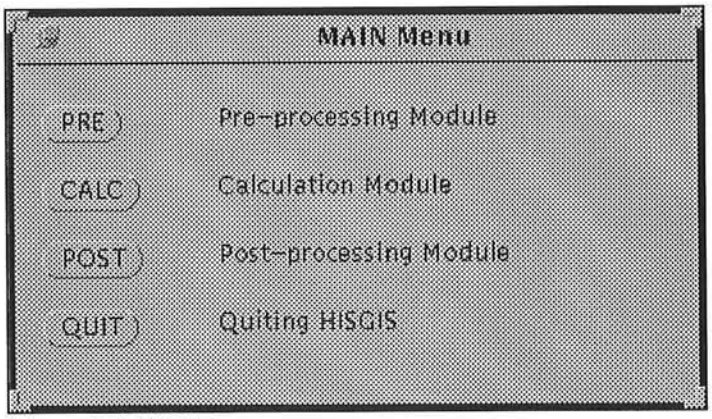


Figure 5: MAIN Menu

The menu consists of four buttons and lines of explaining text about the button-functions behind them.

By pressing the 'PRE'-button the pre-processing module is started.

The 'CALC'-button invokes the calculation module.

By pressing the 'POST'-button the post-processing module is invoked.

Finally, the 'QUIT'-button closes the menu and invokes the menu Thanks.

This is how to quit HISGIS:

- select the 'Quit'-button.

After the selection, the menu Thanks will be displayed.

3.6 Menu Thanks

The menu Thanks is the good-bye screen of HISGIS. In this screen you are thanked for using the application and is referred to the contact in case of problems and suggestions concerning HISGIS.

The menu Thanks is displayed in figure 6.

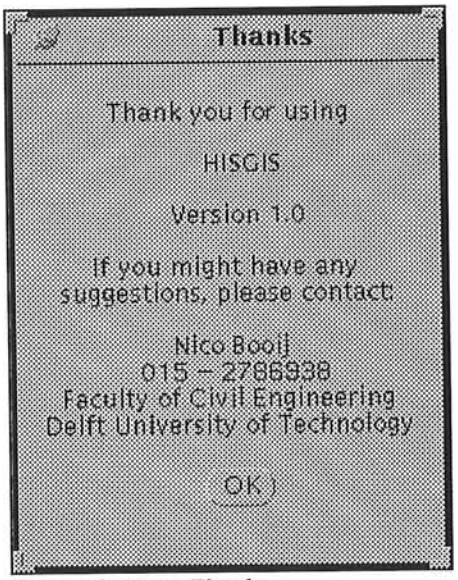


Figure 6: Menu Thanks

The menu consists of a piece of text and an 'OK'-button. By pressing the 'OK'-button HISGIS is closed and you return to ARC/INFO.

This is how to close HISGIS:

- select the 'OK'-button.

After the selection, the application HISGIS is closed and you are back in ARC/INFO.

Chapter 4: The pre-processing module PRE

After finishing chapter 3, you are able to start and quit HISGIS. In this chapter attention is paid to the functionalities of the pre-processing module.

Before you go any further, restart HISGIS by repeating the actions from paragraph 3.2, 3.3 and 3.4, so the MAIN Menu is be displayed again.

4.1 Structure of the subsystem PRE

From the MAIN Menu the pre-processing module can be started. The module consists of 12 menus.

The menu-structure of the pre-processing module can be schematised like in figure 7.

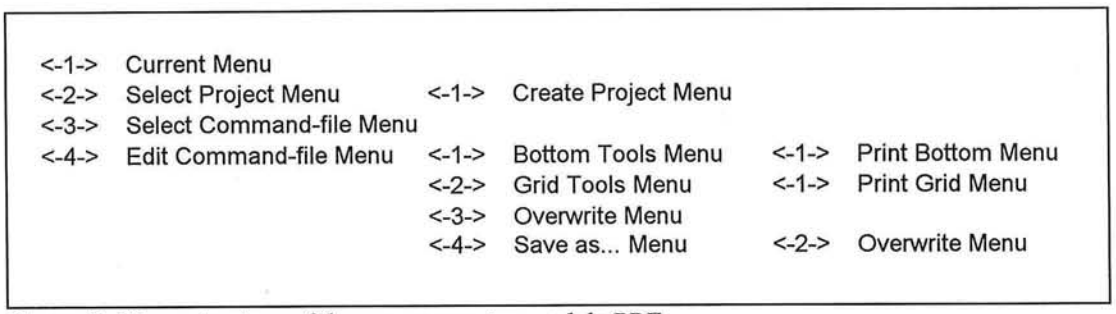


Figure 7: Menu-structure of the pre-processing module PRE

4.2 Starting the pre-processing module PRE

After you have reached the MAIN Menu, this is how to start the pre-processing module:

- select the 'PRE'-button

After selection the Select Project Menu is displayed.

4.3 Select Project Menu

The Select Project Menu enables you to create and select a project, consisting of several command-files.

The Select Project Menu is displayed in figure 8.

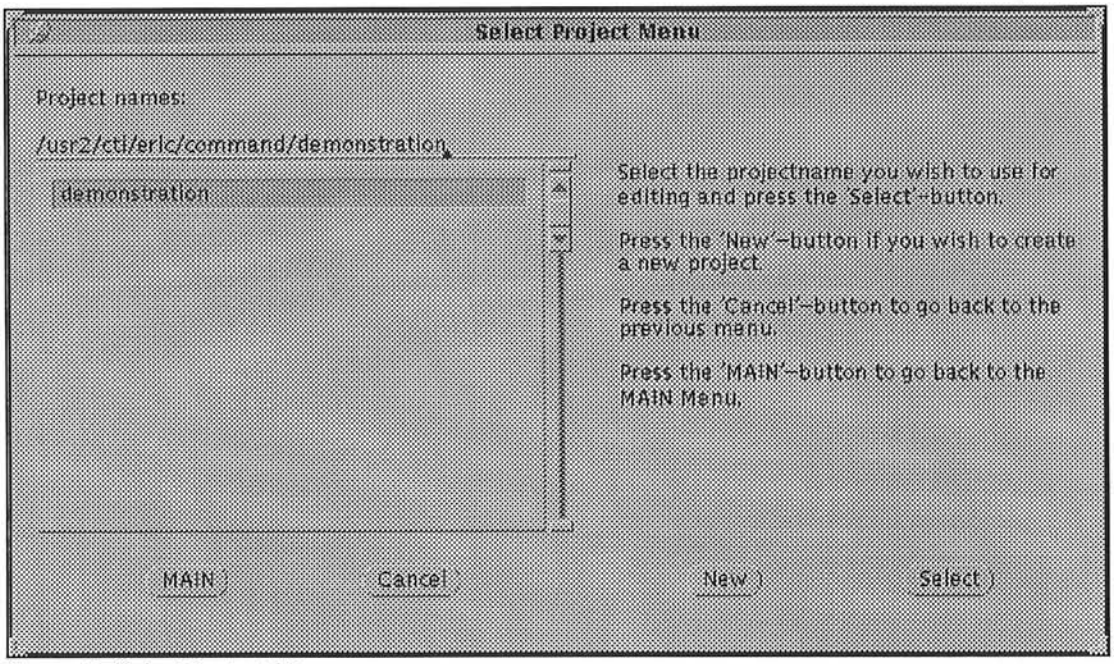


Figure 8: Select Project Menu

The menu consists of an input-field with scrolling list and four buttons. Next to the scrolling list an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select a project. This can be done either by selecting a project from the list with the mouse by clicking on it or by typing the name at the input-field. When the project does not exist an error message will occur in the bottom-left corner of the menu.

The 'Main'-button enables you to go back to the MAIN Menu without selecting anything. The previously shown menus will not be displayed.

The 'Cancel'-button lets you step backward through the menu-structure. Each time a 'Cancel'-button is selected the previous menu will be displayed.

The 'New'-button enables you to create a new project.

By pressing the 'Select'-button the currently selected project will be opened.

This is how to create a new project:

- select the 'New'-button.

After the selection, the Create Project Menu will be displayed.

4.4 Create Project Menu

The Create Project Menu enables you to enter a name for a new project.

The Create Project Menu is displayed in figure 9.

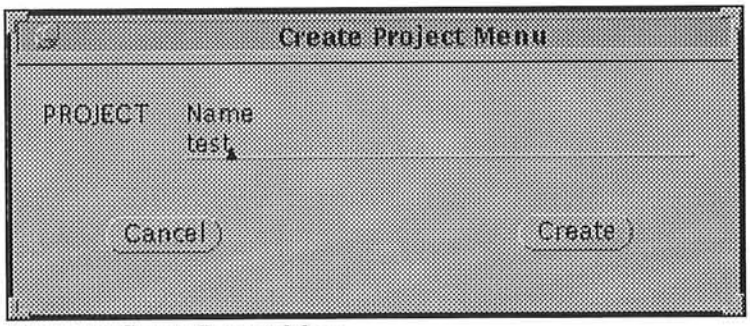


Figure 9: Create Project Menu

The menu consists of an input-field, in which a name can be entered, and two buttons, namely a 'Cancel'-button and a 'Create'-button.

The 'Cancel'-button enables you to go back to the previous menu without creating a new project.

The 'Create'-button creates a new project with the given name. When no name is given in the input-field, an error message will occur in the bottom-left corner of the menu.

This is how to create a new project 'test':

⌨ *test*

🖱 select the 'Create'-button.

After the selection, the Select Project Menu will be displayed and the project 'test' is given in the list of projects.

This is how to open the project 'demonstration':

🖱 select the project 'demonstration' from the list.

🖱 select the 'Select'-button.

After selection the Select Command-file Menu will be displayed.

4.5 Select Command-file Menu

The Select Command-file Menu enables you to select a new or existing command-file for editing.

The Select Command-file Menu is displayed in figure 10.

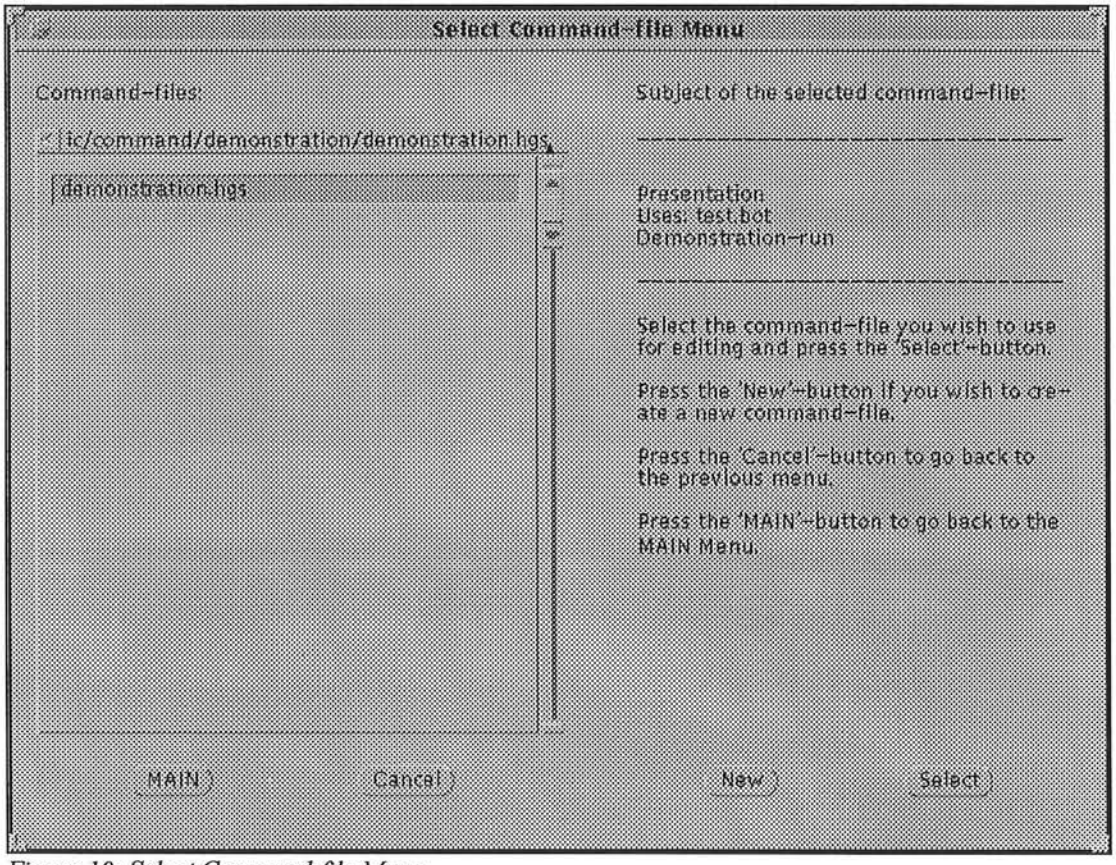


Figure 10: Select Command-file Menu

The menu consists of an input-field with scrolling list, a display-field and four buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select a command-file for editing. This can be done either by selecting a command-file from the list with the mouse by clicking on it (the subject of the selected command-file will be displayed in the display field) or by typing the name at the input-field. When the command-file does not exist an error message will occur in the bottom-left corner of the menu.

The 'Main'-button enables you to go back to the MAIN Menu without selecting anything.

The 'Cancel'-button lets you step backward through the menu-structure.

The 'New'-button enables you to create a new command-file with default values.

By pressing the 'Select'-button the currently selected command-file will be opened.

This is how to create a new command-file:

- select the 'New'-button.

After the selection, the Edit Command-file Menu will be displayed, with the default values.

4.6 Edit Command-file Menu

The Edit Command-file Menu enables you to view, edit, print and save a command-file, select, view and print a bottom-file (Bottom Tools) and graphically edit, view and print the computational grid (Grid Tools).

The Edit Command-file Menu is displayed in figure 11.

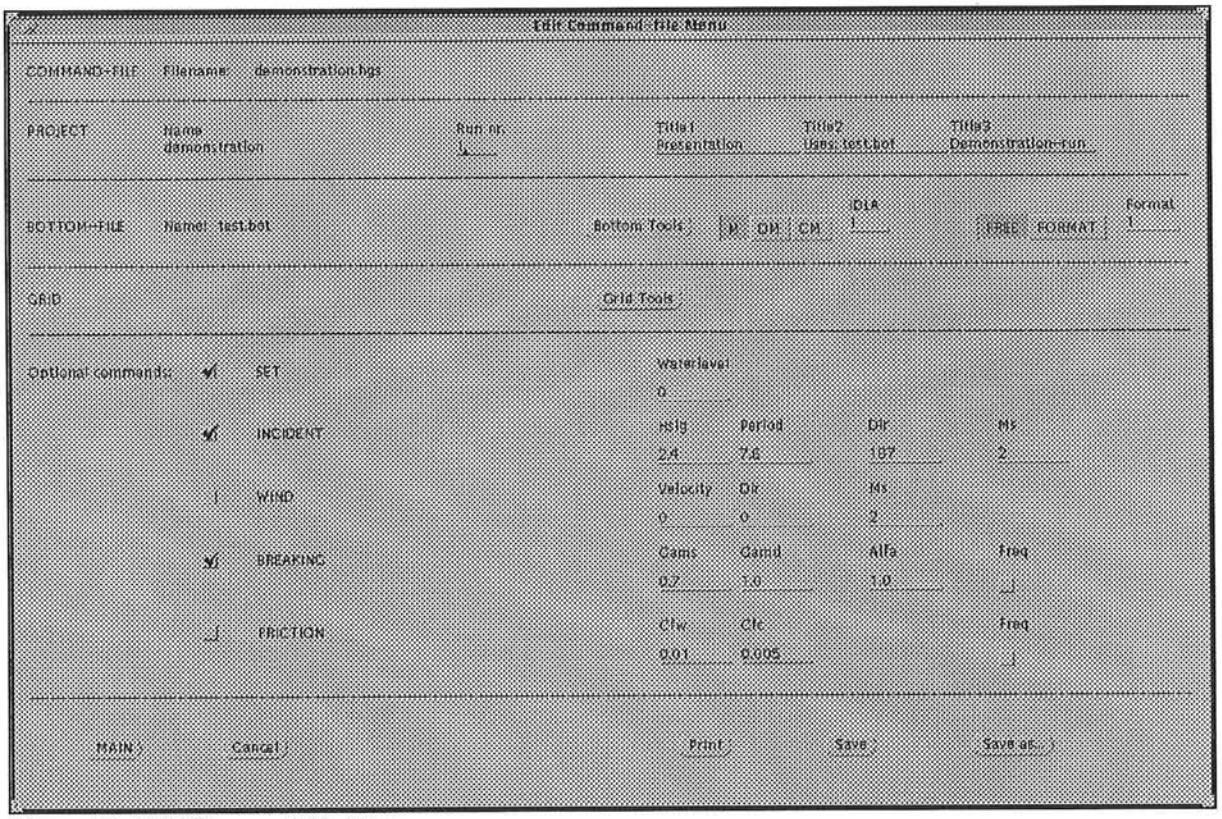


Figure 11: Edit Command-file Menu

The menu consists of three display-fields, nineteen input-fields, seven checkboxes, two choices and seven buttons. All functionalities on the menu enable you to edit the commands and matching parameters of the command-file. Below the different commands and parameters are reviewed.

Behind the text 'COMMAND-FILE: Filename:' the name of the selected command-file is displayed. This name can not be edited in this menu.

Behind the text 'PROJECT' the values of the parameters projectname, run number, title 1, title 2 and title 3 are displayed in one display-field (projectname), which can not be edited, and four input-fields. De default values of the four input-fields are respectively '1', 'untitled', 'untitled' en 'untitled'. These values can be edited in the menu.

Behind the text 'BOTTOM-FILE' the values of the parameters filename, multiplication factor FAC, IDLA, formattype and formatnumber IDFM are displayed in one display-field, two choices and two input-fields.

- The name of the bottom-file is displayed in a display-field (and can not be edited in this menu). An other bottom-file can be selected by selecting the 'Bottom Tools'. When no bottom-file is selected, the value of the display-field is 'none'.
- The unit of the bottom-file is displayed in a choice, consisting of metres, decimetres and centimetres. The default unit of the bottom-file is metres.
- The value of the IDLA is displayed in an input-field, with the default value IDLA = 2. IDLA is used to define the way HISWA reads the bottom-file.
- The formattype is displayed in a choice, consisting of 'Format' and 'Free'. The default value of the choice is 'Format'.
- The formatnumber IDFM is displayed in an input-field, with the default value as defined in the userfile (.bottomformat). The formatnumber is only necessary when the formattype is 'Format'. When 'Free' is selected, HISWA doesn't need a formatnumber.

For more information about the HISWA commands, reference is made to the HISWA manual.

Besides the above mentioned fields, a 'Bottom Tools'-button is given in the menu, with which you can select, view and print a bottom.

Behind the text 'GRID' a button is displayed, with which the 'Grid Tools' can be started. These 'Grid Tools' enable you to edit and select the computational grid graphically.

Behind the optional command 'SET', which can be (de)activated with the matching checkbox, the waterlevel can be entered in a input-field. The default value of the waterlevel is 0.

Behind the optional command 'INCIDENT', which can also be (de)activated with the matching checkbox, you can enter the parameters significant waveheight, period, wavedirection and MS. These parameters are all displayed in input-fields, with the default values of respectively 0, 0, 0 and 2.

Behind the optional command 'WIND', (de)activated with a checkbox, the parameters windvelocity, winddirection and MS can be entered. The default values of these parameters are respectively 0, 0 and 2.

Behind the optional command 'BREAKING', (de)activated with a checkbox, you can enter a number of coefficients (GAMS, GAMD en ALFA) displayed in input-fields. The default values of the above mentioned coefficients are respectively 0.8 , 1.0 and 1.0. Furthermore the influence of the command on the mean wavefrequency can be turned on/off by using a checkbox. The default is 'off'.

Behind the optional command 'FRICTION', (de)activated with a checkbox, two coefficients (CFW en CFC) can be entered in input-fields. The default values of the above mentioned coefficients are respectively 0.01 and 0.005. Furthermore the influence of the command on the mean wavefrequency can be turned on/off by using a checkbox. The default is 'off'.

All checkboxes, used for turning on/off of the optional commands, are set to 'off' by default.

Besides the functionalities for the editing of the command-file, the menu contains five buttons, namely a 'MAIN'-button, a 'Cancel'-button, a 'Print'-button, a 'Save'-button and a 'Save as'-button.

The 'Main'-button enables you to go back to the MAIN Menu without editing anything.

The 'Cancel'-button lets you step backward through the menu-structure.

The 'Print'-button enables you to print the current command-file. This is done by creating a temporary file, which is printed and afterwards removed.

By pressing the 'Save'- or 'Save as'-button the command-file is saved, either with the current name or with a new name.

This is how to close the Edit Command-file Menu and select the command-file 'demonstration.hgs':

- select the 'Cancel'-button.

After the selection, the Select Command-file Menu will be displayed.

- select the command-file 'demonstration.hgs' from the list.
- select the 'Select'-button.

After the selection, the Edit Command-file Menu will be displayed, with the values of the command-file 'demonstration.hgs'.

This is how to start the Bottom Tools:

select the 'Bottom Tools'-button.

After the selection, the Bottom Tools Menu will be displayed.

4.7 Bottom Tools Menu

The Bottom Tools Menu enables you to select a bottom-file and a presentation (2D, 3D, isolines). When you are sure that the right bottom-file is selected, it can be used in the current command-file.

The Bottom Tools Menu is displayed in figure 12.

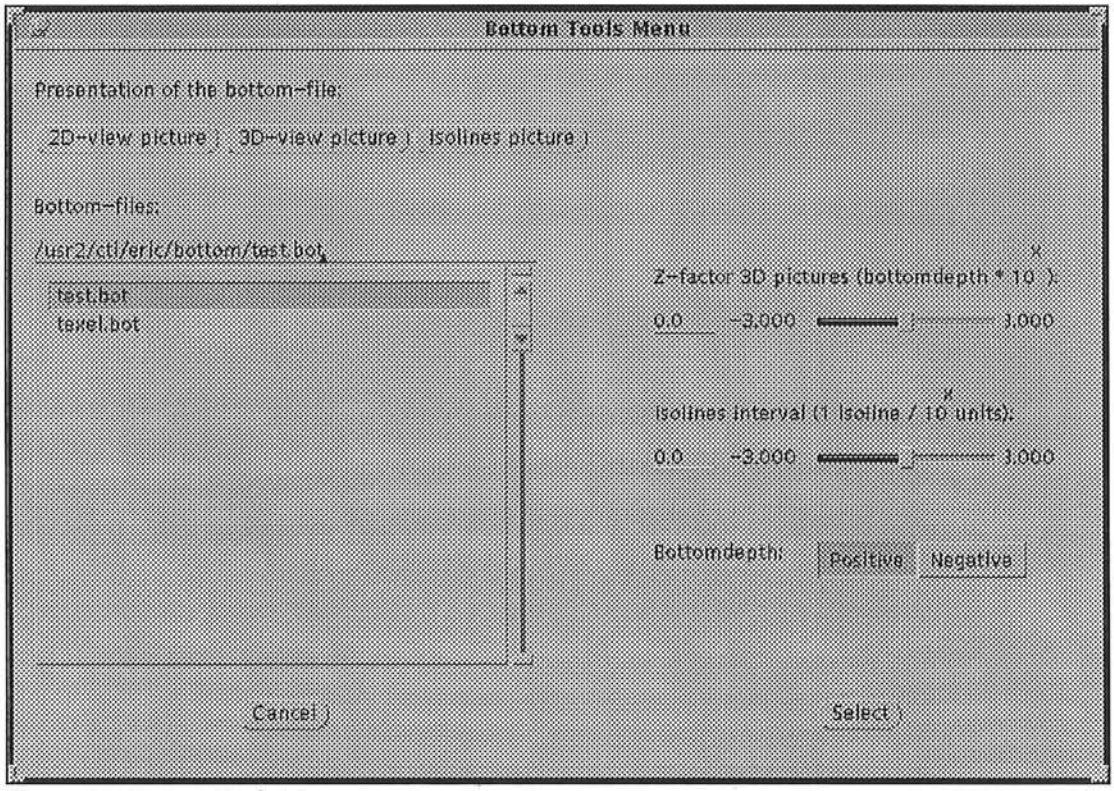


Figure 12: Bottom Tools Menu

The menu consists of an input-field with scrolling list, two sliders, a choice and five buttons.

The input-field with scrolling list enables you to select a bottom-file. This can be done as described earlier.

The sliders can be used to edit the scales of both the 3D pictures and the isolines pictures. The slider, used for 3D pictures, multiplies the bottomdepth with a factor 10^x, with x varying between -3 and 3 (the means a multiplication factor between 0.001 and 1000). The slider, used for isolines pictures, sets the number of units (10^x) per isoline, with x varying between -3 and 3 (1 isoline every 0.001 - 1000 units).

In the choice a selection can be made between positive and negative. This is done because not all bottom-files use a positive bottomdepth. The right value of the choice can be selected by picking one of the choices or by simply selecting a bottom-file. When a bottom-file is selected, a check is performed to see if the bottomdepth is positive or negative. This check uses the assumption that more than half the area of a bottom-file consists of water. This implicates that the bottomdepth is positive if the mean value of all bottomvalues is positive, vice versa.

The presentation (2D-view picture, 3D-view picture, Isolines picture) can be selected by pressing one of the buttons at the top of the menu.

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Select'-button, at the bottom of the menu, the currently selected bottom-file is used in the current command-file.

This is how to display the bottom 'test.bot':

- select the bottom-file 'test.bot' (if not already selected)
- select one of the presentation buttons (2D-view, 3D-view, isolines picture)

After the selection, the bottom-file will be displayed in an ARCPLOT display and the Print Bottom Menu will be displayed. Examples of the pictures in ARCPLOT-display and the Print Bottom Menu are given figure 1,2 and 3 in appendix 3.

4.8 Print Bottom Menu

In the Print Bottom Menu a choice can be made between returning to the previous menu and sending the picture in the current display to the printer or to a file.

The Print Bottom Menu is displayed in figure 13.

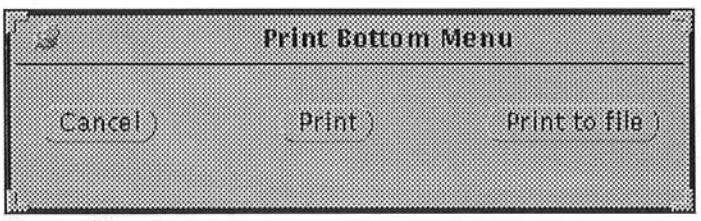


Figure 13: print.menu

The menu consists of three buttons, namely a 'Cancel'-button, a 'Print'-button, which sends the picture to the printer, and a 'Print to file'-button, which sends the picture to a plotfile.

This is how to send a picture to a file:

- select the 'Print to file'-button

After the selection, the plotfile is written to the bottom-file directory, which is made during the installation (see appendix 1) and the Bottom Tools Menu will be displayed. Examples of the plotfiles are displayed in appendix 4.

This is how to return to the Edit Command-file Menu:

- select the 'Cancel'-button.

After the selection, the Edit Command-file Menu will be displayed. The name of the bottom-file is not changed and so it stays 'test.bot'.

This is how to start the Grid Tools:

- select the 'Grid Tools'-button.

After selection the current bottom-file is displayed (in 2D) in an ARCPLOT-display and the Grid Tools Menu will be displayed.

4.9 Grid Tools Menu

The Grid Tools Menu enables you edit the grid parameters of the computational grid graphically and by use of the menu. Furthermore the edited grid can be selected for use in the current bottom-file.

The menu consists of seven input-fields, two display-fields and four buttons.

Behind the text '1st point' the co-ordinates (x and y) of the origin of the grid can be defined. When one of the two co-ordinates is changed, the grid is recalculated and redisplayed.
Remark: The 2nd point stays the same during the calculation. The angle is changed.

Behind the text '2nd point' the co-ordinates (x and y) of the second point (support point of the base line) of the computational grid can be defined. When one of the grid parameters is changed, the computational grid is recalculated and redisplayed. The second gridcorner in x-direction is calculated from the 1st point across the second point (the second point is not a gridcorner).
Remark: The 1st point stays the same during the calculation. The angle is changed.

Behind the text 'Angle' the angle of the computational grid can be entered. The value angle = 0 means horizontally aimed to the right. When the angle is changed, the grid is recalculated and redisplayed

Remark: The 1st point stays the same during calculation. The 2nd point is changed.

The Grid Tools Menu is displayed in figure 14.

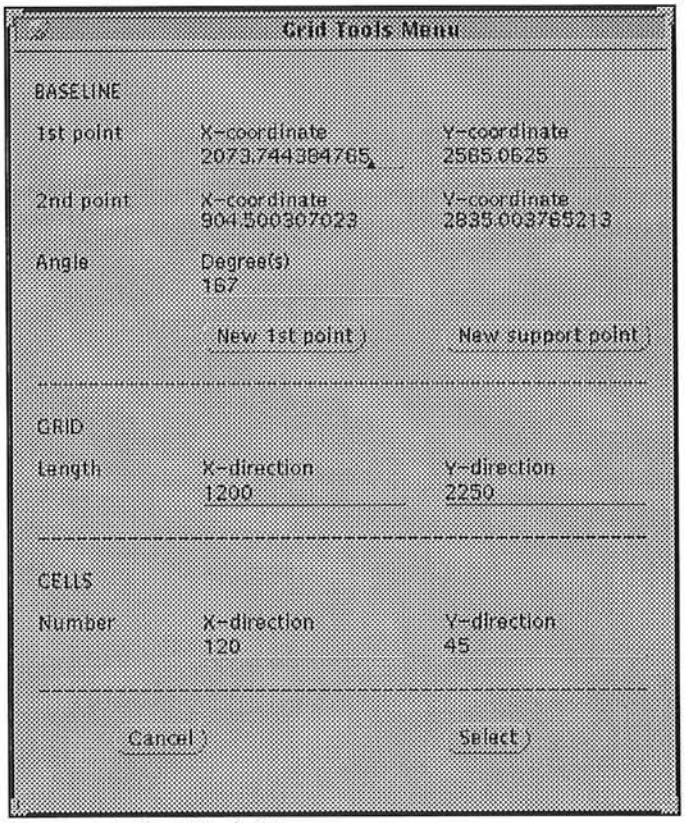


Figure 14: Grid Tools Menu

The first and second point can also be defined graphically by using the buttons 'New 1st point' en 'New support point'. By selecting one of these buttons a selectioncross is displayed in the ARCPLOT-display, with which a point can be selected. After selection, the grid is recalculated and redisplayed.

Behind the text 'Length' the length of the computational grid in x- and y-direction can be entered. When one of the lengths is changed, the grid is recalculated/redisplayed.

Behind the text 'Number' you can enter the number of cells in both the x- and y-direction. Changing this parameter will not influence the size, location or orientation of the grid, so it will not be recalculated and redisplayed when a value is changed.

Besides the above mentioned buttons ('New 1st point' and 'New support point') two other button are present on the menu, namely a 'Cancel'-button and a 'Select'-button.

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Select'-button, the currently selected computational grid is used in the current command-file.

This is how to change the current computational grid:

- select one of the lines behind '1st point'.
- change the co-ordinate and press [enter].

After pressing [enter] the display is refreshed with the current bottom and a new grid. The Grid Tools Menu will be displayed again. Try to do some more things with the grid (also use the two buttons 'New 1st point' and 'New support point'). **Do not press the 'Cancel'- or 'Select'-button.** Examples of the pictures in ARCPLOT-display and Print Grid Menu are displayed in appendix 3. The plotfiles are displayed in appendix 4.

This is how to return to the Edit Command-file Menu without changing the grid:

- select the 'Cancel'-button.

After the selection, the Edit Command-file Menu will be displayed.

This is how to edit the command-file:

- select the line below 'Hsig'.
- make the new value 3 (the old value was 2.4).

This is how to save the changes to a new file:

- select the 'Save'-button.

After the selection, the Overwrite Menu will be displayed.

4.10 Overwrite Menu

The Overwrite Menu warns you that an existing file is about to be overwritten. You can choose whether the existing command-file should be overwritten or not.

The menu consists of a display-field and a choice. Between the two fields an explanation is given of the functionalities of the menu.

The display-field shows the filename which is about to be overwritten.

In the choice a selection can be made between overwriting the existing file ('Yes') and giving the command-file a new name ('No').

The Overwrite Menu is displayed in figure 15.

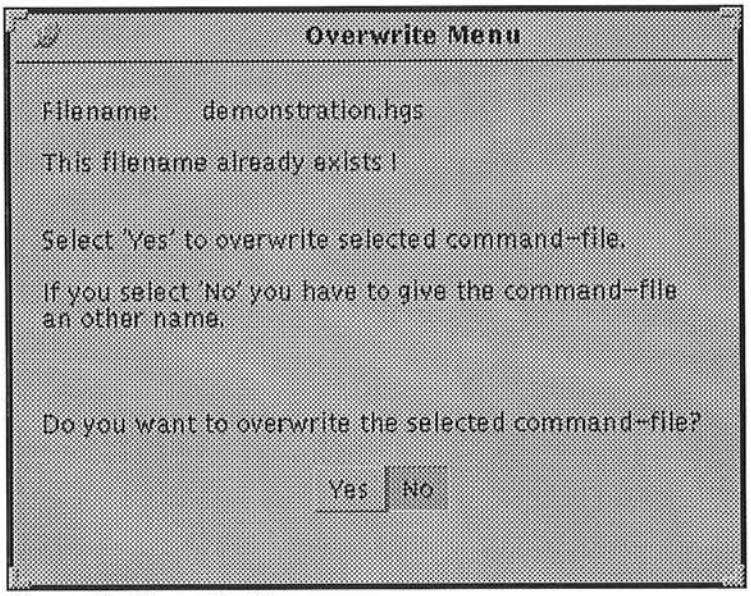


Figure 15: Overwrite Menu

This is how to save the command-file with a new name:

- select the 'No' choice.

After the selection, the Save as... Menu will be displayed.

4.11 Save as... Menu

The Save as... Menu enables you to enter a new name for the current command-file.

The menu consists of a input-field, in which a new name can be entered, and two buttons, namely a 'Cancel'-button and a 'Save'-button, which uses the entered name for saving the command-file.

The Save as... Menu is displayed in figure 16.

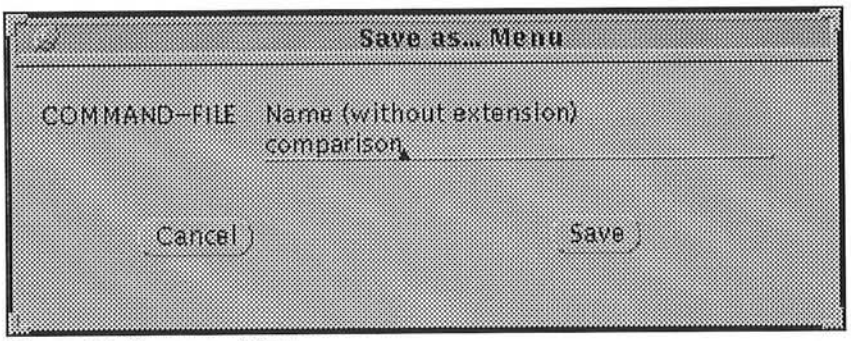


Figure 16: Save as... Menu

This is how to give the current command-file the name 'comparison.hgs':

- select the line below 'Name (without extension)' at the end of 'demonstration'.
- erase the whole line by pressing [backspace].
- *comparison*
- select the 'Save'-button.

After the selection, the command-file is saved with the name 'comparison.hgs' and the Edit Command-file Menu is displayed.

This is how to close the pre-processing module:

- select the 'MAIN'-button.

After the selection, the MAIN Menu will be displayed.

This is how to start the pre-processing module again:

- select the 'PRE'-button.

After the selection, the Current Menu will be displayed.

4.12 Current Menu

The Current Menu enables you to choose between editing a command-file selected earlier in the current HISGIS session or selecting an other command-file. This menu is only invoked when a command-file has been selected earlier.

The Current Menu is displayed in figure 17.

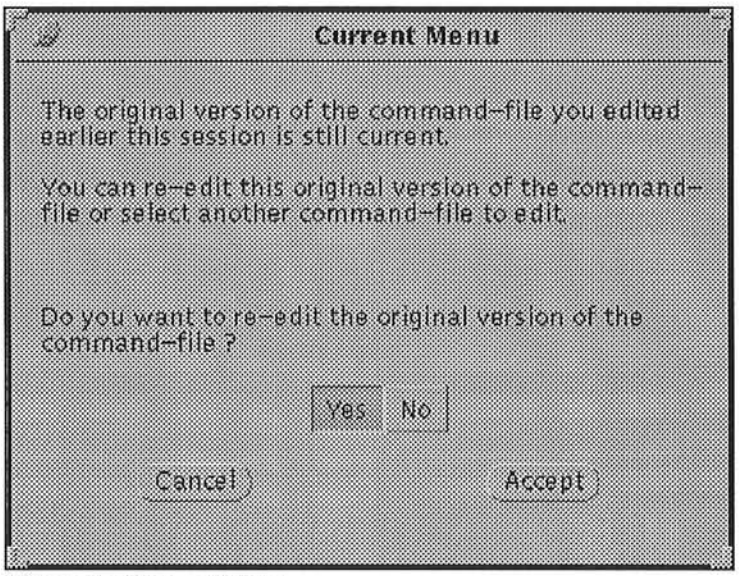


Figure 17: Current Menu

The menu consists of a piece of text, a choice and two buttons, namely a 'Cancel'-button and an 'Accept'-button. In the Current Menu a description is given why the menu is displayed. Further the question is asked if you want to re-edit the original version of the command-file. The original version of the command-file is the version as it was read when it was selected (so without any changes).

The choice can either be set to 'Yes' or 'No'.

The 'Cancel'-button enables you to return to the MAIN Menu without editing or selecting anything.

By pressing the 'Accept'-button, you accept the currently selected choice. Now the next menu will be invoked, which can be either Edit Command-file Menu or Select Project Menu.

This is how to re-invoke the command-file 'demonstration.hgs':

- select the 'Yes' choice.
- select the 'Accept'-button.

After the selection, the Edit Command-file Menu will be displayed, with the values of the command-file 'demonstration.hgs' as it was when it was invoked. In this example the command-file 'demonstration.hgs' has not been overwritten. If it would have been overwritten, even then the values would be the same as they were when the command-file was invoked.

This is how to return to the MAIN Menu:

select the 'MAIN'-button.

After the selection, the MAIN Menu will be displayed.

Chapter 5: The calculation module CALC

In the previous chapter a command-file 'demonstration.hgs' has been edited and saved as 'comparison.hgs'. The two files are now ready for a calculation in the calculation module.

5.1 Structure of the subsystem CALC

From the MAIN Menu the calculation module can be started, in which a HISWA calculation is performed. This module consists of three menus. The menu-structure of the module can be schematised like in figure 18.

<-1->	Select Project Menu
<-2->	Select Command-file Menu
<-3->	Calculation Completed Menu

Figure 18: Menu-structure of the calculation module CALC

5.2 Starting the calculation module

This is how to start the calculation module:

- select the 'CALC'-button

After selection the Select Project Menu is displayed.

5.3 Select Project Menu

The Select Project Menu, which is almost the same as in the pre-processing module, enables you to select a project, consisting of several command-files.

The menu consists of a input-field with scrolling list and two buttons. Next to the scrolling list an explanation is given to the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select a project. This can be done as described earlier.

The Select Project Menu is displayed in figure 19.

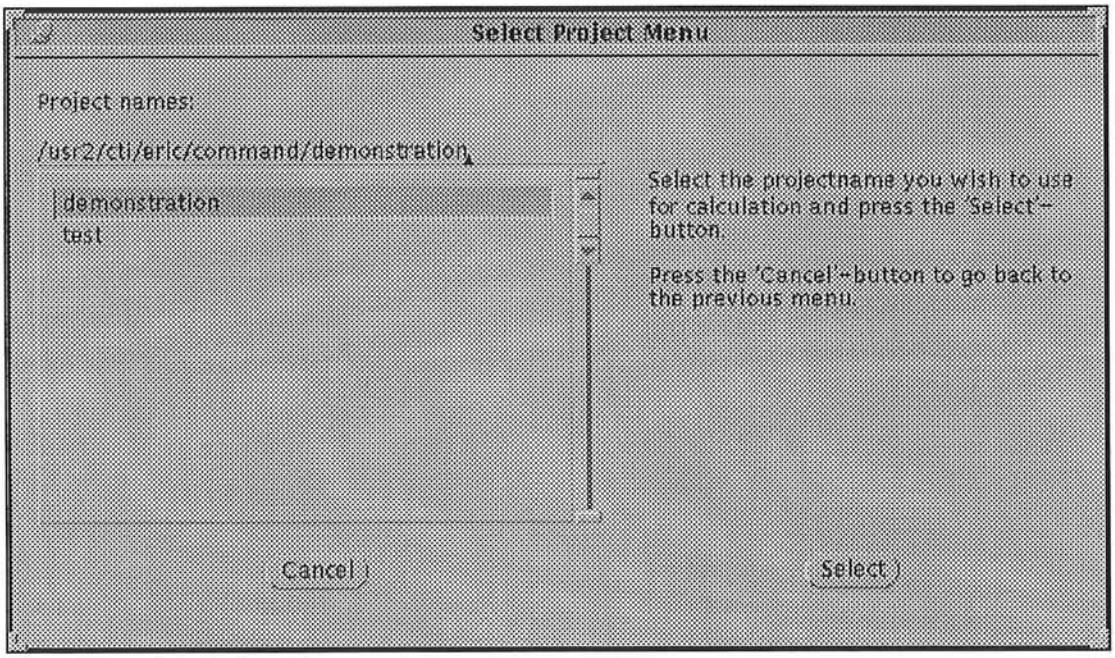


Figure 19: Select Project Menu

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Select'-button the currently selected project will be opened.

