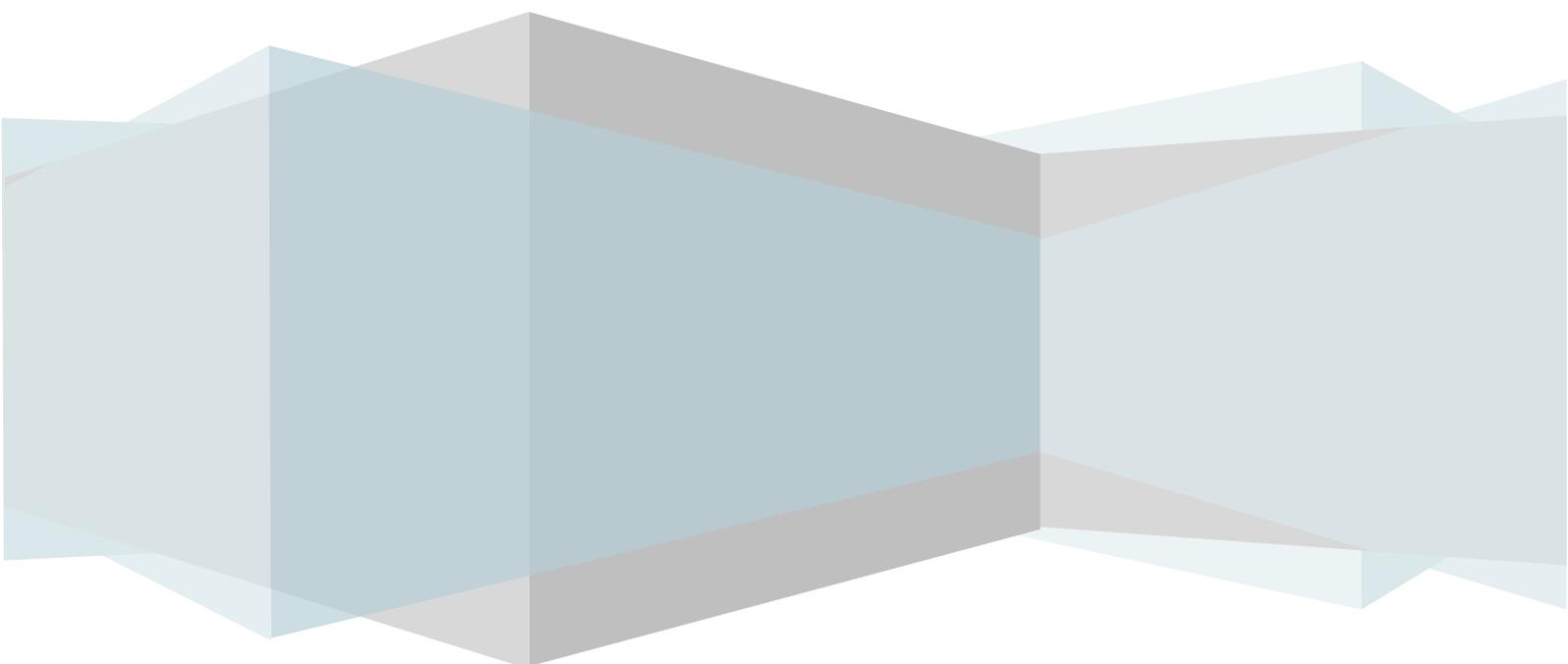


SURVIVAL GUIDE TO USE THE NEW HYDROSWEEP DS3 ON FS-POLARSTERN

Expedition ANTXXVII/1, October-November 2010

Laura Fillinger, PhD student, AWI



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INTRODUCTION

GOAL OF THIS GUIDE

This guide has been developed in order to help non specialists to get an image of the seafloor with the new multibeam echo sounder Hydrosweep DS3 on the R.V. Polarstern when no one from the bathymetry section is on board.

It focuses on the steps needed from turning on the acoustic device until getting an acceptable display in Hypack.

This instrument is anything but trivial. There are many things you could do wrong so please try to stay in the frame described within those pages. Think other people will come after you who also would like to use it without having to fight with the parameters that you might have changed.

The author (who hasn't studied bathymetry) would like to remind the people interested in using the multibeam to map the seafloor that they should get help from a specialist!

Nevertheless, she has written this guide because it wasn't possible for her so she understands you!

Have a nice and successful cruise!!!
Might the Hydrosweep be nice with you!!!

P.S. When you actually get it to run properly, avoid changing the parameters again unless necessary!!!

THINGS YOU WILL NEED

HARDWARE

- Serial-usb adaptor
- Ethernet cable
- External disc (1Tera)
- CDRW/DVDRW

- For Valeport (if used): Batteries Duracell Procell C MN1400 LR14 1.5V Alkaline

SOFTWARE

CDs with setups as backup!!

Some dongles are available for additional licenses (check with the bathymetry section).

| Type of work | Software | Application | Availability |
|-----------------|------------------------|--|--|
| Data recording | DataLog Express | Deployment/recovery of Valeport (SVP) | CD on board with instrument |
| Data recording | CTD software | Deployment/recovery of Seabird CTD | Installed on a computer on Polarstern |
| Data processing | SVP.exe | SVP data cleaning for integration to Hypack | Installed in HS room on Polarstern |
| Network | Atlas Hydromap Server | Communication between database and system | Installed in HS room on Polarstern |
| Data recording | Atlas Hydromap Control | Setup the connection with the multibeam echo sounder | Installed in HS room on Polarstern |
| Data recording | Hypack | Software associated to Hydrosweep Real time display of multibeam bathymetry and side scan sonar | Installed in HS room on Polarstern, on the bridge and in the winch control room. |
| Network | UltraVNC Viewer | Display screens from one computer on another | Installed in HS room on Polarstern, on the bridge and in the winch control room. |
| Network | UltraVNC Server | Get license from one computer on another | Installed in HS room on Polarstern, on the bridge and in the winch control room. |

DATA

We recommend you to get in touch with the AWI Bathymetry section before your cruise in order to check if there are any existing charts for the area where you intend to work.

Data that might be useful onboard:

- Past CTD/SVP profiles of the area in case you are unable to do one by yourself
- Existing georeferenced maps of the seafloor (geotif) in your area. (Can be opened in Hypack.)

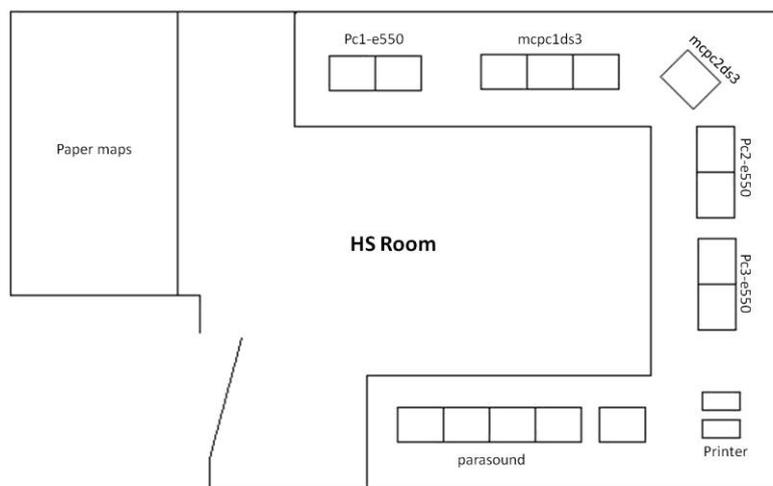
This data will help you setting priorities, choosing the useful parameters and checking where data is already available in order to complete the charts or to spare time.

WHERE IS WHAT?

ROOM DESCRIPTION

The Hydrosweep (HS) room is located on the E deck (E-550 “Technische Büro” “HS-PS Zentrale”) on Polarstern. The following drawing show you the location of the bathymetry dedicated computers, their name and the number of screens available for each.

To avoid unnecessary warming of the room please switch off all unused computers **EXCEPT Pc1-e550** which has to remain switched on all the time!!!



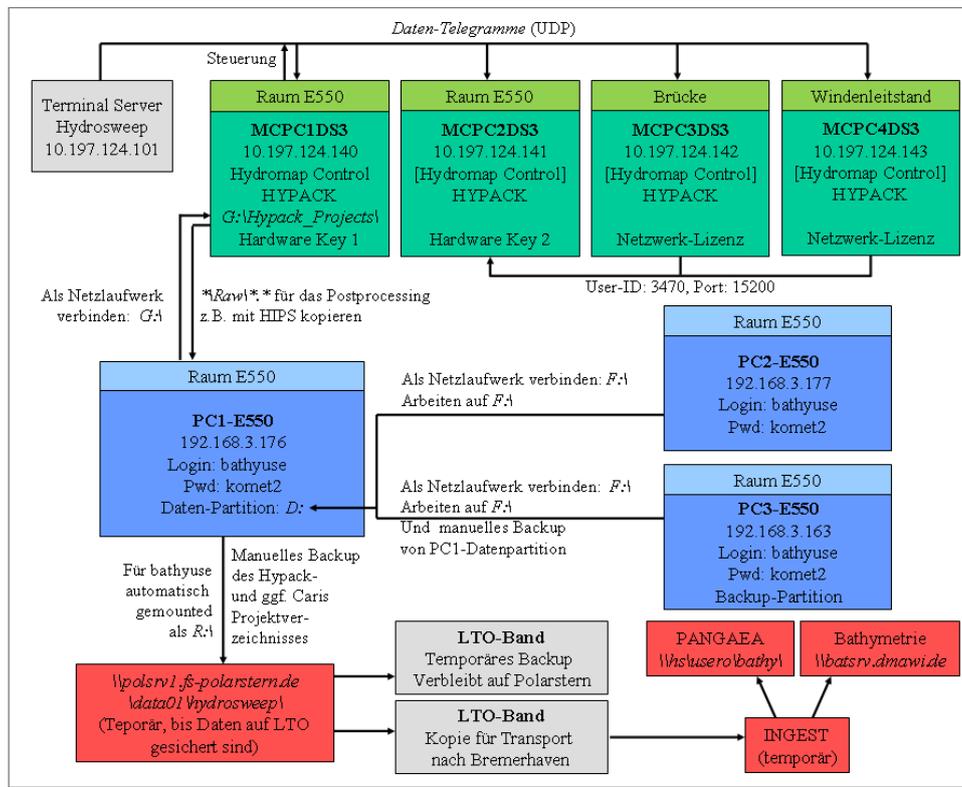
SOFTWARE

The following table lists the software available on each computer of the HS room that you might need.

| Computer | Software | Path |
|--|--|---|
| Pc1-e550: server Login: bathyuse Password: komet2 | Svp.exe Trackplaner.exe | D:\software\executables D:\software\executables |
| Pc2-e550 Login: bathyuse Password: komet2 | Svp.exe Trackplaner.exe | F:\software\executables F:\software\executables |
| Pc3-e550 Login: bathyuse Password: komet2 | Svp.exe Trackplaner.exe | F:\software\executables F:\software\executables |
| Mcp1ds3 | Atlas Hydromap Server Atlas Hydromap Control Atlas Sensor Manager Hypack UltraVNC Viewer | Desktop Desktop Desktop Desktop Desktop |
| Mcp2ds3 | Atlas Hydromap Server Atlas Hydromap Control Atlas Sensor Manager Hypack UltraVNC Viewer | Desktop Desktop Desktop Desktop Desktop |
| Mcp3ds3 (on bridge) | Hypack UltraVNC Viewer | Desktop Desktop |
| Mcp4ds3 (in winch control room) | Hypack UltraVNC Viewer | Desktop Desktop |

SYSTEM

The following drawing describes the infrastructure of the Hydrosweep system and the data flow.



CALIBRATION

Calibration is needed when a new echo sounder or a new component is installed. It is a complex procedure which should only be executed by experienced staff of the bathymetry section.

As calibration has been done during ANTXXVII/1, it shouldn't be needed for the upcoming expeditions unless some components are replaced.