This is how to select a project for calculation:

- select the project 'demonstration'.
- select the 'Select'-button.

After the selection, the Select Command-file Menu will be displayed.

5.4 Select Command-file Menu

The Select Command-file Menu enables you to select a command-file for a HISWA calculation.

The menu consists of an input-field with scrolling list, a display-field and three buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The Select Command-file Menu is displayed in figure 20.

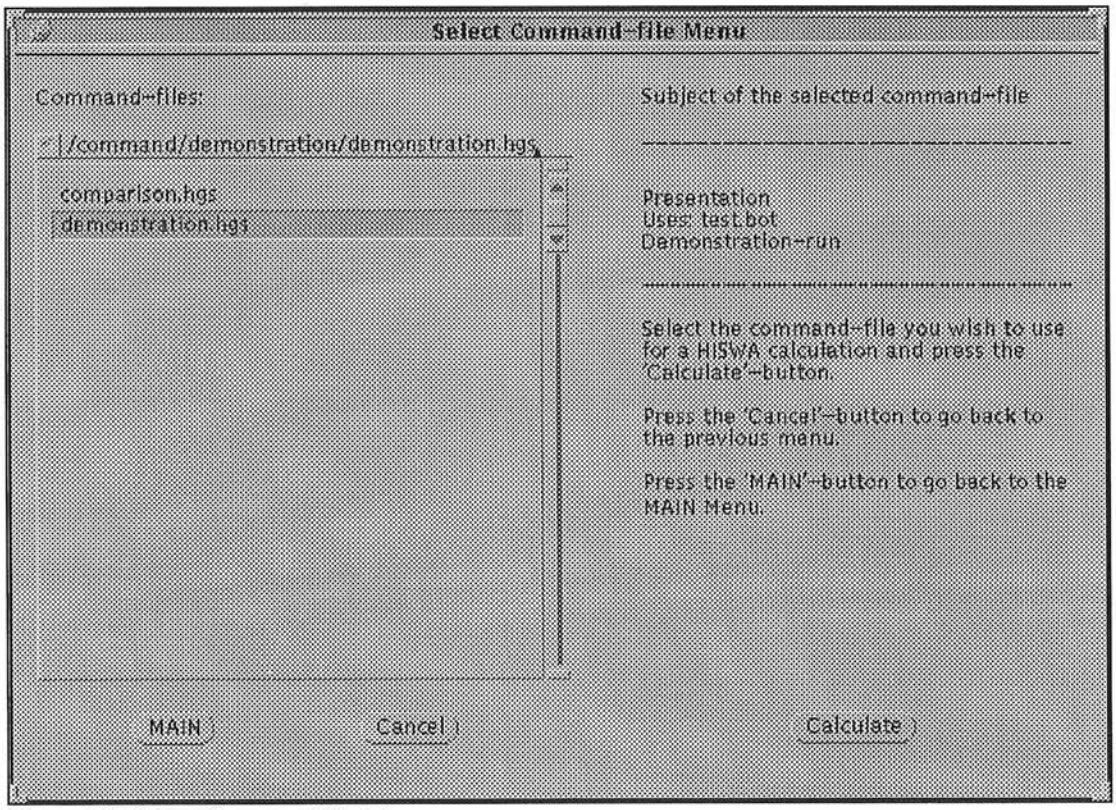


Figure 20: Select Command-file Menu

The input-field with scrolling list is meant to enable you to select a command-file for a HISWA calculation. This can be done as described earlier.

The 'MAIN'-button enables you to go back to the MAIN Menu without selecting anything.

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Calculate'-button the currently selected command-file will be used for a HISWA calculation.

This is how to select a command-file for a HISWA calculation:

- select the command-file 'demonstration.hgs'.
- select the 'Calculate'-button.

After the selection, the actual calculation will be performed and the Calculation Completed Menu will be displayed.

5.5 Calculation Completed Menu

The Calculation Completed Menu informs you that the calculation is completed successfully.

The Calculation Completed Menu is displayed in figure 21.

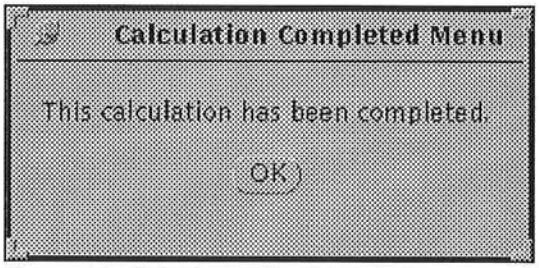


Figure 21: Calculation Completed Menu

The menu consists of a line of text and an 'OK'-button, with which you can return to the MAIN Menu.

This is how to return to the MAIN Menu and perform an other calculation:

- select the 'OK'-button.
- select the 'CALC'-button in the MAIN Menu.
- select the project 'demonstration' in the Select Project Menu.
- select the 'Select'-button.
- select the command-file 'comparison.hgs' in the Select Command-file Menu.
- select the 'Calculate'-button.
- select the 'OK'-button in the Calculation Completed Menu.

After the selection the MAIN Menu will be displayed again.

Chapter 6: The post-processing module POST

In the previous chapter the calculation has been performed. Now the results of the two command-files can be displayed and compared.

6.1 Structure of the subsystem POST

From the MAIN Menu the post-processing module can be invoked. This module consists of five menus. The menu-structure of the module can be schematised like in figure 22.

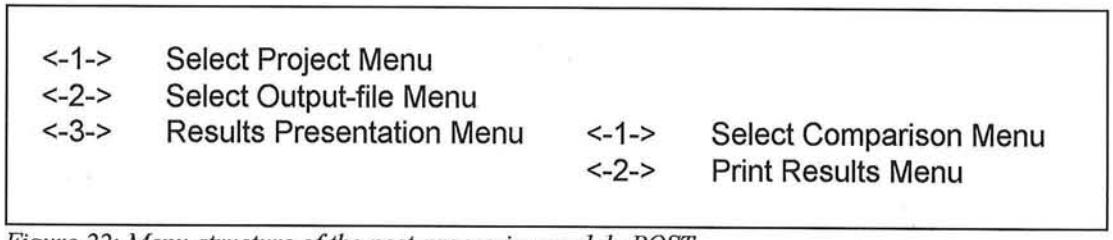


Figure 22: Menu-structure of the post-processing module POST

6.2 Starting the post-processing module POST

This is how to start the post-processing module:

- select the 'POST'-button

After selection the Select Project Menu is displayed.

6.3 Select Project Menu

The Select Project Menu, which is almost the same as the Select Project Menu in CALC, enables you to select a project, consisting of several output-files belonging to the command-file with the same name.

The menu consists of an input-field with scrolling list and two buttons. Next to the scrolling list an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select a project. This can be done as described earlier.

The Select Project Menu is displayed in figure 23.

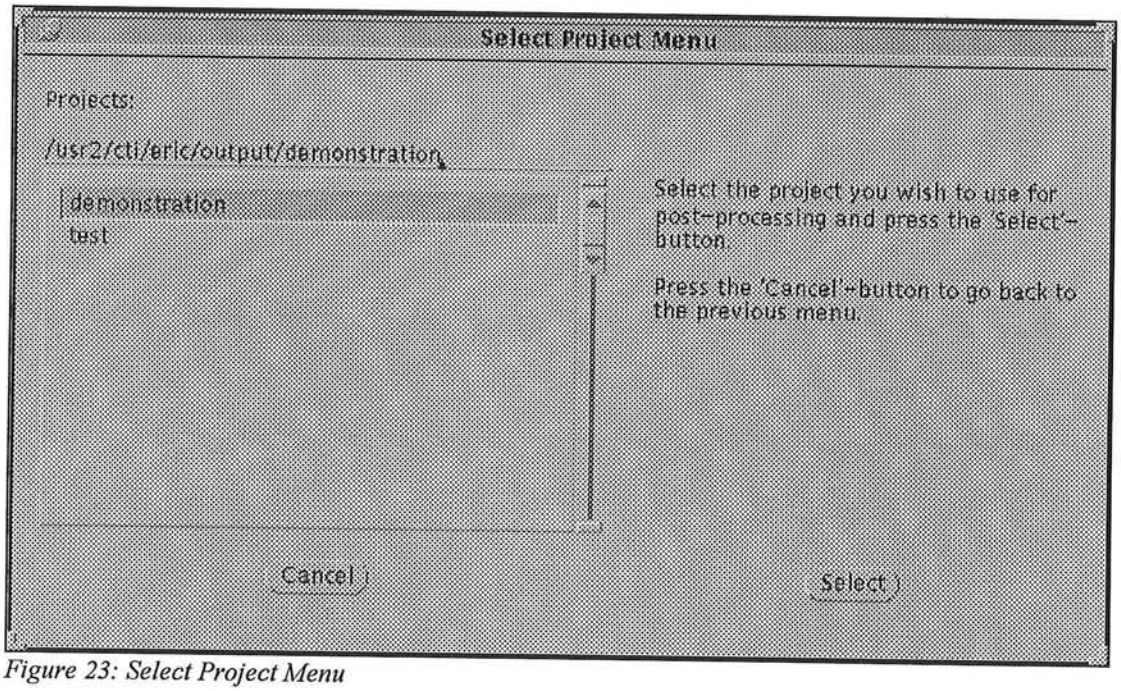


Figure 23: Select Project Menu

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Select'-button the currently selected project will be opened.

This is how to select a project for post-processing:

- select the project 'demonstration'.
- select the 'Select'-button.

After the selection, the Select Command-file Menu will be displayed.

6.4 Select Output-file Menu

The Select Output-file Menu enables you to select an output-file for post-processing purposes.

The menu consists of an input-field with scrolling list, a display-field and three buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select an output-file for post-processing purposes. This can be done as described earlier.

The Select Output-file Menu is displayed in figure 24.

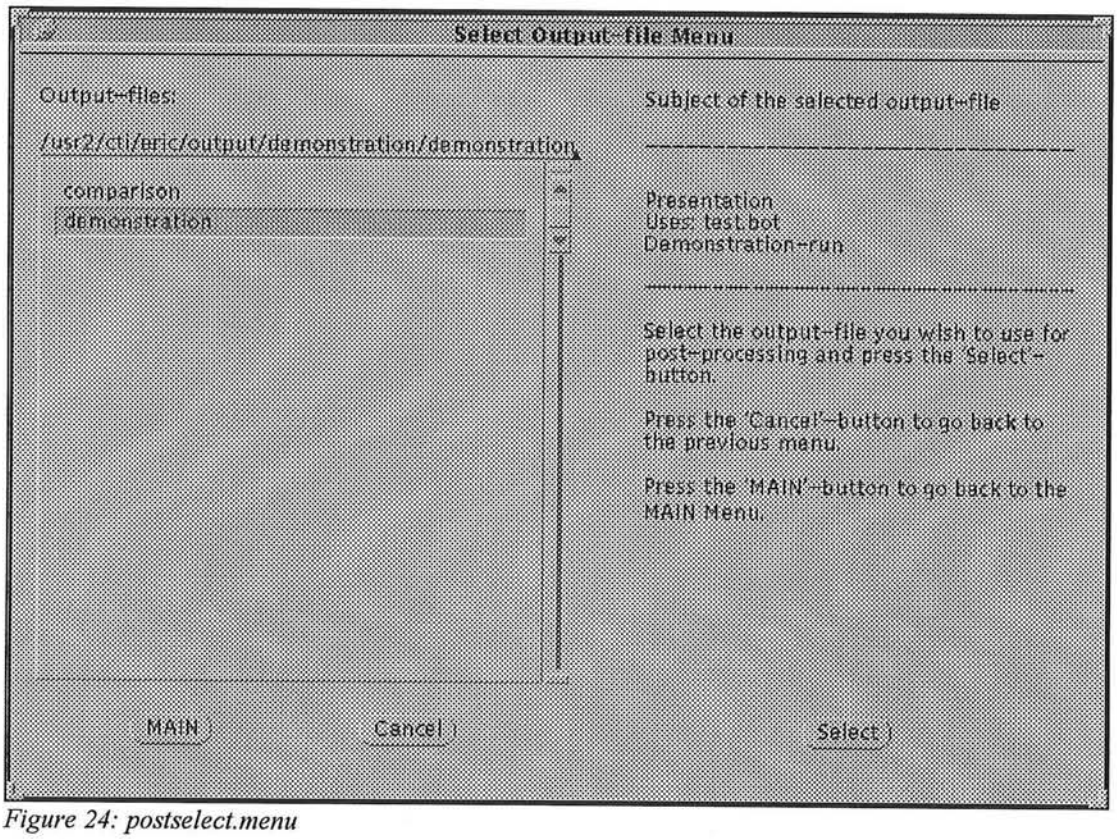


Figure 24: postselect.menu

The 'Main'-button enables you to return to the MAIN Menu without selecting anything.

The 'Cancel'-button lets you step backward through the menu-structure.

By pressing the 'Select'-button the currently selected command-file will be used for post-processing.

This is how to select an output-file for post-processing purposes:

- select output-file 'demonstration'
- select the 'Select'-button.

After the selection the Results Presentation Menu will be displayed.

6.5 Results Presentation Menu

The Results Presentation Menu enables you to select a parameter and a presentation (2D, 3D, isolines, comparison, table).

The Results Presentation Menu is displayed in figure 25.

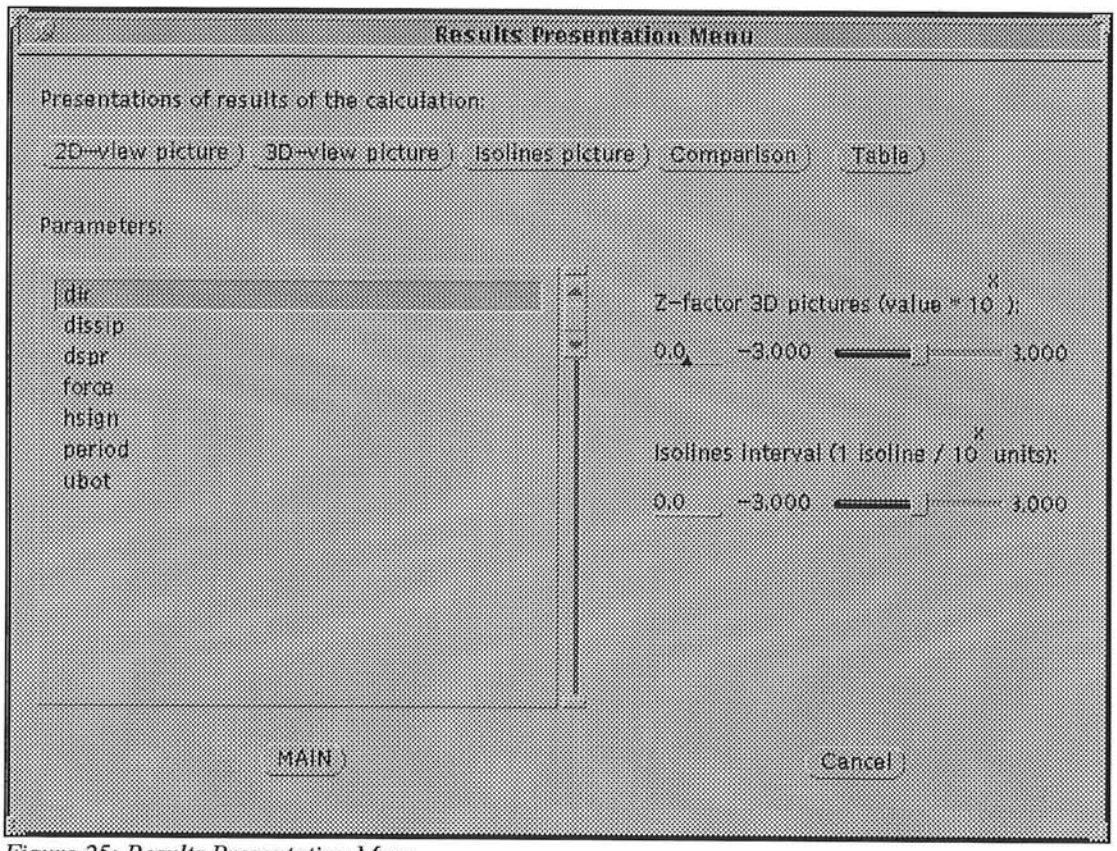


Figure 25: Results Presentation Menu

The menu consists of an input-field with scrolling list, two sliders and seven buttons.

The input-field with scrolling list enables you to select a parameter. This can be done as described earlier.

The sliders can be used to edit the scales of both the 3D pictures and the isolines pictures. The slider, used for 3D pictures, multipicates the results with a factor 10^x, with x varying between -3 and 3 (factor between 0.001 and 1000). The slider, used for isolines pictures, sets the number of units (10^x) per isoline, with x varying between -3 and 3 (1 isoline every 0.001 - 1000 units).

The presentationtype can be selected by pressing one of the buttons at the top of the menu.

The 'Main'-button enables you to go back to the MAIN Menu without selecting anything.

The 'Cancel'-button lets you step backward through the menu-structure.

This is how to display the results of the parameter Hsign:

- select the parameter hsign
- select the 3D-view picture presentation button
- select the 'Cancel'-button in the Print Results Menu.

After the selection, the Results Presentation Menu will be displayed again. An example of the picture in ARCPLOT display and the Print Results Menu is displayed in appendix 3. The plotfile is displayed in appendix 4.

This is how to display the results of a comparison with the parameter Hsign:

- select the parameter hsign
- select the 'Comparison'-button

After the selection, the Select Comparison Menu will be displayed.

6.6 Select Comparison Menu

The Select Comparison Menu enables you to select an output-file for comparison with an earlier selected command-file. The comparison is done by subtracting the second output-file from the first.

The menu consists of an input-field with scrolling list, a display-field and four buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable you to select an output-file for comparison purposes. This can be done as described earlier.

In the bottom-right corner of the menu three buttons are displayed, which enable you to select a presentation (2D, 3D, isolines) for comparison. Besides these buttons, an other button is displayed in the lower-left corner of the menu, namely a 'Cancel'-button. The 'Cancel'-button lets you step backward through the menu-structure.

The Select Comparison Menu is displayed in figure 26.

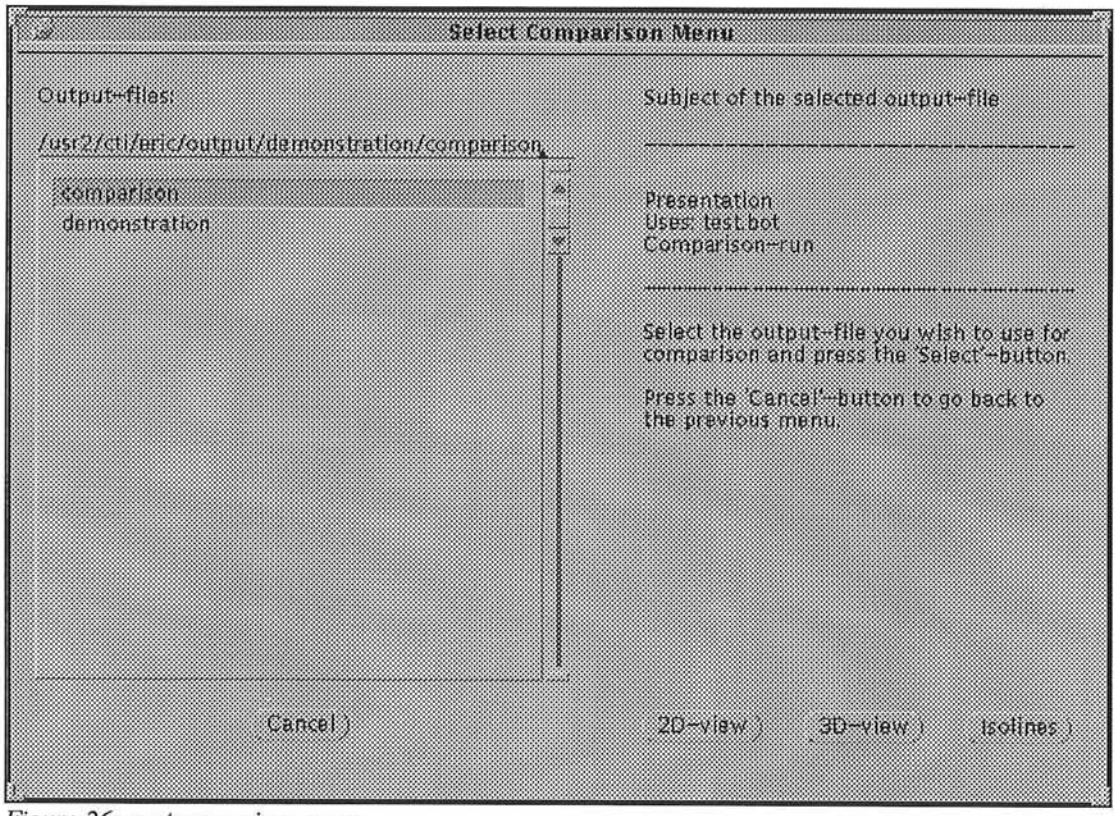


Figure 26: postcomparison.menu

This is how to select a second output-file for comparison with the first:

- select the output-file 'comparison' (subject is displayed).
- select the 3D-view presentation.

After the selection, the comparison is displayed in an ARCPLOT-display and the Print Results Menu is will be displayed. An example of the picture in ARCPLOT-display and the Print Results Menu is displayed in appendix 3. The plotfile is displayed in appendix 4.

This is how to close the post-processing module:

- select the 'Cancel'-button in the Print Results Menu.
- select the 'MAIN'-button in the Results Presentation Menu.

After the selection, the MAIN Menu will be displayed. HISGIS can be closed as described in chapter 3.

References

- AML User's Guide. ESRI REDLANDS. Manual AML, mai 1992.
- Command-Reference ARC/INFO. ESRI REDLANDS. Overview of all ARC/INFO commands.
- Command-Reference ARCPLOT. ESRI REDLANDS. Overview of all ARCPLOT commands.
- Coverage Display and Query Version 6.0. ESRI REDLANDS. Manual ARCPLOT.
- Formedit User's Guide Version 6.0. ESRI REDLANDS. Manual menu-editor Formedit.
- HISWA User Manual. N. BOOIJ, L.H. HOLTHUIJSEN. Manual HISWA version 100.21. October 1993.
- Surface-analyses with GRID Version 6.0. ESRI REDLANDS. Manual GRID.

Appendix 1: How to install HISGIS on your system

When your system meets the system requirements, mentioned in paragraph 1.4, the installation should not give any problems. During the installation a few steps have to be taken to copy the HISGIS-files correctly to your system. The necessary steps are given on the next page.

The application HISGIS consists of a total of 38 different files:
- 1 editable userfile *test.aml*, necessary to log on to HISGIS
- 1 example bottom-file and 1 example command-file
- 14 program-AMLs
- 21 menus.

The HISGIS-disk contains the following files:
- hisgis.aml
- passwordinput.menu
- test.aml
- test.bot
- demonstration.hgs
- intro.menu
- main.menu
- thanks.menu
- pre.aml
- precurrent.menu
- preproject.menu
- precreate.menu
- preselect.menu
- readsubject.aml
- predefault.aml
- preread.aml
- preinput.menu
- preinit.aml
- prebottom.aml
- prebottomtools.menu
- print.menu
- pregrid.aml
- pregridtools.menu
- presave.aml
- preoverwrite.menu
- prepresaveas.aml
- presavename.menu
- prewritehgs.aml
- calc.aml
- calcproject.menu
- calcselect.menu
- calccomplete.menu
- post.aml
- postproject.menu
- postselect.menu
- postviewresult.aml
- postpresentation.menu
- postcomparison.menu

The names of the files on the disk consist of a maximum of 8 characters and the extension of 3 characters. This is because DOS only supports short filenames and extensions. The files have to be renamed during the installation procedure (see step 6).

The following steps have to be made to install HISGIS correctly:

1. Create 7 new directories in your home-directory:
   - a user directory, e.g. name: 'users'
   - an AML directory, e.g. name: 'AMLs'
     a menu directory, e.g. name: 'menus' (can be the same as AML directory)
   - a command-file directory, e.g. name: 'command'
   - a bottom-file directory, e.g. name: 'bottom'
   - an output directory, e.g. name: 'output'
   - a HISWA directory, e.g. name: 'hiswa'

2. Create a directory in your command-file directory and your output directory, e.g. name: 'demonstration'.

3. Create a directory in the directory you just created in the output directory (see step 2) named 'demonstration'.

4. Copy all AMLs on the HISGIS-disk to the AML directory.

5. Copy all menus on the HISGIS-disk to the menu directory.

6. Rename the AMLs in the AML directory and the menus in the menu directory.

7. Move/copy all the bottom-files to the bottom-file directory.

8. Copy the example bottom-file *test.bot* to the bottom-file directory.

9. Copy the example command-file *demonstration.hgs* to the directory you've just created in the command-file directory (see step 2).

10. Rename the command-file *demonstration.hgs* (on the HISGIS-disk only 8 characters).

11. Move/copy the HISWA program-files to the HISWA directory.

12. Open the user-file *test.aml* and edit the filename, password, name, companyname, etc. The directories have to be changed to the directories you have just created (see step 1). The default bottomformat can be set to the bottomformat of the majority of your bottom-files.

    Reminder: .workspace = your home directory
    .hiswapath = directory containing HISWA program-files
    .commandpath = directory for your command-files
    .bottompath = directory containing the bottom-files
    .outputpath = directory for your output-files
    Attention: When containing blanks, the line after the equal-sign have to be quoted.

13. Start ARC/INFO.

14. Enter the &terminal-command (with station-file number).

15. Encode the new user-file by typing *&encode &encrypt <name user-file>*. Now a file exists with the same filename but with the extension *.aef*.

16. Close ARC/INFO

17. Copy the *.aef*-file to the user directory.

18. Open the AML *hisgis.aml* and change the directories in the changeable part of the AML to the directories you have just created (see step 1). Change the hardware settings in the changeable part (.terminal, .plotfile and .display) to the settings of your own hardware (dependent on hardware type, see ARC/INFO manual).
    Reminder: .amlpath = directory containing the AMLs
    .menupath = directory containing the menus
    .userpath = directory for the user-files
    .terminal = definition of the station-file
    .plotfile = definition of the way to create a plotfile
    .display = definition of the way to create a picture on screen
    Attention: When containing blanks, the line after the equal-sign have to be quoted.

19. Copy the new *hisgis.aml*-file to your home-directory.

20. HISGIS is now installed correctly. You can start HISGIS by starting ARC/INFO and typing '&r hisgis'.

Appendix 2: Troubleshooting

1. General error messages

In the application HISGIS some error messages are built in.

Errors in the pre-processing module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.
- 'Error during overwriting.'
  This error is given when the file can't be deleted/overwritten. The error can be given if the file to be deleted/overwritten is missing or still opened.
- 'The selected file is empty'
  This error is given if the selected command-file doesn't contain any characters (thus is empty).
- 'Bottom-file doesn't exist. Select a new bottom-file'
  This error is given when the selected bottom-file doesn't exist. It is also displayed when the value of the name of the bottom-file in the menu *preinput.menu* is still 'none'.

Errors in the calculation module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.
- 'Severe error in calculation ! Check the selected command-file.'
  This error is given when one of the result-tables is missing. This does not necessarily mean that the calculation of the rest of the tables is wrong. Check the '.PRT'-file in the output directory of the selected output-file.

Errors in the post-processing module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.

2. HISWA error messages

HISWA may also generate error messages. Most of the time, these are caused by errors in the command-file or bottom-file. The errors can be looked up in the '.PRT'-file in the output directory of the concerning command-file.

The errors can be of three different levels of severity:

1. warning
2. error
3. severe error

HISGIS is instructed only not to perform the calculation when a severe error occurs. See the '.PRT'-file for the severe error messages.

Error messages, which are not severe, and warnings do not influence the performing of the calculation, but they can influence the results of the calculation. Therefore always check the '.PRT'-file after a HISWA/HISGIS run.

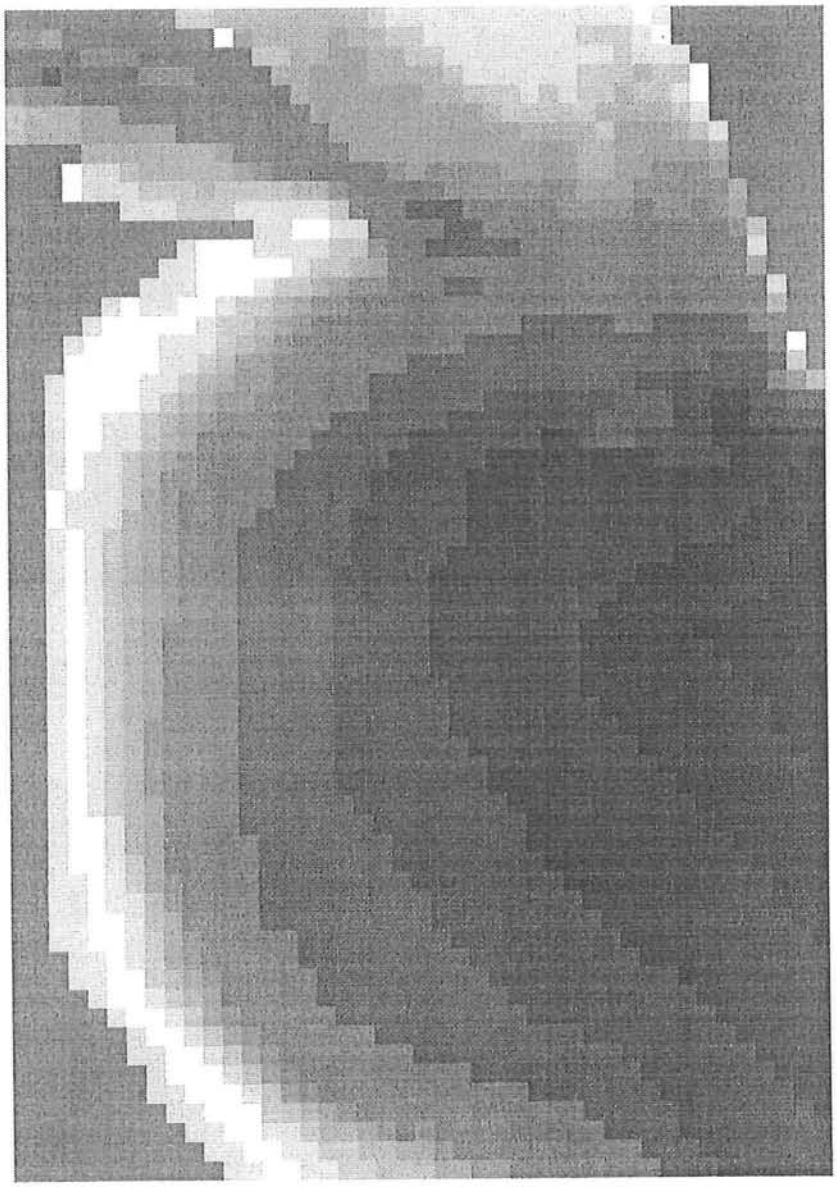
See the HISWA manual for the different HISWA error messages.

Attention: *If any other errors should occur, please report this to the contact mentioned in the preface.*

HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

2d – representation



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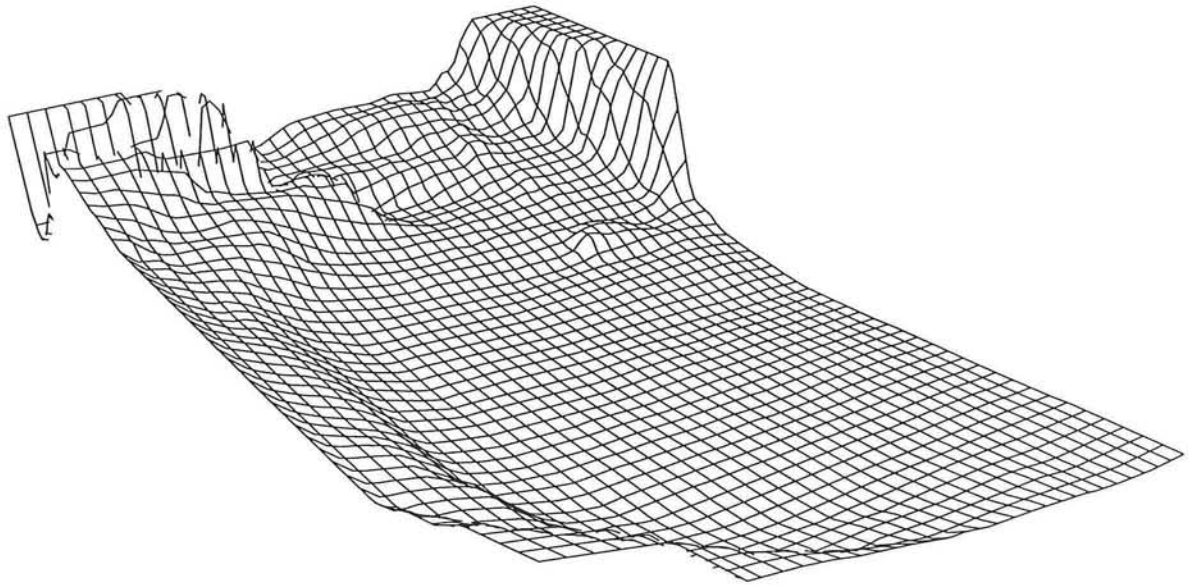
Created by:

Eric Oschatz
August 16, 1996
1:46 PM

HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

3d – representation



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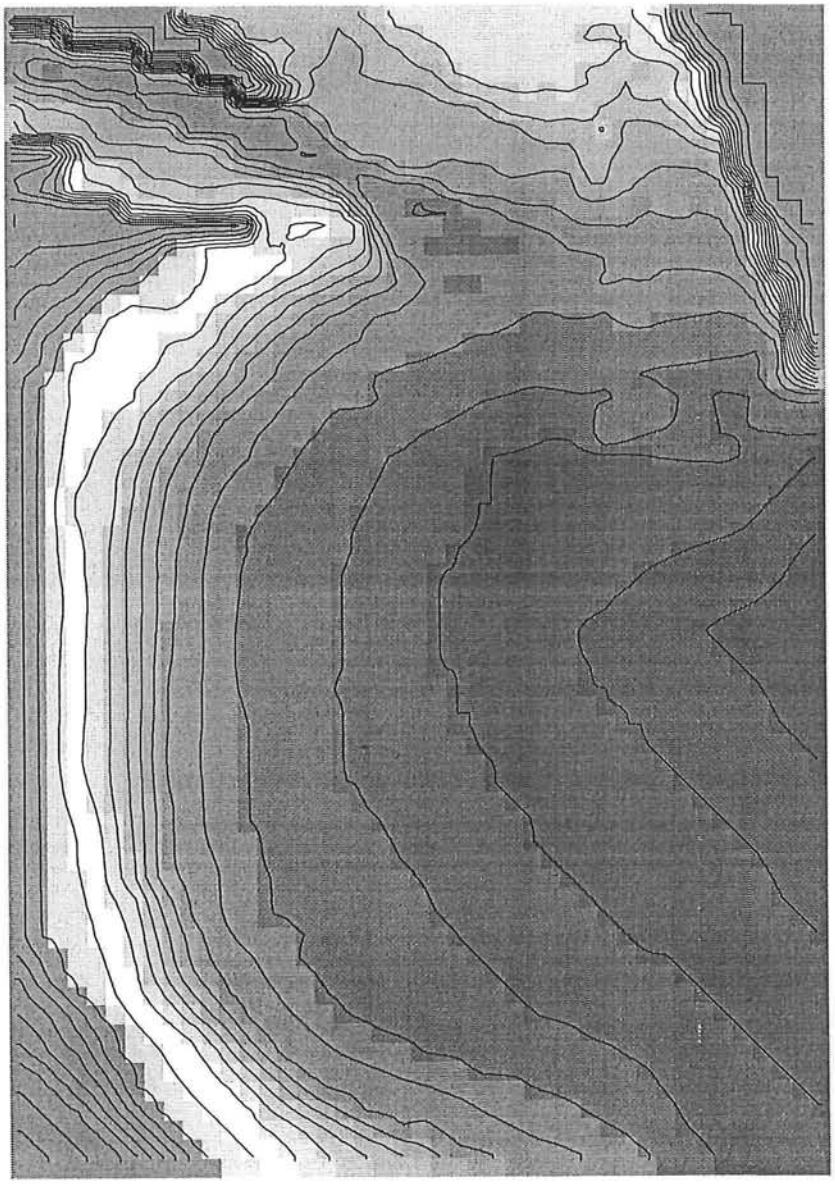
HISGIS – BOTTOM PRESENTATION

Bottomfile: test.bot

isolines – representation

1 isoline / 1 meter(s) bottomdepth



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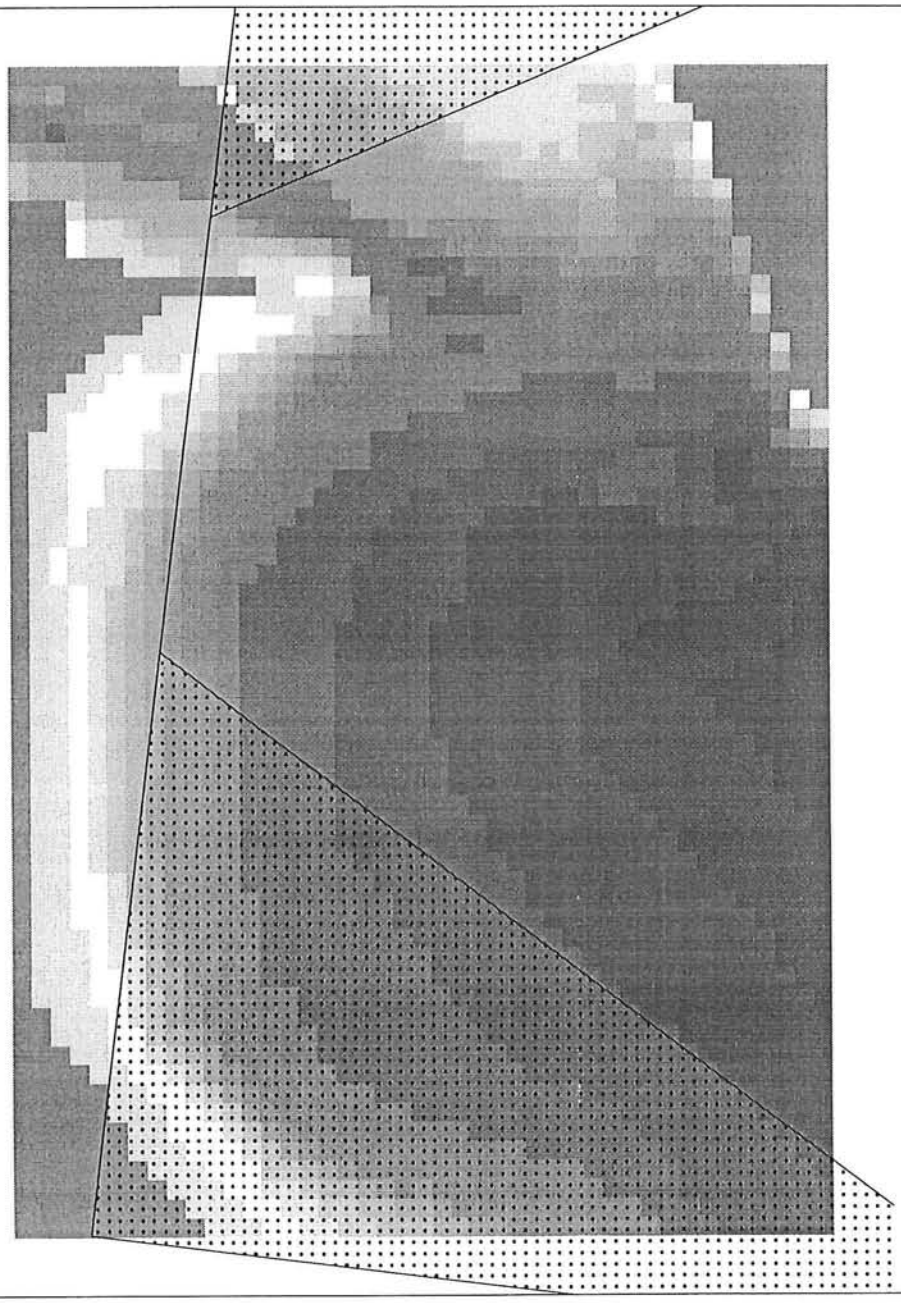
1:48 PM

HISGIS – GRID PRESENTATION

Bottomfile: test.bot

2d – representation



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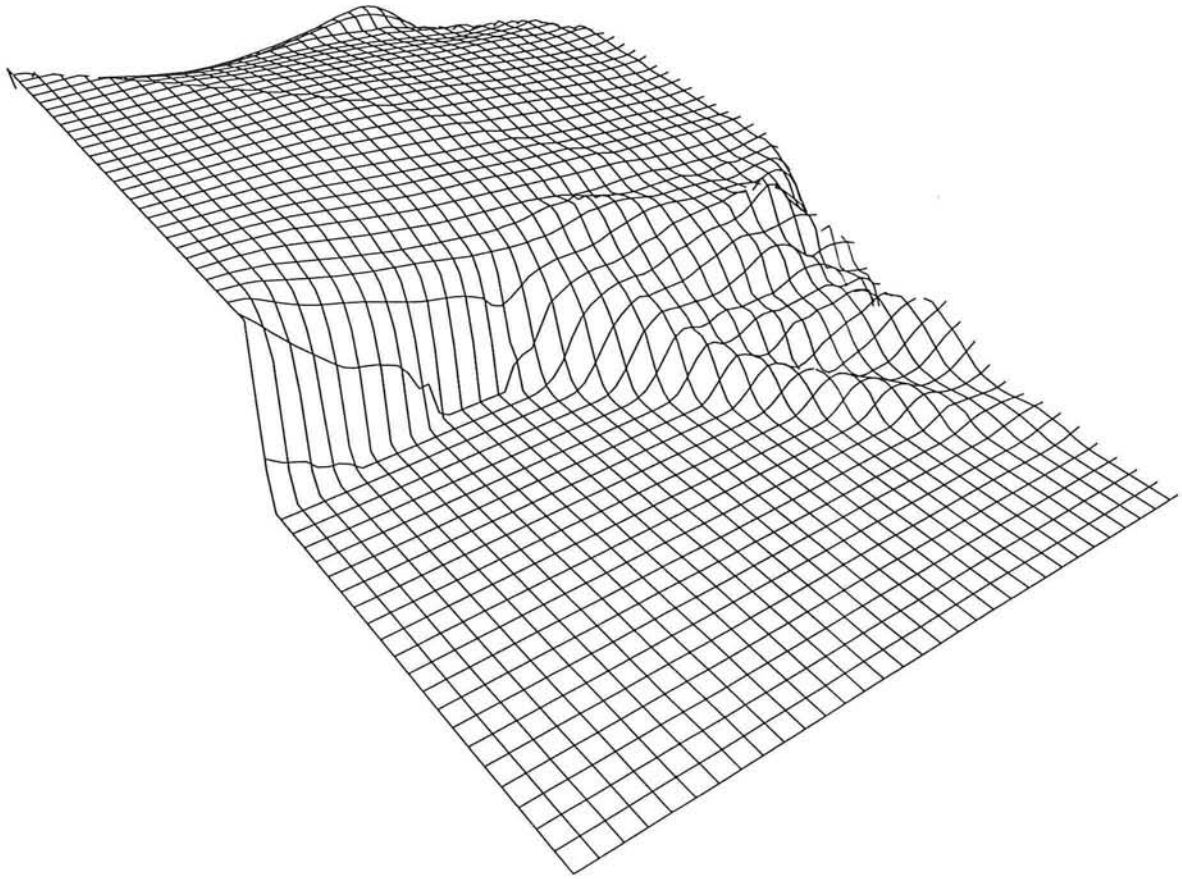
1:50 PM

HISGIS – RESULT PRESENTATION

Resultfile: demonstration Parameter: hsign

3d – representation



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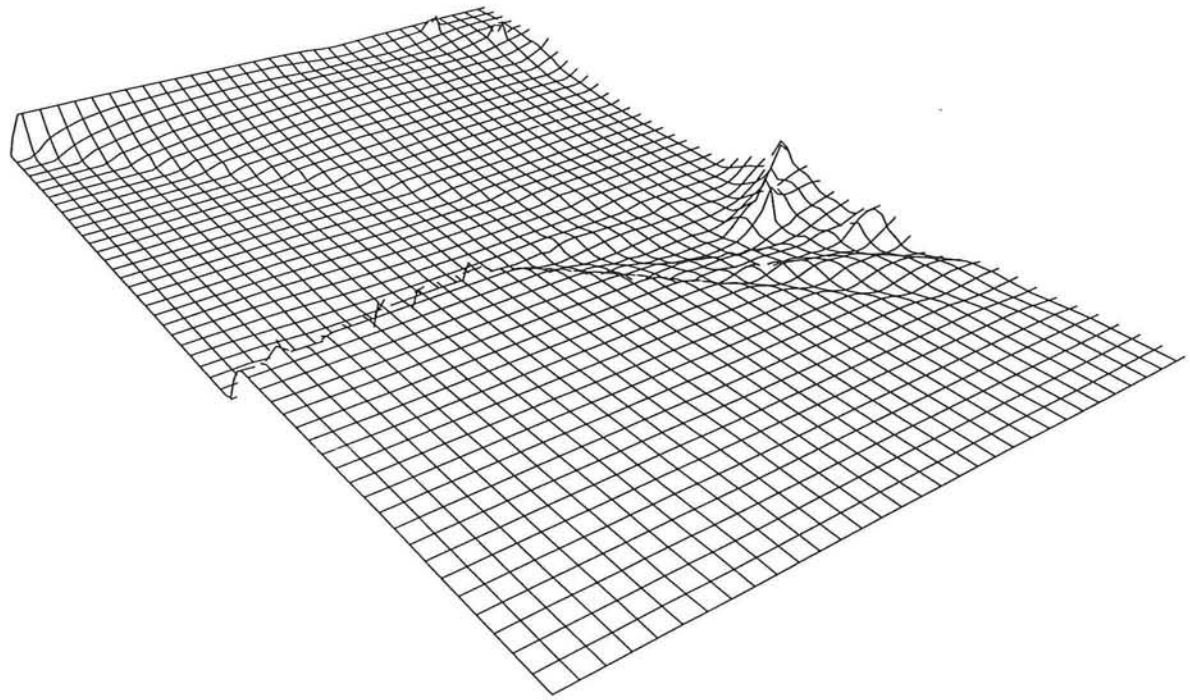
2:01 PM

HISGIS – RESULT PRESENTATION

Resultfile: demonstration Parameter: hsign

Comparison with comparison



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2:04 PM

Preface

The application HISGIS has been developed in 1996 within the scope of finishing my study of Civil Engineering at Delft University of Technology (DUT). HISGIS sets (one of) the first step(s) in the direction of integrating several models in one system. HISGIS is the integration of the two dimensional wavemodel HISWA and the GIS ARC/INFO. It can be used by both regular (experienced) HISWA users and (inexperienced) students, because of the easy-to-understand user-interface.

I would like to thank all participants in this project, especially the support-group, consisting of:

- Prof. Dr. Ir. P. van der Veer (DUT - Civil Engineering & Computer Science)
- Dr. Ir. N. Booij (DUT - Fluid Mechanics)
- Ir. IJ. G. Haagsma (DUT - Civil Engineering & Computer Science)

Eric Oschatz

If you might have any suggestions concerning HISWA or HISGIS, please contact:

Dr. Ir. N. Booij
Delft University of Technology
Faculty of Civil Engineering
Telephone: xx31 - 15 - 2786938.

The meaning of the logo: The reflection of the sunset in a fairly calm sea.

Contents

Chapter 1: Introduction

The application HISGIS has been developed in 1996 by order of the Delft University of Technology, faculty of Civil Engineering. It is an application meant to join the two-dimensional wavemodel HISWA and the GIS package ARC/INFO.

1.1 Why HISGIS ?

During the use of HISWA three major problems arise. The first problem concerns difficulties creating/editing a command-file for HISWA, because of the amount of different commands and parameters (especially for inexperienced users). The second problem is lack of insight, given by HISWA, in the orientation and location of both the bottom-file and the computational grid. The last problem is lack of post-processing possibilities offered by HISWA. Hardly any user uses the post-processing possibilities given by HISWA at the moment.

The conclusion of the above mentioned problems is that, at the moment, a user-friendly and surveyable way to do the pre- and post-processing is missing in HISWA.

The objective of the development of HISGIS is to create a user-friendly application in which HISWA and ARC/INFO are joined, in order to simplify and enlarge the pre- and post-processing possibilities.

1.2 Development requirements

The requirements for developing HISGIS mainly concern surveyability of the lay-out of the menus, editing of the command-file by using a special menu (no use of commands) and displaying the bottom-file, computational grid and the calculation-results of a HISWA run. Furthermore the user has to be able to make a comparison of results of different HISWA runs.

1.3 HISGIS functionalities in short

HISGIS enables the user to create projects containing different command-files with the same subject. The command-files can be edited, saved, printed and used for a HISWA calculation. Furthermore the bottom-file can be selected and displayed in 2D, 3D and isolines and the computational grid can be edited graphically. Concerning the post-processing, HISGIS enables the user to look at the calculation results in 2D, 3D, isolines, comparison and tables and create/print pictures of these results.

Chapter 2: Getting started with HISGIS

In this chapter attention is paid to the installation of HISGIS. First of all, the minimum system requirements to let HISGIS operate correctly are given. Further, an overview of the steps to be taken to install the application HISGIS correctly on your workstation and an explanation on how to handle the different functionalities on a menu are given.

2.1 Minimum system requirements

In order to let the application HISGIS operate correctly on your system, it has to meet certain requirements.

First of all your system has to be a UNIX system containing 'OpenWindows'/ 'XWindows', HISWA and ARC/INFO, at least version 6.0. The requirement concerning 'OpenWindows'/'XWindows' is set because the user-interface is built to work in a Windows environment. The requirement concerning HISWA is a logical one, because HISWA is used for performing calculations. The requirement concerning the version of ARC/INFO is set because the application has been developed using the AML of ARC/INFO 6.0. If an earlier version of ARC/INFO is used, it might give problems with certain functionalities of HISGIS (especially the GRID commands).

The second requirement concerns the printer connected to your system. If you want to use the 'Print'-button of HISGIS, which sends a picture directly to the printer, your printer has to support PostScript2. If it does not support PostScript2, you will get an error message out of it.

Finally, all files used by HISGIS have to be installed in a correct way and in the directories as mentioned in the paragraph 2.2.

2.2 How to install HISGIS on your system

When your system meets the above mentioned requirements, the installation should not give any problems. During the installation a few steps have to be taken to copy the HISGIS-files correctly to your system. The necessary steps are given on the next page.

The application HISGIS consists of a total of 38 different files:
- 1 editable userfile *test.aml*, necessary to log on to HISGIS
- 1 example bottom-file and 1 example command-file
- 14 program-AMLs
- 21 menus.

The HISGIS-disk contains the following files:

- hisgis.aml
- passwordinput.menu
- test.aml
- test.bot
- demonstration.hgs
- intro.menu
- main.menu
- thanks.menu
- pre.aml
- precurrent.menu
- preproject.menu
- precreate.menu
- preselect.menu
- readsubject.aml
- predefault.aml
- preread.aml
- preinput.menu
- preinit.aml
- prebottom.aml
- prebottomtools.menu
- print.menu
- pregrid.aml
- pregridtools.menu
- presave.aml
- preoverwrite.menu
- prepresaveas.aml
- presavename.menu
- prewritehgs.aml
- calc.aml
- calcproject.menu
- calcselect.menu
- calccomplete.menu
- post.aml
- postproject.menu
- postselect.menu
- postviewresult.aml
- postpresentation.menu
- postcomparison.menu

The names of the files on the disk consist of a maximum of 8 characters and the extension of 3 characters. This is because DOS only supports short filenames and extensions. The files have to be renamed during the installation procedure (see step 7).

The following steps have to be made to install HISGIS correctly:

1. Create 3 new directories in your home-directory:
   - a user directory, e.g. name: 'users'
   - an AML directory, e.g. name: 'AMLs'
   - a menu directory, e.g. name: 'menus'
     This directory can be the same as the AML directory

2. Create 4 new directories in the home-directories of all the users:
   - a command-file directory, e.g. name: 'command'
   - a bottom-file directory, e.g. name: 'bottom'
   - an output directory, e.g. name: 'output'
   - a HISWA directory, e.g. name: 'hiswa'

3. Create a directory in the command-file directories and output directories of all users, e.g. name: 'demonstration'.

4. Create a directory in the directories you just created in the output directories (see step 3) named 'demonstration'.

5. Copy all AMLs on the HISGIS-disk to the AML directory.

6. Copy all menus on the HISGIS-disk to the menu directory.

7. Rename the AMLs in the AML directory and the menus in the menu directory.

8. Move/copy all the bottom-files to the bottom-file directories.

9. Copy the example bottom-file *test.bot* to the bottom-file directories.

10. Copy the example command-file *demonstration.hgs* to the directories you've just created in the command-file directories (see step 3).

11. Move/copy the HISWA program-files to the HISWA directories.

12. Open the user-file *test.aml* and edit the filename, password, name, companyname, etc., for each user personally. The directories have to be changed to the directories you have just created (see step 2). The default bottomformat can be set to the bottomformat of the majority of your bottom-files.

    Reminder: .workspace = your home directory
    .hiswapath = directory containing HISWA program-files
    .commandpath = directory for your command-files
    .bottompath = directory containing the bottom-files
    .outputpath = directory for your output-files
    Attention: When containing blanks, the line after the equal-sign have to be quoted.

13. Start ARC/INFO.

14. Enter the &terminal-command (with station-file number).

15. Encode the new user-file by typing *&encode &encrypt <name user-file>*. Now a file exists with the same filename but with the extension *.aef*.

16. Close ARC/INFO

17. Copy the *.aef*-file to the user directory.

18. Open the AML *hisgis.aml* and change the directories in the changeable part of the AML to the directories you have just created (see step 1). Change the hardware settings in the changeable part (.terminal, .plotfile and .display) to the settings of your own hardware (dependent on hardware type, see ARC/INFO manual).

    Reminder: .amlpath = directory containing the AMLs
    .menupath = directory containing the menus
    .userpath = directory for the user-files
    .terminal = definition of the station-file
    .plotfile = definition of the way to create a plotfile
    .display = definition of the way to create a picture on screen
    Attention: When containing blanks, the line after the equal-sign have to be quoted.

19. Copy the new *hisgis.aml*-file to the home-directory of the users.

20. HISGIS is now installed correctly. You can start HISGIS by starting ARC/INFO and typing '&r hisgis'.

2.3 Menu handling

On a menu several functionalities are possible, e.g. buttons, input-fields (with scrolling lists), checkboxes, sliders and choices. All the mentioned functionalities are reviewed below.

Button
A button can be selected by pressing on it with the left mouse button.
The help-message belonging to the button can be invoked by pressing the right mouse button, while aiming on the concerning button in the menu.

Input-field (with scrolling list)
An input-field can be edited by selecting it with the mouse and typing the new value in it. The scrolling list can be useful when editing an input-field, because it gives an overview of the possibilities, from which the user can select one.

Checkbox
The checkbox can be selected by pressing on it with the left mouse button. The checkbox will then be marked with a checkmark (✓).

Slider
A slider can be edited by simply typing the text in the input-field belonging to the slider or by sliding the slider-button to the right value. This sliding can either be done by keeping the left mouse button pressed on the slider-button and pulling it to the right value or by pressing next to the slider button at the side you want the button to go to. Every time you release the mouse button, the slider button moves one step.

Choice
A choice can be edited by pressing on the wanted choice with the left mouse button. The other options on the choice will be released.

Chapter 3: Structure of application and data

In this chapter attention is paid to the structure of HISGIS. This includes the application itself, the main system MAIN, the three subsystems PRE, CALC and POST and the files the application uses, namely the user-file and the bottom-file.

3.1 Structure of the application HISGIS

HISGIS is an application which consists of a main system MAIN and three subsystems namely the pre-processing module PRE, the calculation module CALC and the post-processing module POST. From the main system MAIN the different subsystems can be started. After closing one of the subsystem the user automatically returns to the main system.

The structure of HISGIS can be schematised like in figure 1.

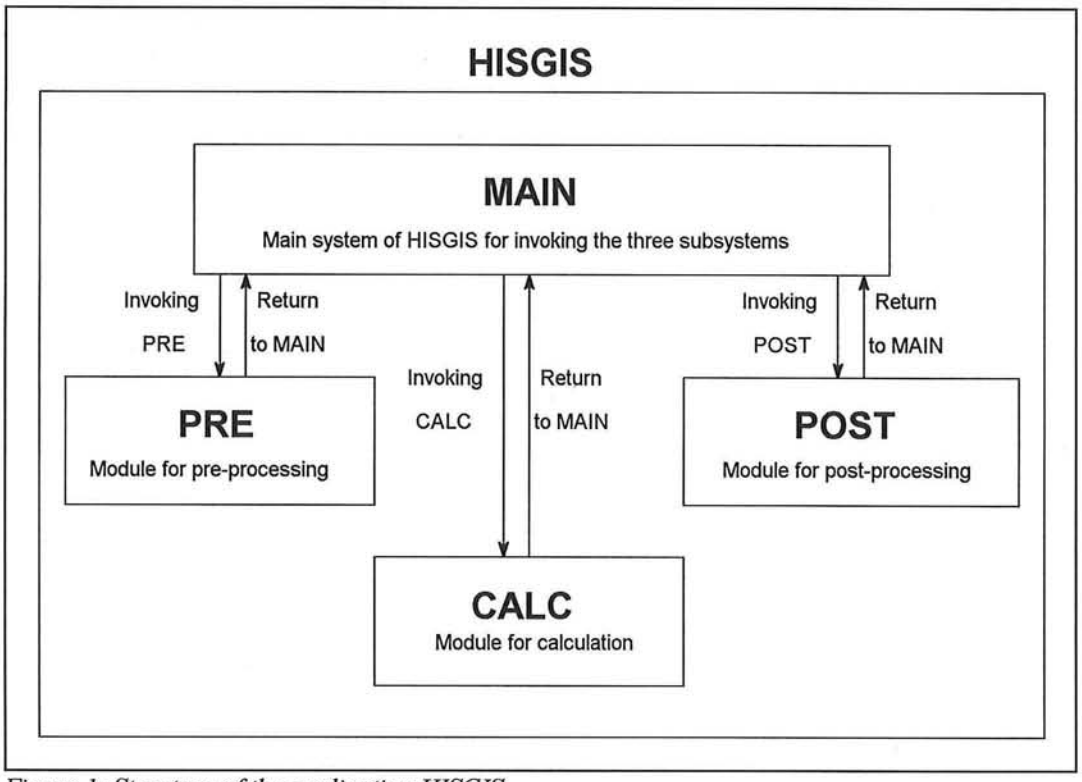

Figure 1: Structure of the application HISGIS

By splitting up HISGIS into one main system and three subsystems, the subsystems operate totally independent of each other, with absolutely no data-exchange.

3.2 Structure of the main system MAIN

The main system MAIN consists of two AMLs and four menus. Together they are the foundation of the application HISGIS. The structure of the main system can be schematised like in figure 2.

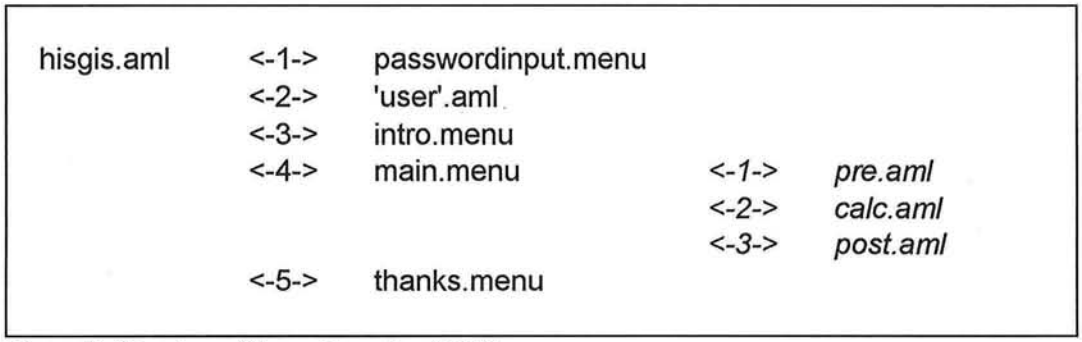

Figure 2: Structure of the main system MAIN

Basic-AML hisgis.aml
The AML *hisgis.aml* is the start-up file of the application HISGIS.

When HISGIS is started, the AML *hisgis.aml*, which is the basic-AML of the main system, is invoked. This AML calls one other AML, namely the *'user'.aml*, in which the personal data of the user is defined. Further it calls four menus, namely *passwordinput.menu*, in which the user has to enter his/her personal username and password, the introduction screen *intro.menu*, the main menu *main.menu*, in which the subsystems can be selected, and the good-bye screen *thanks.menu*.

Main menu main.menu
The main menu *main.menu* invokes three AMLs, namely the three basic-AMLs with which the subsystems are started: *pre.aml*, *calc.aml* and *post.aml*. These three AMLs, which are all button-functionalities, do not belong to the main system, but to their own subsystem, respectively the pre-processing module PRE, the calculation module CALC and the post-processing module POST (that's why they are printed *italic*).

3.3 Structure of the subsystem PRE

From the main menu the pre-processing module can be started. This is done by *main.menu* by invoking the basic-AML of the pre-processing module *pre.aml*. The total module consists of ten AMLs and ten menus.

The structure of the pre-processing module can be schematised like in figure 3.

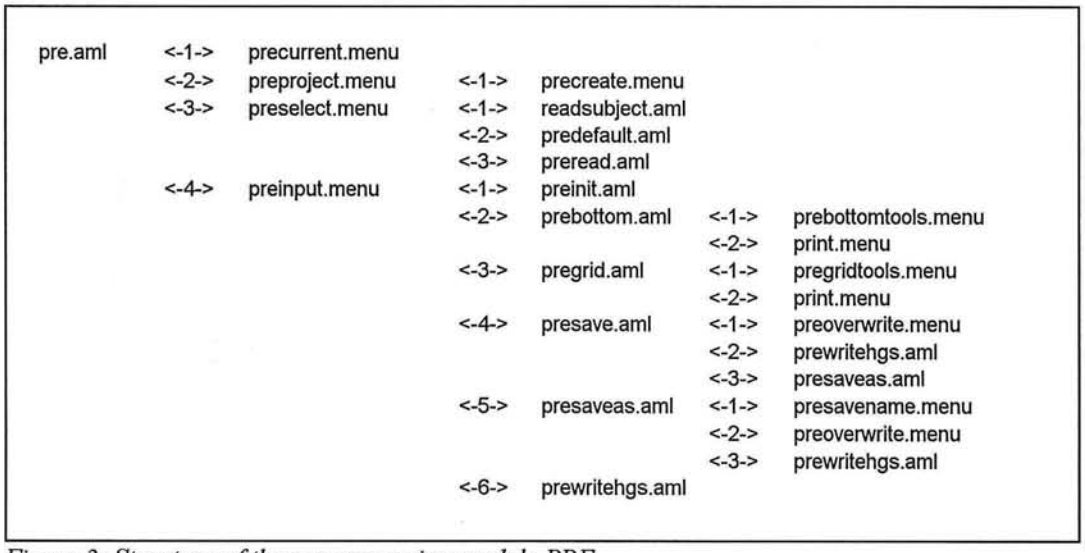

Figure 3: Structure of the pre-processing module PRE

Basic-AML pre.aml

The basic-AML *pre.aml* invokes four menus, namely *precurrent.menu*, in which the user can choose between editing a new command-file or editing a file he/she edited earlier this HISGIS session, *preproject.menu*, in which a project can be selected, *preselect.menu*, in which a command-file can be selected for editing, and *preinput.menu*, in which the selected command-file can be edited.

When *pre.aml* is finished, it returns automatically to the main menu.

Preproject.menu

The menu *preproject.menu* invokes one other menu, namely *precreate.menu*, in which a new project can be created. The menu *precreate.menu* is a button-functionality ('New'-button).

Preselect.menu

The menu *preselect.menu* invokes three AMLs, namely *readsubject.aml*, in which the subject of the selected command-file is read, *predefault.aml*, in which the default values for the command-file are set, and *preread.aml*, in which the selected command-file is read (not invoked in case a new command-file has to be created). The last two AMLs, *predefault.aml* and *preread.aml*, are button-functionalities of *preselect.menu*.

Preinput.menu

The menu *preinput.menu* invokes six AMLs, which are almost all button functionalities. The AML *preinit.aml* is not a button functionality. It initialises the menu *preinput.menu* by setting the values displayed on the menu to the default values (see *predefault.aml*) or the values of the selected command-file (see *preread.aml*).

The other AMLs are all button-functionalities, which are invoked when the matching button is pressed. The concerning AMLs are *prebottom.aml*, which enables the user to select, view and print a bottom-file, *pregrid.aml*, which enables the user to edit the computational grid graphically, *presave.aml*, *presaveas.aml*, both meant for file-managing purposes, and *prewritehgs.aml*, which writes the edited command-file.

Prebottom.aml
The AML *prebottom.aml* invokes two menus, namely *prebottomtools.menu*, in which the bottom-file and a presentation (2D, 3D, isolines) can be selected, and *print.menu*, which enables the user to send the created picture to the printer or to a plotfile.

Pregrid.aml
In *pregrid.aml* also two menus are invoked, namely *pregridtools.menu*, in which the tools are given for editing the computational grid, and the same menu as invoked by *prebottom.aml*, *print.menu*, in which the picture of the grid can be send to a printer or to a plotfile.

Presave.aml
The AML *presave.aml* invokes one menu and two AMLs. The menu *preoverwrite.menu* is used to enable the user to choose between overwriting an existing command-file and giving the file a new name. The two AMLs are *prewritehgs.aml*, which writes the edited command-file, and *presaveas.aml*, which enables the user to give the edited command-file a new name.

Presaveas.aml
In *presaveas.aml* two menus and one AML are invoked, namely *presavename.menu*, in which a new name for a command-file can be entered, *preoverwrite.menu*, which enables the user to choose between overwriting an existing command-file and giving the file a new name, and *prewritehgs.aml*, which writes the edited command-file.

3.4 Structure of the subsystem CALC

From the main menu the calculation module can be started, in which a HISWA calculation is performed. This module consists of two AMLs and three menus. The structure of the module can be schematised like in figure 4.

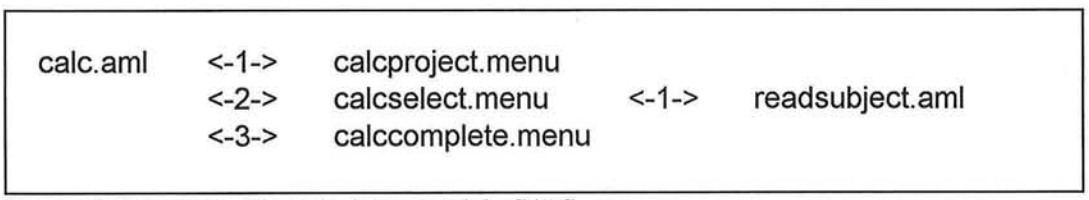

Figure 4: Structure of the calculation module CALC

The calculation module is started by the main menu by invoking the basic-AML *calc.aml*.

Basic-AML calc.aml
In the basic-AML *calc.aml* three menus are invoked, namely *calcproject.menu*, in which a project can be selected, *calcselect.menu*, in which a command-file can be selected for a HISWA calculation, and *calccomplete.menu*, which appears when the calculation has been successful.

Calcselect.menu
The menu *calcselect.menu* invokes one AML, namely *readsubject.aml*, in which the subject of the selected command-file is read.

3.5 Structure of the subsystem POST

From the main menu the post-processing module can be invoked. This module consists of three AMLs and five menus. The structure of the module can be schematised like in figure 5.

post.aml	<-1->	postproject.menu		
	<-2->	postselect.menu	<-1->	readsubject.aml
	<-3->	postviewresult.aml	<-1->	postpresentation.menu
			<-2->	postcomparison.menu
			<-3->	print.menu

Figure 5: Structure of the post-processing module POST

From the main-menu the post-processing module is started by invoking the AML *post.aml*.

Basic-AML post.aml
In the basic-AML *post.aml* two menus and one AML are invoked, namely the menu *postproject.menu*, in which a project can be selected, *postselect.menu*, in which an output-file can be selected for post-processing, and *postviewresult.aml*, which enables the user to view the calculation results of HISWA runs (2D, 3D, isolines, comparison, table).

Postselect.menu
In the menu *postselect.menu* one AML is invoked, namely *readsubject.aml*, in which the subject of the selected output-file is read.

Postviewresult.aml

The AML *postviewresult.aml* invokes three menus, namely *postpresentation.menu*, in which the parameter of the results (e.g. Hsign) and a presentation (2D, 3D, isolines, comparison, table) can be selected, *postcomparison.menu*, in which a second output-file can be selected for result-comparison with the current output-file, and *print.menu*, which enables the user to send the created picture to the printer or to a plotfile.

3.6 Data-structure of the 'user'.aml

The core of the AML 'user'.aml consists of 14 lines containing information about the user's personal data, directories and default bottomformat. The personal data is only used for checking the password and creating a plotfile. The directories are used throughout the whole program to define the different workspaces. These are to locations where HISGIS has to look for its files. The default bottomformat (handy in case your organisation uses only one format for its bottom-files) is used in the menu for editing a command-file, when a new command-file is created.

The HISGIS-disk contains a 'user'.aml named *test.aml*, which can be edited for personal use. The edited user-file has to be encoded before it can be used by HISGIS. This has to be done in the ARC/INFO environment by typing the following command:

&encode & encrypt <name user-file>

After entering this command, a file is created with the extension *.aef*, which is used by HISGIS.

3.7 Data-structure of the bottom-file

A bottom-file which can be used for a HISWA calculation consists of two parts: the heading lines, which are neglected by HISWA, and the actual data. For use of the bottom-file in HISGIS the heading lines have to have a certain format.

- line 1: NCOLS <number of columns of the bottom-file>
- line 2: NROWS <number of rows of the bottom-file>
- line 3: XLLCORNER 0
- line 4: YLLCORNER 0
- line 5: CELLSIZE <cellsize of the bottom-file>
- line 6: <empty line>
- line 7: <start of the actual data>
- etc.

The heading thus consists of 6 lines before the data starts. The first line declares the number of columns of the bottom-file. The second line declares the number of rows. The fifth line declares the cellsize of the bottom-file (length in x- and y-direction have to be equal).

The third and fourth line need some attention. Normally in these lines the geographic location of the origin of the bottom-file is entered, which is not possible in HISGIS version 1.0 because of the limitations of ARC/INFO 6.0 (see chapter 5: limitations, extension and improvement).

In HISGIS version 1.0 these lines should both always have the value 0, to define the start of the input grid. This means that the co-ordinate system in the input grid has its origin in the lower left corner of the bottom-file. The x- and y-co-ordinates you will see on top of your ARCPLOT-display will be local co-ordinates.

The reason for adding these lines to the bottom-file is that ARC/INFO needs those lines to transform the raw bottom-file to an ARC/INFO format: 'GRID'. A GRID consists of a number of gridpoints all having a x- and y-co-ordinate and a third value, which in this case is the bottomdepth at that certain point.

The HISGIS-disk contains a simple bottom-file called *test.bot* in which the heading lines are already set to correct values.

Chapter 4: How do the AMLs and menus work ?

In this chapter attention is paid to the operation and functionalities of the different AMLs and menus of the main system and the three subsystems of HISGIS.

4.1 AMLs and menus of the main system MAIN

The main system MAIN consists of two AMLs and four menus:
- *hisgis.aml*
- *passwordinput.menu*
- *'user'.aml*
- *intro.menu*
- *main.menu*
- *thanks.menu*

All the above mentioned AMLs and menus are reviewed below.

hisgis.aml
The Program Structure Diagram of *hisgis.aml* is displayed in figure 6.

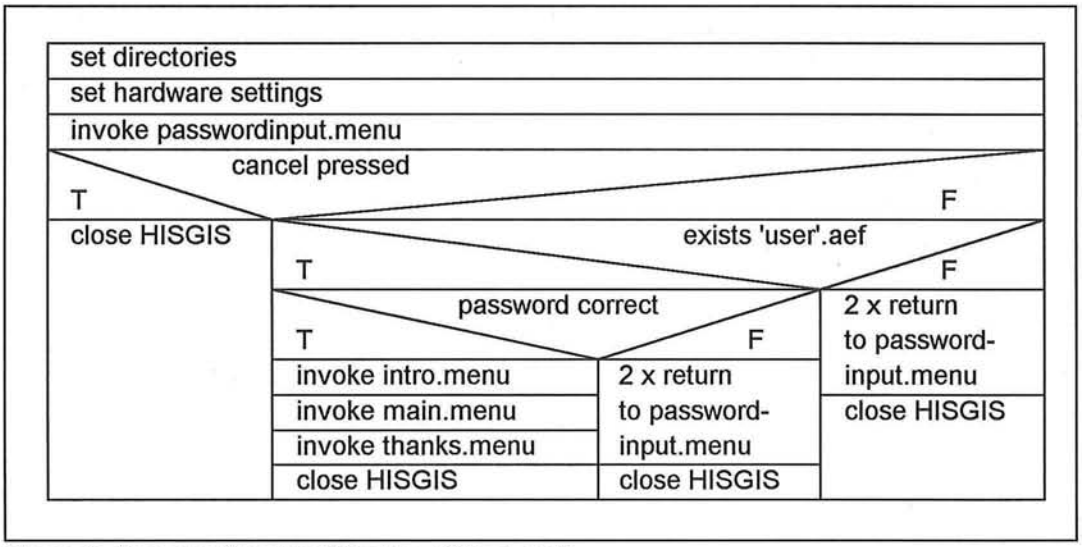

Figure 6: Program Structure Diagram of hisgis.aml

First of all, *hisgis.aml* sets the directories (.amlpath, .menupath and .userpath) and hardware settings (.terminal, .plotfile and .display) for personal use. This is done in the changeable part of *hisgis.aml*. This part should be the same for all users in an organisation and has to be edited during installation on a new system (see paragraph 2.2).

Next *hisgis.aml* invokes the *passwordinput.menu* in which the personal username and password have to be entered. They are checked by invoking the user-file and comparing the name of it and the password in it with the username and password given.

When the two usernames or passwords do not correspond with each other, the AML returns to the *passwordinput.menu*. This is done for two times in total, after which *hisgis.aml* returns to ARC/INFO.

When both the usernames and the passwords correspond with each other, *hisgis.aml* invokes the introduction screen *intro.menu* and after that the main menu *main.menu*. When HISGIS is closed by pressing the 'Quit'-button or pulling the pin from the main menu, *hisgis.aml* invokes the good-bye screen *thanks.menu*, deletes all created variables and returns to ARC/INFO.

Passwordinput.menu

In the menu *passwordinput.menu* the user has to enter his/her personal username (which equals the name of the user-file without the extension *.aef*) and password. The username will be displayed in the menu. The password will not be displayed in the menu, but will be replaced by asterisks (*). This way the password can not be copied by someone else.

The menu *passwordinput.menu* is displayed in figure 7.

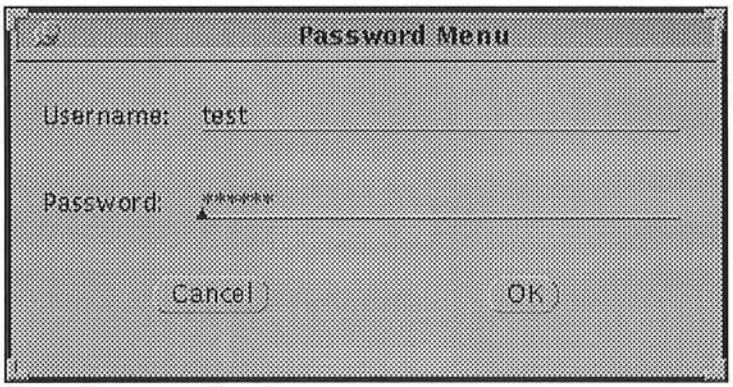

Figure 7: passwordinput.menu

The menu consists of two input-fields and two buttons, namely a 'Cancel'-button and an 'OK'-button. The 'Cancel'-button enables the user to return to ARC/INFO without having to enter a username or password. By pressing the 'OK'-button the user accepts the entered username and password and returns to *hisgis.aml*.

The buttons are provided with the following help-messages:

- Cancel: Press 'Cancel'-button to exit Password Menu.
- OK: Press 'OK'-button to accept username and password.

'user'.aml

The Program Structure Diagram of the AML *'user'.aml* is displayed in figure 8.

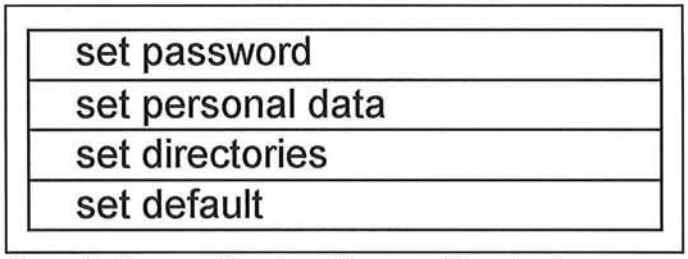

Figure 8: Program Structure Diagram of 'user'.aml

The AML *'user'.aml* contains all data for each user personal. In contrast with *hisgis.aml*, which is the same for all users in an organisation, each user has his/her own 'user'.aml.

The user-file *'user'.aml* contains besides the password (.password) also the full name of the user (.name), the company-data (.companyname, .department, .address, .city, country en .phone), the user's home-directory (.workspace), the locations of the model HISWA (.hiswapath), the command-files (.commandpath), the bottom-files (.bottompath) and the output-files (.outputpath), and finally the default bottomformat (.bottomformat).

The whole AML *'user'.aml* can be edited for personal use. The full name and company-data are used for creating a plotfile.

Intro.menu

The menu *intro.menu* is the introduction screen of HISGIS. The menu is displayed in figure 9.

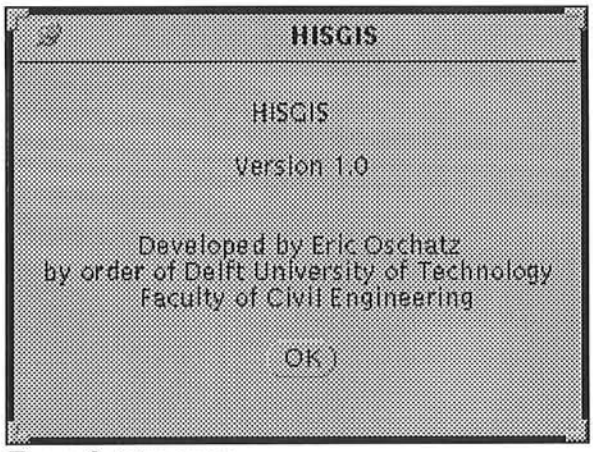

Figure 9: intro.menu

The menu consists of a few lines of text and an 'OK'-button. By pressing the 'OK'-button *intro.menu* returns to *hisgis.aml* and the main menu is invoked.

The button is provided with the following help-message:
- OK: Press 'OK'-button to continue.

Main.menu

The menu *main.menu* is the main menu of the application HISGIS. From this main menu the different subsystems PRE, CALC en POST can be invoked. After closing one of the subsystems the user automatically returns to this menu.

The main menu is displayed in figure 10.

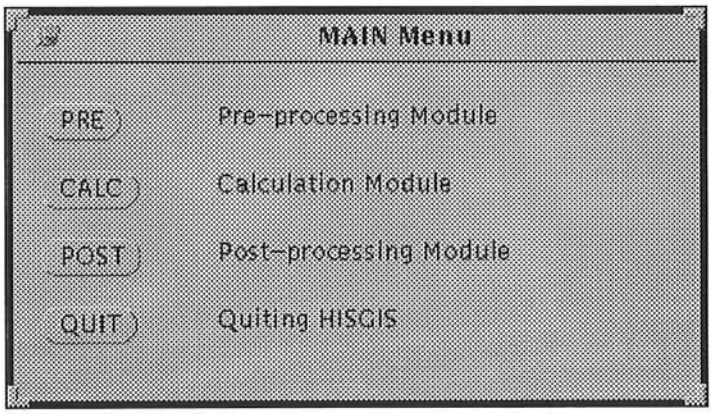

Figure 10: main.menu

The lay-out of the main menu is kept very simple. This is done to enlarge the clearness and surveyability of the menu. The menu consists of four buttons and lines of explaining text about the button-functions behind them.