SOUND VELOCITY PROFILES (SVP)

Sound velocity profiles are needed to get precise measurements of the bathymetry with a multibeam echo sounder. They should be recorded at least once for each region to be mapped (more often if you expect the profile to change significantly):

- Before the mapping starts for direct display of precise depth
- During the survey if the profile changes or if else not possible
- After the survey (from theoretical models) for integration during the post processing.

SVP can be calculated from CTD profiles or measured via a Valeport. The best option is to measure the SVP **down to the sea bottom**. If this reveals impossible, you will have to extrapolate the profile by yourself.

CTD: CONDUCTIVITY, TEMPERATURE, DEPTH PROFILER

On stations where the CTD is deployed anyway, you can determine the sound velocity profile from the CTD data to spare time.

In this case you don't have to worry about programming the CTD and recovering the data, some people will be busy doing it!

Several calculations can be made from the raw data. You just have to describe what you need to the people responsible for the data collection.

You need the sound velocity calculated in 1m depth increment on the way down.

VALEPORT: SOUND VELOCITY PROFILER

In case no CTD profile is planned on the area where you want to use the multibeam echo sounder the easiest way to get the SVP is to use the Valeport available onboard.

CHARACTERISTICS OF THE POLARSTERN VALEPORT

Onboard FS Polarstern is a Valeport Limited, MIDAS SVP with the following sensors:

- **Sound velocity sensor:** range 1400 to 1600m/s, accuracy ~0.03m/s, resolution 0.001m/s
- **Pressure sensor:** temperature compensated, range 600Bar (6000m depth), precision ~0.6m, resolution 0.06m
- **Temperature sensor:** range -5 to 35°C, accuracy ~0.01°C, resolution 0.002°C

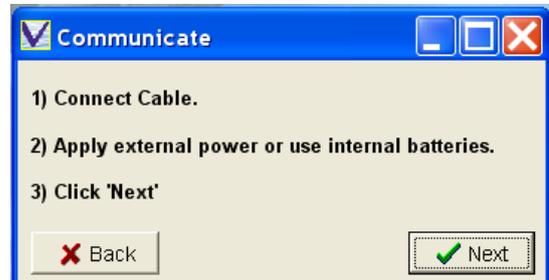
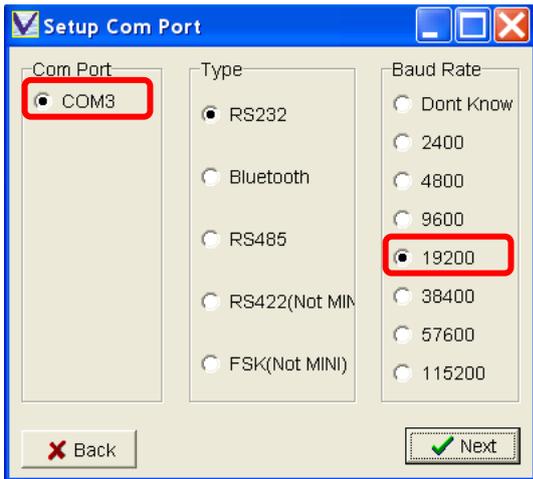
VALEPORT: PROGRAMMING AND DEPLOYMENT

Software: DataLog Express

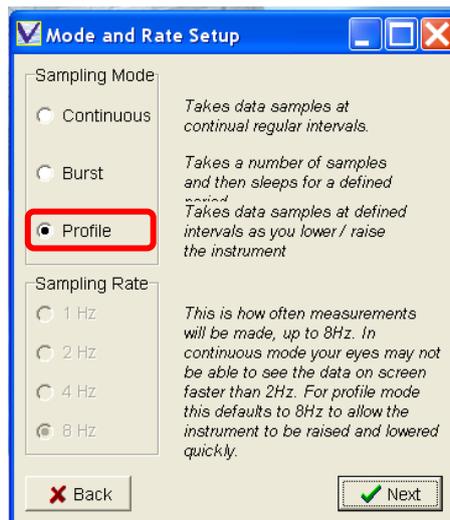
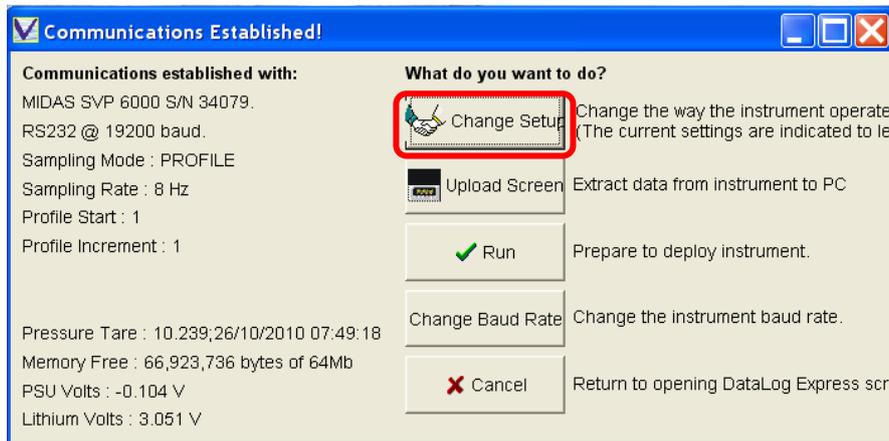
START COMMUNICATION

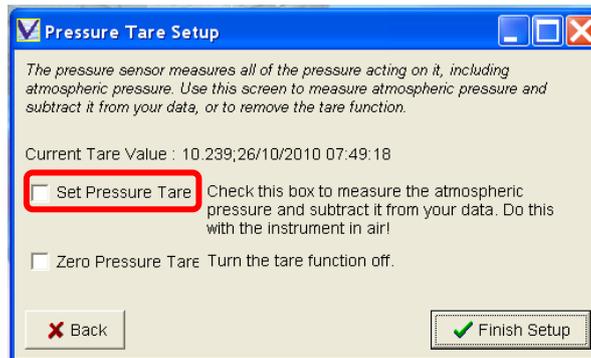
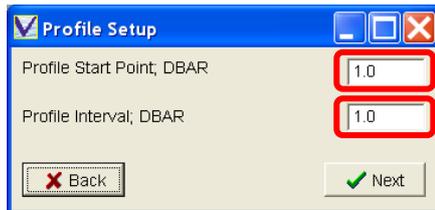
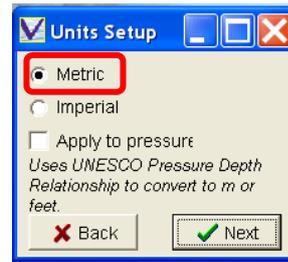
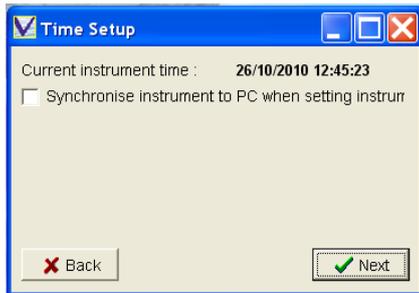


Check the Com Port number!!



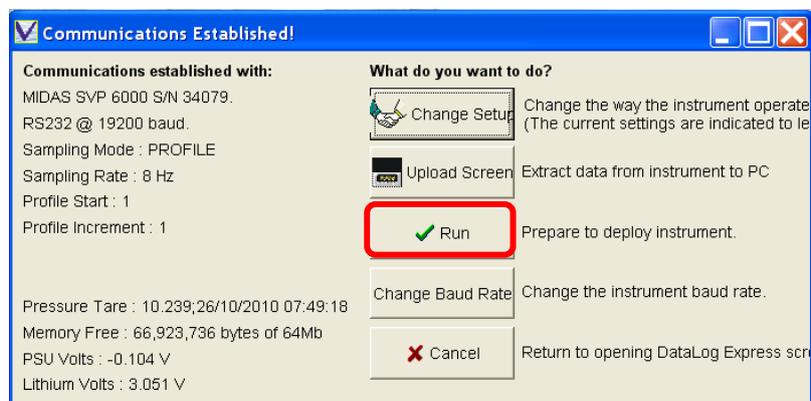
VALEPORT SETUP

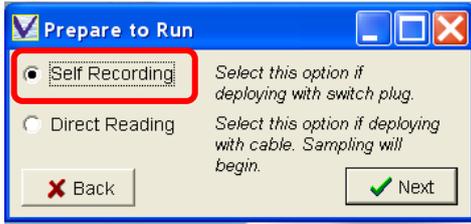




Set pressure tare: measures the pressure at sea level (atmosphere) and subtract this value from each subsequent pressure reading (recommended for profiling mode)
Zero pressure tare: take into account variations of the atmospheric pressure (added as a text file to the program, recommended for long term deployment).

VALEPORT DEPLOYMENT

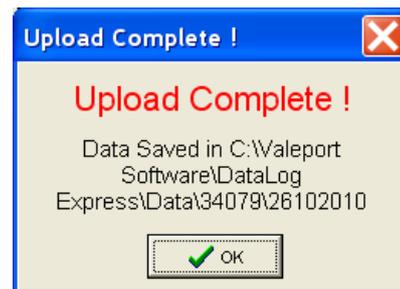
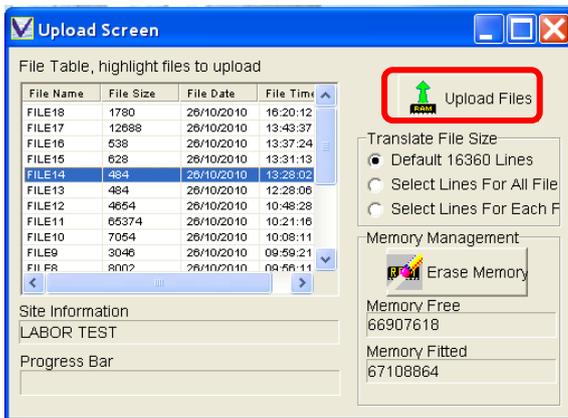
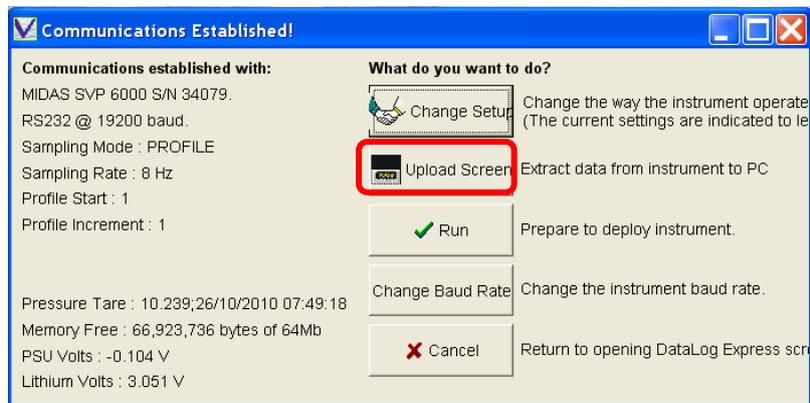




VALEPORT: DATA RECOVERY

Start the communication with the instrument as described in the start communication section.

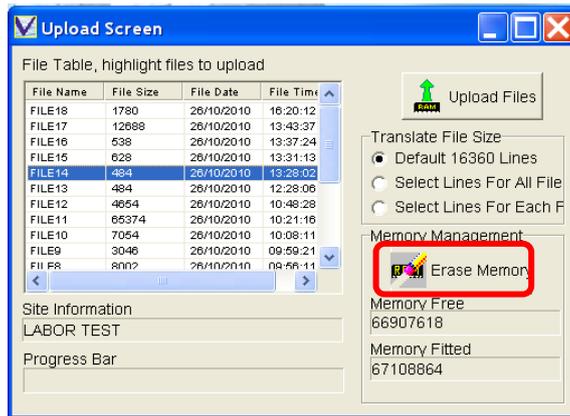
DOWNLOAD DATA FROM INSTRUMENT



Data are stored by default in:

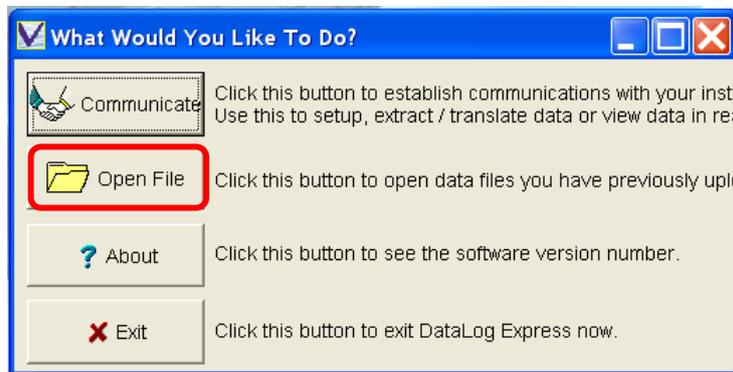
C:\Valeport Software\DataLog Express\Data\34079\ddmmYYYY

If the data are safe and there is a need for space in the instrument memory it is possible to erase the data.