By pressing the 'PRE'-button the pre-processing module is started. The 'CALC'-button invokes the calculation module and by pressing the 'POST'-button the post-processing module is invoked. Finally, the 'QUIT'-button closes the menu and returns to *hisgis.aml*, where the menu *thanks.aml* is invoked.

The buttons are provided with the following help-messages:
- PRE: 'Press button to start Pre-processing Module.'
- CALC: 'Press button to start Calculation Module.'
- POST: 'Press button to start Post-processing Module.'
- QUIT: 'Press button to quit HISGIS and return to ARC/INFO.'

Thanks.menu

The menu *thanks.menu* is the good-bye screen of HISGIS. In this screen the user is thanked for using the application and is referred to the contact in case of problems and suggestions concerning HISGIS.

The menu *thanks.aml* is displayed in figure 11.

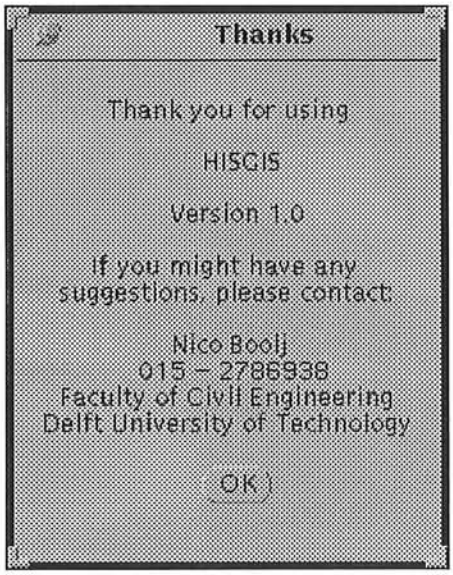

Figure 11: thanks.menu

The menu consists of a piece of text and an 'OK'-button. By pressing the 'OK'-button HISGIS is closed and the user returns to ARC/INFO.

The following help-message is provided with the button:
- OK: 'Press 'OK'-button to quit.'

4.2 AMLs and menus of the subsystem PRE

The pre-processing module PRE consists of ten AMLs and ten menus:
- *pre.aml*
- *precurrent.menu*
- *preproject.menu*
- *precreate.menu*
- *preselect.menu*
- *readsubject.aml*
- *predefault.aml*
- *preread.aml*
- *preinput.menu*

- *preinit.aml*
- *prebottom.aml*
- *prebottomtools.menu*
- *print.menu*
- *pregrid.aml*
- *pregridtools.menu*
- *presave.aml*
- *preoverwrite.menu*
- *presaveas.aml*
- *presavename.menu*
- *prewritehgs.aml*

All the above mentioned AMLs and menus are reviewed below.

pre.aml

The Program Structure Diagram of *pre.aml* is displayed in figure 12.

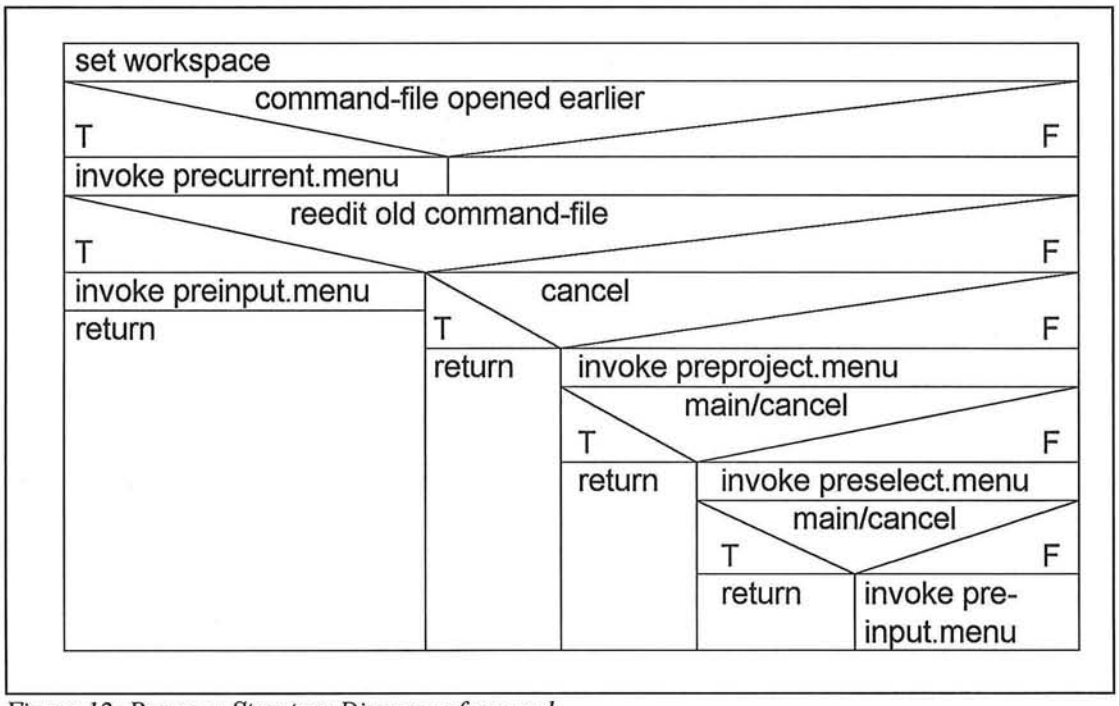

Figure 12: Program Structure Diagram of pre.aml

First of all, the AML *pre.aml* sets the workspace to the location of the command-files and checks if any command-files have been edited earlier this HISGIS session. If so, the menu *precurrent.menu* is invoked, in which the user can choose between editing the earlier opened command-file or another command-file. When the user chooses to edit the used command-file, the AML *preinput.menu* is invoked directly. When the choice is to select another command-file, the menu *preproject.menu* is invoked.

When a project is selected in *preproject.menu*, the menu *preselect.menu*, which displays all the command-files of the selected project, is invoked by *pre.aml*. When a new or existing command-file is selected in *preselect.menu*, *pre.aml* invokes the menu *preinput.menu*, in which the selected command-file can be edited.

precurrent.menu

The menu *precurrent.menu* enables the user to choose between editing a command-file selected earlier in the current HISGIS session or selecting an other command-file. This menu is only invoked when a command-file has been selected earlier.

The menu *precurrent.menu* is displayed in figure 13.

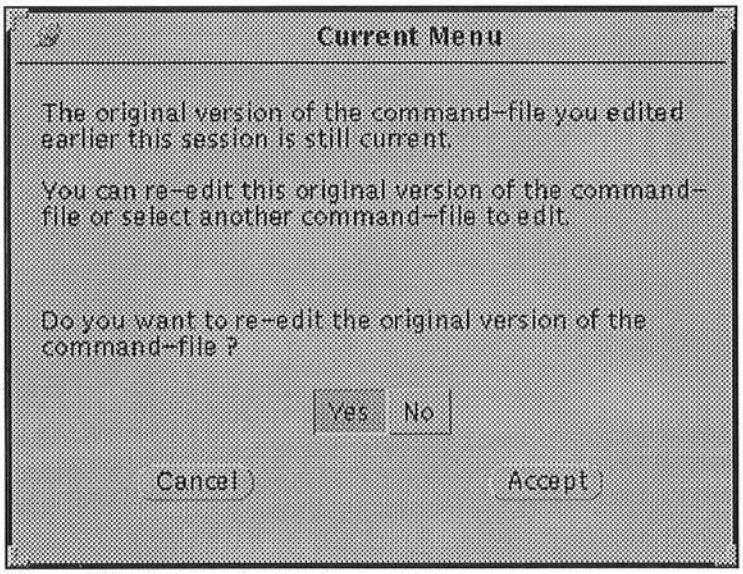

Figure 13: precurrent.menu

The menu consists of a piece of text, a choice and two buttons, namely a 'Cancel'-button and an 'Accept'-button. In the menu *precurrent.menu* a description is given why the menu is displayed. Further the question is asked if the user wants to re-edit the original version of the command-file. The original version of the command-file is the version as it was read when it was selected (so without any changes).

The choice can either be set to 'Yes' or 'No'.

The 'Cancel'-button enables the user to return to the main menu without editing or selecting anything. This is done by returning to *pre.aml* and closing it.

By pressing the 'Accept'-button, the user accepts the currently selected choice. The menu will also return to the AML *pre.aml*, but now the next menu is invoked, which can be either *preinput.menu* or *preproject.menu*.

The buttons are provided with the following help-messages:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Accept: 'Press 'Accept'-button to accept the current choice.'

preproject.menu
After the menu *precurrent.menu* has been closed (when invoked), the menu *preproject.menu* is invoked. This menu enables the user to create and select a project, consisting of several command-files.

The menu *preproject.menu* is displayed in figure 14.

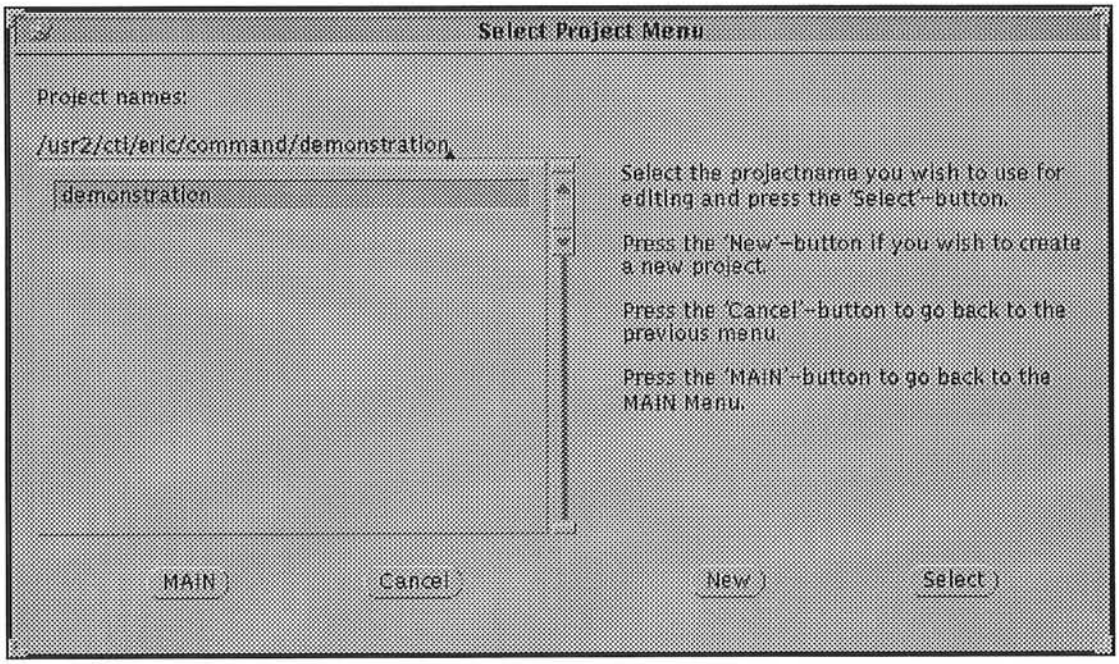

Figure 14: preproject.menu

The menu consists of an input-field with scrolling list and four buttons. Next to the scrolling list an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable the user to select a project. This can be done either by selecting a project from the list with the mouse by clicking on it or by typing the name at the input-field. When the project does not exist an error message will occur in the bottom-left corner of the menu.

The 'Main'-button enables the user to go back to the main menu without selecting anything. The previously shown menus will not be displayed.

The 'Cancel'-button lets the user step backward through the menu-structure. Each time a 'Cancel'-button is selected the previous menu will be displayed.

The 'New'-button enables the user to create a new project. When the button is selected the menu *precreate.menu* is invoked, in which the name of the new project can be given.

By pressing the 'Select'-button the currently selected project will be opened.

The buttons are provided with the following help- messages:
- Main: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- New: 'Press 'New'-button to create a new project.'
- Select: 'Press 'Select'-button to go to the command-files of the selected project.'

precreate.menu
The menu *precreate.menu* enables the user to enter a name for a new project.

The menu *precreate.menu* is displayed in figure 15.

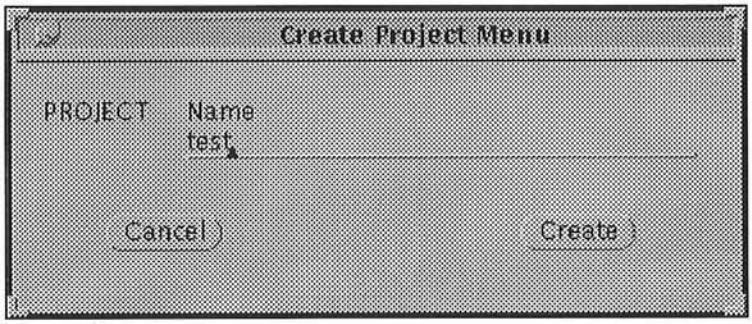

Figure 15: precreate.menu

The menu consists of an input-field, in which a name can be entered, and two buttons, namely a 'Cancel'-button and a 'Create'-button.

The 'Cancel'-button enables the user to go back to the previous menu without creating a new project.

The 'Create'-button creates a new project with the given name. A new directory is made in both the command-file directory and the output directory. When no name is given in the input-field, an error message will occur in the bottom-left corner of the menu.

The buttons are provided with the following help-messages:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Create: 'Press 'Create'-button to create the new project.'

preselect.menu

The menu *preselect.menu* enables the user to select a new or existing command-file for editing.

The menu *preselect.menu* is displayed in figure 16.

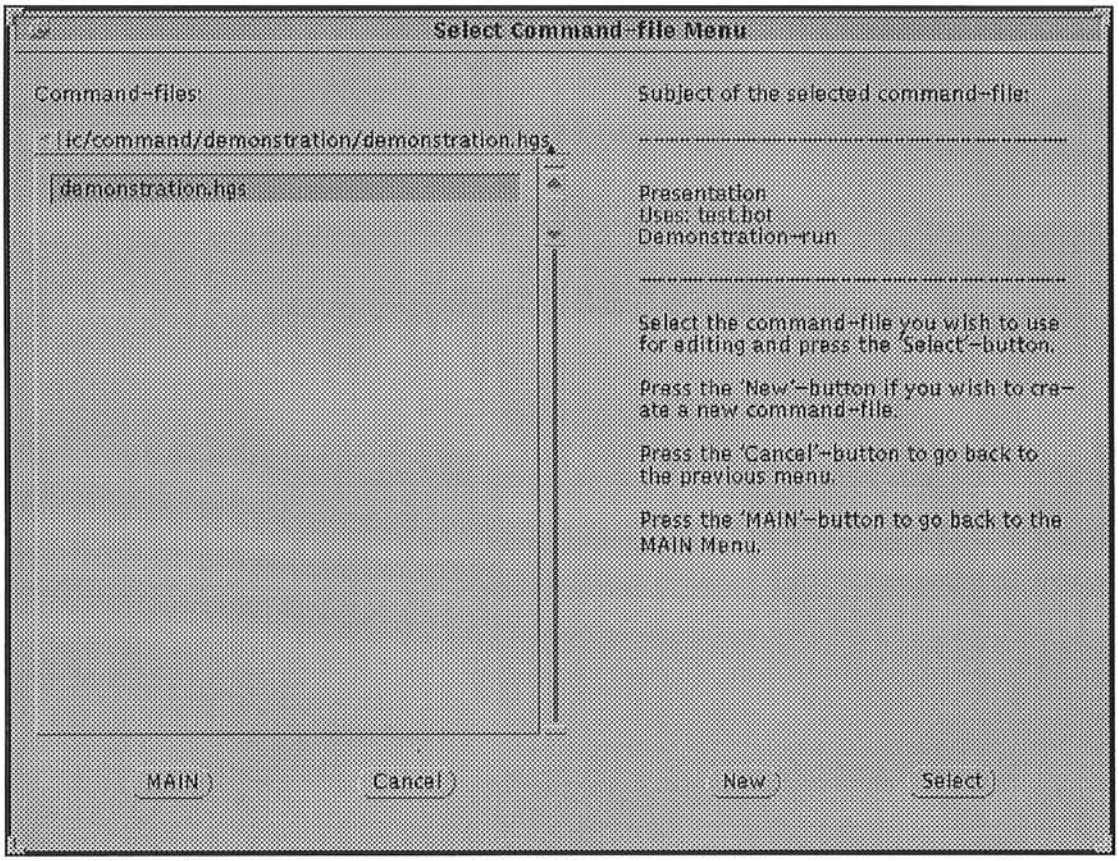

Figure 16: preselect.menu

The menu consists of an input-field with scrolling list, a display-field and four buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enables the user to select a command-file for editing. This can be done either by selecting a command-file from the list with the mouse by clicking on it (*readsubject.aml* is invoked and the subject of the selected command-file will be displayed in the display field) or by typing the name at the input-field. When the command-file does not exist an error message will occur in the bottom-left corner of the menu.

The 'Main'-button enables the user to go back to the main menu without selecting anything.

The 'Cancel'-button lets the user step backward through the menu-structure.

The 'New'-button enables the user to create a new command-file. When the button is selected the AML *predefault.aml* is invoked to set the default values of the command-file.

By pressing the 'Select'-button the currently selected command-file will be opened. When the button is pressed, two AMLs will be invoked, namely *predefault.aml*, to set the default values of the command-file, and *preread.aml*, to read the selected command-file.

The buttons are provided with the following help- messages:
- Main: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- New: 'Press 'New'-button to create a new command-file.'
- Select: 'Press 'Select'-button to use the selected command-file for editing.'

readsubject.aml
The Program Structure Diagram is displayed in figure 17.

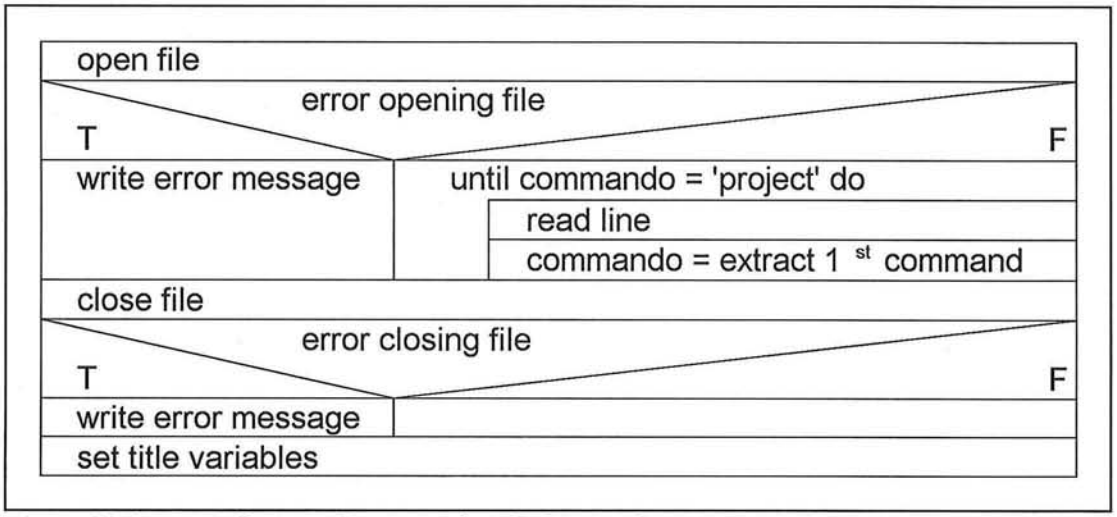

Figure 17: Program Structure Diagram of readsubject.aml

This AML is invoked when a command-file is selected in the scrolling list of a menu.

The AML *readsubject.aml* opens the selected file and reads the lines of the file until the first command of a line is 'PROJECT'. When this line is found, the file will be closed and the parameters of the 'PROJECT'-command will be set to the title variables. These variables are displayed in the display-field of the menus *preselect.menu*, *calcselect.menu*, *postselect.menu* and *postcomparison.menu*.

predefault.aml

The Program Structure Diagram is displayed in figure 18.

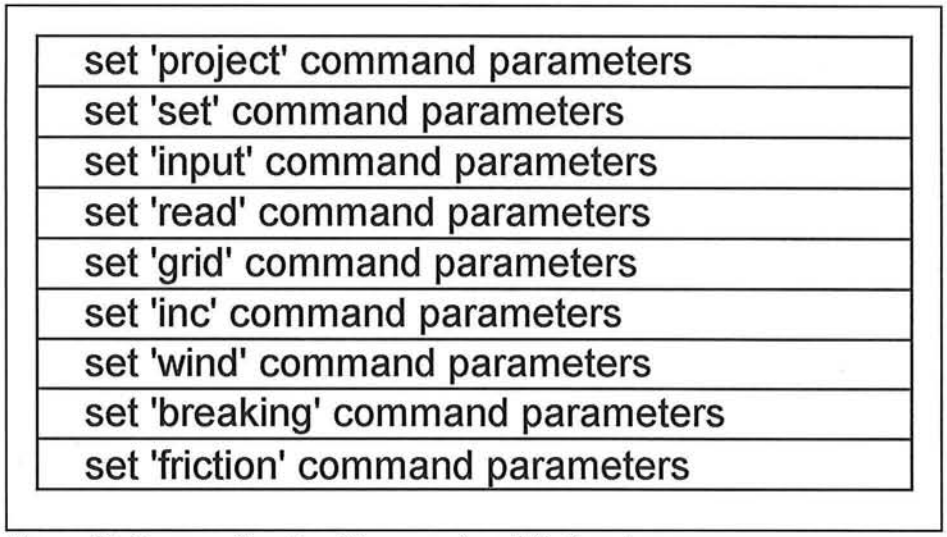

Figure 18: Program Structure Diagram of predefault.aml

This AML is invoked when the 'New'- or 'Select'-button is pressed in the menu *preselect.menu*.

In this AML the default values for the command parameters of the command-file are set. Most of these default values are set equal to the default values for HISWA, mentioned in the HISWA manual.

Exceptions (see listing in appendix 1):

- The title parameters belonging to the 'PROJECT'-command are all set to 'untitled'.
- The parameters belonging to the 'INPUT'-command, of which no default HISWA values are present, are all set to 0.
- The IDLA parameter belonging to the 'READ'-command is set to 2 (HISWA = 1). This is done because the IDLA-value 2 reads IDLA = 1 as well and not the other way around.
- The NHED parameter belonging to the 'READ'-command is set to 6, because of the number of headers necessary for converting the raw bottom-file to GRID (ARC/INFO format).
- All parameters belonging to the 'GRID'-command, except SECTOR and MDC, are set to 0. SECTOR is set to 120 degrees and MDC is set to 12, which yield a resolving power of 10 degrees.
- All parameters belonging to the 'INC'-command, except MS, are set to 0.
- The parameters VEL and DIR belonging to the 'WIND'-command are set to 0.
- For both breaking and friction the frequency is set off.

preread.aml

The Program Structure Diagram is displayed in figure 19.

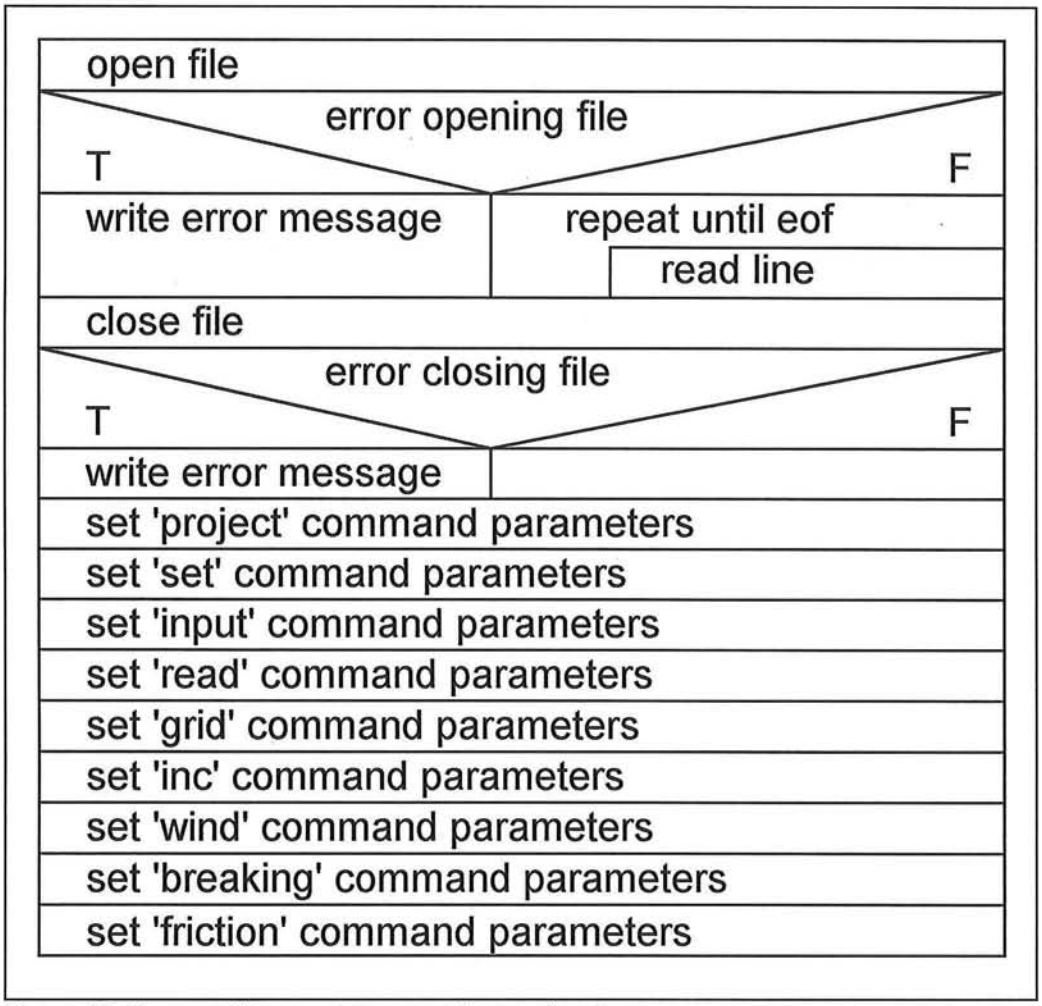

Figure 19: Program Structure Diagram of preread.aml

This AML is invoked when the 'Select'-button is pressed in the menu *preselect.menu*.

First of all, the AML opens the selected command-file, reads all the lines in this file and closes it again. When all the lines are read correctly, the commands and matching parameter values are assigned one by one to variables, which will be shown in the menu *preinput.menu*, so they can be edited.

preinput.menu

The menu *preinput.menu* enables the user to view, edit, print and save a command-file, select, view and print a bottom-file (Bottom Tools) and graphically edit, view and print the computational grid (Grid Tools).

The menu *preinput.menu* is displayed in figure 20.

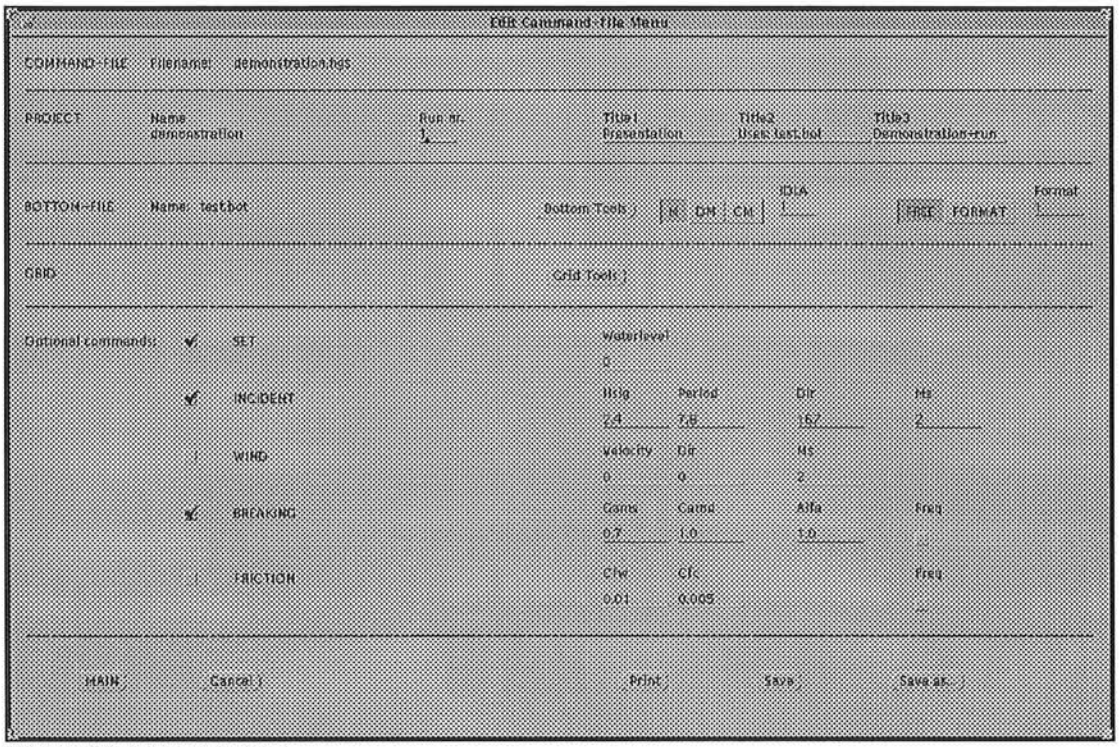

Figure 20: preinput.menu

The menu consists of three display-fields, nineteen input-fields, seven checkboxes, two choices and seven buttons. When the menu is invoked it is initialised by the AML *preinit.aml*, in which the values are set to the values, which are read earlier (either by *predefault.aml* or by *preread.aml*). All functionalities on the menu enable the user to edit the commands and matching parameters of the command-file. Below the different commands and parameters are reviewed.

Behind the text 'COMMAND-FILE: Filename:' the name of the selected command-file is displayed. This name can not be edited in this menu.

Behind the text 'PROJECT' the values of the parameters (projectname, run number, three titles) of the command of the same name are displayed in one display-field (projectname), which can not be edited and four input-fields. De default values of the four input-fields are respectively '1', 'untitled', 'untitled' en 'untitled'. These values can be edited in the menu.

Behind the text 'BOTTOM-FILE' the values of the parameters (filename, multiplication factor FAC, IDLA, formattype, formatnumber IDFM) belonging to the 'READ' command are displayed in one display-field, two choices and two input-fields.

- The name of the bottom-file is displayed in a display-field (and can not be edited in this menu). An other bottom-file can be selected by selecting the 'Bottom Tools'. When no bottom-file is selected, the value of the display-field is 'none'.
- The unit of the bottom-file is displayed in a choice, consisting of metres, decimetres and centimetres. These values correspond to values of the multiplication factor of respectively 1, 0.1 en 0.01. The default unit of the bottom-file is, which means a FAC-value of 1.
- The value of the IDLA is displayed in an input-field, with the default value IDLA = 2. IDLA is used to define the way HISWA reads the bottom-file.
- The formattype is displayed in a choice, consisting of 'Format' and 'Free'. The default value of the choice is 'Format'.
- The formatnumber IDFM is displayed in an input-field, with the default value as defined in the userfile (.bottomformat). The formatnumber is only necessary when the formattype is 'Format'. When 'Free' is selected, HISWA doesn't need a formatnumber.

For more information about the HISWA commands, reference is made to the HISWA manual.

Besides the above mentioned fields, a 'Bottom Tools'-button is given in the menu, with which the user can select, view and print a bottom. This button is provided with the following help-message: 'Press 'Bottom Tools'-button to go to the tools for selecting, viewing and printing a bottom.'

Behind the text 'GRID' a button is displayed, with which the 'Grid Tools' can be started. These 'Grid Tools' enable the user to edit and select the computational grid graphically. This button is provided with the following help-message: 'Press 'Grid Tools'-button to go to the tools for editing, viewing and printing a computational grid.'

Behind the optional command 'SET', which can be (de)activated with the matching checkbox, the waterlevel can be entered in a input-field. The default value of the waterlevel is 0.

Behind the optional command 'INCIDENT', which can also be (de)activated with the matching checkbox, the user can enter the parameters significant waveheight, period, wavedirection and MS. These parameters are all displayed in input-fields, with the default values of respectively 0, 0, 0 and 2.

Behind the optional command 'WIND', (de)activated with a checkbox, the parameters windvelocity, winddirection and MS can be entered. The default values of these parameters are respectively 0, 0 and 2.

Behind the optional command 'BREAKING', (de)activated with a checkbox, the user can enter a number of coefficients (GAMS, GAMD en ALFA) displayed in input-fields. The default values of the above mentioned coefficients are respectively 0.8 , 1.0 and 1.0. Furthermore the influence of the command on the mean wavefrequency can be turned on/off by using a checkbox. The default is 'off'.

Behind the optional command 'FRICTION', (de)activated with a checkbox, two coefficients (CFW en CFC) can be entered in input-fields. The default values of the above mentioned coefficients are respectively 0.01 and 0.005. Furthermore the influence of the command on the mean wavefrequency can be turned on/off by using a checkbox. The default is 'off'.

All checkboxes, used for turning on/off of the optional commands, are set to 'off' by default.

Besides the functionalities for the editing of the command-file, the menu contains five buttons, namely a 'MAIN'-button, a 'Cancel'-button, a 'Print'-button, a 'Save'-button and a 'Save as'-button.

The 'Main'-button enables the user to go back to the main menu without editing anything.

The 'Cancel'-button lets the user step backward through the menu-structure.

The 'Print'-button enables the user to print the current command-file. This is done by creating a temporary file, which is printed and afterwards removed.

By pressing the 'Save'- or 'Save as'-button the command-file is saved, either with the current name or with a new name.

The buttons are provided with the following help-messages:

- Main: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Print: 'Press 'Print'-button to print the current command-file.'
- Save: 'Press 'Save'-button to save the current command-file.'
- Save as: 'Press 'Save as'-button to give the current command-file a new name.'

preinit.aml

The Program Structure Diagram is displayed in figure 21.

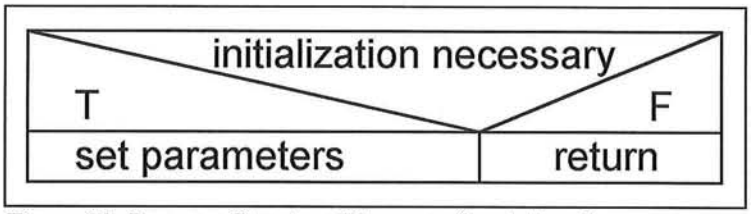

Figure 21: Program Structure Diagram of preinit.aml

This AML initialises the menu *preinput.menu*. It is invoked when *preinput.menu* is invoked. When the 'Main'- or 'Cancel'-button is pressed, the menu *preinput.menu* will be re-initialised when it is re-invoked. Pressing the other buttons will not initialise the menu, so the current values of *preinput.menu* will not be lost.

prebottom.aml

The Program Structure Diagram is displayed in figure 22.

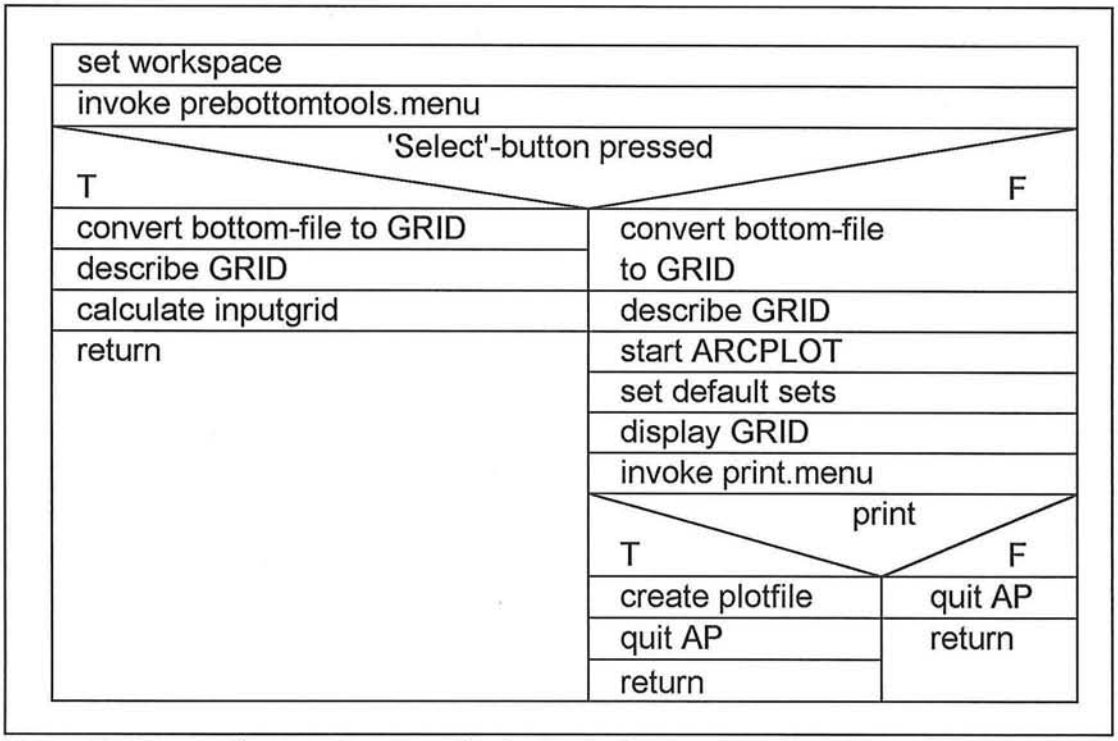

Figure 22: Program Structure Diagram of prebottom.aml

This AML enables the user to select, view and print a bottom-file. The AML is invoked when the 'Bottom Tools'-button in the menu *preinput.menu* is pressed.

First of all the workspace is set to the location of the bottom-files, the bottom directory. Next the menu *prebottomtools.menu* is invoked, in which a bottom-file and a presentation (2D, 3D, isolines) can be selected.

When a bottom-file is selected and one of the presentation-buttons is pressed, the selected bottom-file is converted to a GRID, ARCPLOT is started and the GRID is displayed. When the displaying is finished, the menu *print.menu* is invoked, in which a choice can be made between going back to *prebottomtools.menu* or printing the current display to the printer or to a file.

When the user selects the bottom-file for usage in the current command-file, the bottom-file is converted to a GRID (when necessary) and the input (bottom) grid is calculated.

prebottomtools.menu

The menu *prebottomtools.menu*, which is part of the 'Bottom Tools', enables the user to select a bottom-file and a presentation (2D, 3D, isolines). When the user is sure that the right bottom-file is selected, it can be used in the current command-file.

The menu *prebottomtools.menu* is displayed in figure 23.

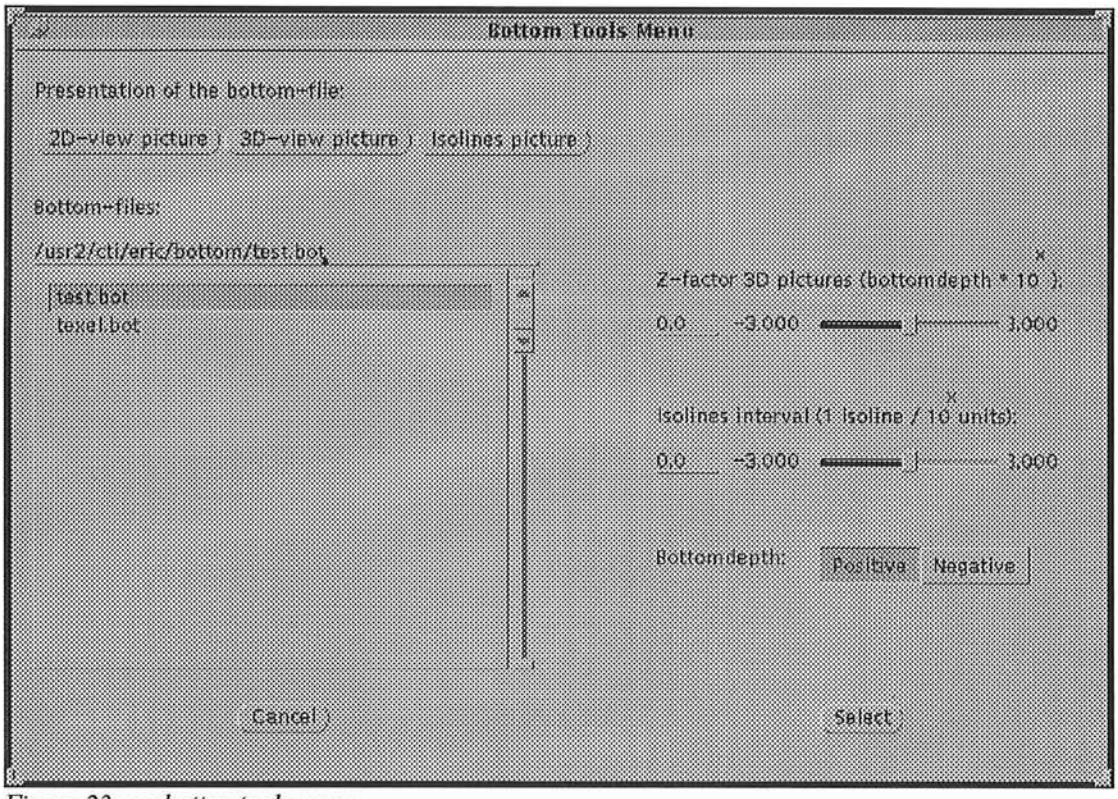

Figure 23: prebottomtools.menu

The menu consists of an input-field with scrolling list, two sliders, a choice and five buttons.

The input-field with scrolling list enables the user to select a bottom-file. This can be done as described earlier.

The sliders can be used to edit the scales of both the 3D pictures and the isolines pictures. The slider, used for 3D pictures, multiplies the bottomdepth with a factor 10^x, with x varying between -3 and 3 (the means a multiplication factor between 0.001 and 1000). The slider, used for isolines pictures, sets the number of units (10^x) per isoline, with x varying between -3 and 3 (1 isoline every 0.001 - 1000 units).

In the choice a selection can be made between positive and negative bottomdepths. This is done because not all of the bottom-files use a positive bottomdepth. The right value of the choice can be selected by picking one of the choices or by simply selecting a bottom-file. When a bottom-file is selected, a check is performed to see if the bottomdepth is positive or negative. This check uses the assumption that more than half the area of a bottom-file consists of water. This implicates that the bottomdepth is positive if the mean value of the all bottomvalues is positive, vice versa.

The presentation (2D-view picture, 3D-view picture, Isolines picture) can be selected by pressing one of the buttons at the top of the menu.

These buttons are provided with the following help-messages:
- 2D-view picture: 'Press '2D-view picture'-button to view a 2D picture of the selected bottom.'
- 3D-view picture: 'Press '3D-view picture'-button to view a 3D picture of the selected bottom.'
- Isolines picture: 'Press 'Isolines picture'-button to view an isolines picture of the selected bottom.'

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Select'-button, at the bottom of the menu, the currently selected bottom-file is used in the current command-file

The button is provided with the following help-message:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Select: 'Press 'Select'-button to select the current bottom-file.'

Print.menu

In the menu *print.menu* a choice can be made between returning to the previous menu and sending the picture in the current display to the printer or to a file.

The menu *print.menu* is displayed in figure 24.

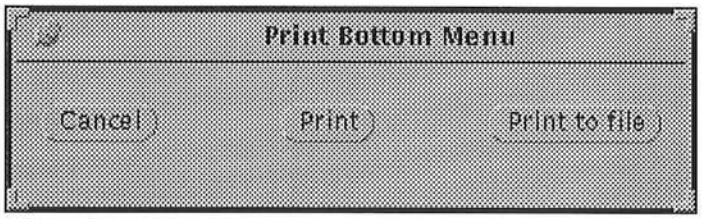

Figure 24: print.menu

The menu consists of three buttons, namely a 'Cancel'-button, a 'Print'-button, which sends the picture in the ARCPLOT-display to the printer, and a 'Print to file'-button, which sends the picture to a plotfile.

The buttons are provided with the following help-messages:

- Cancel: 'Press 'Cancel'-button to go to the previous menu.'
- Print: 'Press 'Print'-button to print current display.'
- Print to file: 'Press 'Print to file'-button to print the current display to file.'

pregrid.aml

The Program Structure Diagram is displayed in figure 25.

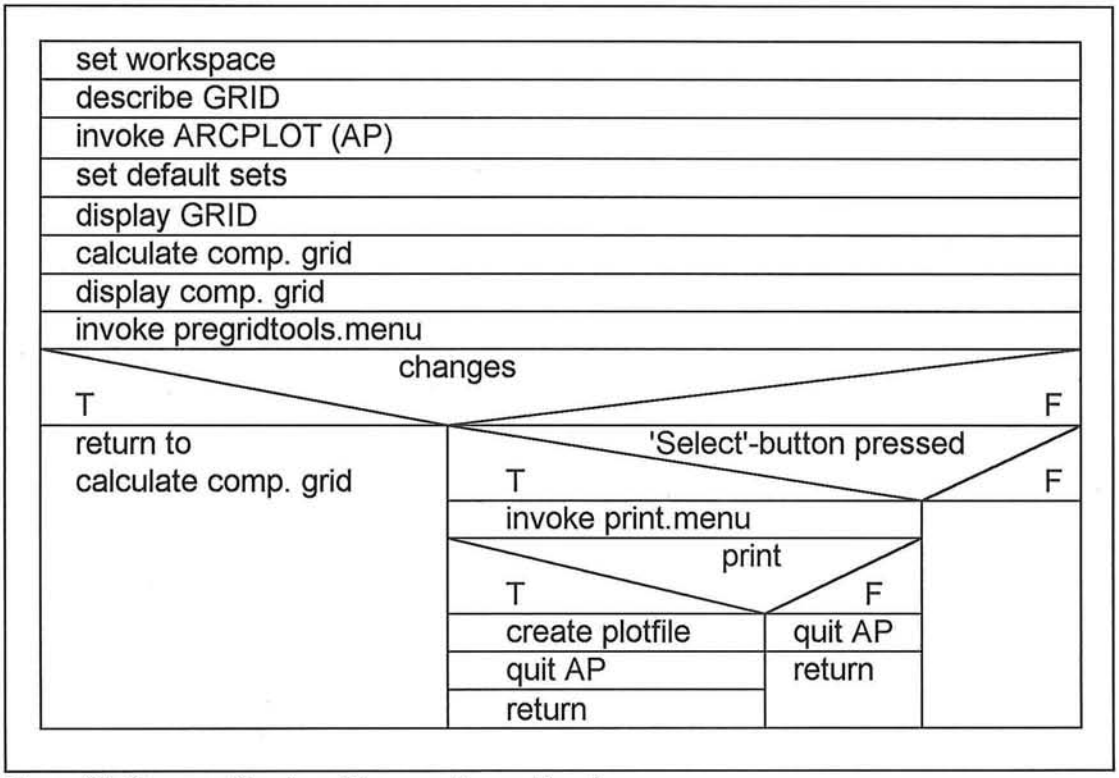

Figure 25: Program Structure Diagram of pregrid.aml

The AML *pregrid.aml* enables the user to edit, view and print the computational grid.

First of all, the workspace is set to the location of the bottom-files. Next, the GRID of the selected bottom-file is displayed and the computational grid is calculated and displayed. When the displaying is finished, the menu *pregridtools.menu* is invoked, in which the different grid parameters can be edited. When one of the grid parameters is changed, the computational grid is recalculated and redisplayed. When the user accepts the current values of the grid parameters and selects the current grid, the menu *print.menu* is invoked and the picture can be printed.

pregridtools.menu

The menu *pregridtools.menu* enables the user to edit the grid parameters of the computational grid graphically and by use of the menu. Furthermore the edited grid can be selected for use in the current bottom-file.

The menu *pregridtools.menu* is displayed in figure 26.

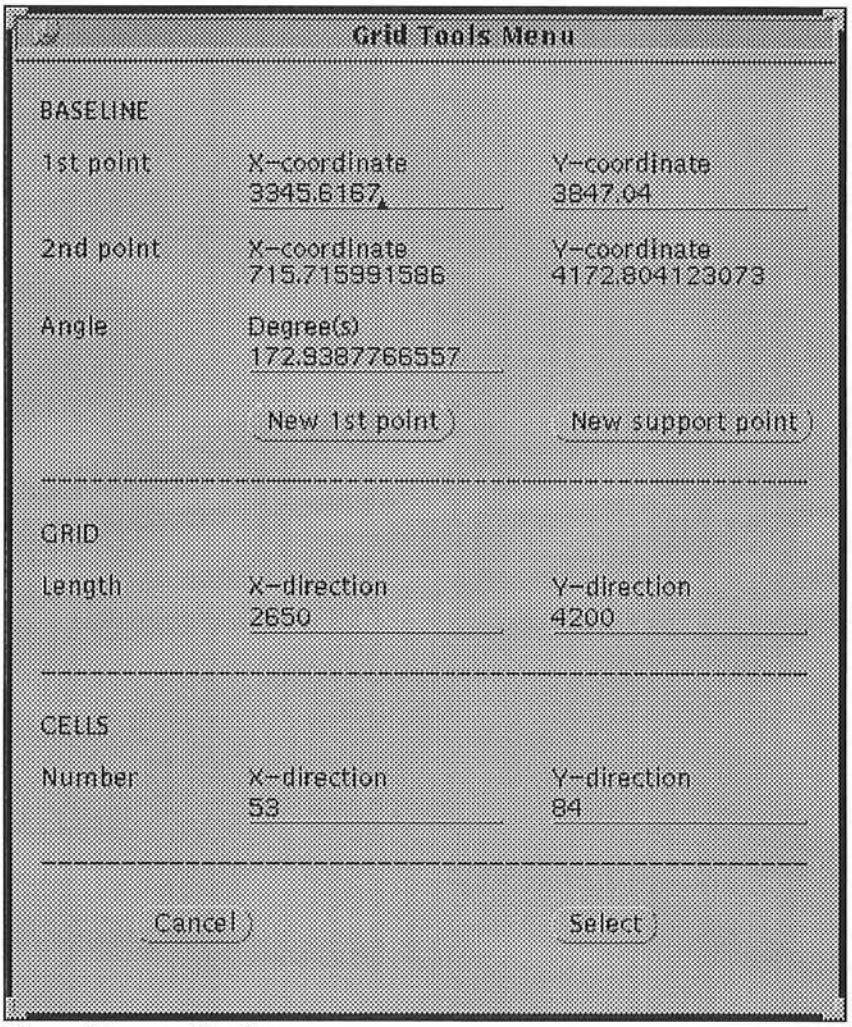

Figure 26: pregridtools.menu

The menu consists of seven input-fields, two display-fields and four buttons.

Behind the text '1st point' the co-ordinates (x and y) of the origin of the grid can be defined. When one of the two co-ordinates is changed, the grid is recalculated and redisplayed.
Remark: The 2nd point stays the same during the calculation. The angle is changed.

Behind the text '2nd point' the co-ordinates (x and y) of the second point (support point of the base line) of the computational grid can be defined. When one of the grid parameters is changed, the computational grid is recalculated and redisplayed. The second gridcorner in x-direction is calculated from the 1st point across the second point (the second point is not a gridcorner).
Remark: The 1st point stays the same during the calculation. The angle is changed.

Behind the text 'Angle' the angle of the computational grid can be entered. The value angle = 0 means horizontally aimed to the right. When the angle is changed, the grid is recalculated and redisplayed
Remark: The 1st point stays the same during calculation. The 2nd point is changed.

The first and second point can also be defined graphically by using the buttons 'New 1st point' en 'New support point'. By selecting one of these buttons a selectioncross is displayed in the ARCPLOT-display, with which a point can be selected. After selection, the grid is recalculated and redisplayed.

Behind the text 'Length' the length of the computational grid in x- and y-direction can be entered. When one of the lengths is changed, the grid is recalculated/redisplayed.

Behind the text 'Number' the user can enter the number of cells in both the x- and y-direction. Changing this parameter will not influence the size, location or orientation of the grid, so it will not be recalculated and redisplayed when a value is changed.

Besides the above mentioned buttons ('New 1st point' and 'New support point') two other button are present on the menu, namely a 'Cancel'-button and a 'Select'-button.

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Select'-button, the currently selected computational grid is used in the current command-file.

The buttons are provided with the following help-messages:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Select: 'Press 'Select'-button to select the current computational grid.'

presave.aml

The Program Structure Diagram is displayed in figure 27.

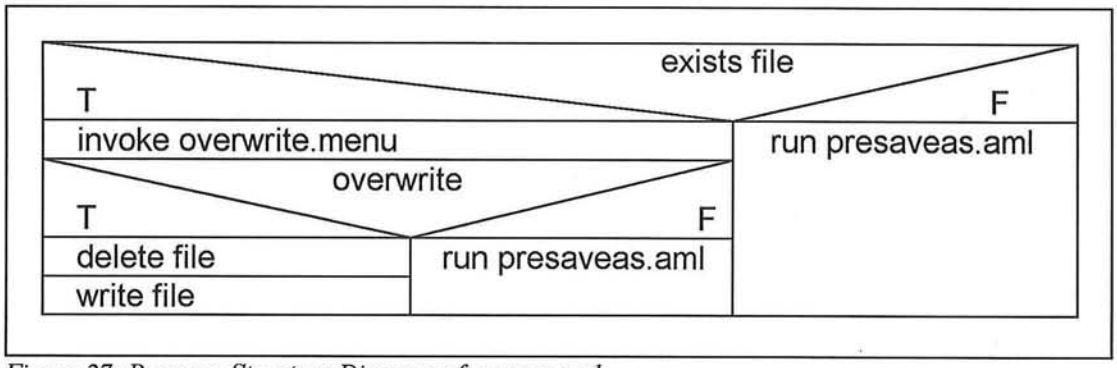

Figure 27: Program Structure Diagram of presave.aml

First the name of the command-file to be saved is checked. If the name already exists, the menu *preoverwrite.menu*, in which a choice can be made between overwriting the existing file by the current command-file and giving the current command-file a new name, is invoked. If the user wants to overwrite the existing file, the file is deleted and the current command-file is written, by invoking *prewritehgs.aml*. If the user wants to give the command-file a new name, the AML *presaveas.aml* is invoked.

When the file does not exist (only when a new command-file is created), the AML *presaveas.aml* is invoked to give the user the opportunity to change the name 'untitled' into a new name.

preoverwrite.menu

The menu *preoverwrite.menu* is displayed in figure 28.

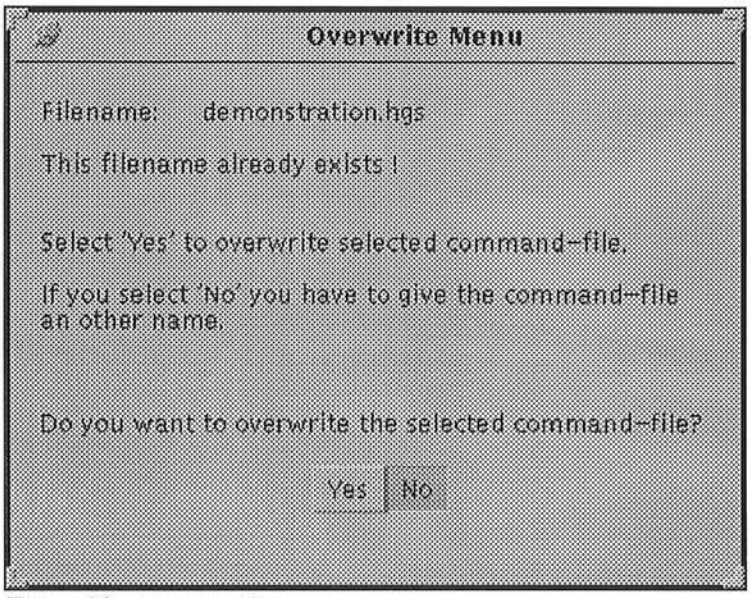

Figure 28: preoverwrite.menu

The menu *preoverwrite.menu* warns the user that an existing file is about to be overwritten. The user chooses whether the existing command-file should be overwritten or not.

The menu consists of a display-field and a choice. Between the two fields an explanation is given of the functionalities of the menu.

The display-field shows the filename which is about to be overwritten.

In the choice a selection can be made between overwriting the existing file ('Yes') and giving the command-file a new name ('No').

presaveas.aml

The Program Structure Diagram of *presaveas.aml* is displayed in figure 29.

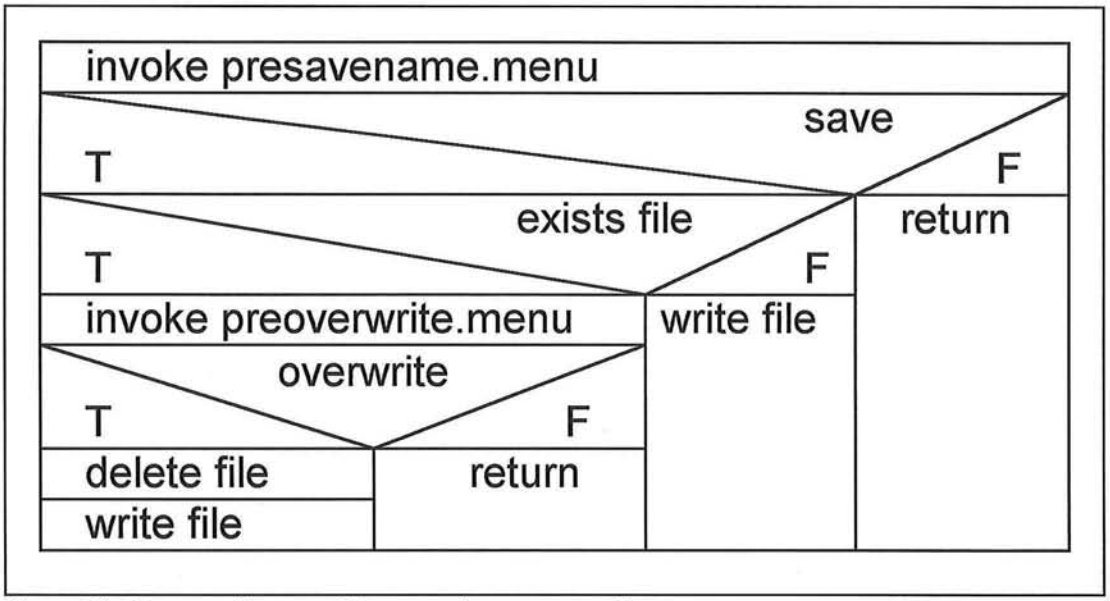

Figure 29: Program Structure Diagram of presaveas.aml

The AML *presaveas.aml* offers the user the opportunity to give the current command-file a new name.

First, the menu *presavename.menu*, in which a new name for the command-file can be entered, is invoked. When the 'Save'-button is pressed a check is performed to look if the filename already exists. If so, the menu *preoverwrite.menu* is invoked, in which a choice can be made (see *preoverwrite.menu*). If the filename does not exist the file is written by invoking *prewritehgs.aml*.

presavename.menu

The menu *presavename.menu* enables the user to enter a new name for the current command-file.

The menu *presavename.menu* is displayed in figure 30.

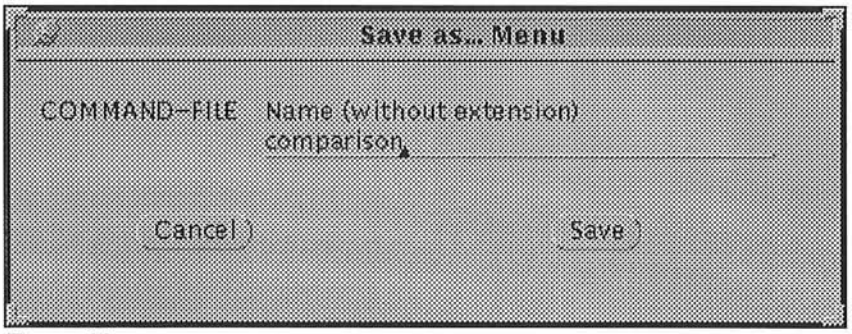

Figure 30: presavename.menu

The menu consists of a input-field, in which a new name can be entered, and two buttons, namely a 'Cancel'-button and a 'Save'-button, which uses the entered name for saving the command-file.

The buttons are provided with the following help-messages:

- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Save: 'Press 'Save'-button to give the command-file the current name.'

prewritehgs.aml

The AML *prewritehgs.aml* writes the current command-file to a file.

First, the default directories are set. This is done to define the default values for the CALC and POST module. Next the workspace is set to the location of the bottom-files.

A file, with the current filename or the filename given in the menu *presavename.menu*, is opened and the different commands are written to the file. Besides the commands, seven output options are written to the file. The output options are definitions of tables with different parameters in it.
One of the lines of the output options : *TABLE 'frame1' FILE 'dir.tab' dir*
These seven lines create seven tables, with all a different parameter in it (dir, dissip, dspr, force, hsign, period, ubot). These tables are used for the post-processing of HISGIS.

When all the lines are written the file is closed.

The Program Structure Diagram is displayed in figure 31.

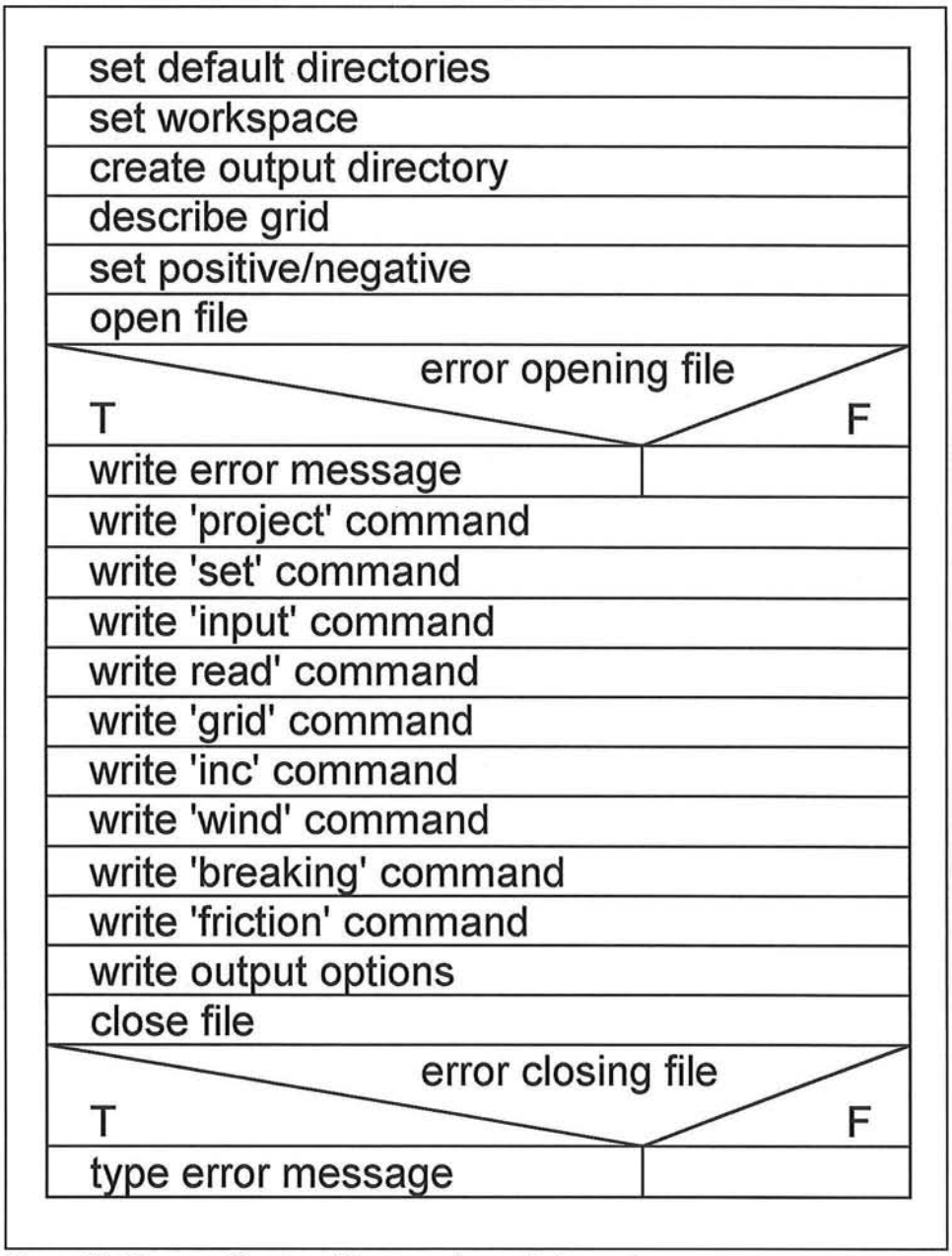

Figure 31: Program Structure Diagram of prewritehgs.aml

4.3 AMLs and menus of the subsystem CALC

The calculation module CALC consists of two AMLs and three menus:
- *calc.aml*
- *calcproject.menu*
- *calcselect.menu*
- *readsubject.aml*
- *calccomplete.menu*

All the mentioned AMLs and menus are reviewed below.

calc.aml
The Program Structure Diagram of *pre.aml* is displayed in figure 32.

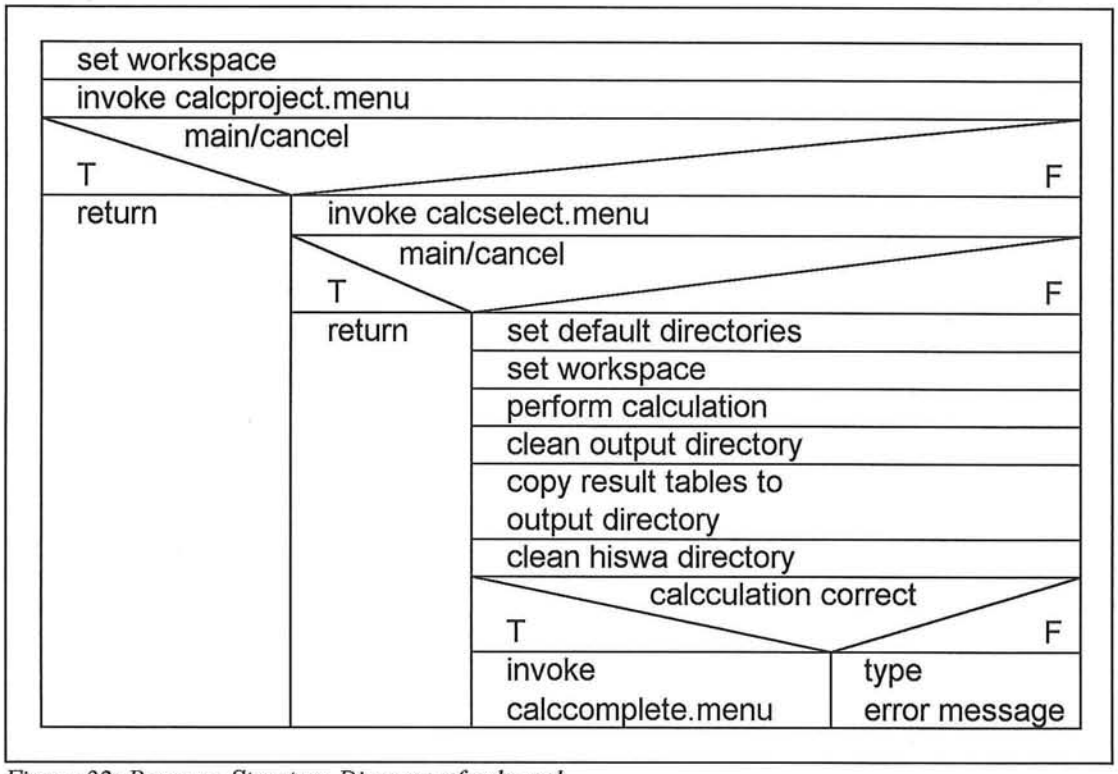

Figure 32: Program Structure Diagram of calc.aml

First of all, the menu *calcproject.menu* is invoked, in which the user can select a project, consisting of several command-files. Afterwards the selected project is opened by *calc.aml* and the menu *calcselect.menu* is invoked, in which the command-files of the selected project are displayed. The user can select a command-file (*readsubject.aml* reads the subject) to use for a HISWA calculation.

After selecting a command-file, the default directories are set (default values for PRE and POST), the workspace is set to the location of HISWA and the actual calculation is performed. This is done by copying the selected command-file to a file called INPUT, which is placed in the HISWA directory. HISWA uses the 'INPUT'-file as a command-file. When the calculation is finished the output directory is cleaned and the different result tables (see *prewritehgs.aml*) and the '.PRT'-file are copied to the output directory, which was created during the saving of the command-file. This means that the calculation results of an earlier calculation with the same command-file will be lost. Finally the correctness of the calculation is checked.

When the calculation is perform correctly, the menu *calccomplete.menu* is invoked, in which the user is informed about the completion of the calculation.

After closing this menu, the user returns to the main menu.

calcproject.menu

The menu *calcproject.menu* enables the user to select a project, consisting of several command-files.

The menu *calcproject.menu* is displayed in figure 33.

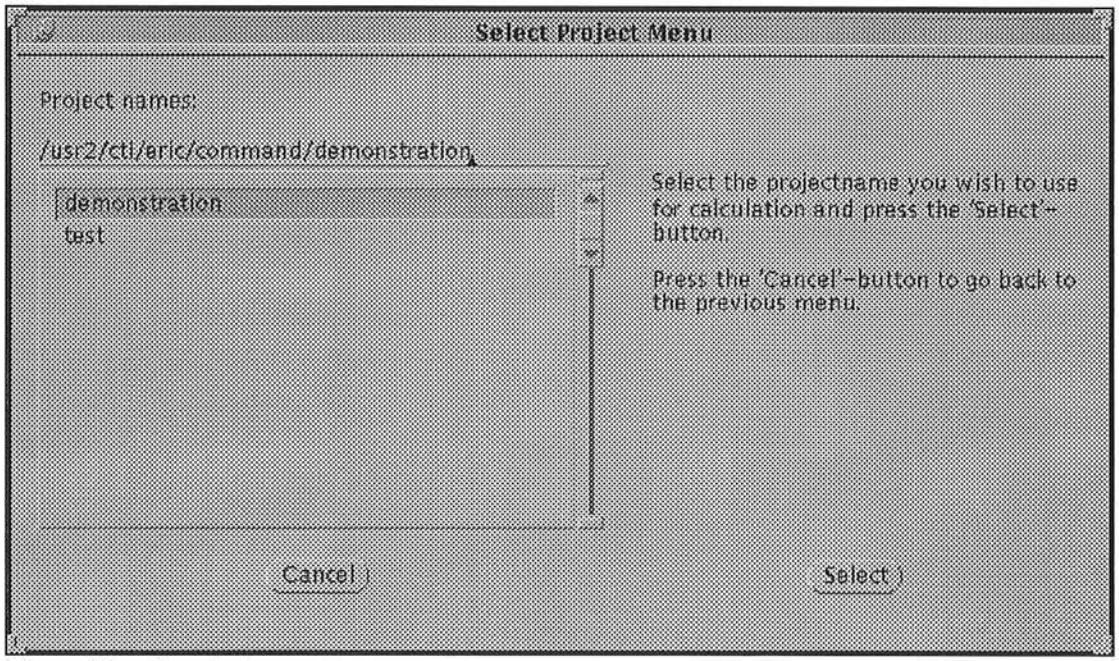

Figure 33: calcproject.menu

The menu consists of a input-field with scrolling list and two buttons. Next to the scrolling list an explanation is given to the different functionalities of the menu.

The input-field with scrolling list is meant to enable the user to select a project. This can be done as described earlier

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Select'-button the currently selected project will be opened.

The buttons are provided with the following help- messages:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Select: 'Press 'Select'-button to go to the command-files of the selected project.'

calcselect.menu
The menu *calcselect.menu* enables the user to select a command-file for a HISWA calculation.

The menu *calcselect.menu* is displayed in figure 34.

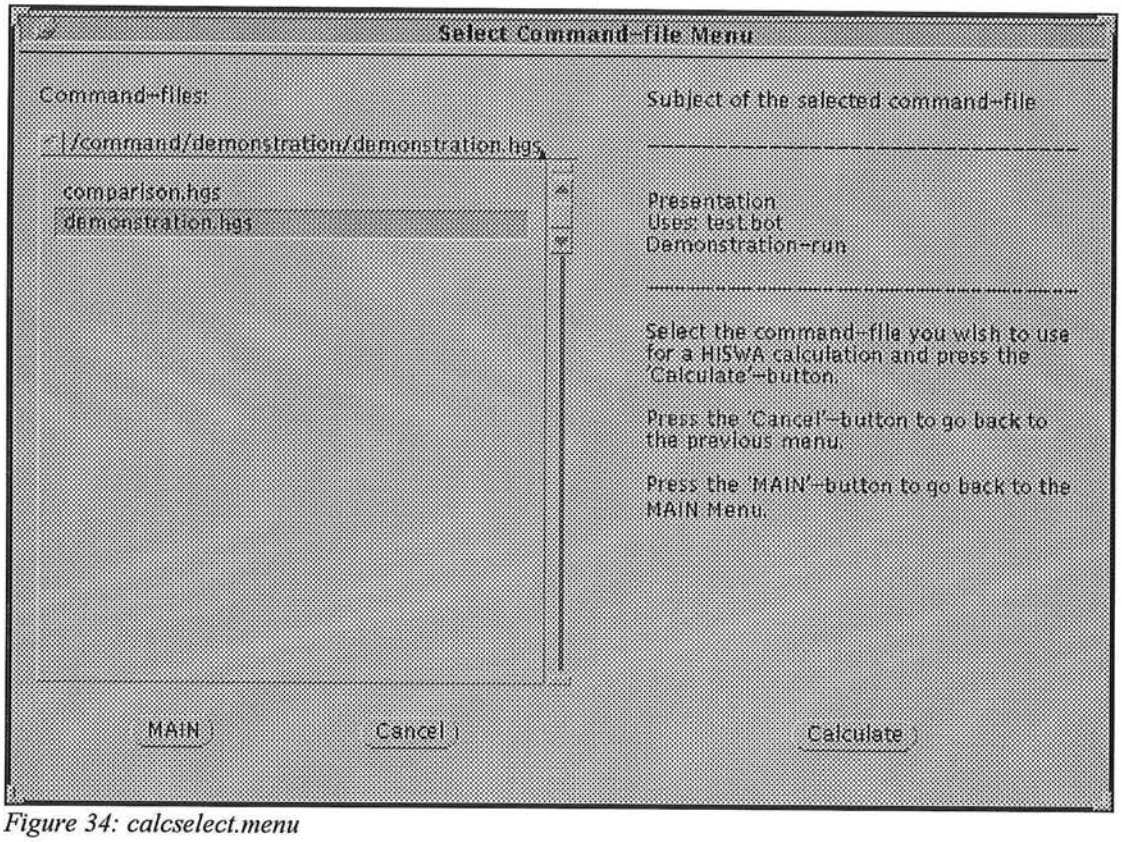

Figure 34: calcselect.menu

The menu consists of an input-field with scrolling list, a display-field and three buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable the user to select a command-file for a HISWA calculation. This can be done as described earlier.

The 'MAIN'-button enables the user to go back to the main menu without selecting anything.

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Calculate'-button the currently selected command-file will be used for a HISWA calculation.

The buttons are provided with the following help- messages:
- MAIN: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Calculate: 'Press 'Calculate'-button to use the selected command-file for a HISWA calculation.'

readsubject.aml
This AML is described earlier in paragraph 4.2.

calccomplete.menu
The menu *calccomplete.menu* informs the user that the calculation is completed successfully.

The menu *calccomplete.menu* is displayed in figure 35.

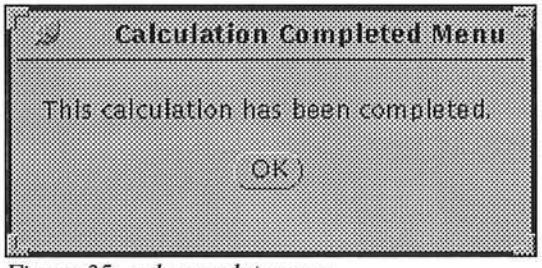

Figure 35: calccomplete.menu

The menu consists of a line of text and an 'OK'-button, with which the user can return to the main menu.

The button is provided with the following help-message:
OK: 'Press 'OK'-button to go to the Main Menu.'

4.4 AMLs and menus of the subsystem POST

The post-processing module POST consists of three AMLs and five menus:
- *post.aml*
- *postproject.menu*
- *postselect.menu*
- *readsubject.aml*
- *postviewresult.aml*
- *postpresentation.menu*
- *postcomparison.menu*
- *print.menu*

All the mentioned AMLs and menus are reviewed below.

post.aml
The Program Structure Diagram is displayed in figure 36.

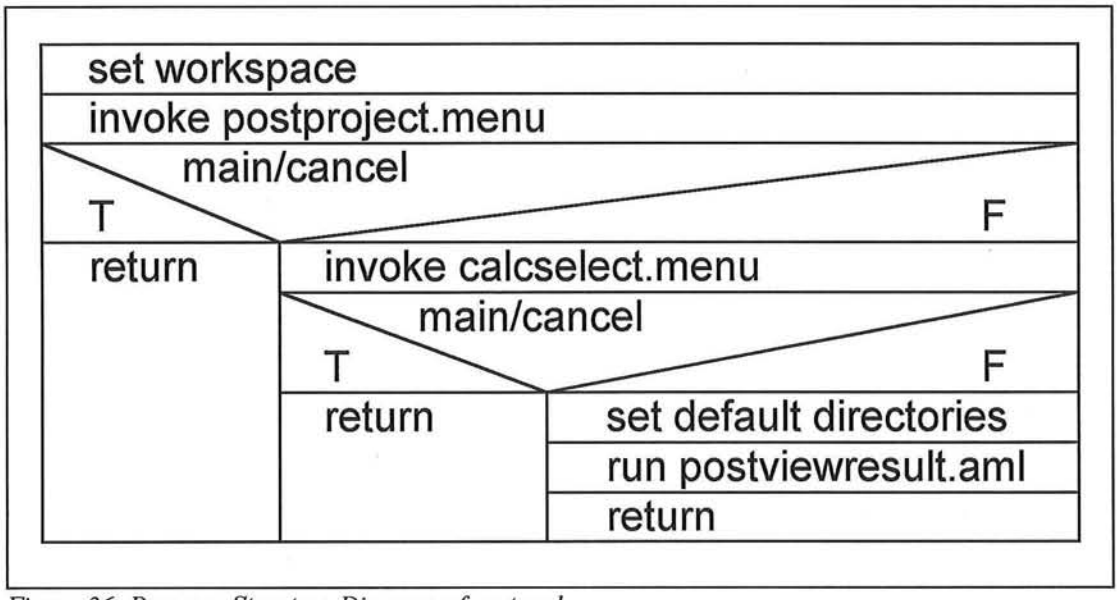

Figure 36: Program Structure Diagram of post.aml

First of all, the AML sets the workspace to the location of the output-files. Next, the menu *postproject.menu* is invoked, in which a project can be selected, consisting of several output-files. After a project is selected, the project is opened by *post.aml* and the menu *postselect.menu* is invoked, which enables the user to select an output-file of which he/she wants to see the results. When an output-file is selected, the default directories are set (default values for PRE and CALC) and the AML *postviewresult.aml* is started.

postproject.menu

The menu *postproject.menu* enables the user to select a project, consisting of several output-files belonging to the command-file with the same name.

The menu *postproject.menu* is displayed in figure 37.

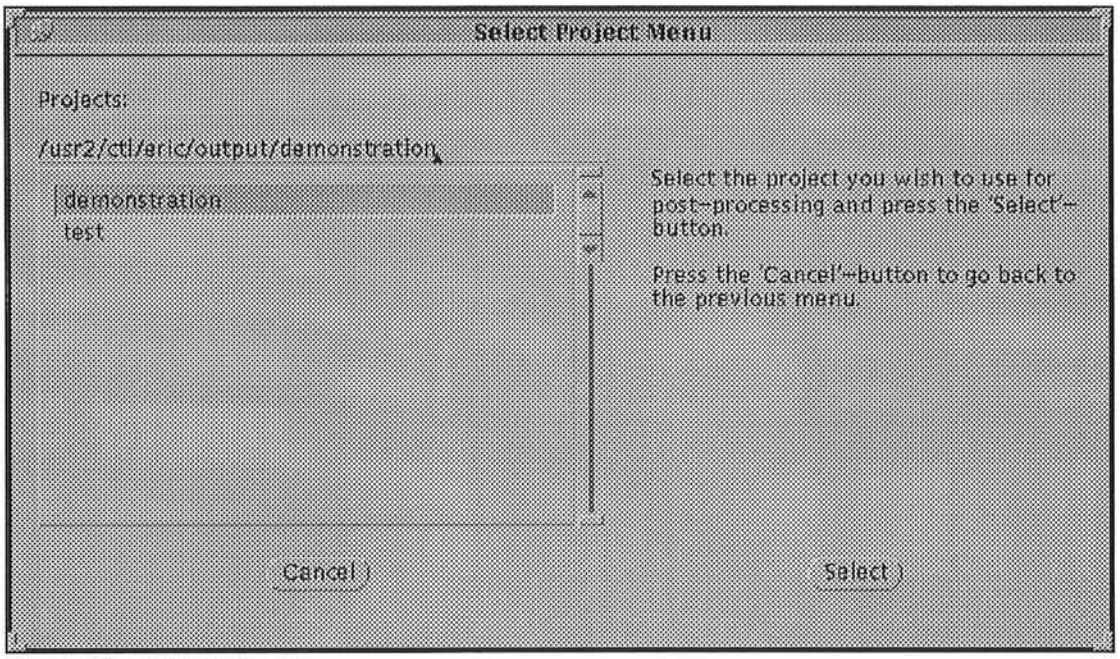

Figure 37: postproject.menu

The menu consists of an input-field with scrolling list and two buttons. Next to the scrolling list an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable the user to select a project. This can be done as described earlier

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Select'-button the currently selected project will be opened.