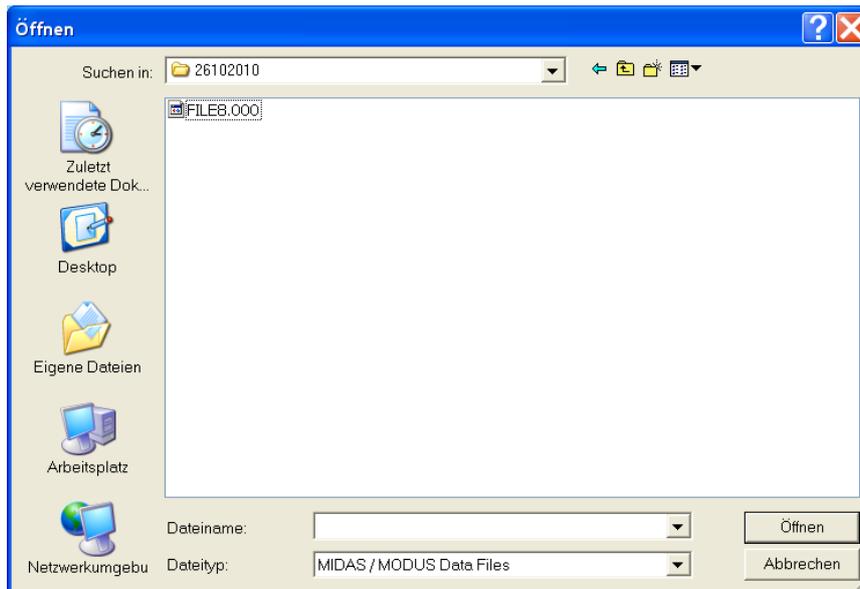
OPEN FILE

Either directly from the dialog that opens when DataLog Express is started:



Or from the menu: File> Open file (ctrl+O)

In both cases you land on the following interface:

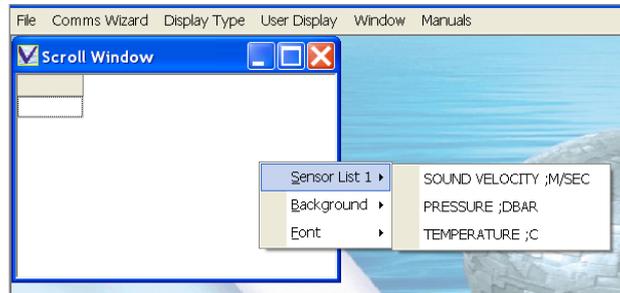


Data are stored by default in:
 C:\Valeport Software\DataLog Express\Data\34079\ddmmyyyy

When you open the file nothing seems to happen: you need to choose a display type.

For this in the menu bar: display type>scroll display

At first the window appears empty of records, but if you right click on it, you can choose the sensors you'd like to display.



Types of display:

Scroll display

| Date | Time | SOUND VELOCITY;M | PRESSURE;DBAR | TEMPERATURE;C |
|------------|----------|------------------|---------------|---------------|
| 27/10/2010 | 13:58:50 | 0.000 | 0.025 | 14.923 |
| 27/10/2010 | 13:58:50 | 0.000 | -0.005 | 14.949 |
| 27/10/2010 | 13:58:49 | 1506.868 | 0.431 | 14.953 |
| 27/10/2010 | 13:58:47 | 1506.883 | 0.953 | 14.959 |
| 27/10/2010 | 13:58:47 | 1506.899 | 1.463 | 14.959 |
| 27/10/2010 | 13:58:45 | 1506.895 | 1.975 | 14.951 |
| 27/10/2010 | 13:58:44 | 1506.884 | 2.466 | 14.937 |
| 27/10/2010 | 13:58:43 | 1506.861 | 2.957 | 14.935 |
| 27/10/2010 | 13:58:43 | 1506.859 | 3.428 | 14.939 |
| 27/10/2010 | 13:58:42 | 1506.882 | 3.866 | 14.946 |
| 27/10/2010 | 13:58:42 | 1506.909 | 4.456 | 14.945 |
| 27/10/2010 | 13:58:41 | 1506.920 | 4.965 | 14.945 |
| 27/10/2010 | 13:58:39 | 1506.917 | 5.460 | 14.934 |

Profile display



Graph display



You can organize several displays in the window and save your setting via:

User display> User display 1 (or 2)> Save

You can also name it: User display> User display 1 (or 2)> Rename

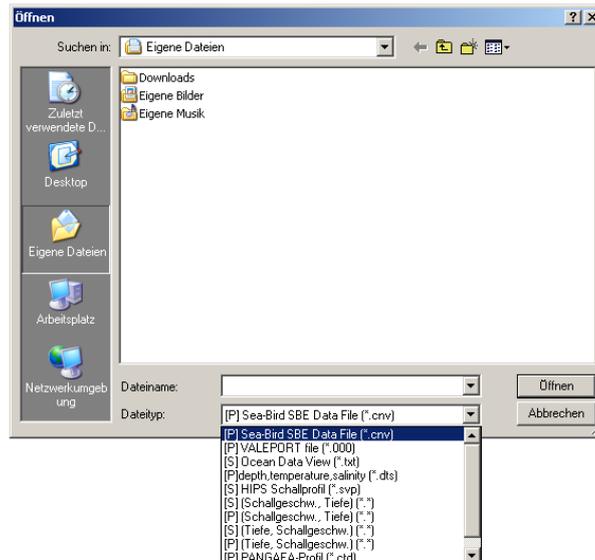
Next time you open a file you can load your display settings: User display> User display 1 (or 2)> Load

DATA CLEANING: SVP.EXE

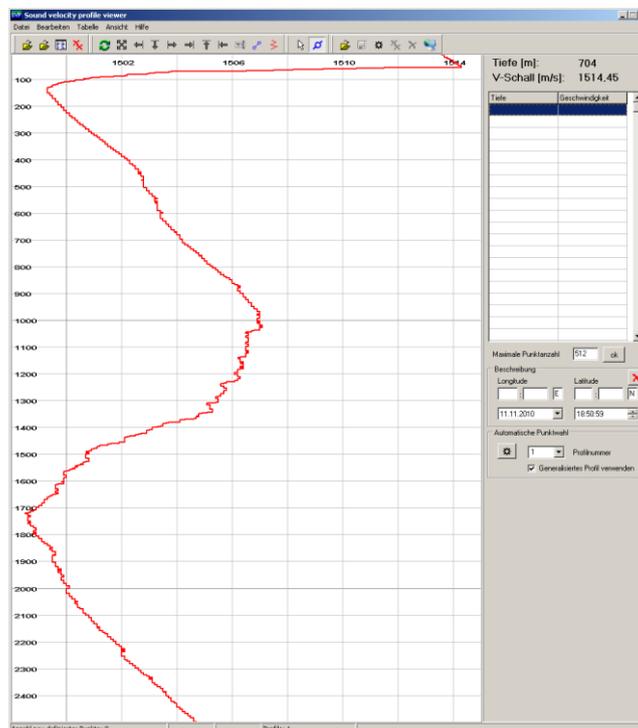
Hypack and Atlas Sensor Manager can integrate sound velocity profiles with a **maximum number of 512 data points for Hypack** and **about 128 for Atlas Sensor Manager**. Those data must also go **down to the sea bottom**. If your SVP or CTD file already fit to both those criteria then you might proceed further. If not it is necessary to prepare your CTD (.cnv) or SVP (.000) files before integrating them in Hypack and in Atlas Sensor Manager. For this you can use the small program `svp.exe`.

You can open CTD (.cnv) files containing sound velocity (check how to get these in the CTD section) or SVP (.000) files.

Datei > CTD öffnen



If you don't see your data it might be that the dots are only too small to be seen. You can use this icon  to draw a line linking them.



REDUCING THE NUMBER OF DATA POINTS

You have to fill the number of points you want (512 max for Hypack, 128 for Atlas Sensor Manager).

Maximale Punktzahl: 512 ok

Beschreibung

Longitude: [] E Latitude: [] N

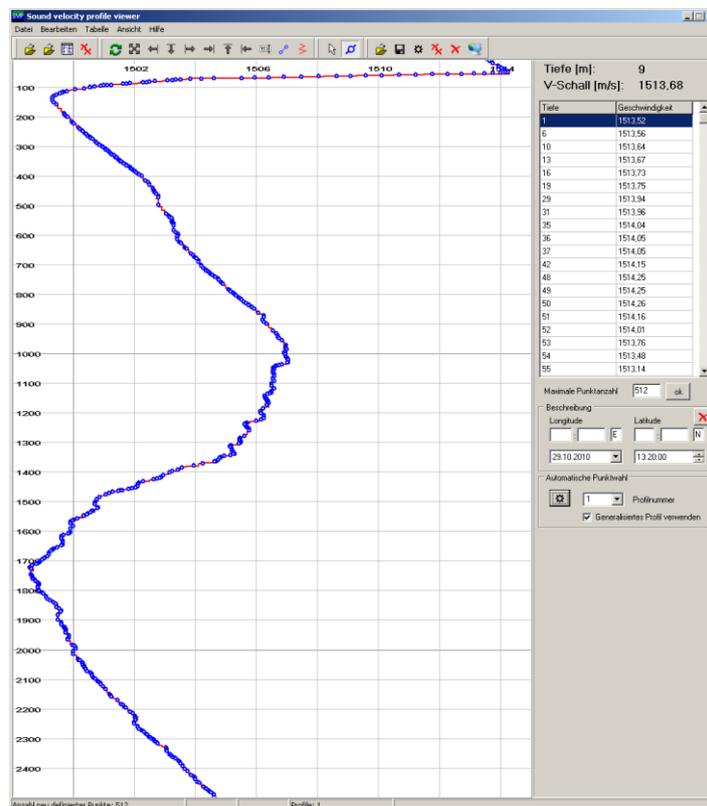
11.11.2010 18:50:59

Automatische Punktwahl

[] Profilnummer: 1

Generiertes Profil verwenden

And you can press this icon  to start the processing.



The program processes your profile to select 512 (the maximum number chosen) representative points. If there are some mistakes you can remove points manually by selecting them in the table and clicking this icon  in the menu bar (not near the coordinates).

EXTEND THE DATA TO THE SEA BOTTOM

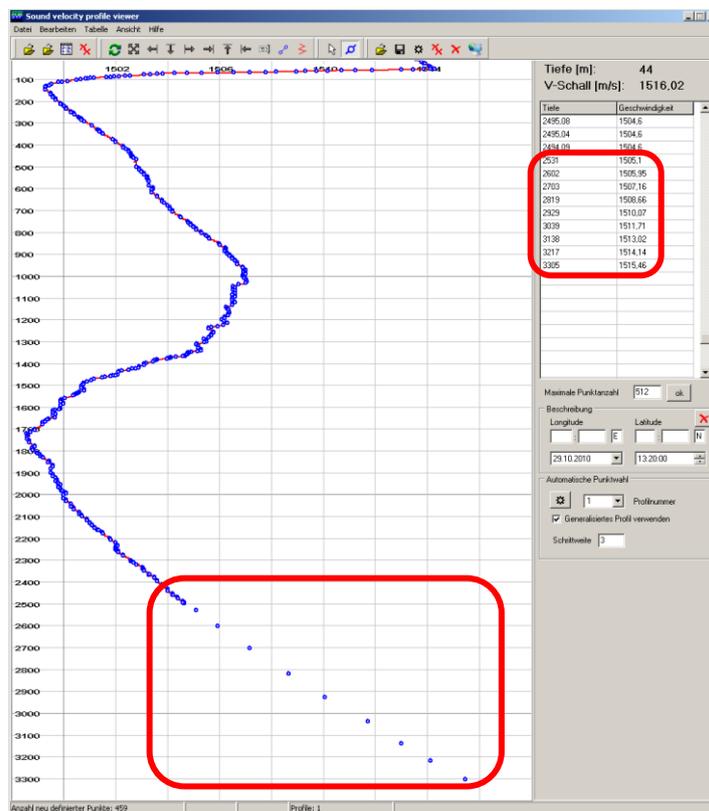
For your profile to be useful, it must go down to the seafloor. If for any reason you weren't able to get your instrument down to the bottom, you will have to extend it by hand in svp.exe.

For this, reduce your number of point below what is finally expected so that you can add some point without exceeding the maximum number (see previous section).

Then change the maximal number of point to the real max (512 or 128) again and click OK. You can now add points by hand.

These tools  enable you to extend your scale and panel for display so that you can add points deeper.

When this icon  is selected you can add points into your profile by simply clicking on the position where you wish to add your point. The drawn points are added to the table.



You can link those points with this icon . Go on until you reach the deeper point you expect to find (even a bit deeper).

Remark about the extension to the seafloor

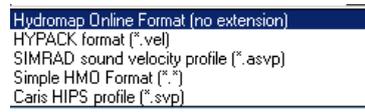
If you have no idea how the sound velocity varies with depth, some models exist (databases) or you could find older SVP. If you have no access to those, then we recommend you to extend your SVP below 1000-2000 m by keeping the same slope down to the floor (as drawn above).

Any comments by oceanographers are here more than welcome!!!

CREATING THE NECESSARY FILES

When your new profile is ready you can save it:

Tabelle > Speichern



- As a velocity file (.vel) for Hypack
- As Hydromap Online format (no extension) for Sensor Manager

We recommend you to create both formats.

ATLAS HYDROMAP CONTROL: TURN ON THE HYDROSWEEP AND BASIC SETUP

First of all you should ask the **ship technician** responsible for it to **turn on the sounder** and which **MINS** (1 or 2) is used (usually MINS1 is used and you should always be warned if the MINS are switched). (MINS are Marine Initial Navigation System used to smooth the raw GPS position, depending on the ship's movements)

HOW TO START?

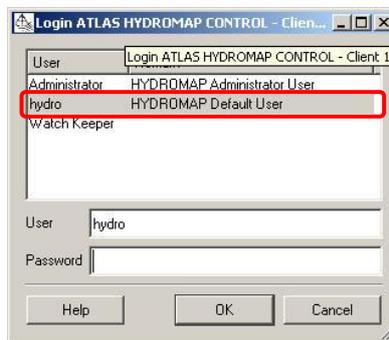
Turn on the main Hydrosweep computer (**mcpc1ds3**).

Atlas Hydromap Server should start automatically (check in the menu bar!!!)



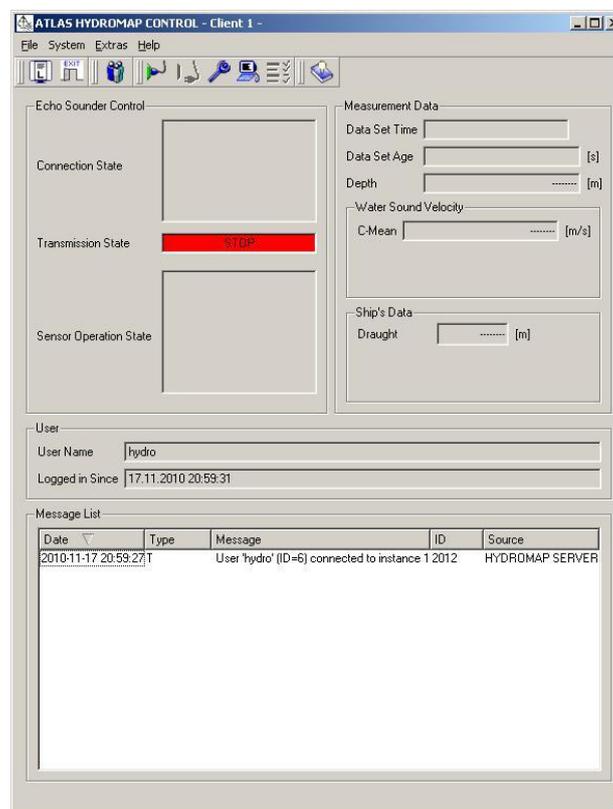
If it hasn't started (or if it stops during the logging) then start it manually (by simply clicking on the icon on the desktop).

Open Atlas Hydromap Control



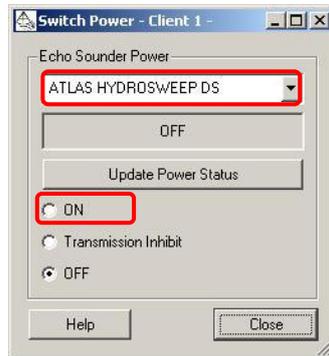
Identification: user = hydro, no password.

This window opens:



SWITCH ON THE MULTIBEAM

System > Switch power



Close and confirm then wait... it takes some time for the system to start.

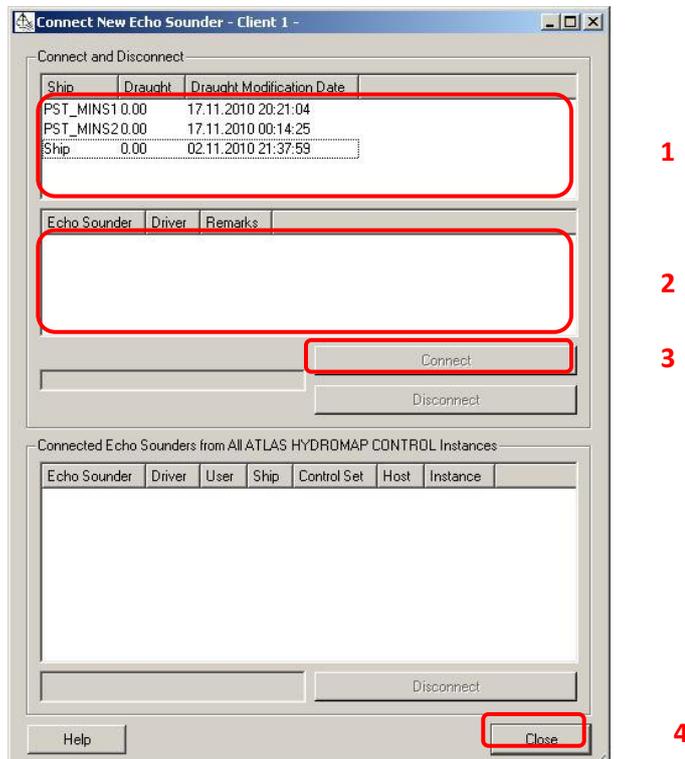
When the system is started you get a message: "Echo sounder is switched on!" in the message list (Main window).

You can then Close the Switch power window.

You need to wait **5 minutes** before proceeding further.

SETUP THE POSITIONING SYSTEM AND CONNECT TO THE ECHO SOUNDER

- If this is the first time you switch on the multibeam or if you wish to change the MINS
System > Connect new Echo Sounder



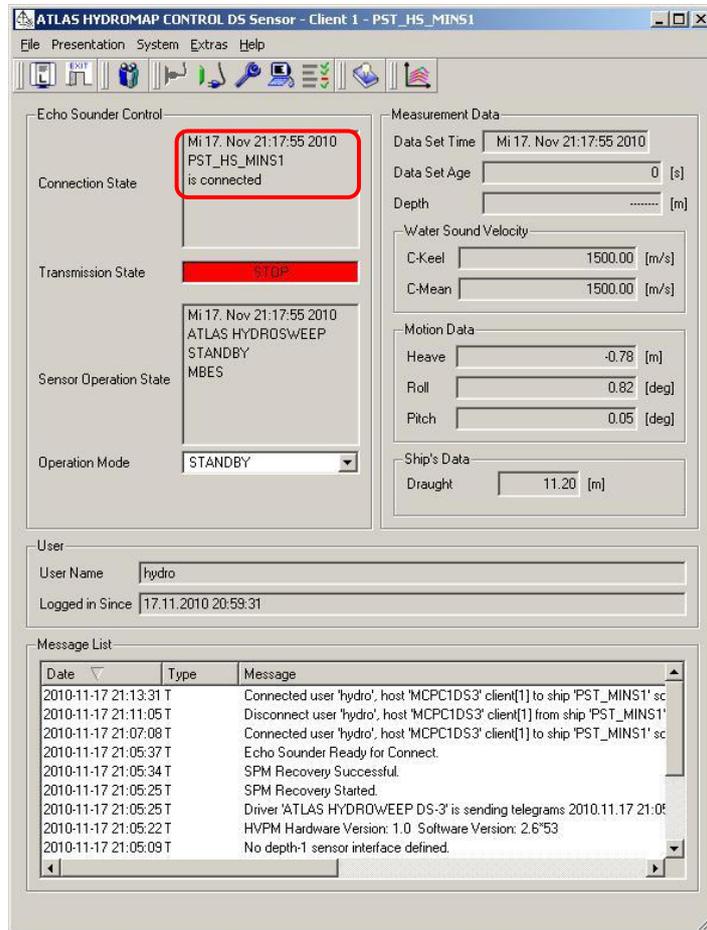
Choose MINS (1 or 2)

1. Select the MINS on the upper field
2. Select it again on the middle field
3. Click Connect
4. Close

- If you're just connecting again during the same cruise

System > Connect Echo Sounder or 

- Check if says 'is connected'



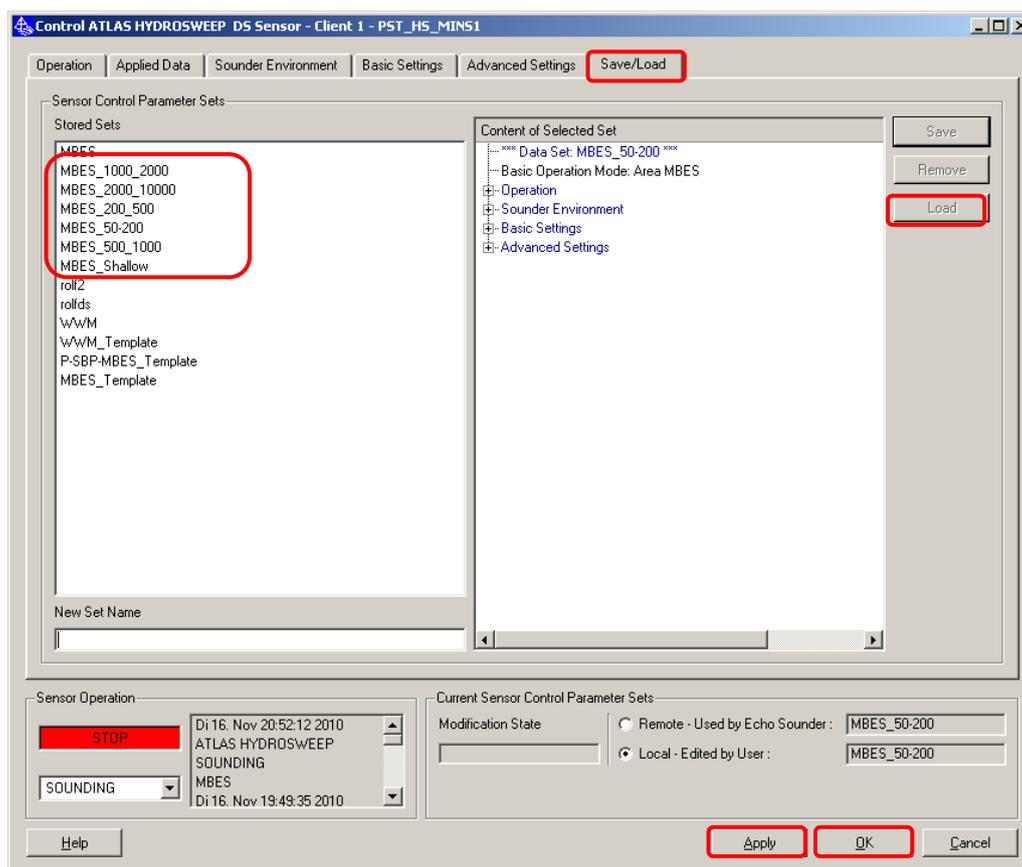
PIGGING

PARAMETERS

You must set your pinging parameters depending on the depths you intend to work in:

System > Control Echo Sounder or 

Templates are available for different working depths (MBES =MultiBeam Echo Sounder):



Here are the recommended parameters:

| Working depth | Template | Pulse rate |
|---------------|-----------------|------------|
| 20-50m | MBES_shallow | 0.8ms |
| 50-200m | MBES_50_200 | 1ms |
| 200-500m | MBES_200_500 | 3ms |
| 500-1000m | MBES_500_1000 | 5ms |
| 1000-2000m | MBES_1000_2000 | 10ms |
| 2000-10000m | MBES_2000_10000 | 15ms |

Pulse rate: never below 0,8ms!!! Never over 15ms!!!