The buttons are provided with the following help- messages:

- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Select: 'Press 'Select'-button to go to the output-files of the selected project.'

postselect.menu

The menu *postselect.menu* enables the user to select a output-file for post-processing purposes.

The menu *calcselect.menu* is displayed in figure 38.

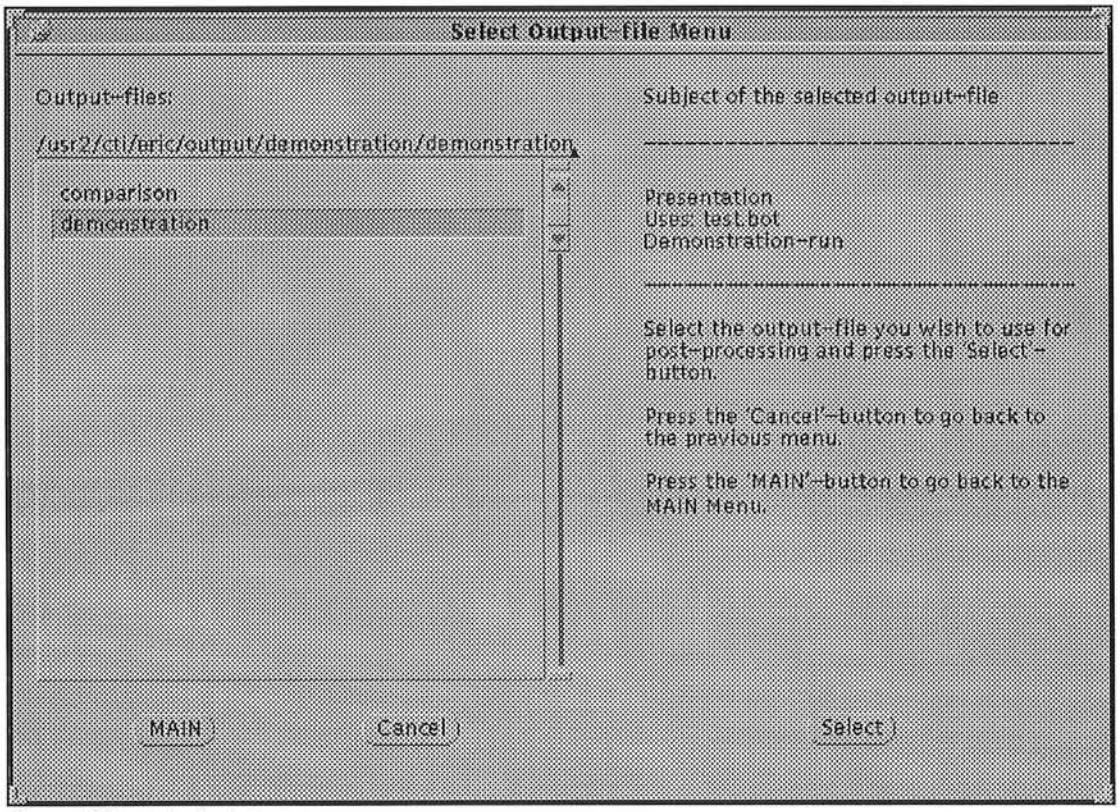

Figure 38: postselect.menu

The menu consists of an input-field with scrolling list, a display-field and three buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enable the user to select an output-file for post-processing purposes. This can be done as described earlier.

The 'Main'-button enables the user to return to main menu without selecting anything.

The 'Cancel'-button lets the user step backward through the menu-structure.

By pressing the 'Select'-button the currently selected command-file will be used for post-processing.

The buttons are provided with the following help- messages:

- Main: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'
- Select: 'Press 'Select'-button to use the selected output-file for post-processing.'

readsubject.aml
This AML is described earlier in paragraph 4.2.

postviewresult.aml
The Program Structure Diagram is displayed in figure 39.

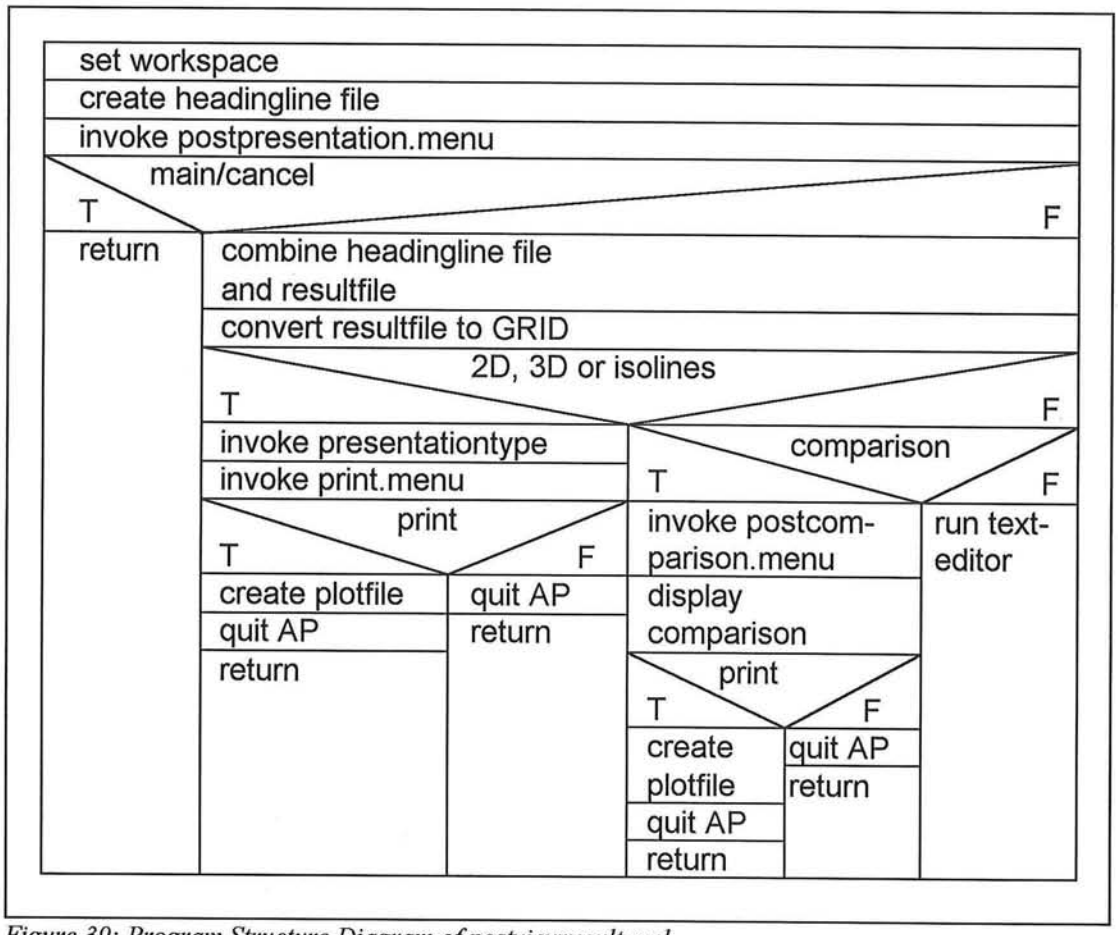

Figure 39: Program Structure Diagram of postviewresult.aml

First of all, the workspace is set to the location of the selected output-file. Next, a headingline-file is created, in which the values of the headinglines, necessary for creating a GRID, are written to a file called 'temp'.

When the headingline-file is written, the menu *postpresentation.menu* is invoked, in which a parameter of the output-file and a presentation (2D, 3D, isolines, comparison, table) can be selected. When a parameter and a presentation are selected, the headingline-file and the result table of the selected parameter are combined and saved to a file with the same name as the parameter.

If 2D, 3D or isolines is selected the concerning presentation is invoked, followed by the menu *print.menu*.

If the presentation 'Table' is selected, a texteditor is started with the table of the selected parameter. After closing the editor, the user returns to the menu *postpresentation.menu*.

If the presentation 'Comparison' is selected, the menu *postcomparison.menu* is invoked, in which a second output-file can be selected. The same parameter as selected in the first output-file, will be used for comparison. The comparison is performed by subtracting the second output-file from the first. The result is display in an ARCPLOT-display. After the displaying is finished, the menu *print.menu* is invoked and the picture can be printed.

postpresentation.menu

The menu *postpresentation.menu* enables the user to select a parameter and a presentation (2D, 3D, isolines, comparison, table).

The menu *postpresentation.menu* is displayed in figure 40.

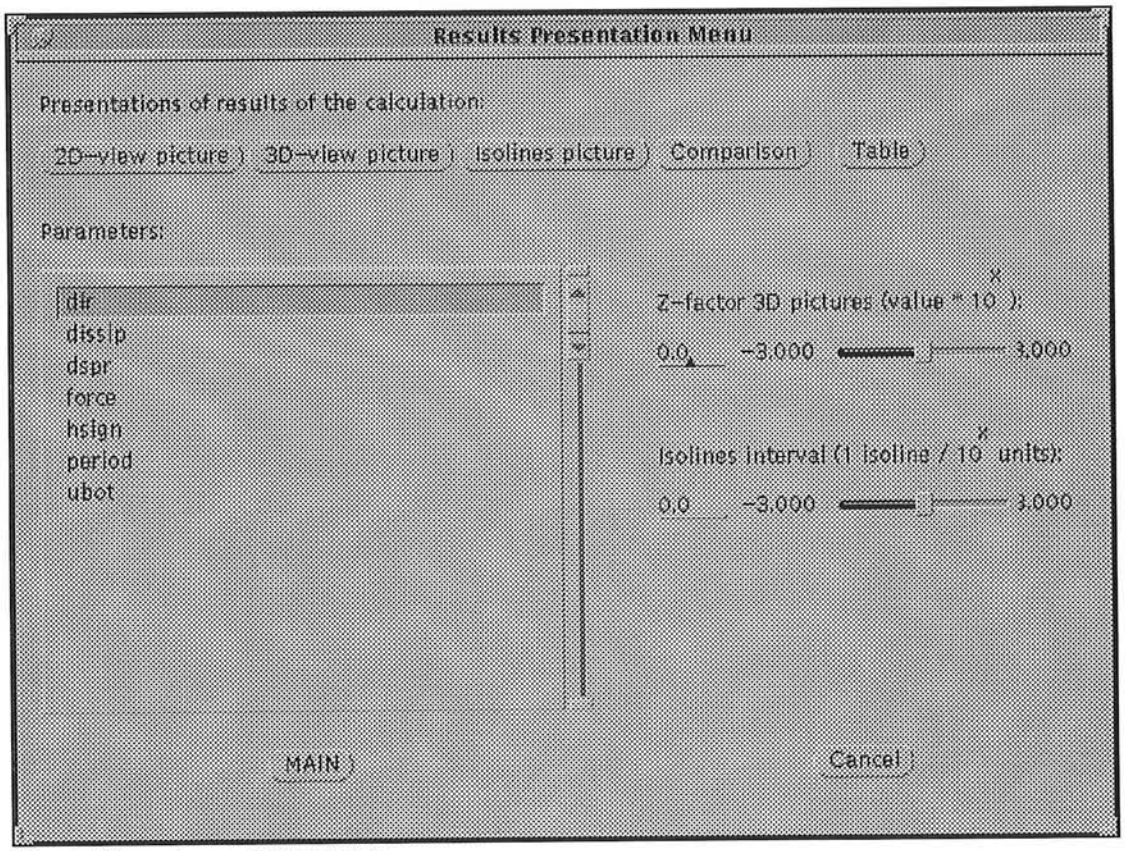

Figure 40: postpresentation.menu

The menu consists of an input-field with scrolling list, two sliders and seven buttons.

The input-field with scrolling list enables the user to select a parameter. This can be done as described earlier.

The sliders can be used to edit the scales of both the 3D pictures and the isolines pictures. The slider, used for 3D pictures, multipicates the results with a factor 10^x, with x varying between -3 and 3 (factor between 0.001 and 1000). The slider, used for isolines pictures, sets the number of units (10^x) per isoline, with x varying between -3 and 3 (1 isoline every 0.001 - 1000 units).

The presentationtype can be selected by pressing one of the buttons at the top of the menu.

These buttons are provided with the following help-messages:
- 2D-view picture: 'Press '2D-view picture'-button to view a 2D picture of the selected bottom.'
- 3D-view picture: 'Press '3D-view picture'-button to view a 3D picture of the selected bottom.'
- Isolines picture: 'Press 'Isolines picture'-button to view an isolines picture of the selected bottom.'
- Comparison: 'Press 'Comparison'-button to make a comparison between the selected results of two runs.'
- Table: 'Press 'Table'-button to view a table of the selected results.'

The 'Main'-button enables the user to go back to the main menu without selecting anything.

The 'Cancel'-button lets the user step backward through the menu-structure.

The buttons are provided with the following help- messages:
- Main: 'Press 'Main'-button to go back to the MAIN Menu.'
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'

postcomparison.menu

The menu *postcomparison.menu* enables the user to select an output-file for comparison with an earlier selected command-file.

The menu consists of an input-field with scrolling list, a display-field and four buttons. Next to the scrolling list, under the display field, an explanation is given of the different functionalities of the menu.

The input-field with scrolling list is meant to enables the user to select an output-file for comparison purposes. This can be done as described earlier.

The menu *postcomparison.menu* is displayed in figure 41.

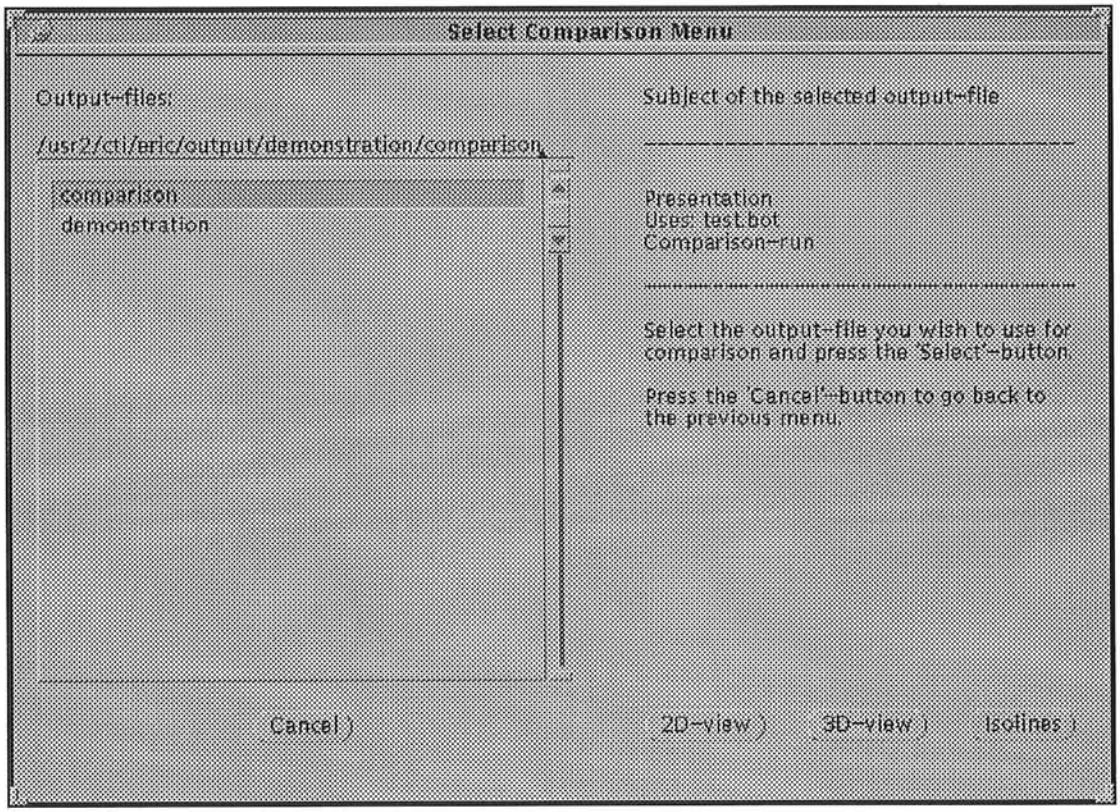

Figure 41: postcomparison.menu

In the bottom-right corner of the menu three buttons are displayed, which enable the user to select a presentation (2D, 3D, isolines) for the comparison. Besides these buttons, an other button is displayed in the lower-left corner of the menu, namely a 'Cancel'-button.

The 'Cancel'-button lets the user step backward through the menu-structure.

The button is provided with the following help-message:
- Cancel: 'Press 'Cancel'-button to go back to the previous menu.'

print.menu
This menu is described earlier in paragraph 4.2.

Chapter 5: Limitations, extension and improvement

In this chapter attention is paid to the limitations of HISGIS. Furthermore an overview is given of the possible extensions and improvements of HISGIS, which are most of all result of the above mentioned limitations.

5.1 Limitations of HISGIS

The current version of HISGIS has been developed with the AML of ARC/INFO 6.0. This version of ARC/INFO offers a lot of functionalities, which all can be used in the AMLs. However, the follow-up version of ARC/INFO, version 7.0, offers a few extra functionalities. These extra functionalities, especially GRID-functionalities, could improve HISGIS in a few ways (see paragraph 5.2). Because of the lack of functionalities of ARC/INFO 6.0 HISGIS has a few limitations.

An other reasons why there are some limitations in HISGIS, is because of the limited amount of time available for the developing of HISGIS.

The (known) limitations of the current version of HISGIS:
- It is not built to perform nested calculations.
- It does not have any built-in current functionalities.
- It supports only a limited number of HISWA commands. Only the most necessary commands are used in HISGIS. Therefore it can only read command-files created by HISGIS itself.
- It is not able to export the bottom-, grid- and calculationresults to point- or linecovers for use in other programs, e.g. ARCVIEW.
- It only supports square gridcells (length in x- and y-direction are equal).
- It only supports correctly oriented bottom-files. This means that the bottom-files should not have to be transformed (mirrored or rotated) within the application to get the correct geographic orientation, because HISGIS can not do such transformations.
- It does not support the definition of points, lines or windows for value viewing/editing or other analysis purposes.
- Performing a geographical analysis on bottom-data and calculationresults is not supported by HISGIS.
- Plotfiles made by HISGIS can only be printed on a printer which supports PostScript2 format.

5.2 Extension and improvement of HISGIS

A few of the above mentioned limitations are caused by lack of functionalities of ARC/INFO 6.0. To minimise the limitations of HISGIS a few extensions and improvements can be made. An important condition for improving HISGIS is to use the most recent version of ARC/INFO, so all the latest functionalities are built in. On the rest of this page an overview is given of the advised extensions and improvements of HISGIS. A division is made into three categories, namely general-, pre-processing- and post-processing extensions/improvements.

General extensions/improvements:

- Built-in possibilities for export of files. This could be built in into the menu *print.menu*. Several export formats should be supported.

Pre-processing extensions/improvements:

- Enlarge the number of supported HISWA commands. This is probably not very necessary, but the practice will learn for your own organisation.
- Built-in possibility of transforming a bottom-file. The necessary functionalities are given in ARC/INFO 7.0. When rotation and mirroring are possible, it is wise to add the geographical co-ordinates to the headinglines of the bottom-file.
- Built-in nesting functionalities. This can be done by adding a checkbox on the menu *pregridtools.menu*. When the checkbox is activated the user can select two computational grids. The calculation will be performed twice as well.
- Built-in current functionalities. This can be done by adding a button to the menu *preinput.menu*. This button invokes a number of menus and AMLs, which offer the current functionalities.
- Built-in possibilities for geographical analysis. This can be done by enabling the user to select points, lines and windows of which he/she can edit the attributes.

Post-processing extensions/improvements:

- Built-in possibilities for geographical analysis. This can be done by enabling the user to select points, lines and windows of which he/she can edit the attributes.

Attention should be paid to the changing wishes of the users of the application HISGIS. When performing extensions and improvements the users should always be questioned.

Chapter 6: Troubleshooting

6.1 General error messages

In the application HISGIS some error messages are built in.

Errors in the pre-processing module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.
- 'Error during overwriting.'
  This error is given when the file can't be deleted/overwritten. The error can be given if the file to be deleted/overwritten is missing or still opened.
- 'The selected file is empty'
  This error is given if the selected command-file doesn't contain any characters (thus is empty).
- 'Bottom-file doesn't exist. Select a new bottom-file'
  This error is given when the selected bottom-file doesn't exist. It is also displayed when the value of the name of the bottom-file in the menu *preinput.menu* is still 'none'.

Errors in the calculation module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.
- 'Severe error in calculation ! Check the selected command-file.'
  This error is given when one of the result-tables is missing. This does not necessarily mean that the calculation of the rest of the tables is wrong. Check the '.PRT'-file in the output directory of the selected output-file.

Errors in the post-processing module

- 'Error opening file.'
  This error is given when the file is already opened or doesn't exist. The error can be caused by an earlier error, which occurred during the closing of the same file.
- 'Error closing file.'
  This error is given when the file is never opened, already closed or doesn't exist anymore. The error can be caused by an earlier error, which occurred during the opening of the same file.

6.2 HISWA error messages

HISWA may also generate error messages. Most of the time, these are caused by errors in the command-file or bottom-file. The errors can be looked up in the '.PRT'-file in the output directory of the concerning command-file.

The errors can be of three different levels of severity:
1. warning
2. error
3. severe error

HISGIS is instructed only not to perform the calculation when a severe error occurs. See the '.PRT'-file for the severe error messages.

Error messages, which are not severe, and warnings do not influence the performing of the calculation, but they can influence the results of the calculation. Therefore always check the '.PRT'-file after a HISWA/HISGIS run.

See the HISWA manual for the different HISWA error messages.

Attention: *If any other errors should occur, please report this to the contact mentioned in the preface.*

References

- AML User's Guide. ESRI REDLANDS. Manual AML, mai 1992.
- Command-Reference ARC/INFO. ESRI REDLANDS. Overview of all ARC/INFO commands.
- Command-Reference ARCPLOT. ESRI REDLANDS. Overview of all ARCPLOT commands.
- Coverage Display and Query Version 6.0. ESRI REDLANDS. Manual ARCPLOT.
- Formedit User's Guide Version 6.0. ESRI REDLANDS. Manual menu-editor Formedit.
- HISWA User Manual. N. BOOIJ, L.H. HOLTHUIJSEN. Manual HISWA version 100.21. October 1993.
- Surface-analyses with GRID Version 6.0. ESRI REDLANDS. Manual GRID.

Appendix 1: Listings AMLs and menus HISGIS

- Listing hisgis.aml
- Listing passwordinput.menu
- Listing test.aml (user-file)
- Listing intro.menu
- Listing main.menu
- Listing thanks.menu
- Listing pre.aml
- Listing precurrent.menu
- Listing preproject.menu
- Listing precreate.menu
- Listing preselect.menu
- Listing readsubject.aml
- Listing predefault.aml
- Listing preread.aml
- Listing preinput.menu
- Listing preinit.aml
- Listing prebottom.aml
- Listing prebottomtools.menu
- Listing print.menu
- Listing pregrid.aml
- Listing pregridtools.menu
- Listing presave.aml
- Listing preoverwrite.menu
- Listing prepresaveas.aml
- Listing presavename.menu
- Listing prewritehgs.aml
- Listing calc.aml
- Listing calcproject.menu
- Listing calcselect.menu
- Listing calccomplete.menu
- Listing post.aml
- Listing postproject.menu
- Listing postselect.menu
- Listing postviewresult.aml
- Listing postpresentation.menu
- Listing postcomparison.menu

Listing hisgis.aml

```
/* ================================================
/* hisgis.aml
/* ------------------------------------------------------------------
/* This AML is the startup-file of HISGIS. In this AML
/* a few global variables get a value. The variables keep
/* the value during the whole HISGIS session, unless they
/* are changed or deleted.
/*
/* In this AML a password-menu is invoked, in which the
/* user has to give his name and password. Next a special
/* user-AML is invoked, in which a few personal variables
/* get a value, e.g. the variable .password. When the
/* given password corresponds with the password in the
/* personal AML, the programme is started (2 x retry).
/* ================================================
/* Invokes: passwordinput.menu, 'user'.aml, intro.menu,
/*        main.menu en thanks.menu
/* ================================================
/* Is invoked by: ARC/INFO
/* ================================================
/*
&echo &off
/*
/*****************************************************
/* This AML can be changed from here till the next
comment.
/*****************************************************
/*
&s .amlpath = /usr2/cti/eric/aml
&s .menupath = /usr2/cti/eric/menu
&s .userpath = /usr2/cti/eric/users
&s .terminal = 9999
&s .plotfile = '1040 2'
&s .display = 9999
/*
/*****************************************
/* End of the changable part of this AML.
/*****************************************
/*
&s counter = 0
&amlpath %.amlpath%
&menupath %.menupath%
&terminal %.terminal%
&goto passwordinput
/*
/*****************************************************
/* This label checks the password and starts the programme.
/*****************************************************
/*
&label passwordinput
&do
  &s .cancel = .false.
  &menu passwordinput &pinaction '&goto close' ~
    &position &cc &size &frame 360 185 &stripe 'Password
Menu'
  &if %.cancel% &then &goto close
  &else
  &do
    &s .user = %.userpath%/%.username%.eaf
    &if [exists %.user%] &then
    &do
      &r %.user%
      &if %.userpassword% = %.password% &then
      &do
        &s .precurrent = .false.
        &terminal %.terminal%
        display %.display%
        &messages &popup
        &fullscreen &popup
        &workspace %.workspace%
        &menu intro &pos &cc &size &frame 290 215
&stripe 'HISGIS'
        &menu main &pos &cc &size &frame 350 200
&stripe 'MAIN Menu'
        &menu thanks &pos &cc &size &frame 220 280
&stripe 'Thanks'
        &goto close
      &end
      &else
      &do
        &s counter = [calc %counter% + 1]
        &if %counter% < 3 &then
        &do
          &delvar .username
          &delvar .userpassword
          &goto passwordinput
        &end
        &else &goto close
      &end
    &end
    &else
    &do
      &s counter = [calc %counter% + 1]
      &if %counter% < 3 &then
      &do
        &delvar .username
        &delvar .userpassword
        &goto passwordinput
      &end
      &else &goto close
    &end
  &end
&end
/*
/*****************************************************
/* This label deletes all variables and stops the programme.
/*****************************************************
/*
&label close
&do
  &delvar *
  &delvar .*
  &stop
&end
```

Listing passwordinput.menu

```
/* ==========================================
/* passwordinput.menu
/* ------------------------------------------
/* In this menu the user has to enter his username and
/* password.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: hisgis.aml
/* ==========================================
/*
7 passwordinput.menu
/*

 Username: %i1


 Password: %i2


      %b1              %b2

%i1 INPUT .username 30 typein yes required character
%i2 INPUT .userpassword 30 noecho typein yes required
character
%b1 BUTTON cancel ~
 HELP ' Press "Cancel"-button to exit Password Menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b2 BUTTON ~
 HELP ' Press "OK"-button to accept username and
password.' ~
 'OK' &return
```

Listing 'user'.aml

```
/* ==========================================
/* 'user'.aml
/* ------------------------------------------
/* In this AML a few variables get a value, personal for
/* each user.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: hisgis.aml
/* ==========================================
/*
/**************************************************
/* This AML can be changed from here till the next
comment.
/**************************************************
/*
&s .password = hisgis
&s .name = 'Eric Oschatz'
&s .companyname = 'Delft University of Technology'
&s .department = 'Faculty of Civil Engineering'
&s .address = 'Stevinweg 1'
&s .city = '2628 CN  Delft'
&s .country = 'The Netherlands'
&s .phone = '015 - 2787921'
&s .workspace = /usr2/cti/eric
&s .hiswapath = /usr2/cti/eric/hiswa
&s .commandpath = /usr2/cti/eric/command
&s .bottompath = /usr2/cti/eric/bottom
&s .outputpath = /usr2/cti/eric/output
&s .bottomformat = 1
&return
/*
/****************************************
/* End of the changable part of this AML.
/****************************************
```

Listing intro.menu

```
/* ==========================================
/* intro.menu
/* ------------------------------------------
/* This menu is the introduction-screen, which appears
/* after starting HISGIS. By pressing the 'OK'-button
/* the actual programme is started.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: hisgis.aml
/* ==========================================
/*
7 intro.menu
/*

        HISGIS

        Version 1.0


    Developed by Eric Oschatz
by order of Delft University of Technology
    Faculty of Civil Engineering

        %b1

%b1 BUTTON ~
 HELP ' Press "OK"-button to continue.' ~
 'OK' &return
```

Listing main.menu

```
/* ==========================================
/* main.menu
/* ------------------------------------------
/* This is the main-menu from which the pre- and post-
/* processing part and the calculation part can be in-
/* voked.
/* ==========================================
/* Invokes: pre.aml, calc.aml en post.aml
/* ==========================================
/* Is invoked by: hisgis.aml
/* ==========================================
/*
7 main.menu
/*

 %b1     Pre-processing Module

 %b2     Calculation Module

 %b3     Post-processing Module

 %b4     Quiting HISGIS

%b1 BUTTON ~
 HELP ' Press "PRE"-button to start Pre-processing Module.'
~
 'PRE' &r pre
%b2 BUTTON ~
 HELP ' Press "CALC"-button to start Calculation Module.' ~
 'CALC' &r calc
%b3 BUTTON ~
 HELP ' Press "POST"-button to start Post-processing
Module.' ~
 'POST' &r post
%b4 BUTTON ~
 HELP ' Press "QUIT"-button to quit and return to
ARC/INFO.' ~
 'QUIT' &return
```

Listing thanks.menu

```
/* ==========================================
/* thanks.menu
/* ------------------------------------------------------------------------
/* This menu is the closing-screen, which appears
/* after pressing the 'Quit'-button in the main-menu.
/* By pressing the 'OK'-button in this menu, the user
/* returns to ARC/INFO.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: hisgis.aml
/* ==========================================
/*
7 thanks.menu
/*

   Thank you for using

       HISGIS

      Version 1.0

  If you might have any
 suggestions, please contact:

      Nico Booij
     015 - 2786938
 Faculty of Civil Engineering
Delft University of Technology

       %b1

%b1 BUTTON ~
 HELP ' Press "OK"-button to quit.' ~
 'OK' &return
```

Listing pre.aml

```
/* ===========================================
/* pre.aml
/* -------------------------------------------
/* This AML invokes the menus necessary for the pre-
/* processing module.
/* ===========================================
/* Invokes: precurrent.menu, preproject.menu,
/*          preselect.menu en preinput.menu
/* ===========================================
/* Is invoked by: main.menu
/* ===========================================
/*
&workspace %.commandpath%
&goto precurrent
/*
/*************************************************
/* This label calls the menu in which the user can choose
/* to edit the current command-file or edit a new one.
/*************************************************
/*
&label precurrent
&do
  &s .reedit = .false.
  &s .cancel = .false.
  &if %.precurrent% &then &menu precurrent &pinaction
'&goto close' ~
    &position &cc &size &frame 365 280 &stripe 'Current
Menu'
&end
&if %.reedit% = .false. &then
&do
  &if %.cancel% &then
  &do
    &goto close
  &end
  &else
  &do
    &s .precurrent = .false.
    &goto preproject
  &end
&end
&else &goto preinput
/*
/*************************************
/* This label calls the menu in which
/* a project can be selected.
/*************************************
/*
&label preproject
&do
  &s .main = .false.
  &s .cancel = .false.
  &menu preproject &pinaction '&goto close' ~
    &position &cc &size &frame 650 380 &stripe 'Select
Project Menu'
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &if %.cancel% &then
    &do
      &if %.precurrent% &then
      &do
        &goto precurrent
      &end
      &else
      &do
        &goto close
      &end
    &end
    &else
    &do
      &goto preselect
    &end
  &end
&end
/*
/*************************************
/* This label calls the menu in which
/* a command-file can be selected.
/*************************************
/*
&label preselect
&do
  &s .title1 =
  &s .title2 =
  &s .title3 =
  &s .main = .false.
  &s .cancel = .false.
  &workspace %.preproject%
  &menu preselect &pinaction '&goto close' ~
    &position &cc &size &frame 660 505 &stripe 'Select
Command-file Menu'
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &if %.cancel% &then
    &do
      &workspace %.commandpath%
      &goto preproject
    &end
    &else
    &do
      &goto preinput
    &end
  &end
&end
/*
/*************************************
/* This label calls the menu in which
/* the selected command-file can be
/* edited.
/*************************************
/*
&label preinput
&do
  &s .main = .false.
  &s .cancel = .false.
  &s .keep = .false.
  &workspace %.preproject%
  &menu preinput &pinaction '&goto close' ~
    &position &cc &size &frame 1060 700 &stripe 'Edit
Command-file Menu'
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &if %.cancel% &then
```

```
    &do
      &if %.precurrent% &then
      &do
        &workspace  %.commandpath%
        &goto precurrent
      &end
      &else
      &do
        &goto preselect
      &end
    &end
  &end
&end
/*
/*************************************************
/* This label stops the pre-processing module
/* and returns to the main-menu.
/*************************************************
/*
&label close
&do
  &workspace %.workspace%
  &return
&end
```

Listing precurrent.menu

```
/* ========================================
/* precurrent.menu
/* ----------------------------------------
/* In this menu a choice can be made between editing
/* the current command-file and selecting a new one.
/* ========================================
/* Invokes:
/* ========================================
/* Is invoked by: pre.aml
/* ========================================
/*
7 precurrent.menu
/*

The original version of the command-file you edited
earlier this session is still current.

You can re-edit this original version of the command-
file or select another command-file to edit.


Do you want to re-edit the original version of the
command-file ?

            %c01

    %b01            %b02

%c01 CHOICE .reedit pairs Yes .true. No .false.
%b01 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .reedit = .false.; &s .cancel = .true.; &return
%b02 BUTTON ~
 HELP ' Press "Accept"-button to accept the current choice.' ~
 'Accept' &return
%forminit &s .reedit = .true.
```

Listing preproject.menu

```
/* ==========================================
/* preproject.menu
/* ------------------------------------------
/* In this menu a existing project can be selected,
/* consisting of several command-files or a new one
/* can be created.
/* ==========================================
/* Invokes: precreate.menu
/* ==========================================
/* Is invoked by: pre.aml
/* ==========================================
/*
7 preproject.menu
/*

 Project names:

 %i1
                        ^Select the projectname you wish
to use for
                        ^editing and press the 'Select'-
button.

                        ^Press the 'New'-button if you
wish to create
                        ^a new project.

                        ^Press the 'Cancel'-button to go
back to the
                        ^previous menu.

                        ^Press the 'MAIN'-button to go
back to the
                        ^MAIN Menu.

      %b1       %b2             %b3       %b4

%i1 INPUT .preproject 40 typein yes scroll yes rows 11 ~
 required file * -directory
%b1 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .main = .true.; &return
%b2 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b3 BUTTON cancel ~
 HELP ' Press "New"-button to create a new project.' ~
 'New' &s .projectname = ; &menu precreate &position &cc
~
 &size &frame 370 155 &stripe 'Create Project Menu'
%b4 BUTTON ~
 HELP ' Press "Select"-button to go to the command-files of
the selected project.' ~
 'Select' &s .project [entryname %.preproject%]; &return
```

Listing precreate.menu

```
/* ==========================================
/* precreate.menu
/* ------------------------------------------
/* This menu enables the user to create a new project.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: preproject.menu
/* ==========================================
/*
7 precreate.menu
/*

 PROJECT  ^Name
       %i01


    %b01              %b02

%i01 INPUT .projectname 32 size 32 typein yes required ~
 character
%b01 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
Menu.' ~
 'Cancel' &return
%b02 BUTTON ~
 HELP ' Press "Create"-button to create the new project.' ~
 'Create' &system mkdir %.projectname% ; &workspace
%.outputpath% ; ~
 &system mkdir %.projectname% ; &workspace
%.commandpath% ; &return
```

Listing preselect.menu

```
/* ==========================================
/* preselect.menu
/* ------------------------------------------
/* In this menu a command-file can be selected.
/* ==========================================
/* Invokes: readsubject.aml, predefault.aml en
/*          preread.aml
/* ==========================================
/* Is invoked by: pre.aml
/* ==========================================
/*
7 preselect.menu
/*

 Command-files:                    ^Subject of the selected
command-file:

 %i1                                ---------------------------------

                                   %d1
                                   %d2
                                   %d3

                                   ---------------------------------


                                   ^Select the command-file you
wish to use
                                   ^for editing and press the
'Select'-button.

                                   ^Press the 'New'-button if you
wish to cre-
                                   ^ate a new command-file.

                                   ^Press the 'Cancel'-button to go
back to
                                   ^the previous menu.

                                   ^Press the 'MAIN'-button to go
back to the
                                   ^MAIN Menu.

      %b1          %b2                %b3          %b4

%i1 INPUT .preselect 40 typein yes scroll yes rows 18 ~
 required return '&s .file %.preselect%; &r readsubject' file
*.hgs -all
%b1 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .main = .true.; &return
%b2 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b3 BUTTON cancel ~
 HELP ' Press "New"-button to create a new command-file.' ~
 'New' &r predefault; &return
%b4 BUTTON ~
 HELP ' Press "Select"-button to use the selected command-
file for editing.' ~
 'Select' &r predefault; &r preread; ~
        &s .file [entryname %.preselect%]; ~
        &s .file [before %.file% .]; &return
%d1 DISPLAY .title1 32 value
%d2 DISPLAY .title2 32 value
%d3 DISPLAY .title3 32 value
%formopt setvariables immediate
```

Listing readsubject.aml

```
/* ============================================
/* readsubject.aml
/* --------------------------------------------------------------------
/* This AML reads the three titles (part of the PRO-
/* JECT command) in an existing command-file.
/* ============================================
/* Invokes:
/* ============================================
/* Is invoked by: preselect.menu, calcselect.menu
/*              en postselect.menu
/* ============================================
/*
&s correct = .false.
/*
/*********************************
/* This part of the AML read the
/* line of the PROJECT command.
/*********************************
/*
&setvar fileunit = [open %.file% openstatus -read]
&if %openstatus% <> 0 &then &type 'Error opening file.'
&else
&do counter = 0 &repeat %counter% + 1 &until %correct%
  &s line [read %fileunit% readstatus]
  &s lineunquote = [unquote %line%]
  &s commando [extract 1 %lineunquote%]
  &if %commando% = PROJECT &then
  &do
    &s correct = .true.
  &end
&end
&if [close %fileunit%] <> 0 &then &type 'Error closing file'
/*
/*********************************
/* In this part of the AML the
/* title variables get a value.
/*********************************
/*
&s .title1 = [extract 4 %lineunquote%]
&s .title2 = [extract 5 %lineunquote%]
&s .title3 = [extract 6 %lineunquote%]
&s .title1 = [unquote %.title1%]
&s .title2 = [unquote %.title2%]
&s .title3 = [unquote %.title3%]
&return
```