We recommend you to use these templates (Load then Apply then OK).

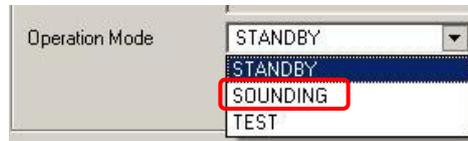
These templates aren't protected so you can change the parameters within them. If you wish to do so please **rename the template you are changing** (New Set Name) so that the original templates will always be available for the future users.

The parameters you are most likely to change are the min and max depths and the pulse length (see screenshots in the appendix).

START THE PIGGING

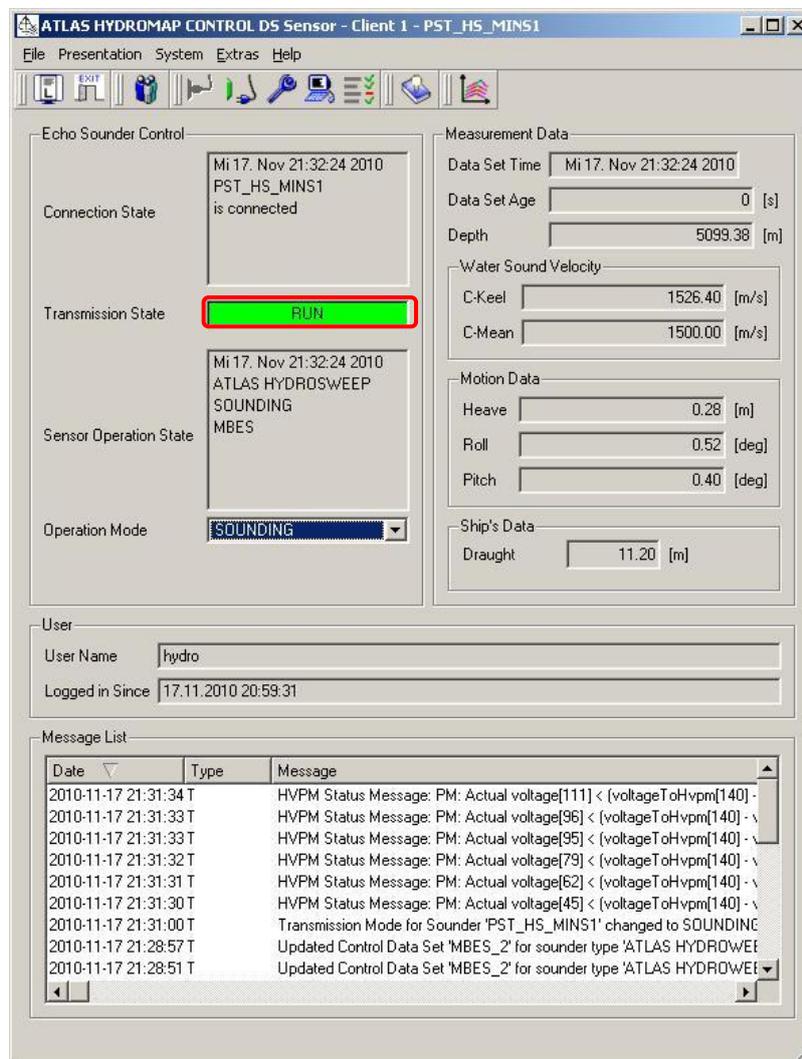
Then you can start the transmission:

Operation mode > Sounding



This step is also necessary if you changed the parameters described on the previous page during the sounding. In this case, the system goes into "Standby" automatically and you need to set the operation mode back to sounding.

Now everything is running and you should get a similar display:

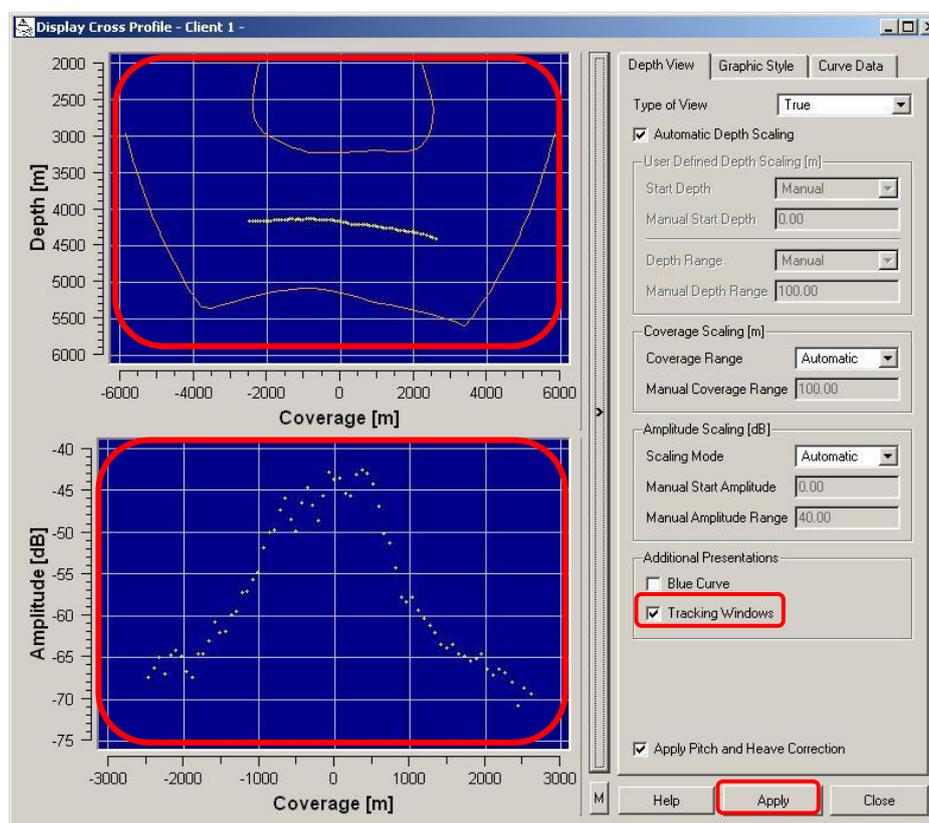


CONTROL

CHECK THE SIGNAL

Check that the sounding really has started:

Presentation > Display cross profile or 



Check if there is a signal (yellow dots). It will take about 10 pings until the profiles are displayed.

Turn on the tracking window then **Apply**. The tracking window is drawn as two orange lines (nose and chin of the 'face' you can see on the upper window). It represents the region where the signal is expected. The signal should lie between those lines. If not then your template might be wrong (min max depths....)

Special case for shallow water

When you are working in shallow water, you will have the tendency to increase the coverage (swath width) in order to 'see' a bigger portion of the seafloor. In some cases you will have to adapt this swath width depending on the shape of the tracking window.

- If the upper line is U shaped (like above) then reduce the swath width
- If the upper line is really flat the increase the swath width

It is not recommended to change those parameters during the survey as it takes some time for the program to recalculate the parameters.

SENSOR STATUS

Another display is important to check that everything is running well:

Presentation > Display Sensor Status

Display Sensor Status - Client 1

Position
Date/Time: Mi 17. Nov 21:15:05 2010 Alarm
Latitude/Longitude: 013° 55.109' S ° 003° 43.739' W °

Heading
Date/Time: Mi 17. Nov 21:15:06 2010 Alarm
Heading: 130.5 °

Motion
Date/Time: Mi 17. Nov 21:15:06 2010 Alarm
Heave/Roll/Pitch: 0.2 m 0.3 ° -0.1 °

CKeel
Date/Time: Mi 17. Nov 21:15:05 2010 Alarm
CKeel: 1500.0 m/s from ckeel

Alarm Output
 Acoustic Message Box

Position Heading Motion CKeel

Help Close

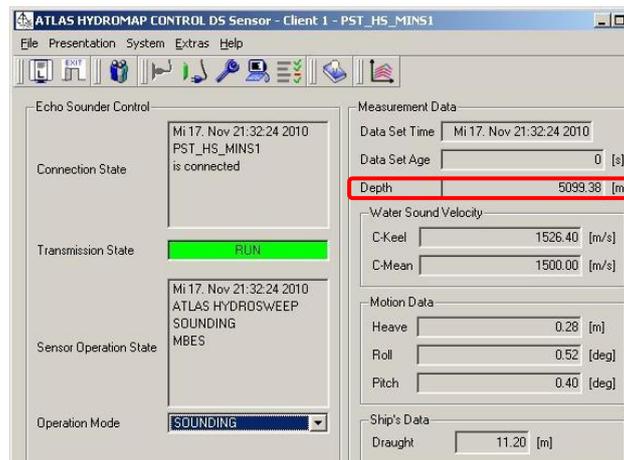
Position, Heading, Motion and CKeel must be green!

You can then move all Atlas Hydromap Control windows to the left screen so you can always control if the soundings are going on.

ATLAS SENSOR MANAGER: INTEGRATING THE SVP TO ATLAS HYDROMAP CONTROL

This section is extremely important if you intend to read the **exact depth** under the ship. If you need a very precise measurement you definitely need to integrate a sound velocity profile of the area into the program. This profile needs to go **down to the seafloor** and the integration works better with a **reduced number of data point!!** We highly recommend you to refer to the Data Cleaning section in the SVP chapter.

- If you don't need to display the depth along your track but only check it under the ship, you can use only Atlas Hydromap Control, no need to use Hypack. Parasound is even better for this purpose but goes beyond the scope of this guide (ask the ship technician if he can help).

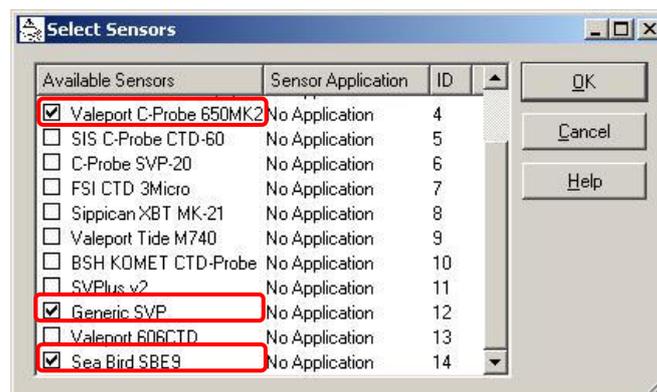


- If you intend to record and display your data in Hypack then you will anyway integrate the SVP in Hypack but having it also in Atlas Hydromap Control doesn't hurt.

We recommend you to integrate the SVP to Atlas Hydromap Control Data in any case.

For this you will have to use Atlas Sensor Manager (The multibeam must already be running as described in the previous pages).

System > Select Sensors

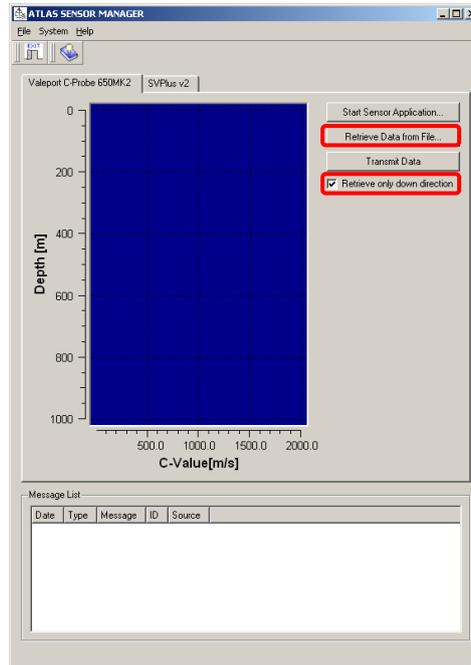


Choose your instrument:

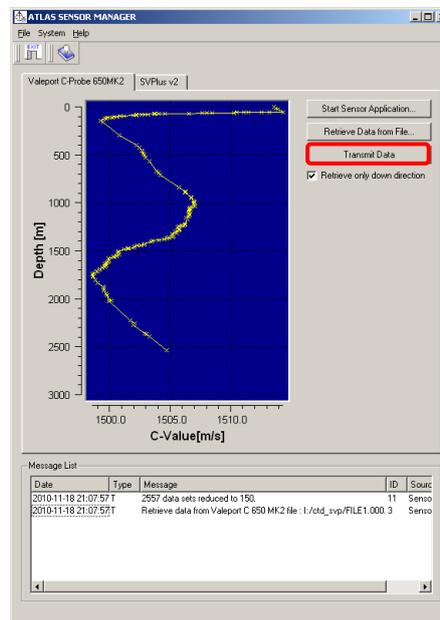
- Original CTD profile containing sound velocity (.cnv) = Sea Bird SBE9
- Original Valeport SVP profile (.000) = Valeport C-Probe
- File prepared in svp.exe (Hydromap Online format) = Generic SVP (for textfiles)

Atlas Sensor Manager might have difficulties reading formats from the CTD. We recommend you to clean and extend your data in svp.exe prior to the export as described in the SVP chapter.

Check the Retrieve only down direction box



Then click Retrieve data from file and choose your file.
The chosen profile should appear in the window.



You can then click Transmit data. The SVP is now integrated to Atlas Hydromap Control (for both Hydrosweep and Parasound) and taken into account for the water depth calculation.
You can now close Atlas Sensor Manager.

STOPPING THE SYSTEM

There are precautions to take to stop the multibeam from pigging.

In Atlas Hydromap Control

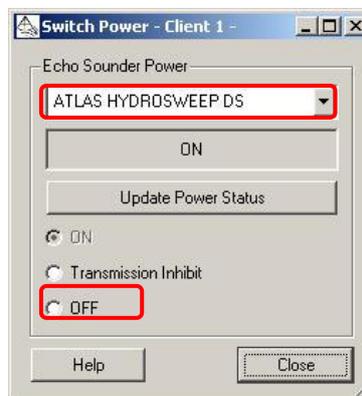
Do NOT disconnect!!!! This would cause several troubles in the system.

Instead:

1. Operation mode> standby

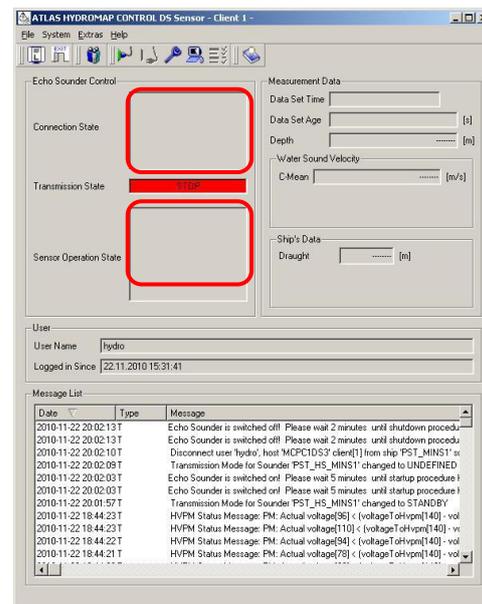
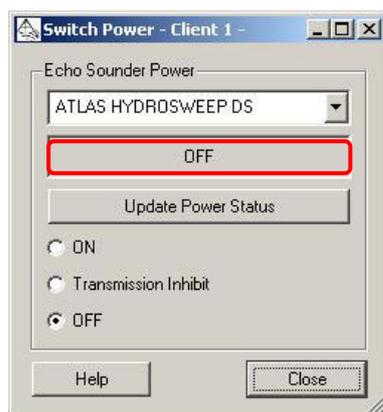


2. System>Switch power



Close and confirm.

The windows should look like this:

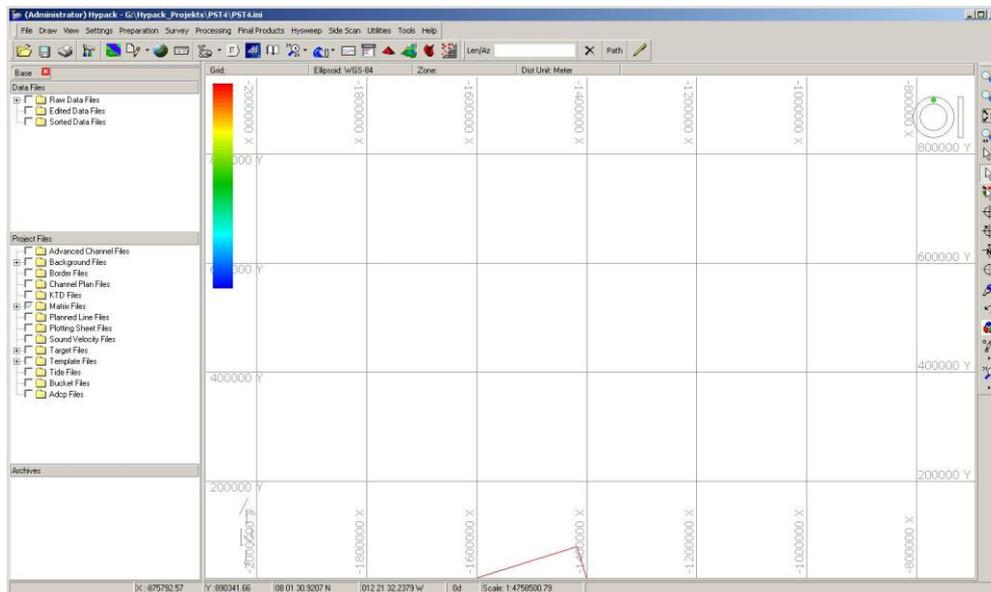


HYPACK: MAP OF THE SEAFLOOR

START YOUR WORK IN HYPACK

The data can be displayed and recorded in real time in Hypack.

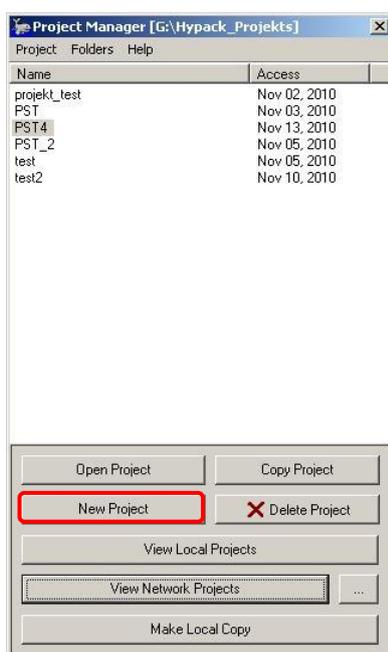
Start Hypack



You need to create a project where all your data and settings will be saved. For this you have two options: either creating a completely new project or copying an existing project (especially recommended when measuring in the same area)).

CREATE A NEW PROJECT

File > Project manager



Choose your saving folder 

You should save your project in **G:\Hypack_projects** (Network Projects)

> New project: you must name your project



Please include your **cruise id** to your projects names.

Example: ant27-1_project1

(The projects in the screenshot are test projects and do not fulfill these specifications)

When you create a new project, parameters are either copied from the last project or set to default:

Default parameters:

- Display

Parameters copied from the LAST project:

- Geodesy
- Boat hardware configuration
- Survey program parameters

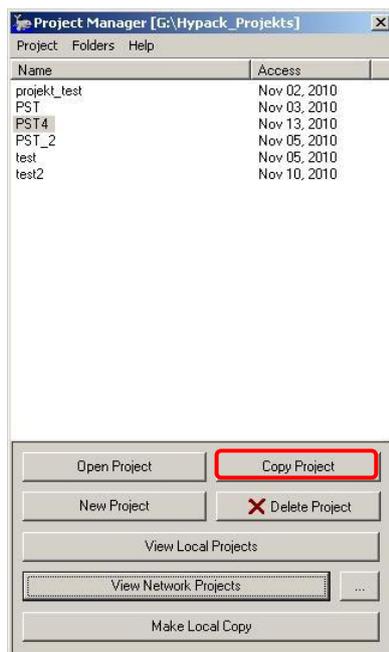
Parameters NOT copied from the LAST project:

- Planned lines
- Background data
- Matrices
- Target files
- Data files

COPY AN EXISTING PROJECT

You can also copy an existing project to import its parameters.

File > Project manager



Choose the project folder from which you wish to copy a project 
You should save your project in G:\Hypack_projects (Network Projects)

Select an existing project

> Copy project: you must name your project



Please include your **cruise id** to your projects names.
Example: ant27-1_project1

(The projects in the screenshot are test projects and do not fulfill these specifications)

Parameters copied from the SELECTED project:

- Geodesy
- Boat hardware configuration
- Survey program parameters
- Planned lines
- Background data
- Matrices
- Target files
- Display settings

Parameters NOT copied from the SELECTED project:

- Data files

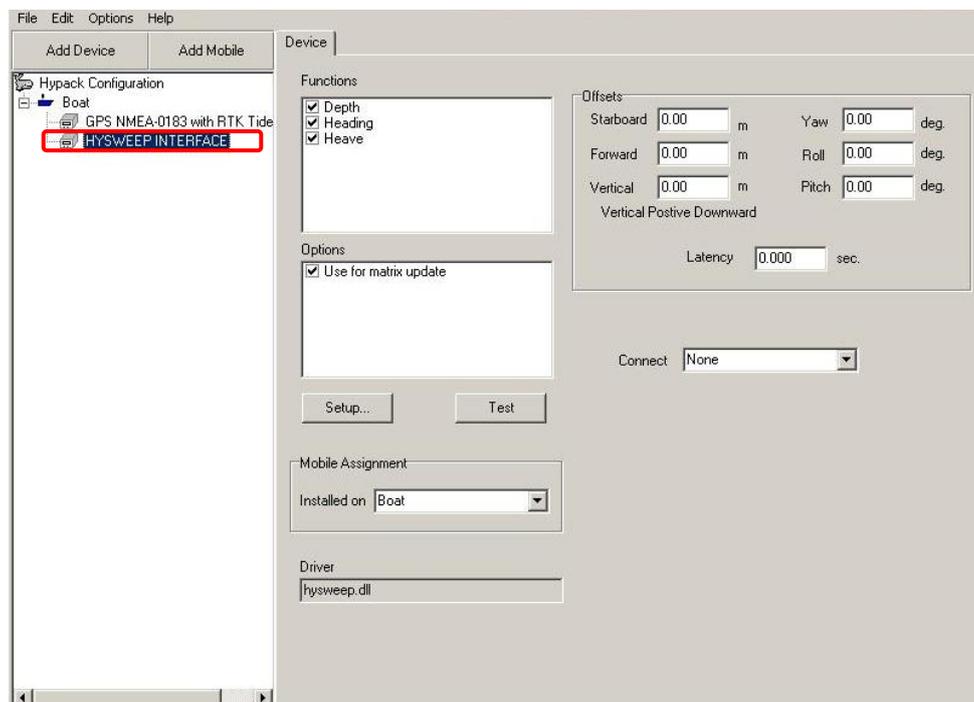
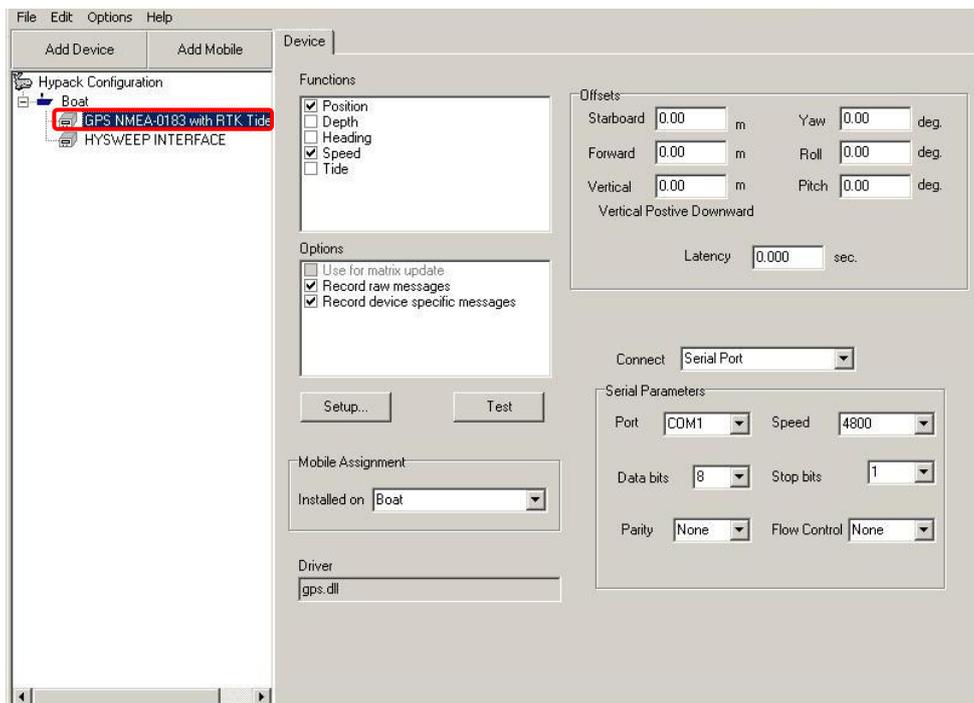
HYPACK: POSITIONING AND BACKGROUND