Listing predefault.aml

```
/* ==========
/* predefault.aml
/* ----------
/* This AML assigns default-values to variables used
/* in the command-files.
/* ==========
/* Invokes:
/* ==========
/* Is invoked by: preselect.menu
/* ==========
/*
&setvar .filenamepre := untitled
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the PROJECT command to the variables.
/*************************************************
/*
&setvar .projectnamepre := [entryname %.preproject%]
&setvar .projectnrpre := 1
&setvar .projecttitle1pre := untitled
&setvar .projecttitle2pre := untitled
&setvar .projecttitle3pre := untitled
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the SET command to the variables.
/*************************************************
/*
&setvar .setconditionpre := .false.
&setvar .setlevelpre := 0
&setvar .setcfaepre := 1.09
&setvar .setdepminpre := 0.05
&setvar .setnegmespre := 200
&setvar .setinterppre := 1
&setvar .setmaxerrpre := 1
&setvar .setgravpre := 9.81
&setvar .setrhopre := 1025
&setvar .setinrhogpre := 1
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the INPUT command to the variables.
/*************************************************
/*
&setvar .inputxppre := 0
&setvar .inputyppre := 0
&setvar .inputalppre := 0
&setvar .inputmxpre := 0
&setvar .inputmypre := 0
&setvar .inputdxpre := 0
&setvar .inputdypre := 0
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the READ command to the variables.
/*************************************************
/*
&setvar .readfnamepre := none
&setvar .readfacpre := 1
&setvar .readidlapre := 2
&setvar .readnhedpre := 6
&setvar .readformatpre = .true.
&setvar .readidfmpre := %.bottomformat%
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the GRID command to the variables.
/*************************************************
/*
&setvar .gridxclenpre := 0
&setvar .gridyclenpre := 0
&setvar .gridsectorpre := 120
&setvar .gridmxcpre := 0
&setvar .gridmycpre := 0
&setvar .gridmdcpre := 12
&setvar .gridxpcpre := 0
&setvar .gridypcpre := 0
&setvar .gridalpcpre := 0
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the INC command to the variables.
/*************************************************
/*
&setvar .incconditionpre := .false.
&setvar .inchsigpre := 0
&setvar .incperpre := 0
&setvar .incdirpre := 0
&setvar .incmspre := 2
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the WIND command to the variables.
/*************************************************
/*
&setvar .windconditionpre := .false.
&setvar .windvelpre := 0
&setvar .winddirpre := 0
&setvar .windapre := 1.44e-8
&setvar .windbpre := 1.12
&setvar .windppre := 43.59
&setvar .windqpre := -0.3333
&setvar .windtmaxpre := 6.6e4
&setvar .windmspre := 2
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the BREAKING command to the variables.
/*************************************************
/*
&setvar .breakingconditionpre := .false.
&setvar .breakinggamspre := 0.8
&setvar .breakinggamdpre := 1.0
&setvar .breakingalfapre := 1.0
&setvar .breakingfreqpre := no
&setvar .breakingbfpre := 0.5
/*
/*************************************************
/* This part of the AML assigns the default-values
/* of the FRICTION command to the variables.
/*************************************************
/*
&setvar .frictionconditionpre := .false.
&setvar .frictioncfwpre := 0.01
&setvar .frictioncfcpre := 0.005
&setvar .frictionfreqpre := no
&setvar .frictionbfpre := 0.5
&return
```

Listing preread.aml

```
/* ==========================================
/* preread.aml
/* ------------------------------------------
/* This AML reads an existing command-file. All the
/* commands are assigned to variables.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is involed by: preselect.menu
/* ==========================================
/*
/*****************************************
/* This part of the AML reads the file
/* and assigns the lines to variables.
/*****************************************
/*
&setvar fileunit = [open %.preselect% openstatus -read]
&if %openstatus% <> 0 &then &type 'Error opening file.'
&setvar counter = 1
&setvar readline%counter% [read %fileunit% readstatus]
&if %readstatus% = 102 &then &return &warning 'The
selected file is empty.'
&else &do counter = 2 &repeat %counter% + 1 &until
%readstatus% = 102
      &setvar readline%counter% [read %fileunit%
readstatus]
    &end
&setvar numberlines = [calc %counter% - 1]
&if [close %fileunit%] <> 0 &then &type 'Error closing file.'
/*
/*****************************************
/* In this part of the AML the variables
/* are split and assigned to variables
/* used in the input-menu.
/*****************************************
/*
&s .filenamepre = [entryname %.preselect%]
&do counter = 1 &to %numberlines%
 &s .line%counter% [unquote [value readline%counter%]]
 &s nr = 1
 &s .command%nr% = [extract %nr% [value
.line%counter%]]
 &select %.command1%
  &when PROJECT
    &call project
  &when SET
    &call set
  &when INPUT
    &call input
  &when READ
    &call read
  &when GRID
    &call grid
  &when INC
    &call inc
  &when WIND
    &call wind
  &when BREAKING
    &call breaking
  &when FRICTION
    &call friction
 &end
&end
&return
/*
/*************************************************
/* In this routine the PROJECT command is split up.
/*************************************************
/*
&routine project
  &do nr = 2 &to 6
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .projectnamepre = [unquote %.command2%]
  &s .projectnrpre = [unquote %.command3%]
  &s .projecttitle1pre = [unquote %.command4%]
  &s .projecttitle2pre = [unquote %.command5%]
  &s .projecttitle3pre = [unquote %.command6%]
&return
/*
/*************************************************
/* In this routine the SET command is split up.
/*************************************************
/*
&routine set
  &do nr = 2 &to 10
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .setconditionpre = .true.
  &s .setlevelpre = %.command2%
  &s .setcfaepre =  %.command3%
  &s .setdepminpre = %.command4%
  &s .setnegmespre = %.command5%
  &s .setinterppre = %.command6%
  &s .setmaxerrpre = %.command7%
  &s .setgravpre = %.command8%
  &s .setrhopre = %.command9%
  &s .setinrhogpre = %.command10%
&return
/*
/*************************************************
/* In this routine the INPUT command is split up.
/*************************************************
/*
&routine input
  &do nr = 4 &to 10
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .inputxppre = %.command4%
  &s .inputyppre = %.command5%
  &s .inputalppre = %.command6%
  &s .inputmxpre = %.command7%
  &s .inputmypre = %.command8%
  &s .inputdxpre = %.command9%
  &s .inputdypre = %.command10%
&return
/*
/*************************************************
/* In this routine the READ command is split up.
/*************************************************
/*
&routine read
  &do nr = 3 &to 8
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .readfnamepre = [unquote %.command3%]
  &s .readfnamepre = [entryname %.readfnamepre%]
  &s .readfacpre =  [abs %.command4%]
  &s .readidlapre = %.command5%
  &s .readnhedpre = %.command6%
  &if %.command7% = FORMAT &then
```

```
  &do
    &s .readformatpre = .true.
    &s .readidfmpre = %.command8%
  &end
  &else &s .readformatpre = .false.
&return
/*
/************************************************
/* In this routine the GRID command is split up
/************************************************
/*
&routine grid
  &do nr = 2 &to 11
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .gridxclenpre = %.command2%
  &s .gridyclenpre =  %.command3%
  &s .gridsectorpre = %.command4%
  &s .gridmxcpre = %.command5%
  &s .gridmycpre = %.command6%
  &s .gridmdcpre = %.command7%
  &s .gridxpcpre = %.command9%
  &s .gridypcpre = %.command10%
  &s .gridalpcpre = %.command11%
&return
/*
/************************************************
/* In this routine the INC command is split up.
/************************************************
/*
&routine inc
  &do nr = 3 &to 6
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .incconditionpre = .true.
  &s .inchsigpre = %.command3%
  &s .incperpre = %.command4%
  &s .incdirpre = %.command5%
  &s .incmspre = %.command6%
&return
/*
/************************************************
/* In this routine the WIND command is split up.
/************************************************
/*
&routine wind
  &do nr = 2 &to 9
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .windconditionpre = .true.
  &s .windvelpre = %.command2%
  &s .winddirpre =  %.command3%
  &s .windapre = %.command4%
  &s .windbpre = %.command5%
  &s .windppre = %.command6%
  &s .windqpre = %.command7%
  &s .windtmaxpre = %.command8%
  &s .windmspre = %.command9%
&return
/*
/************************************************
/* In this routine the BREAKING command is split up.
/************************************************
/*
&routine breaking
  &do nr = 2 &to 6
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .breakingconditionpre = .true.
  &s .breakinggamspre = %.command2%
  &s .breakinggamdpre = %.command3%
  &s .breakingalfapre = %.command4%
  &if %.command5% = FREQ &then ~
  &do
    &s .breakingfreqpre = .true.
    &s .breakingbfpre = %.command6%
  &end
&return
/*
/************************************************
/* In this routine the FRICTION command is split up.
/************************************************
/*
&routine friction
  &do nr = 2 &to 5
    &s .command%nr% = [extract %nr% [value
.line%counter%]]
  &end
  &s .frictionconditionpre = .true.
  &s .frictioncfwpre = %.command2%
  &s .frictioncfcpre = %.command3%
  &if %.command4% = FREQ &then ~
  &do
    &s .frictionfreqpre = .true.
    &s .frictionbfpre = %.command5%
  &end
&return
```

Listing preinput.menu

```
/* ================================================
/* preinput.menu
/* ------------------------------------------------------------------------
/* In this menu the command-file can be edited.
/* ================================================
/* Invokes: preinit.aml, prebottom.aml, pregrid.aml,
/*          presave.aml, presaveas.aml and prewritehgs.aml
/* ================================================
/* Is invoked by: pre.menu
/* ================================================
/*
7 preinput.menu
/*

 COMMAND-FILE   ^Filename:%inpa-d01

 ------------------------------------------------------------------------
------------------------------------------------

 PROJECT       ^Name     ^Run nr.  ^Title1   ^Title2
^Title3
          %inpb-i01  %inpb-i02 %inpb-i03 %inpb-i04
%inpb-i05

 ------------------------------------------------------------------------
------------------------------------------------

                                   ^IDLA          ^Format
 BOTTOM-FILE   ^Name:%ic-d01%ic-b01       %ic-c01
%ic-i01 %ic-c02 %ic-i02

 ------------------------------------------------------------------------
------------------------------------------------

 GRID                  %inpd-b01

 ------------------------------------------------------------------------
------------------------------------------------

 Optional commands: %ie-c ^SET      ^Waterlevel
                          %ie-i01

               %if-c ^INCIDENT  ^Hsig    ^Period ^Dir    ^Ms
                          %if-i01  %if-i02 %if-i03 %if-i04

               %ig-c ^WIND      ^Velocity^Dir    ^Ms
                          %ig-i01  %ig-i02 %ig-i03

               %ih-c ^BREAKING  ^Gams    ^Gamd   ^Alfa
^Freq
                          %ih-i01  %ih-i02 %ih-i03 %ih-c02

               %ii-c ^FRICTION  ^Cfw     ^Cfc          ^Freq
                          %ii-i01  %ii-i02        %ii-c02

 ------------------------------------------------------------------------
------------------------------------------------


     %inpj-b01     %inpj-b02       %inpj-b03 %inpj-b04
%inpj-b05

%inpa-d01 DISPLAY .filenameinput 40 value
%inpb-i01 DISPLAY .projectnameinput 32 value
%inpb-i02 INPUT .projectnrinput 4 size 4 typein yes
required character
%inpb-i03 INPUT .projecttitle1input 16 size 32 typein yes
required character
%inpb-i04 INPUT .projecttitle2input 16 size 32 typein yes
required character
%inpb-i05 INPUT .projecttitle3input 16 size 32 typein yes
required character
%ic-d01 DISPLAY .readfnameinput 40 value
%ic-c01 CHOICE .readfacinput PAIRS M 1 DM 0.1 CM
0.01
%ic-c02 CHOICE .readformatinput PAIRS FREE .false.
FORMAT .true.
%ic-i01 INPUT .readidlainput 4 size 4 typein yes required
integer
%ic-i02 INPUT .readidfminput 6 size 16 typein yes required
character
%ic-b01 BUTTON cancel ~
 HELP ' Press "Bottom Tools"-button to go to the tools for
selecting, viewing and printing a bottom.' ~
 'Bottom Tools' &r prebottom
%inpd-b01 BUTTON cancel ~
 HELP ' Press "Grid Tools"-button to go to the tools for
editing, viewing and printing a computational grid.' ~
 'Grid Tools' &r pregrid
%ie-c CHECKBOX .setconditioninput
%ie-i01 INPUT .setlevelinput 8 size 8 typein yes required
real
%if-c CHECKBOX .incconditioninput
%if-i01 INPUT .inchsiginput 8 size 8 typein yes required
real
%if-i02 INPUT .incperinput 8 size 8 typein yes required real
%if-i03 INPUT .incdirinput 8 size 8 typein yes required real
%if-i04 INPUT .incmsinput 8 size 8 typein yes required real
%ig-c CHECKBOX .windconditioninput
%ig-i01 INPUT .windvelinput 8 size 8 typein yes required
real
%ig-i02 INPUT .winddirinput 8 size 8 typein yes required
real
%ig-i03 INPUT .windmsinput 8 size 8 typein yes required
real
%ih-c CHECKBOX .breakingconditioninput
%ih-c02 CHECKBOX .breakingfreqinput
%ih-i01 INPUT .breakinggamsinput 8 size 8 typein yes
required real
%ih-i02 INPUT .breakinggamdinput 8 size 8 typein yes
required real
%ih-i03 INPUT .breakingalfainput 8 size 8 typein yes
required real
%ii-c CHECKBOX .frictionconditioninput
%ii-c02 CHECKBOX .frictionfreqinput
%ii-i01 INPUT .frictioncfwinput 8 size 8 typein yes required
real
%ii-i02 INPUT .frictioncfcinput 8 size 8 typein yes required
real
%inpj-b01 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .precurrent = .true.; &s .main = .true.; &return
%inpj-b02 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%inpj-b03 BUTTON ~
 HELP ' Press "Print"-button to print the current command-
file.' ~
 'Print' &s .file = printtemp.prt; &r prewritehgs; &system
print %.file%; ~
 &system rm %.file%; &system rmdir
%.postproject%/printtemp
```

```
%inpj-b04 BUTTON ~
 HELP ' Press "Save"-button to save the current command-
file.' ~
 'Save' &r presave
%inpj-b05 BUTTON ~
 HELP ' Press "Save as..."-button to give the current
command-file a new name.' ~
 'Save as...' &r presaveas
%forminit &r preinit
%formopt setvariables immediate
```

Listing preinit.aml

```
/* ================================================
/* preinit.aml
/* ------------------------------------------------------------------------
/* In this AML the input is initialised.
/* ================================================
/* Invokes:
/* ================================================
/* Is invoked by: input.menu
/* ================================================
/*
/*
/*********************************************
/* When a button is pressed, after which the
/* value may not be initialised, the AML will
/* not perform the initialisation.
/*********************************************
/*
&if %.keep% &then &return
&else
&do
  &setvar .filenameinput = %.filenamepre%
  &setvar .projectnameinput = %.projectnamepre%
  &setvar .projectnrinput = %.projectnrpre%
  &setvar .projecttitle1input = %.projecttitle1pre%
  &setvar .projecttitle2input = %.projecttitle2pre%
  &setvar .projecttitle3input = %.projecttitle3pre%
  &setvar .inputxpinput = %.inputxppre%
  &setvar .inputypinput = %.inputyppre%
  &setvar .inputalpinput = %.inputalppre%
  &setvar .inputmxinput = %.inputmxpre%
  &setvar .inputmyinput = %.inputmypre%
  &setvar .inputdxinput = %.inputdxpre%
  &setvar .inputdyinput = %.inputdypre%
  &setvar .readfnameinput = %.readfnamepre%
  &setvar .readfacinput = %.readfacpre%
  &setvar .readidlainput = %.readidlapre%
  &setvar .readformatinput = %.readformatpre%
  &setvar .readidfminput = %.readidfmpre%
  &setvar .gridxcleninput = %.gridxclenpre%
  &setvar .gridycleninput = %.gridyclenpre%
  &setvar .gridsectorinput = %.gridsectorpre%
  &setvar .gridmxcinput = %.gridmxcpre%
  &setvar .gridmycinput = %.gridmycpre%
  &setvar .gridmdcinput = %.gridmdcpre%
  &setvar .gridxpcinput = %.gridxpcpre%
  &setvar .gridypcinput = %.gridypcpre%
  &setvar .gridalpcinput = %.gridalpcpre%
  &setvar .setconditioninput = %.setconditionpre%
  &setvar .setlevelinput = %.setlevelpre%
  &setvar .incconditioninput = %.incconditionpre%
  &setvar .inchsiginput = %.inchsigpre%
  &setvar .incperinput = %.incperpre%
  &setvar .incdirinput = %.incdirpre%
  &setvar .incmsinput = %.incmspre%
  &setvar .windconditioninput = %.windconditionpre%
  &setvar .windvelinput = %.windvelpre%
  &setvar .winddirinput = %.winddirpre%
  &setvar .windmsinput = %.windmspre%
  &setvar .breakingconditioninput =
%.breakingconditionpre%
  &setvar .breakinggamsinput = %.breakinggamspre%
  &setvar .breakinggamdinput = %.breakinggamdpre%
  &setvar .breakingalfainput = %.breakingalfapre%
  &setvar .breakingfreqinput = %.breakingfreqpre%
  &setvar .frictionconditioninput = %.frictionconditionpre%
  &setvar .frictioncfwinput = %.frictioncfwpre%
  &setvar .frictioncfcinput = %.frictioncfcpre%
  &setvar .frictionfreqinput = %.frictionfreqpre%
  &return
&end
```

Listing prebottom.aml

```
/* ================================================
/* prebottom.aml
/* ------------------------------------------------------------------------
/* This AML invokes the menus and labels necesarry for
/* bottom display.
/* ================================================
/* Invokes: prebottomtools.menu and print.menu
/* ================================================
/* Is invoked by: preinput.menu
/* ================================================
/*
&workspace %.bottompath%
&s .keep = .true.
&s .bottomfile = [entryname %.readfnameinput%]
&s .scale3d = 0
&s .scaleiso = 0
&s .posneg = +
&goto printbottom
/*
/*****************************************************
/* In this label the menu, in which the bottom or the
/* presentation can be selected, is invoked. The label
/* necessary for the presentation is involed.
/*****************************************************
/*
&label printbottom
&do
  &s .cancel = .false.
  &s .select = .false.
  &s .print = ''
  &menu prebottomtools &pinaction '&goto close' &position
&cc ~
   &size &frame 700 490 &stripe 'Bottom Tools Menu'
  &if %.cancel% &then &goto close
  &else
  &do
    &s gridinfile [entryname %.bottomfile%]
    &s gridfile [before %gridinfile% .]
    &s gridoutfile grid%gridfile%
    &if %.select% &then
    &do
      &if [exists %gridoutfile% -directory] = .false. &then
      &do
        asciigrid %gridinfile% %gridoutfile% float
      &end
      &describe %gridoutfile%
      &s .inputmxinput = [calc %grd$ncols% - 1]
      &s .inputmyinput = [calc %grd$nrows% - 1]
      &s .inputdxinput = %grd$dx%
      &s .inputdyinput = %grd$dy%
      &s .inputxpinput = 0
      &s .inputypinput = 0
      &s .inputalpinput = 0
      &if %grd$mean% > 0 &then
      &do
        &s .posneg = +
      &end
      &else
      &do
        &s .posneg = -
      &end
    &end
    &else
    &do
      &if [exists %gridoutfile% -directory] = .false. &then
      &do
        asciigrid %gridinfile% %gridoutfile% float
      &end
      &describe %gridoutfile%
      &s ramp [calc %grd$zmax% - %grd$zmin%]
      &do &while %ramp% > 1000
        &setvar ramp [calc %ramp% / 10]
      &end
      &do &while %ramp% < 10
        &setvar ramp [calc %ramp% * 10]
      &end
      &s ramp [round %ramp%]
      &s scale3d [calc 10 ** %.scale3d%]
      &s scaleiso [calc 10 ** %.scaleiso%]
      &messages &off
      display 9999
      ap
      lineset color
      shadeset colornames
      gridnodatasymbol 69
      textset font
      &s width [calc %grd$xmax% - %grd$xmin%]
      &s height [calc %grd$ymax% - %grd$ymin%]
      &select %.bottomview%
        &when 2d
          &do
            pagesize %width% %height%
            mapex %grd$xmin% %grd$ymin%
%grd$xmax% %grd$ymax%
            units map
            pageextent %grd$xmin% %grd$ymin%
%grd$xmax% %grd$ymax%
          &end
        &when 3d
          &do
            pagesize device
            mapex %gridoutfile%
            units map
            pageextent page
          &end
        &when isolines
          &do
            pagesize %width% %height%
            mapex %grd$xmin% %grd$ymin%
%grd$xmax% %grd$ymax%
            units map
            pageextent %grd$xmin% %grd$ymin%
%grd$xmax% %grd$ymax%
          &end
      &end
      &call %.bottomview%
      &menu print &pinaction '&return' &position &lr
&display &lr ~
       &size &frame 345 100 &stripe 'Print Bottom Menu'
      &if %.print% = printer &then
      &do
        &if [exists %gridfile%.ps] &then
        &do counter = 1 ~
          &repeat %counter% + 1 &until [exists
%gridfile%%counter%.ps] = .false.
          &s plotfile %gridfile%%counter%.ps
        &end
        &else
        &do
          &s plotfile %gridfile%.ps
        &end
        &call makepsfile
        &system print %plotfile%
        &system rm %plotfile%
      &end
```

```
      &if %.print% = file &then
      &do
        &if [exists %gridfile%.ps] &then
        &do counter = 1 ~
         &repeat %counter% + 1 &until [exists
%gridfile%%counter%.ps] = .false.
          &s plotfile %gridfile%%counter%.ps
        &end
        &else
        &do
          &s plotfile %gridfile%.ps
        &end
        &call makepsfile
      &end
      quit
      &messages &popup
      &goto printbottom
    &end
  &end
&end
/*
/*****************************************
/* This label stops the bottom-tools menu
/* and returns either to the input-menu.
/*****************************************
/*
&label close
&do
  &workspace %.preproject%
  &return
&end
/*
/*****************************************
/* This routine displays the GRID in 2D.
/*****************************************
/*
&routine 2d
  &s scaletrue = .false.
  linecolor black
  shadecolorramp 1 %ramp% white navy
  &select %.posneg%
    &when +
      gridquery %gridoutfile% value # # value > 0
    &when -
      gridquery %gridoutfile% value # # value < 0
  &end
  &return
&end
/*
/*****************************************
/* This routine diplays the GRID in 3D.
/*****************************************
/*
&routine 3d
  &s scaletrue = .false.
  &if %.print% = '' &then linecolor white
  &else linecolor black
  &select %.posneg%
    &when +
      surface lattice %gridoutfile% -%scale3d%
    &when -
      surface lattice %gridoutfile% %scale3d%
  &end
  surfacedefaults
  surfacedrape mesh fishnet
  linecolor black
  &return
&end
/*
/*****************************************
/* This routine displays the GRID in isolines.
/*****************************************
/*
&routine isolines
  &select %.readfacinput%
    &when 1
      &s units meter(s)
    &when 0.1
      &s units decimeter(s)
    &when 0.01
      &s units centimeter(s)
  &end
  &s scale = '1 isoline / '%scaleiso%' '%units%' bottomdepth'
  &s scale [unquote %scale%]
  &s scaletrue = .true.
  linecolor black
  shadecolorramp 1 %ramp% white navy
  &select %.posneg%
    &when +
      gridquery %gridoutfile% value # # value > 0
    &when -
      gridquery %gridoutfile% value # # value < 0
  &end
  surface lattice %gridoutfile%
  surfacedefaults
  surfacecontours %scaleiso%
  &return
&end
/*
/*****************************************
/* This routine makes the layout of the
/* postscript-file.
/*****************************************
/*
&routine makepsfile
  &s date [date -cal]
  &s time [date -ampm]
  display [unquote %.plotfile%]
  %plotfile%
  lineset color
  linecolor black
  shadeset colornames
  textset font
  pageunits cm
  pagesize 21 29
  mapposition cen cen
  mapex %gridoutfile%
  pageextent page
  maplimits 2 6.5 19 23.5
  surfacelimits 2 6.5 19 23.5
  &call %.bottomview%
  box 1 1 20 28
  box 2 24 19 27
  box 2 6.5 19 23.5
  box 2 2 19 6
  textquality proportional
  textjustification cl
  textfont times
  move 3 26.5
  textsize 0.8
  text 'HISGIS - BOTTOM PRESENTATION
  move 3 25.4
  textsize 0.5
  text 'Bottomfile:'
  move 5.5 25.4
  text %gridinfile%
  move 3 24.6
  textsize 0.4
  text %.bottomview%
  &if %scaletrue% &then
```

```
  &do
    move 4.25 24.6
  &end
  &else
  &do
    move 3.5 24.6
  &end
  text '- representation'
  &if %scaletrue% &then
  &do
    move 10.5 24.6
    text [quote %scale%]
  &end
  move 3 5.5
  textsize 0.4
  text %.companyname%
  move 3 5
  textsize 0.4
  text %.department%
  move 3 4.5
  text %.address%
  move 3 4
  text %.city%
  move 3 3.5
  text %.country%
  move 3 3
  text 'Tel. '
  move 3.7 3
  text %.phone%
  move 14 5.5
  textsize 0.4
  text 'Created by: '
  move 14 4.5
  text %.name%
  move 14 4
  text [quote %date%]
  move 14 3.5
  text [quote %time%]
  &return
&end
```

Listing prebottomtools.menu

```
/* ==========================================
/* prebottomtools.menu
/* ------------------------------------------
/* This menu enables the user to select a bottom-file,
/* which can be displayed on screen in three different
/* ways (2D, 3D, isolines).
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: prebottom.aml
/* ==========================================
/*
7 prebottomtools.menu
/*

 Presentation of the bottom-file:

 %preb-b03 %preb-b04 %preb-b05


 Bottom-files:

 %preb-i01                                    x
                    Z-factor 3D pictures (bottomdepth *
10 ):

                    %preb-s01


                                    x
                    Isolines interval (1 isoline / 10
units):

                    %preb-s02



                    Bottomdepth: %preb-c01

        %preb-b01                    %preb-b02

%preb-i01 INPUT .bottomfile 40 typein yes scroll yes rows
13 ~
 return '&s desc [entryname %.bottomfile%]; ~
       &s desc [before %desc% .]; ~
       &s desc grid%desc%; ~
       &if [exists %desc% -directory] &then &do; &describe
%desc%; ~
       &if %grd$mean% > 0 &then &s .posneg = +; ~
       &else &s .posneg = -; &end; &else &s .posneg = +' ~
 required file *.bot -all
%preb-b01 BUTTON cancel~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%preb-b02 BUTTON ~
 HELP ' Press "Select"-button to select the current bottom-
file.' ~
 'Select' &s .readfnameinput [entryname %.bottomfile%]; &s
.select = .true. ; &return
%preb-b03 BUTTON ~
 HELP ' Press "2D-view picture"-button to view a 2D picture
of the selected bottom.' ~
 '2D-view picture' &s .bottomview = 2d; &return
%preb-b04 BUTTON ~
 HELP ' Press "3D-view picture"-button to view a 3D picture
of the selected bottom.' ~
 '3D-view picture' &s .bottomview = 3d; &return
%preb-b05 BUTTON ~
 HELP ' Press "Isolines picture"-button to view an isolines
picture of the selected bottom.' ~
 'Isolines picture' &s .bottomview = isolines; &return
%preb-c01 CHOICE .posneg pairs Positive + Negative -
%preb-s01 SLIDER .scale3d 32 step 0.1 real -3 3
%preb-s02 SLIDER .scaleiso 32 step 0.1 real -3 3
```

Listing print.menu

```
/* ==========================================
/* print.menu
/* ------------------------------------------
/* This menu enables the user to print a picture of
/* the bottom or the results to the printer or to a
/* Postscript-file.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: prebottom.aml, pregrid.aml and
/*                postviewresult.aml
/* ==========================================
/*
7 print.menu
/*

 %preprint-b1   %preprint-b2 %preprint-b3

%preprint-b1 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go to the previous menu.' ~
 'Cancel' &s .print = cancel; &return
%preprint-b2 BUTTON ~
 HELP ' Press "Print"-button to print current display.' ~
 'Print' &s .print = printer; &return
%preprint-b3 BUTTON ~
 HELP ' Press "Print"-button to print current display to file.' ~
 'Print to file' &s .print = file; &return
```

Listing pregrid.aml

```
/* ===========================================
/* pregrid.aml
/* -------------------------------------------
/* In this AML the computational grid can be edited.
/* ===========================================
/* Invokes: pregridtools.menu en print.menu
/* ===========================================
/* Is invoked by: preinput.menu
/* ===========================================
/*
&workspace %.bottompath%
&s .keep = .true.
&s .bottomfile = [entryname %.readfnameinput%]
&goto printbottom
/*
/*********************************************
/* In this part of the AML the computational
/* grid is initialized.
/*********************************************
/*
&label printbottom
&do
  &s .cancel = .false.
  &s .print = ''
  &s gridinfile [entryname %.bottomfile%]
  &s gridfile [before %gridinfile% .]
  &s gridoutfile grid%gridfile%
  &if [exists %gridoutfile% -directory] &then
  &do
    &describe %gridoutfile%
    &if %grd$mean% > 0 &then
    &do
      &s .posneg = +
    &end
    &else
    &do
      &s .posneg = -
    &end
    &s ramp [calc %grd$zmax% - %grd$zmin%]
    &do &while %ramp% > 1000
      &setvar ramp [calc %ramp% / 10]
    &end
    &do &while %ramp% < 10
      &setvar ramp [calc %ramp% * 10]
    &end
    &s ramp [round %ramp%]
    &messages &off
    display 9999
    ap
    &s .x1 = %.gridxpcinput%
    &s .y1 = %.gridypcinput%
    &s .numberx = %.gridmxcinput%
    &s .numbery = %.gridmycinput%
    &s .gridangle = %.gridalpcinput%
    &s .gridxlength = %.gridxcleninput%
    &s .gridylength = %.gridycleninput%
    &goto printgrid
  &end
  &else
  &do
    &type 'Bottom-file doesn''t exist. Select a new bottom-
file.'
    &return
  &end
&end
/*
/*********************************************
/* In this part of the AML the bottom and the grid
/* are drawn on the ARCPLOT display. After that the
/* menu is invoked in which the grid can be edited.
/*********************************************
/*
&label printgrid
&do
  &s .point = .false.
  &s .lengthangle = .false.
  clear
  lineset color
  shadeset colornames
  markerset usgs.mrk
  gridnodatasymbol 69
  textset font
  &describe %gridoutfile%
  &s width [calc %grd$xmax% - %grd$xmin%]
  &s height [calc %grd$ymax% - %grd$ymin%]
  pagesize %width% %height%
  mapex %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
  units map
  pageextent %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
  &call 2d
  &call calcgrid
  units map
  line %.x1% %.y1% %.x2% %.y2% %.x4% %.y4%
%.x3% %.y3%
  linecolor red
  line %.x1% %.y1% %.x3% %.y3%
  linecolor black
  shadecolor black
  shadesize [calc %.gridxlength% / 100]
  shadeseparation [calc %.gridxlength% / 50]
  shadetype dots
  shade %.x1% %.y1% %.x5% %.y5% %.x2% %.y2%
  shade %.x3% %.y3% %.x6% %.y6% %.x4% %.y4%
  line %.x1% %.y1% %.x5% %.y5%
  line %.x3% %.y3% %.x6% %.y6%
  markersymbol 104
  markerangle %.gridangle%
  markercolor black
  markersize [calc %.gridxlength% / 5]
  marker %.x2% %.y2%
  markerangle [calc %.gridangle% + 90]
  marker %.x3% %.y3%
  textcolor black
  move [calc %.x1% - [calc %.gridxlength% / 15]] [calc
%.y1% - [calc %.gridxlength% / 15]]
  textjustification ur
  text '0'
  move [calc %.x2% + [calc %.gridxlength% / 10]] [calc
%.y2% + [calc %.gridxlength% / 10]]
  textjustification ul
  text 'X'
  move [calc %.x3% + [calc %.gridxlength% / 10]] [calc
%.y3% + [calc %.gridxlength% / 10]]
  textjustification lr
  text 'Y'
  markersymbol 204
  markerangle %.incdirinput%
  markercolor red
  markersize [calc %.gridxlength% / 5]
  marker %.x7% %.y7%
  &menu pregridtools &pinaction '&goto close' &position
&right &display ~
   &size &frame 420 505 &stripe 'Grid Tools Menu'
```

```
  &if %.cancel% &then
  &do
    quit
    &messages &popup
    &goto close
  &end
  &else
  &do
  &if %.lengthangle% &then &goto printgrid
  &if %.point% &then
  &do
    &s dx [calc %.xp2% - %.x1%]; &s dy [calc %.yp2% -
%.y1%]
    &s dd [sqrt [calc [calc %dx% * %dx%] + [calc %dy% *
%dy%]]]
    &s cos [calc %dx% / %dd%]
    &s .gridangle = [radang [acos %cos%]]
    &goto printgrid
  &end
  &else
  &do
    &menu print &pinaction '&goto close' &position &lr
&display &lr ~
     &size &frame 345 100 &stripe 'Print Grid Menu'
    &if %.print% = printer &then
    &do
      &if [exists %gridfile%.ps] &then
      &do counter = 1 ~
      &repeat %counter% + 1 &until [exists
%gridfile%%counter%.ps] = .false.
      &s plotfile %gridfile%%counter%.ps
      &end
      &else
      &do
        &s plotfile %gridfile%.ps
      &end
      &call makepsfile
      &system print %plotfile%
      &system rm %plotfile%
      &end
      &if %.print% = file &then
      &do
        &if [exists %gridfile%.ps] &then
        &do counter = 1 ~
          &repeat %counter% + 1 &until [exists
%gridfile%%counter%.ps] = .false.
           &s plotfile %gridfile%%counter%.ps
        &end
        &else
        &do
          &s plotfile %gridfile%.ps
        &end
        &call makepsfile
      &end
      quit
      &messages &popup
      &s .gridxpcinput = %.x1%
      &s .gridypcinput = %.y1%
      &s .gridmxcinput = %.numberx%
      &s .gridmycinput = %.numbery%
      &s .gridalpcinput = %.gridangle%
      &s .gridxcleninput = %.gridxlength%
      &s .gridycleninput = %.gridylength%
      &work %.preproject%
      &return
    &end
  &end
  &end
&end
/*
/*****************************************
/* This label stops the grid-tools menu and
/* returns to the input menu.
/*****************************************
/*
&label close
&do
  &workspace %.preproject%
  &return
&end
/*
/*************************************************
/* In this label the bottomfile is drawn in 2D.
/*************************************************
/*
&routine 2d
  linecolor black
  shadecolorramp 1 %ramp% white navy
  &select %.posneg%
    &when +
      gridquery %gridoutfile% value # # value >= 0
    &when -
      gridquery %gridoutfile% value # # value <= 0
  &end
  &return
&end
/*
/*****************************************
/* In this label the location and orientation
/* of the computational grid are calculated.
/*****************************************
/*
&routine calcgrid
  &s rad1 = [angrad %.gridangle%]
  &s rad2 = [angrad [calc %.gridangle% + 90]]
  &s rad3 = [angrad 30]
  &s gridsin1 = [sin %rad1%]
  &s gridcos1 = [cos %rad1%]
  &s gridsin2 = [sin %rad2%]
  &s gridcos2 = [cos %rad2%]
  &s gridtan3 = [tan %rad3%]
  &s .x2 = [calc %.x1% + [calc %.gridxlength% *
%gridcos1%]]
  &s .y2 = [calc %.y1% + [calc %.gridxlength% *
%gridsin1%]]
  &s .x3 = [calc %.x1% + [calc %.gridylength% *
%gridcos2%]]
  &s .y3 = [calc %.y1% + [calc %.gridylength% *
%gridsin2%]]
  &s .x4 = [calc %.x2% + [calc %.gridylength% *
%gridcos2%]]
  &s .y4 = [calc %.y2% + [calc %.gridylength% *
%gridsin2%]]
  &s side = [calc %.gridxlength% * %gridtan3%]
  &s .x5 = [calc %.x2% + [calc %side% * %gridcos2%]]
  &s .y5 = [calc %.y2% + [calc %side% * %gridsin2%]]
  &s .x6 = [calc %.x4% + [calc -%side% * %gridcos2%]]
  &s .y6 = [calc %.y4% + [calc -%side% * %gridsin2%]]
  &s .x7 = [calc %.x1% + [calc [calc %.gridylength% / 2] *
%gridcos2%]]
  &s .y7 = [calc %.y1% + [calc [calc %.gridylength% / 2] *
%gridsin2%]]
  &s .xp2 = %.x2%
  &s .yp2 = %.y2%
  &return
&end
/*
/************************************
/* This label creates the lay-out of
/* the post-script file.
```

```
/************************************
/*
&routine makepsfile
  &s date [date -cal]
  &s time [date -ampm]
  display [unquote %.plotfile%]
  %plotfile%
  lineset color
  linecolor black
  shadeset colornames
  markerset usgs.mrk
  textset font
  pageunits cm
  pagesize 21 29
  mapposition cen cen
  mapex %gridoutfile%
  pageextent page
  maplimits 2 6.5 19 23.5
  surfacelimits 2 6.5 19 23.5
  &call 2d
  &call calcgrid
  units map
  line %.x1% %.y1% %.x2% %.y2% %.x4% %.y4%
%.x3% %.y3%
  linecolor red
  line %.x1% %.y1% %.x3% %.y3%
  linecolor black
  shadecolor black
  shadesize 0.05
  shadeseparation 0.1
  shadetype dots
  shade %.x1% %.y1% %.x5% %.y5% %.x2% %.y2%
  shade %.x3% %.y3% %.x6% %.y6% %.x4% %.y4%
  line %.x1% %.y1% %.x5% %.y5%
  line %.x3% %.y3% %.x6% %.y6%
  markersymbol 104
  markerangle %.gridangle%
  markercolor black
  markersize 1
  marker %.x2% %.y2%
  markerangle [calc %.gridangle% + 90]
  marker %.x3% %.y3%
  textcolor black
  textsize 0.5
  move [calc %.x1% - [calc %.gridxlength% / 15]] [calc
%.y1% - [calc %.gridxlength% / 15]]
  textjustification ur
  text '0'
  move [calc %.x2% + [calc %.gridxlength% / 10]] [calc
%.y2% + [calc %.gridxlength% / 10]]
  textjustification ul
  text 'X'
  move [calc %.x3% + [calc %.gridxlength% / 10]] [calc
%.y3% + [calc %.gridxlength% / 10]]
  textjustification lr
  text 'Y'
  markersymbol 204
  markerangle %.incdirinput%
  markercolor red
  markersize 1
  marker %.x7% %.y7%
  units page
  box 1 1 20 28
  box 2 24 19 27
  box 2 6.5 19 23.5
  box 2 2 19 6
  textquality proportional
  textjustification cl
  textfont times
  move 3 26.5
  textsize 0.8
  text 'HISGIS - GRID PRESENTATION
  move 3 25.4
  textsize 0.5
  text 'Bottomfile: '
  move 5.5 25.4
  text %gridinfile%
  move 3 24.6
  textsize 0.4
  text '2d - representation'
  move 3 5.5
  textsize 0.4
  text %.companyname%
  move 3 5
  textsize 0.4
  text %.department%
  move 3 4.5
  text %.address%
  move 3 4
  text %.city%
  move 3 3.5
  text %.country%
  move 3 3
  text 'Tel. '
  move 3.7 3
  text %.phone%
  move 14 5.5
  textsize 0.4
  text 'Created by: '
  move 14 4.5
  text %.name%
  move 14 4
  text [quote %date%]
  move 14 3.5
  text [quote %time%]
  &return
&end
```

Listing pregridtools.menu

```
/* ============================================
/* pregridtools.menu
/* --------------------------------------------
/* In this menu a grid can be edited. The grid will be
/* displayed on the selected bottomfile.
/* ============================================
/* Invokes:
/* ============================================
/* Is invoked by: prebottom.aml
/* ============================================
/*
7 prebottomtools.menu
/*

 BASELINE

 1st point   ^X-coordinate     ^Y-coordinate
          %i1              %i2

 2nd point   ^X-coordinate     ^Y-coordinate
          %d3              %d4

 Angle       ^Degree(s)
          %i5

          %b1              %b2

 ------------------------------------------------

 GRID

 Length      ^X-direction      ^Y-direction
          %i6              %i7

 ------------------------------------------------

 CELLS

 Number      ^X-direction      ^Y-direction
          %i8              %i9

 ------------------------------------------------

     %b3                  %b4

%i1 INPUT .x1 16 typein yes ~
 return '&s .point = .true.; &return' required real
%i2 INPUT .y1 16 typein yes ~
 return '&s .point = .true.; &return' required real
%d3 DISPLAY .x2 16 value
%d4 DISPLAY .y2 16 value
%i5 INPUT .gridangle 16 typein yes ~
 return '&s .lengthangle = .true.; &return' required real
%i6 INPUT .gridxlength 16 typein yes ~
 return '&s .lengthangle = .true.; &return' required real
%i7 INPUT .gridylength 16 typein yes ~
 return '&s .lengthangle = .true.; &return' required real
%i8 INPUT .numberx 16 typein yes required real
%i9 INPUT .numbery 16 typein yes required real
%b1 BUTTON cancel ~
 HELP ' Press "New 1st point"-button to select a new 1st
point.' ~
 'New 1st point' &getpoint &map; ~
              &s .x1 %pnt$x%; ~
              &s .y1 %pnt$y%; ~
              &s .point = .true.; ~
              &return
%b2 BUTTON cancel~
 HELP ' Press "New support point"-button to select a new
support point.' ~
 'New support point' &getpoint &map; ~
              &s .xp2 %pnt$x%; ~
              &s .yp2 %pnt$y%; ~
              &s .point = .true.; ~
              &return
%b3 BUTTON cancel~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b4 BUTTON ~
 HELP ' Press "Select"-button to select the current
computational grid.' ~
 'Select' &s .point = .false.; &return
%formopt setvariables immediate
```