INTEGRATE HYDROSWEEP AND GPS DATA

You have to describe the devices you are recording data from:

Preparation > Hypack Hardware

Check if the settings are as follow:



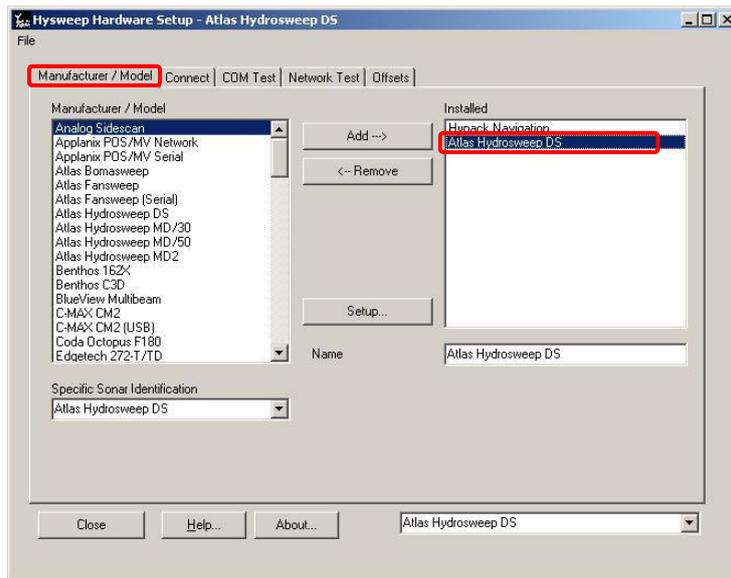
SETUP THE MINS

The correct MINS must also be selected in Hypack because there are some correction parameters to apply.
Hysweep > Hysweep Hardware

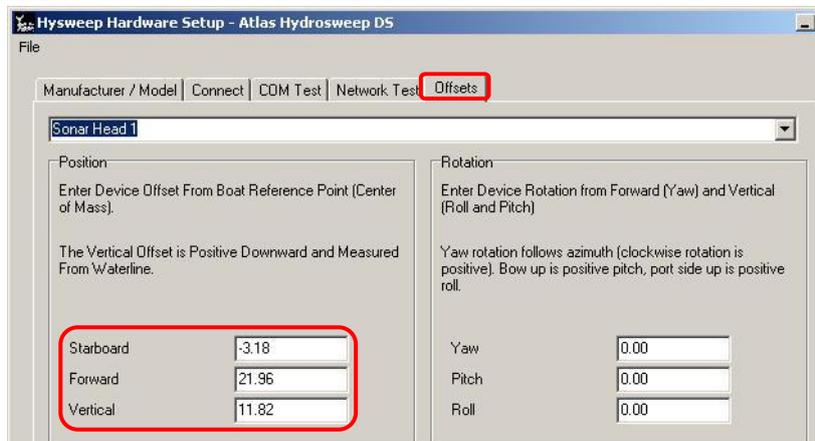
File > Open

In the folder Installation select MINS1.ini or MINS2.ini depending on the MINS used.

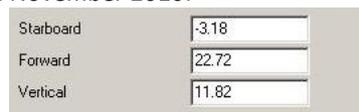
Select Atlas Hydrosweep DS and go to Offsets to check that the parameters are loaded.



Parameters for MINS1 as calibrated in November 2010:



Parameters for MINS 2 as calibrated in November 2010:



For both MINS 1 and 2: the Yaw, Pitch and Roll angle are already applied in Atlas Hydromap Control and must be set to zero in Hypack.

You can then close and save your parameters.

CONFIGURE THE GEODETIC PARAMETERS

Hypack only records projected coordinates (what you would have on a map, distance units), no geographic coordinates (what you get from the GPS, angle units). You have to set the geodetic parameters, i.e. the geometric transformation you use to draw what is on a sphere onto a plane.

There are projections adapted for each region of the world but we recommend you to use the Mercator projection with Greenwich (0°0'0'') as central meridian. This projection is known to most software and we have decided to use it for all our datasets (except for the Arctic where it is not applicable).

Preparation > geodesy

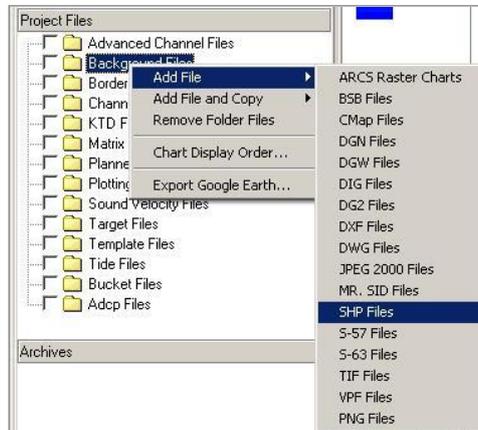
The screenshot shows the 'Hypack - Geodetic parameters' dialog box. Key settings are highlighted with red boxes: 'Projektion' is set to 'Mercator'; 'Central Meridian' is '000d00'00.0000'E' and 'Reference latitude' is '00d00'00.0000'N'; 'Distance Unit' is 'Meter'; 'False Easting (X)' and 'False Northing (Y)' are both '0.0000'. Other visible settings include 'Gitter' set to 'none', 'Zone' as an empty dropdown, 'Depth Unit' set to 'same as horizontal', 'Ellipsoid' set to 'WGS-84', 'Große Halbachse' at '6378137.000', 'Flattening (1/f)' at '298.257223563', 'Delta X', 'Delta Y', 'Delta Z', 'Delta rX', 'Delta rY', and 'Delta rZ' all at '0.00', 'Delta Scale' at '0.00000', 'Datum shift file' as an empty field, 'Local Grid Adjustment' unchecked, 'Orthometric Height Correction' at '0.000' m, and 'Chart datum level above geoid' at '0.00'. Buttons for 'OK' and 'Abbrechen' are at the bottom.

Take extra care that the false easting should be set to 0 as it is wrong in some older projects.

There you can also setup the distance units you want to use (meters or feet).

ADD BACKGROUND CHARTS AND DATA

You can add background layers in Hypack to help you planning and following your measurements. In the Hypack administration window, right click on **Background files** (File arborescence left of the map).



Select your file type and then the file you want to open.

Background files must be either in the same projection as your project or in geographic coordinates (WGS-84).

Layouts available on mcpc1ds3: in Data(G) > Backgrounds

| File | Description | Format | Reference system |
|-----------|------------------|---------------------|------------------|
| Continent | World coastlines | .shp (ArcGIS shape) | WGS-84 |
| | | | |

More layouts might be added later on.

PLANNING A SURVEY

PLAN THE TRANSECTS

If you just intend to visualize what is under the ship you can go directly to the next point. But if you want to map a certain part of the seafloor you have to plan your transect.

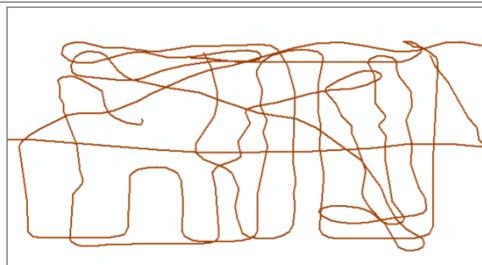
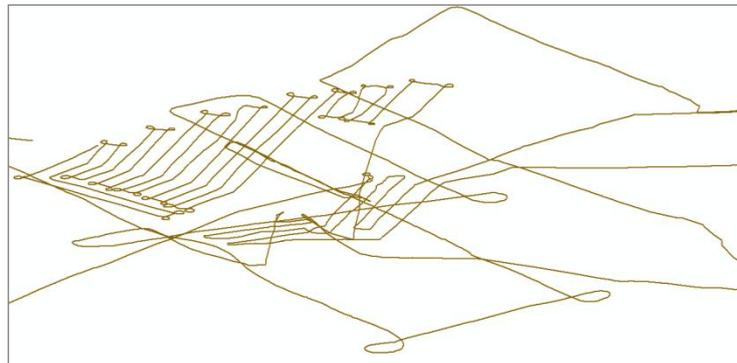
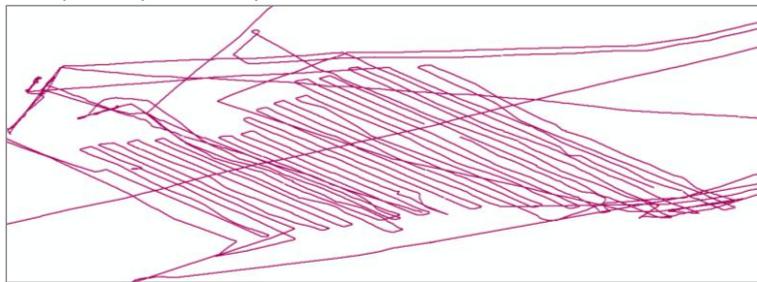
Most of the time you don't know what to expect so you'll have to adapt to what is appearing on your screen. The main difficulty to overcome is the variation in the coverage width with depth (the shallower the depth, the narrower the portion of seafloor which you can map).