Listing presave.aml

```
/* ==========================================
/* presave.aml
/* ------------------------------------------
/* In this AML the command-file is saved with the ex-
/* isting filename. This AML is invoked by pressing
/* the 'Save'-button.
/* ==========================================
/* Invokes: preoverwrite.menu, prewritehgs.aml and
/*          presaveas.aml
/* ==========================================
/* Is invoked by: preinput.menu
/* ==========================================
/*
&s .keep = .true.
&s .file = %.filenameinput%
&s .overwrite = .false.
/*
/************************************************
/* This part of the AML check if the command-file
/* already exists. If so, the overwrite menu is
/* invoked. If not, the file is saved.
/************************************************
/*
&if [exists %.file%] &then
&do
  &menu preoverwrite &pinaction '&return' &position &cc ~
    &size &frame 370 290 &stripe 'Overwrite Menu'
  &if %.overwrite% &then
  &do
    &if [delete %.file%] <> 0 &then &type 'Error during
overwriting'
    &r prewritehgs
    &return
  &end
  &else
  &do
    &r presaveas
    &return
  &end
&end
&else
&do
  &r presaveas
  &return
&end
```

Listing preoverwrite.menu

```
/* ==========================================
/* preoverwrite.menu
/* ------------------------------------------
/* In this menu a choice can be made whether to over-
/* write the selected command-file or not.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: presave.aml and presaveas.aml
/* ==========================================
/*
7 preoverwrite.menu
/*

 Filename: %over-d01

 This filename already exists !


 Select 'Yes' to overwrite selected command-file.

 If you select 'No' you have to give the command-file
 an other name.


 Do you want to overwrite the selected command-file?

              %over-c01

%over-d01 DISPLAY .file 40 value
%over-c01 CHOICE .overwrite pairs return &return Yes
.true. No .false.
```

Listing presaveas.aml

```
/* ================================================
/* presaveas.aml
/* ------------------------------------------------
/* In this AML the command-file is saved with a new
/* name. This AML is invoked when the 'Save as'-button
/* is pressed or when the 'Save'-buttonis pressed and
/* the choice is not to overwrite the existing file.
/*================================================
/* Invokes: presavename.menu, preoverwrite.menu and
/*          prewritehgs.aml
/*================================================
/* Is invoked by: preinput.menu and presave.aml
/*================================================
/*
&s .keep = .true.
&s .file = %.filenameinput%
&s .file = [before %.file% .]
&s .overwrite = .false.
&s .presavename = .false.
/*
/*****************************************************
/* This part of the AML Invokes the menus necessary to
/* give the command-file a new name. It also checkes if
/* the command-file already exists.
/*****************************************************
&menu presavename &pinaction '&return' &position &cc ~
  &size &frame 420 160 &stripe 'Save as... Menu'
&if %.presavename% &then
&do
  &if [exists %.file%.hgs] &then
  &do
    &s .file = %.file%.hgs
    &menu preoverwrite &pinaction '&return' &position &cc
~
      &size &frame 370 290 &stripe 'Overwrite Menu'
    &if %.overwrite% &then
    &do
      &if [delete %.file%] <> 0 &then &type 'Error during
overwriting'
      &r prewritehgs
      &return
    &end
    &else &return
  &end
  &else
  &do
    &s .file = %.file%.hgs
    &r prewritehgs
    &return
  &end
&end
&else &return
```

Listing presavename.menu

```
/* ================================================
/* presavename.menu
/* ------------------------------------------------
/* This menu enables the user to enter a new name for
/* the saving of the current command-file.
/* ================================================
/* Invokes:
/* ================================================
/* Is invoked by: presaveas.aml
/* ================================================
/*
7 presavename.menu
/*

 COMMAND-FILE  ^Name (without extension)
          %i01


     %b01                %b2

%i01 INPUT .file 32 size 32 typein yes required character
%b01 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
Menu.' ~
 'Cancel' &return
%b2 BUTTON ~
 HELP ' Press "Save"-button to give the command-file the
current name.' ~
 'Save' &s .presavename = .true.; &return
```

Listing prewritehgs.aml

```
/* ========================================
/* prewritehgs.aml
/* ----------------------------------------
/* This AML writes the variables from the input-menu
/* to a file with the extension .hgs. This file can
/* be used with a HISWA calculation.
/* ========================================
/* Invokes:
/* ========================================
/* Is invoked by: preinput.menu, presave.aml and
/*                presaveas.aml
/* ========================================
/*
&s file [before %.file% .]
&s .project [entryname %.preproject%]
&s .calcproject = %.commandpath%/%.project%
&s .calcselect = %.commandpath%/%.project%/%.file%
&s .postproject = %.outputpath%/%.project%
&s .postselect = %.postproject%/%file%
&workspace %.postproject%
&if [exists %file% -directory] = .false. &then
&do
  mkdir %file%
&end
&workspace %.bottompath%
&s gridinfile [entryname %.readfnameinput%]
&s gridfile [before %gridinfile% .]
&s gridoutfile grid%gridfile%
&if [exists %gridoutfile% -directory] = .false. &then
&do
  asciigrid %gridinfile% %gridoutfile% float
&end
&describe %gridoutfile%
&if %grd$mean% > 0 &then
&do
  &s .posneg =
&end
&else
&do
  &s .posneg = -
&end
&workspace %.preproject%
&s fileunit = [open %.file% openstatus -write]
&if %openstatus% <> 0 &then &type 'Error opening file.'
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'PROJECT'-command.
/*********************************************
/*
&setvar project1un = [unquote %.projectnameinput%]
&setvar project2un = [unquote %.projectnrinput%]
&setvar project3un = [unquote %.projecttitle1input%]
&setvar project4un = [unquote %.projecttitle2input%]
&setvar project5un = [unquote %.projecttitle3input%]
&setvar project1 = [quote %project1un%]
&setvar project2 = [quote %project2un%]
&setvar project3 = [quote %project3un%]
&setvar project4 = [quote %project4un%]
&setvar project5 = [quote %project5un%]
&setvar .project = [unquote 'PROJECT'] %project1%
%project2% %project3% %project4% %project5%
&setvar .project = [quote %.project%]
&setvar writestat = [write %fileunit% %.project%]
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'SET'-command.
/*********************************************
/*
&if %.setconditioninput% &then ~
&do
  &setvar sl := %.setlevelinput%
  &setvar sc := %.setcfaepre%
  &setvar sd := %.setdepminpre%
  &setvar sn := %.setnegmespre%
  &setvar si := %.setinterppre%
  &setvar sm := %.setmaxerrpre%
  &setvar sg := %.setgravpre%
  &setvar sr := %.setrhopre%
  &setvar sin := %.setinrhogpre%
  &setvar writestat = ~
    [write %fileunit% 'SET '%sl%' '%sc%' '%sd%' '%sn%'
'%si%' '%sm%' '%sg%' '%sr%' '%sin%]
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'INPUT'-command.
/*********************************************
/*
&setvar ix := %.inputxpinput%
&setvar iy := %.inputypinput%
&setvar ia := %.inputalpinput%
&setvar imx := %.inputmxinput%
&setvar imy := %.inputmyinput%
&setvar idx := %.inputdxinput%
&setvar idy := %.inputdyinput%
&setvar writestat = ~
  [write %fileunit% 'INPUT GRID BOTTOM '%ix%'
'%iy%' '%ia%' '%imx%' '%imy%' '%idx%' '%idy%]
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'READ'-command.
/*********************************************
/*
&setvar rfnun = [unquote %.readfnameinput%]
&setvar rfn = [quote %rfnun%]
&setvar rf := %.readfacinput%
&setvar ri := %.readidlainput%
&setvar rn := %.readnhedpre%
&if %.readformatinput% = .false. &then
&do
  &setvar writestat = ~
    [write %fileunit% 'READ BOTTOM '%rfn%' '%rf%'
'%ri%' '%rn%' FREE']
&end
&else
&do
  &setvar rif := %.readidfminput%
  &setvar writestat = ~
    [write %fileunit% 'READ BOTTOM '%rfn%' '%rf%'
'%ri%' '%rn%' FORMAT '%rif%]
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'GRID'-command.
/*********************************************
/*
&setvar gx := %.gridxcleninput%
&setvar gy := %.gridycleninput%
&setvar gs := %.gridsectorpre%
&setvar gmx := %.gridmxcinput%
```

```
&setvar gmy := %.gridmycinput%
&setvar gmd := %.gridmdcpre%
&setvar gxp := %.gridxpcinput%
&setvar gyp := %.gridypcinput%
&setvar ga := %.gridalpcinput%
&setvar writestat = ~
  [write %fileunit% 'GRID '%gx%' '%gy%' '%gs%' '%gmx%'
'%gmy%' '%gmd%' FIXED '%gxp%' '%gyp%' '%ga%']
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'INC'-command.
/*********************************************
/*
&if %.incconditioninput% &then ~
&do
  &setvar ih := %.inchsiginput%
  &setvar ip := %.incperinput%
  &setvar id := %.incdirinput%
  &setvar im := %.incmsinput%
  &setvar writestat = ~
    [write %fileunit% 'INC PARAM '%ih%' '%ip%' '%id%'
'%im%]
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'WIND'-command.
/*********************************************
/*
&if %.windconditioninput% &then ~
&do
  &setvar wv := %.windvelinput%
  &setvar wd := %.winddirinput%
  &setvar wa := %.windapre%
  &setvar wb := %.windbpre%
  &setvar wp := %.windppre%
  &setvar wq := %.windqpre%
  &setvar wt := %.windtmaxpre%
  &setvar wm := %.windmsinput%
  &setvar writestat = ~
    [write %fileunit% 'WIND '%wv%' '%wd%' '%wa%'
'%wb%' '%wp%' '%wq%' '%wt%' '%wm%]
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'BREAKING'-command.
/*********************************************
/*
&if %.breakingconditioninput% &then ~
&do
  &setvar bs := %.breakinggamsinput%
  &setvar bd := %.breakinggamdinput%
  &setvar ba := %.breakingalfainput%
  &if %.breakingfreqinput% = .true. &then ~
  &do
    &setvar bb := %.breakingbfpre%
    &setvar writestat = ~
      [write %fileunit% 'BREAKING '%bs%' '%bd%'
'%ba%' FREQ '%bb%]
  &end
  &else
  &do
    &setvar writestat = ~
      [write %fileunit% 'BREAKING '%bs%' '%bd%'
'%ba%]
  &end
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the 'FRICTION'-command.
/*********************************************
/*
&if %.frictionconditioninput% &then ~
&do
  &setvar fw := %.frictioncfwinput%
  &setvar fc := %.frictioncfcinput%
  &if %.frictionfreqinput% = .true. &then ~
  &do
    &setvar fb := %.frictionbfpre%
    &setvar writestat = ~
      [write %fileunit% 'FRICTION '%fw%' '%fc%' FREQ
'%fb%]
  &end
  &else
  &do
    &setvar writestat = ~
      [write %fileunit% 'FRICTION '%fw%' '%fc%]
  &end
&end
/*
/*********************************************
/* This part of the AML writes the variables
/* of the output-files.
/*********************************************
/*
&setvar writestat = ~
  [write %fileunit% 'FRAME "frame1" '%gx%' '%gy%'
'%gxp%' '%gyp%' '%ga%' '%gmx%' '%gmy%]
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "dir.tab" LAY 1
dir']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "dissip.tab"
LAY 1 dissip']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "dspr.tab" LAY
1 dspr']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "force.tab"
LAY 1 force']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "hsign.tab"
LAY 1 hsign']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "period.tab"
LAY 1 period']
&setvar writestat = ~
  [write %fileunit% 'BLOCK "frame1" FILE "ubot.tab" LAY
1 ubot']
&setvar writestat = [write %fileunit% 'STOP']
&if [close %fileunit%] <> 0 &then &type 'Error closing file.'
&return
```

Listing calc.aml

```
/* ==========================================
/* calc.aml
/* ------------------------------------------
/* This AML invokes the menus, necessary for performing
/* a HISWA calculation with the selected command-file.
/* ==========================================
/* Invokes: calcproject.menu, calcselect.menu,
/*          en calccomplete.menu
/* ==========================================
/* Is invoked by: main.menu
/* ==========================================
/*
&workspace %.commandpath%
&goto calcproject
/*
/*************************************
/* This label calls the menu in which
/* a project can be selected.
/*************************************
/*
&label calcproject
&do
  &s .cancel = .false.
  &menu calcproject &pinaction '&goto close' ~
    &position &cc &size &frame 620 360 &stripe 'Select
Project Menu'
  &if %.cancel% &then
  &do
    &goto close
  &end
  &else
  &do
    &goto calcselect
  &end
&end
/*
/*************************************
/* This label calls the menu in which
/* a command-file can be selected.
/*************************************
/*
&label calcselect
&do
  &s .title1 =
  &s .title2 =
  &s .title3 =
  &s .main = .false.
  &s .cancel = .false.
  &workspace %.commandpath%/%.project%
  &menu calcselect &pinaction '&goto close' ~
    &position &cc &size &frame 655 470 &stripe 'Select
Command-file Menu'
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &if %.cancel% &then
    &do
      &workspace %.commandpath%
      &goto calcproject
    &end
    &else
    &do
      &goto calc
    &end
  &end
&end
/*
/*********************************************
/* This label performs the actual calculation.
/*********************************************
/*
&label calc
&do
  &s .preproject = %.commandpath%/%.project%
  &s .preselect =
%.commandpath%/%.project%/%.file%.hgs
  &s .postproject = %.outputpath%/%.project%
  &s .postselect = %.outputpath%/%.project%/%.file%
  &workspace %.hiswapath%
  &system cp %.calcselect% INPUT
  &system hispre.e
  &system mv PRINT temp1
  &system hiscom.e
  &system mv PRINT temp2
  &system hisout.e
  &system mv PRINT temp3
  &workspace %.postselect%
  &system rm *
  &messages &off
  &if [exists griddir -grid] &then kill griddir
  &if [exists griddissip -grid] &then kill griddissip
  &if [exists griddspr -grid] &then kill griddspr
  &if [exists gridforce -grid] &then kill gridforce
  &if [exists gridhsign -grid] &then kill gridhsign
  &if [exists gridperiod -grid] &then kill gridperiod
  &if [exists gridubot -grid] &then kill gridubot
  &if [exists info -directory] &then
  &do
    &workspace %.postselect%/info
    &system rm *
    &workspace %.postselect%
    &system rmdir info
  &end
  &message &popup
  &workspace %.hiswapath%
  &s outputname %.file%
  &s outputpathname = %.postselect%/%outputname%.prt
  &if [exists %outputpathname%] &then &system rm
%outputpathname%
  &system cat temp1 temp2 temp3 > %outputpathname%
  &system mv *.tab %.postselect%
  &system rm INSTU
  &system rm INSTR
  &system rm INPUT
  &system rm HRES*
  &system rm temp*
  &system rm PLF*
  &system rm *.RES
  &workspace %.postselect%
  &if [exists dir.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists dissip.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists dspr.tab] = .false. &then
```

```
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists force.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists hsign.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists period.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &if [exists ubot.tab] = .false. &then
  &do
    &type 'Severe error in calculation! Check the selected
command-file.'
    &return
  &end
  &menu calccomplete &pinaction '&goto close' ~
    &position &cc &size &frame 265 125 &stripe
'Calculation Completed Menu'
  &workspace %.workspace%
  &return
&end
/*
/*****************************************
/* This label stops the calculation module
/* and returns to the main-menu.
/*****************************************
/*
&label close
&do
  &workspace %.workspace%
  &return
&end
```

Listing calcproject.menu

```
/* ========================================
/* calcproject.menu
/* ----------------------------------------
/* This menu enables the user to select a project,
/* consisting of several command-files.
/* ========================================
/* Invokes:
/* ========================================
/* Is invoked by: calc.aml
/* ========================================
/*
7 calcproject.menu
/*

 Project names:

 %i1
                        ^Select the projectname you wish
to use
                        ^for calculation and press the
'Select'-
                        ^button.

                        ^Press the 'Cancel'-button to go
back to
                        ^the previous menu.



          %b1                    %b2

%i1 INPUT .calcproject 40 typein yes scroll yes rows 10 ~
 required file * -directory
%b1 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b2 BUTTON ~
 HELP ' Press "Select"-button to go to the command-files of
the selected project.' ~
 'Select' &s .project [entryname %.calcproject%]; &return
```

Listing calcselect.menu

```
/* ==========================================
/* calcselect.menu
/* ------------------------------------------
/* With this menu a command-file can be selected, with
/* which a HISWA calculation will be performed.
/* ==========================================
/* Invokes: readsubject.aml
/* ==========================================
/* Is invoked by: calc.aml
/* ==========================================
/*
7 calcselect.menu
/*

 Command-files:                    ^Subject of the selected
command-file

 %i1                                ---------------------------------

                                   %d1
                                   %d2
                                   %d3

                                   ---------------------------------

                                   ^Select the command-file you
wish to use
                                   ^for a HISWA calculation and
press the
                                   ^'Calculate'-button.

                                   ^Press the 'Cancel'-button to go
back to
                                   ^the previous menu.

                                   ^Press the 'MAIN'-button to go
back to the
                                   ^MAIN Menu.

      %b1          %b2                    %b3

%i1 INPUT .calcselect 40 typein yes scroll yes rows 16 ~
 required return '&s .file %.calcselect%; &r readsubject' file
*.hgs -all
%b1 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .main = .true.; &return
%b2 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b3 BUTTON ~
 HELP ' Press "Calculate"-button to use the selected
command-file for a HISWA calculation.' ~
 'Calculate' &s .file [entryname %.calcselect%]; ~
          &s .file [before %.file% .]; &return
%d1 DISPLAY .title1 32 value
%d2 DISPLAY .title2 32 value
%d3 DISPLAY .title3 32 value
%formopt setvariables immediate
```

Listing calccomplete.menu

```
/* ==========================================
/* calccomplete.menu
/* ------------------------------------------
/* This menu tells the user that the calculation has
/* been completed.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: calc.aml
/* ==========================================
/*
7 calccomplete.menu
/*

 This calculation has been completed.

          %b1

%b1 BUTTON ~
 HELP ' Press "OK"-button to go to Main Menu.' ~
 'OK' &return
```

Listing post.aml

```
/* ========================================
/* post.aml
/* ----------------------------------------
/* This AML invokes the menus necessary for the post-
/* processing module.
/* ========================================
/* Invokes: postproject.menu, postselect.menu en
/*          postpresentation.menu
/* ========================================
/* Is invoked by: main.menu
/* ========================================
/*
&workspace %.outputpath%
&goto postproject
/*
/*************************************
/* This label calls the menu in which
/* a project can be selected.
/*************************************
/*
&label postproject
&do
  &s .cancel = .false.
  &menu postproject &pinaction '&goto close' ~
    &position &cc &size &frame 620 360 &stripe 'Select
Project Menu'
  &if %.cancel% &then
  &do
    &goto close
  &end
  &else
  &do
    &goto postselect
  &end
&end
/*
/*************************************
/* This label calls the menu in which
/* a command-file can be selected.
/*************************************
/*
&label postselect
&do
  &s .title1 =
  &s .title2 =
  &s .title3 =
  &s .main = .false.
  &s .cancel = .false.
  &workspace %.outputpath%/%.project%
  &menu postselect &pinaction '&goto close' ~
    &position &cc &size &frame 655 470 &stripe 'Select
Output-file Menu'
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &if %.cancel% &then
    &do
      &workspace %.outputpath%
      &goto postproject
    &end
    &else
    &do
      &goto postpresentation
    &end
  &end
&end
/*
/*************************************
/* This label calls the menu in which
/* a presentation can be selected.
/*************************************
/*
&label postpresentation
&do
  &s .preproject = %.commandpath%/%.project%
  &s .preselect =
%.commandpath%/%.project%/%.file%.hgs
  &s .calcproject = %.commandpath%/%.project%
  &s .calcselect =
%.commandpath%/%.project%/%.file%.hgs
  &r postviewresult
  &if %.main% &then
  &do
    &goto close
  &end
  &else
  &do
    &goto postselect
  &end
&end
/*
/*********************************************
/* This label stops the post-processing module
/* and returns to the main-menu.
/*********************************************
/*
&label close
&do
  &workspace %.workspace%
  &return
&end
```

Listing postproject.menu

```
/* ================================================
/* postproject.menu
/* ------------------------------------------------
/* In this AML a project, consisting of several out-
/* put-files, can be selected for post-processing.
/* ================================================
/* Invokes:
/* ================================================
/* Is invoked by: post.aml
/* ================================================
/*
7 postproject.menu
/*

 Projects:

 %i1
                    ^Select the project you wish to
use for
                    ^post-processing and press the
'Select'-
                    ^button.

                    ^Press the 'Cancel'-button to go
back to
                    ^the previous menu.




          %b1                  %b2

%i1 INPUT .postproject 40 typein yes scroll yes rows 10 ~
 required file * -directory
%b1 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b2 BUTTON ~
 HELP ' Press "Select"-button to go to the output-files of the
selected project.' ~
 'Select' &s .project [entryname %.postproject%]; &return
```

Listing postselect.menu

```
/* ================================================
/* postselect.menu
/* ------------------------------------------------
/* In this menu an output-file is selected for post-
/* processing.
/* ================================================
/* Invokes: readsubject.aml
/* ================================================
/* Is invoked by: post.aml
/* ================================================
/*
7 postselect.menu
/*

 Output-files:              ^Subject of the selected
output-file

 %i1                  --------------------------------

                    %d1
                    %d2
                    %d3

                    --------------------------------

                    ^Select the output-file you wish
to use for
                    ^post-processing and press the
'Select'-
                    ^button.

                    ^Press the 'Cancel'-button to go
back to
                    ^the previous menu.

                    ^Press the 'MAIN'-button to go
back to the
                    ^MAIN Menu.

     %b1        %b2              %b3

%i1 INPUT .postselect 40 typein yes scroll yes rows 16 ~
 required return '&s filepath [entryname %.postselect%]; &s
.file = %filepath%.hgs; ~
          &workspace %.commandpath%/%.project%; &r
readsubject; ~
          &workspace %.outputpath%/%.project%' file * -
directory
%b1 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .main = .true.; &return
%b2 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b3 BUTTON ~
 HELP ' Press "Select"-button to use the selected output-file
for post-processing.' ~
 'Select' &s .file [entryname %.postselect%]; ~
       &s .file [before %.file% .]; &return
%d1 DISPLAY .title1 32 value
%d2 DISPLAY .title2 32 value
%d3 DISPLAY .title3 32 value
%formopt setvariables immediate
```

Listing postviewresult.aml

```
/* ===========================================
/* postviewresult.aml
/* -------------------------------------------
/* In this AML a presentation can be selected.
/* The HISWA outputfiles are translated into GRID's.
/* ===========================================
/* Invokes: postpresentation.menu, print.menu en
/*          postcomparison.menu
/* ===========================================
/* Is invoked by: post.aml
/* ===========================================
/*
&workspace %.outputpath%/%.project%/%.file%
&s .scale3d = 0
&s .scaleiso = 0
/*
/*************************************************
/* In this part of the AML the FRAME command is read
/* from the selected command-file and split up to be
/* assigned to values for the GRID-header. All these
/* values are written to a file called TEMP.
/*************************************************
/*
&if [exists %.outputpath%/%.project%/%.file%/temp] =
.false. &then
&do
  &s correct = .false.
  &s file = %.commandpath%/%.project%/%.file%.hgs
  &s fileunit = [open %file% openstatus -read]
  &if %openstatus% <> 0 &then
  &do
    &type 'Error opening file.'
    &return
  &end
  &else
  &do counter = 0 &repeat %counter% + 1 &until
%correct%
    &s line [read %fileunit% readstatus]
    &s lineunquote = [unquote %line%]
    &s commando [extract 1 %lineunquote%]
    &if %commando% = FRAME &then
    &do
      &s correct = .true.
    &end
  &end
  &if [close %fileunit%] <> 0 &then
  &do
    &type 'Error closing file.'
    &return
  &end
  &s angle = [extract 7 %lineunquote%]
  &s .length = [extract 3 %lineunquote%]
  &s NCOLS = [extract 8 %lineunquote%]
  &s .NCOLS = [calc %NCOLS% + 1]
  &s NROWS = [extract 9 %lineunquote%]
  &s .NROWS = [calc %NROWS% + 1]
  &s .CELLSIZE = [calc %.length% / %NCOLS%]
  &workspace %.outputpath%/%.project%/%.file%
  &s fileunit = [open temp openstatus -write]
  &if %openstatus% <> 0 &then
  &do
    &type 'Error opening file.'
    &return
  &end
  &s writestat = [write %fileunit% 'NCOLS '%.NCOLS%]
  &s writestat = [write %fileunit% 'NROWS '%.NROWS%]
  &s writestat = [write %fileunit% 'XLLCORNER 0']
  &s writestat = [write %fileunit% 'YLLCORNER 0']
  &s writestat = [write %fileunit% 'CELLSIZE
'%.CELLSIZE%]
  &if [close %fileunit%] <> 0 &then
  &do
    &type 'Error closing file.'
    &return
  &end
&end
&goto printresult
/*
/*************************************************
/* In this label the menu, in which the presentation
/* can be selected, is invoked. The TEMP file and the
/* HISWA output-file are combined to a GRID used for
/* presentation purposes. The label necessary for the
/* selected presentation is invoked.
/*************************************************
/*
&label printresult
&do
  &s .main = .false.
  &s .cancel = .false.
  &s .print = ''
  &s .comparison = .false.
  &s .tableview = .false.
  &menu postpresentation &pinaction '&goto close'
&position &cc ~
   &size &frame 635 475 &stripe 'Results Presentation
Menu'
  &if %.main% &then &goto close
  &else
  &do
    &if %.cancel% &then &goto close
    &else
    &do
      &s gridfile = [entryname %.parameter%]
      &s gridinfile = [before %gridfile% .tab]
      &s gridoutfile grid%gridinfile%
      &if [exists %gridoutfile% -directory] = .false. &then
      &do
        &system cat
%.outputpath%/%.project%/%.file%/temp %.parameter% >
%gridinfile%
        asciigrid %gridinfile% %gridoutfile% float
      &end
      &if %.tableview% &then
      &do
        &call table
        &goto printresult
      &end
      &if %.comparison% &then
      &do
        &s .title1 =
        &s .title2 =
        &s .title3 =
        &s .postgrid2nd =
        &s .cancel = .false.
        &workspace %.outputpath%/%.project%
        &call comparisonmenu
        &if %.cancel% &then
        &do
          &workspace %.outputpath%/%.project%/%.file%
          &goto printresult
        &end
        &workspace %.outputpath%/%.project%/%.file%
        &if [exists
%.outputpath%/%.project%/%.file%/temp2] = .true. &then
```

```
        &do
          &system rm
%.outputpath%/%.project%/%.file%/temp2
        &end
        &s correct = .false.
        &s file [entryname %.postgrid2nd%]
        &s file = %.commandpath%/%.project%/%file%.hgs
        &s fileunit = [open %file% openstatus -read]
        &if %openstatus% <> 0 &then
        &do
          &type 'Error opening file.'
          &return
        &end
        &else
        &do counter = 0 &repeat %counter% + 1 &until
%correct%
          &s line [read %fileunit% readstatus]
          &s lineunquote = [unquote %line%]
          &s commando [extract 1 %lineunquote%]
          &if %commando% = FRAME &then
          &do
            &s correct = .true.
          &end
        &end
        &if [close %fileunit%] <> 0 &then
        &do
          &type 'Error closing file.'
          &return
        &end
        &s angle = [extract 7 %lineunquote%]
        &s .length = [extract 3 %lineunquote%]
        &s NCOLS = [extract 8 %lineunquote%]
        &s .NCOLS = [calc %NCOLS% + 1]
        &s NROWS = [extract 9 %lineunquote%]
        &s .NROWS = [calc %NROWS% + 1]
        &s .CELLSIZE = [calc %.length% / %NCOLS%]
        &workspace %.outputpath%/%.project%/%.file%
        &s fileunit = [open temp2 openstatus -write]
        &if %openstatus% <> 0 &then
        &do
          &type 'Error opening file.'
          &return
        &end
        &s writestat = [write %fileunit% 'NCOLS
'%.NCOLS%]
        &s writestat = [write %fileunit% 'NROWS
'%.NROWS%]
        &s writestat = [write %fileunit% 'XLLCORNER 0']
        &s writestat = [write %fileunit% 'YLLCORNER 0']
        &s writestat = [write %fileunit% 'CELLSIZE
'%.CELLSIZE%]
        &if [close %fileunit%] <> 0 &then
        &do
          &type 'Error closing file.'
          &return
        &end
        &s parameter [entryname %.parameter%]
        &s parameter %.postgrid2nd%/%parameter%
        &messages &off
        &if [exists grid2nd -directory] = .true. &then kill
grid2nd
        &if [exists comparisonfile] &then &system rm
comparisonfile
        &if [exists gridcomp -grid] &then kill gridcomp
        &system cat temp2 %parameter% > comparisonfile
        asciigrid comparisonfile grid2nd float
        display %.plotfile%
        grid
        gridcomp = %gridoutfile% - grid2nd
        &s gridoutfile = gridcomp
          quit
          &messages &popup
          display %.display%
          &call apstart
          &call %.resultview%
        &end
        &else
        &do
          &call apstart
          &call %.resultview%
        &end
        &menu print &pinaction '&return' &position &lr
&display &lr ~
         &size &frame 345 100 &stripe 'Print Results Menu'
        &if %.print% = printer &then
        &do
          &if [exists %gridinfile%.ps] &then
          &do counter = 1 ~
            &repeat %counter% + 1 &until [exists
%gridinfile%%counter%.ps] = .false.
            &s plotfile %gridinfile%%counter%.ps
          &end
          &else
          &do
            &s plotfile %gridinfile%.ps
          &end
          &call makepsfile
          &system print %plotfile%
          &system rm %plotfile%
        &end
        &if %.print% = file &then
        &do
          &if [exists %gridinfile%.ps] &then
          &do counter = 1 ~
            &repeat %counter% + 1 &until [exists
%gridinfile%%counter%.ps] = .false.
            &s plotfile %gridinfile%%counter%.ps
          &end
          &else
          &do
            &s plotfile %gridinfile%.ps
          &end
          &call makepsfile
        &end
        quit
        &messages &popup
        &goto printresult
      &end
    &end
  &end
  /*
  /*****************************************
  /* This label stops the presentation-menu
  /* and returns either to the previous menu
  /* or to the main-menu.
  /*****************************************
  /*
  &label close
  &do
    &workspace %.outputpath%/%.project%
    &return
  &end
  /*
  /*************************************************
  /* In this routine Arcplot is started in the correct way.
  /*************************************************
  /*
  &routine apstart
    &describe %gridoutfile%
    &s ramp [abs [calc %grd$zmax% - %grd$zmin%]]
```

```
  &do &while %ramp% > 1000
    &setvar ramp [calc %ramp% / 10]
  &end
  &do &while %ramp% < 10
    &setvar ramp [calc %ramp% * 10]
  &end
  &s ramp [round %ramp%]
  &s scale3d [calc 10 ** %.scale3d%]
  &s scaleiso [calc 10 ** %.scaleiso%]
  &messages &off
  display 9999
  ap
  lineset color
  shadeset colornames
  gridnodatasymbol 69
  textset font
  &s width [calc %grd$xmax% - %grd$xmin%]
  &s height [calc %grd$ymax% - %grd$ymin%]
  &select %.resultview%
    &when 2d
    &do
      pagesize %width% %height%
      mapex %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
      maplimits %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
      units map
      pageextent %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
    &end
    &when 3d
    &do
      pagesize device
      mapex %gridoutfile%
      units map
      pageextent page
    &end
    &when isolines
    &do
      pagesize %width% %height%
      mapex %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
      units map
      pageextent %grd$xmin% %grd$ymin% %grd$xmax%
%grd$ymax%
    &end
  &end
  &return
&end
/*
/*****************************************
/* This routine displays the GRID in 2D.
/* This routine is also used for comparison
/*****************************************
/*
&routine 2d
  &s scaletrue = .false.
  linecolor black
  shadecolorramp 1 %ramp% white navy
  gridquery %gridoutfile% value # # value <> 0
  &return
&end
/*
/*****************************************
/* This routine displays the GRID in 3D.
/*****************************************
/*
&routine 3d
  &s scaletrue = .false.
  &if %.print% = '' &then linecolor white
  &else linecolor black
  surface lattice %gridoutfile% %scale3d%
  surfacedefaults
  surfacedrape mesh fishnet
  linecolor black
  &return
&end
/*
/*****************************************
/* This routine displays the GRID in isolines.
/*****************************************
/*
&routine isolines
  &s correct = .false.
  &s file = %.commandpath%/%.project%/%.file%.hgs
  &s fileunit = [open %file% openstatus -read]
  &if %openstatus% <> 0 &then
  &do
    &type 'Error opening file.'
    &return
  &end
  &else
  &do counter = 0 &repeat %counter% + 1 &until
%correct%
    &s line [read %fileunit% readstatus]
    &s lineunquote = [unquote %line%]
    &s commando [extract 1 %lineunquote%]
    &if %commando% = READ &then
    &do
      &s correct = .true.
    &end
  &end
  &if [close %fileunit%] <> 0 &then
  &do
    &type 'Error closing file.'
    &return
  &end
  &s readfac [extract 4 %lineunquote%]
  &select %readfac%
    &when 1
      &s units meter(s)
    &when 0.1
      &s units decimeter(s)
    &when 0.01
      &s units centimeter(s)
  &end
  &s scale = '1 isoline / '%scaleiso%' '%units%' bottomdepth'
  &s scale [unquote %scale%]
  &s scaletrue = .true.
  linecolor black
  shadecolorramp 1 %ramp% white navy
  gridquery %gridoutfile% value # # value <> 0
  surface lattice %gridoutfile%
  surfacedefaults
  surfacecontours %scaleiso%
  &return
&end
/*
/*****************************************
/* This routine invokes the menu in which
/* the second output-file can be selected
/* for comparison.
/*****************************************
/*
&routine comparisonmenu
  &menu postcomparison.menu &pinaction 'goto close'
&position &cc ~
   &size &frame 655 470 &stripe 'Select Comparison Menu'
  &return
&end
```

```
/*
/**************************************
/* This routine starts the texteditor
/* to look at the output-file.
/**************************************
/*
&routine table
  &system textedit %gridinfile%
  &return
&end
/*
/**************************************
/* This routine makes the layout of the
/* postscript-file.
/**************************************
/*
&routine makepsfile
  &s date [date -cal]
  &s time [date -ampm]
  display [unquote %.plotfile%]
  %plotfile%
  lineset color
  linecolor black
  shadeset colornames
  textset font
  pageunits cm
  pagesize 21 29
  pageex page
  mapposition cen cen
  mapex %gridoutfile%
  maplimits 2 6.5 19 23.5
  surfacelimits 2 6.5 19 23.5
  &call %.resultview%
  box 1 1 20 28
  box 2 24 19 27
  box 2 6.5 19 23.5
  box 2 2 19 6
  textquality proportional
  textjustification cl
  textfont times
  move 3 26.5
  textsize 0.8
  text 'HISGIS - RESULT PRESENTATION
  &if %.comparison% &then
  &do
    move 3 25.4
    textsize 0.5
    text 'Resultfile:'
    move 5.5 25.4
    text %.file%
    move 11 25.4
    text 'Parameter:'
    move 13.5 25.4
    &s result [entryname %.parameter%]
    &s result [before %result% .]
    text %result%
    move 3 24.6
    textsize 0.4
    text 'Comparison with'
    move 5.9 24.6
    &s comp2 [entryname %.postgrid2nd%]
    &s comp2 [before %comp2% .]
    text %comp2%
  &end
  &else
  &do
    move 3 25.4
    textsize 0.5
    text 'Resultfile:'
    move 5.5 25.4
    text %.file%
    move 11 25.4
    text 'Parameter:'
    move 13.5 25.4
    &s result [entryname %.parameter%]
    &s result [before %result% .]
    text %result%
    move 3 24.6
    textsize 0.4
    text %.resultview%
    &if %scaletrue% &then
    &do
      move 4.25 24.6
    &end
    &else
    &do
      move 3.5 24.6
    &end
    text '- representation'
  &end
  &if %scaletrue% &then
  &do
    move 10.5 24.6
    text [quote %scale%]
  &end
  move 3 5.5
  textsize 0.4
  text %.companyname%
  move 3 5
  textsize 0.4
  text %.department%
  move 3 4.5
  text %.address%
  move 3 4
  text %.city%
  move 3 3.5
  text %.country%
  move 3 3
  text 'Tel. '
  move 3.7 3
  text %.phone%
  move 14 5.5
  textsize 0.4
  text 'Created by: '
  move 14 4.5
  text %.name%
  move 14 4
  text [quote %date%]
  move 14 3.5
  text [quote %time%]
  &return
&end
```

Listing postpresentation.menu

```
/* ==========================================
/* postpresentation.menu
/* ------------------------------------------
/* In this menu a result-presentation can be selected.
/* Also a result-parameter can be selected.
/* ==========================================
/* Invokes:
/* ==========================================
/* Is invoked by: postviewresult.aml
/* ==========================================
/*
7 postpresentation.menu
/*

 Presentations of results of the calculation:

 %b3       %b4       %b5       %b6       %b7


 Parameters:

 %i1                                    x
                        Z-factor 3D pictures (value * 10  ):

                        %s01


                                       x
                        Isolines interval (1 isoline / 10
units):

                        %s02



          %b1                        %b2

%i1 INPUT .parameter 40 typein no scroll yes rows 13 ~
 required file *.tab -file -noext
%b1 BUTTON cancel ~
 HELP ' Press "MAIN"-button to go back to the MAIN
Menu.' ~
 'MAIN' &s .main = .true.; &delvar .parameter; &return
%b2 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &delvar .parameter; &return
%b3 BUTTON ~
 HELP ' Press "2D-view picture"-button to view a 2D picture
of the selected results.' ~
 '2D-view picture' &s .resultview = 2d; &return
%b4 BUTTON ~
 HELP ' Press "3D-view picture"-button to view a 3D picture
of the selected results.' ~
 '3D-view picture' &s .resultview = 3d; &return
%b5 BUTTON ~
 HELP ' Press "Isolines picture"-button to view an isolines
picture of the selected results.' ~
 'Isolines picture' &s .resultview = isolines; &return
%b6 BUTTON ~
 HELP ' Press "Comparison"-button to make a comparison
between the selected results of two runs.' ~
 'Comparison' &s .comparison = .true.; &return
%b7 BUTTON ~
 HELP ' Press "Table"-button to view a table of the selected
results.' ~
 'Table' &s .tableview = .true.; &return
%s01 SLIDER .scale3d 30 step 0.1 real -3 3
%s02 SLIDER .scaleiso 30 step 0.1 real -3 3
```

Listing postcomparison.menu

```
/* ==========================================
/* postcomparison.menu
/* ------------------------------------------
/* In this menu a second output-file can be selected
/* for comparison.
/* ==========================================
/* Invokes: readsubject.aml
/* ==========================================
/* Is invoked by: postviewresult.aml
/* ==========================================
/*
7 postselect.menu
/*

 Output-files:                  ^Subject of the selected
output-file

 %i1                            ------------------------------

                          %d1
                          %d2
                          %d3

                          ------------------------------

                          ^Select the output-file you wish
to use for
                          ^comparison and press the
'Select'-button.

                          ^Press the 'Cancel'-button to go
back to
                          ^the previous menu.




          %b1                %b2      %b3      %b4

%i1 INPUT .postgrid2nd 40 typein yes scroll yes rows 16 ~
 required return '&s file1st = %.file%; ~
          &s filepath [entryname %.postgrid2nd%]; ~
          &s .file = %filepath%.hgs; ~
          &workspace %.commandpath%/%.project%; ~
          &r readsubject; ~
          &workspace %.outputpath%/%.project%; ~
          &s .file = %file1st%' file * -directory
%b1 BUTTON cancel ~
 HELP ' Press "Cancel"-button to go back to the previous
menu.' ~
 'Cancel' &s .cancel = .true.; &return
%b2 BUTTON ~
 HELP ' Press "2D-view"-button to use the selected output-
file for comparison in 2D.' ~
 '2D-view' &s .resultview = 2d; &return
%b3 BUTTON ~
 HELP ' Press "3D-view"-button to use the selected output-
file for comparison in 3D.' ~
 '3D-view' &s .resultview = 3d; &return
%b4 BUTTON ~
 HELP ' Press "isolines"-button to use the selected output-file
for comparison in isolines.' ~
 'Isolines' &s .resultview = isolines; &return
%d1 DISPLAY .title1 32 value
%d2 DISPLAY .title2 32 value
%d3 DISPLAY .title3 32 value
%formopt setvariables immediate
```