Important information:

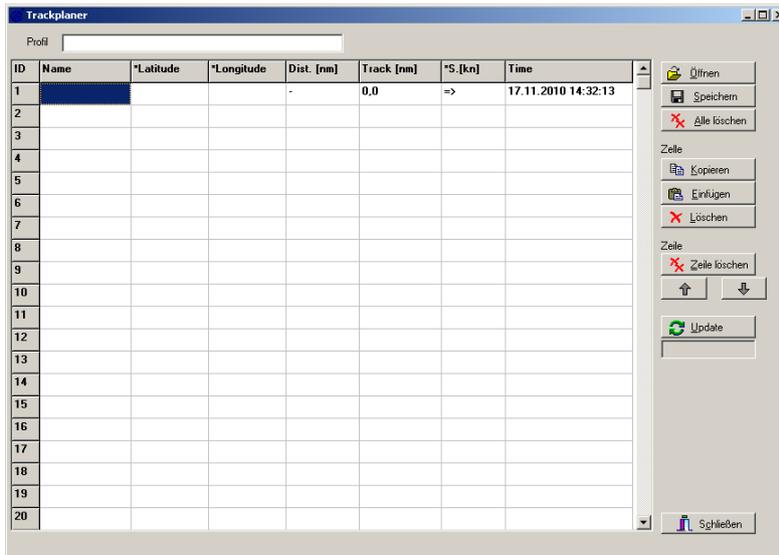
- You can calculate that the portion of seafloor covered by the multibeam is twice the water depth.
- You don't need overlapping.
- Ship time is expensive, so you can map at the speed of 10 knots, the ship speed is no issue.
- Constant communication with the bridge about the feasibility of your survey is extremely important.
- Small gaps can be filled in by interpolation

Recommendations:

- Get a first idea of the depth by covering the whole area with a large distance between two tracks.
- Plan the following tracks according to what you've observed: try to follow contour lines.
- Here some examples of past surveys



- Everything depends on the time you have, if you want to precisely plan a trajectory and calculate how much time you need to make it you can use a small program which allows you to estimate distances between points and time needed to cover the area: [trackplaner.exe](#)

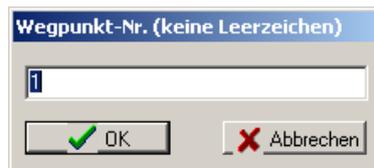


Enter your track name in Profil.

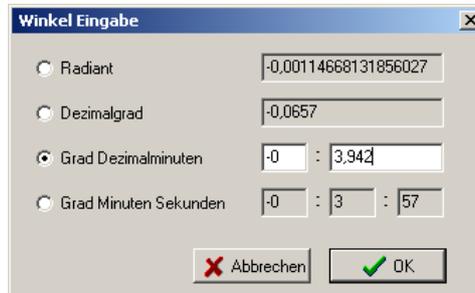


Enter your waypoints:

- Name: double click in the cell to enter the name of your point (no spacing) which makes it easier to identify on a map later on.



- Latitude and longitude: double click in the cell to enter your coordinates (several units possible). Take care of negative values!!!



- Distance (nautical miles) will be automatically calculated
- Track length (nautical miles) will be automatically calculated
- Speed (knots) can be given starting from the second point. This cell => allows you to allocate the same speed between all your points
- Time can be typed or set to the actual system time



When you click on update, all the values are calculated.

You can then save your file as a text (.tpp), point or line shape (.shp to be opened in ArcGIS or in QGIS), as an html file or as a Hydromap Online/ Map (format than [can be read on the bridge](#)).

REAL TIME VISUALISATION OF THE RECORDED DATA: CREATE A MATRIX

A matrix describes the size of the area you are planning to survey and the expected resolution (size of pixels). It allows getting an idea of the memory needed for the recorded data within the matrix (depending on the area covered and the cell size).

Don't exceed a file size of 150 Mb! (Split your matrix or increase the cell size!)

The matrix only affects the display, the raw data aren't changed!!!

You can also draw your matrix after having started the survey in order to see your ship position but the data will only display within a matrix!!

Preparation > Editor > Matrix editor

1. Set the limits of the survey area: you can enter coordinates of the lower left corner and the size of the matrix or draw the area directly by modifying the green frame:



bottom left: move the matrix



bottom right: enlarge the matrix horizontally



top left: enlarge the matrix vertically

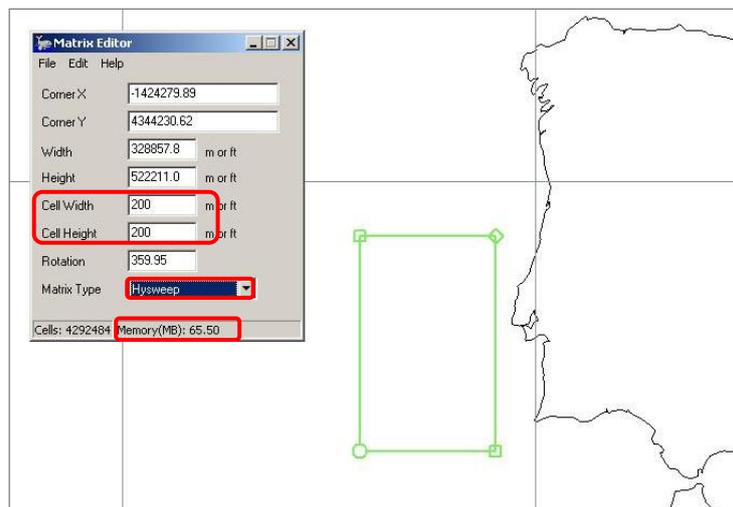


top right: rotate the matrix

2. Set the pixel (cell) size
Recommended cell sizes:

| Depth | Cell Width | Cell Height |
|-----------|------------|-------------|
| 0-100m | 5m | 5m |
| 100-500m | 20m | 20m |
| 500-1000m | 50m | 50m |
| >1000m | 100m | 100m |

3. Matrix type: Hysweep



File > Save

Save the file in your project folder. Then close the Matrix Editor.

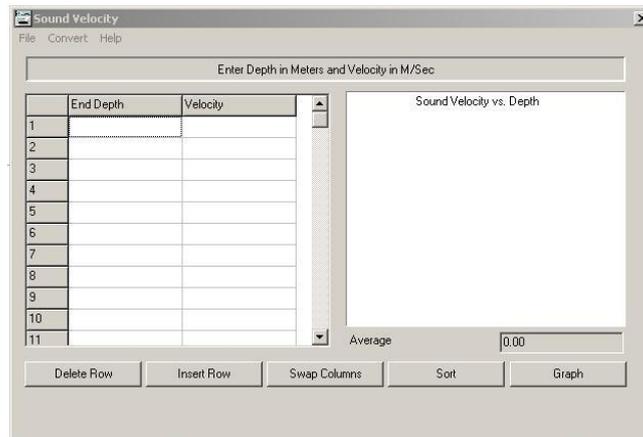
If you want to change your matrix size during the survey you have to first unload the matrix, then modify your file and load it again.

IMPORT A SOUND VELOCITY PROFILE IN HYPACK

You can include sound velocity profiles (SVP) to Hypack in order to increase the accuracy of the multibeam measurements. The steps described here allow you to import a SVP in Hypack, which is needed even if you integrated the SVP to Atlas Hydromap Control. There is another step to integrate the correction to the depth calculation. This one will be described in the following chapter “Conduct a survey” (Hysweep survey window).

The profile needs to go **down to the seafloor** and the integration works better with **a reduced number of data point!!** We highly recommend you to refer to the Data Cleaning section in the SVP chapter.

Processing > Sound velocity > Sound velocity



You have two options to integrate an SVP profile depending on the file type:

- File > Open (.vel from svp.exe)
- File > import (Valeport .000 , ctd .cnv or .txt, .vel would also work)

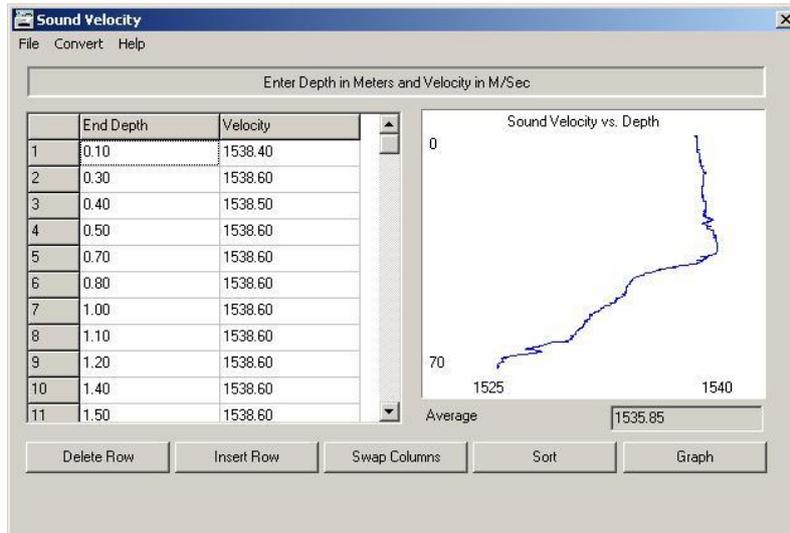


Valeport



CTD

Select the columns containing the depth and the sound velocity (check in editor) then accept all and OK. The profile is drawn, you can still exclude data.



Check that Depth is in the column on the left, SVP on the right, if not swap columns.
 You can sort the columns to check if there aren't any implausible values and delete those rows.
 You can also add data manually with insert row. **The data must go to the sea bottom!**
 Click graph to refresh the display.

Then File > Save for imported files or File> Save as for opened .vel files.
 Save your file in your project folder.
 You can then close the sound velocity window.

Check that the relevant (the latest or the nearest) .vel file (in SVP folder of your project) is active (checked in the file arborescence on the left of the map).

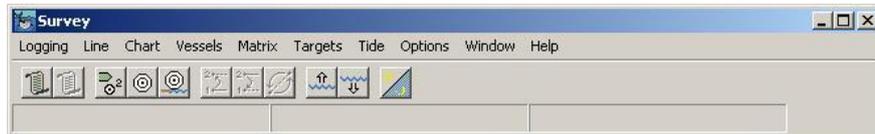
CONDUCT A SURVEY

To start a survey:

Survey > Survey and Hysweep survey

Several windows open.

SURVEY WINDOW



It contains the main commands for the survey.

FILE NAMING

You file naming should match the AWI specifications:

Expedition_Year_DayOfYearAndSystemTime_XX.HSX

Example: ANT27-1_2010_3240915_OA.HSX

Expedition id: ANT27-1: Expedition ANT (Antarctic), 27 (Expedition number), 1 (Track number)

Year 2010

Day of year 324 (20th November)

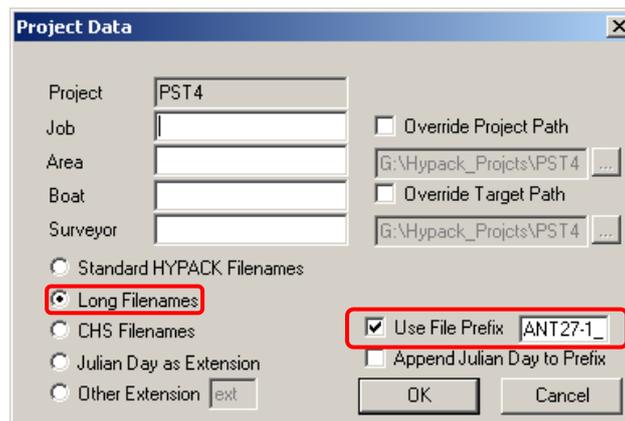
System time 0915 (09:15 am)

Program own id OA

File type .HSX

You can setup a prefix for your files' names:

Options > Project information (only works when not logging)



Long filename will automatically add the year, day of year, system time, program own id and file type.

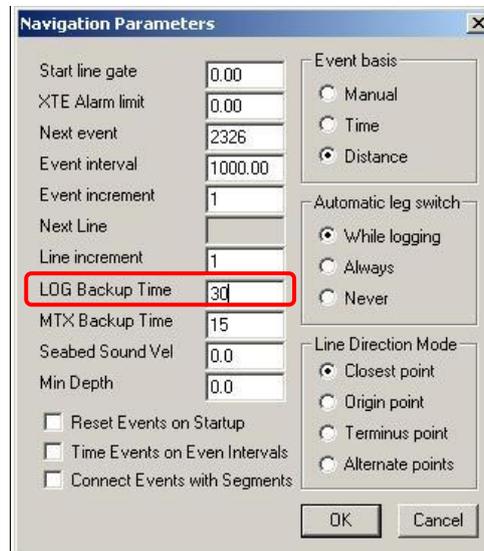
You just need to add the file prefix: you expedition id (here ANT27-1_)

FILE SIZE CONTROL

To avoid your files getting too big, you can set a time interval at which a new file should be created.

Options>Navigation parameters

The Log Backup Time (minutes) can be set:



We recommend you to set it to 30 minutes for shallow water, 60 minutes for deep sea in order to get an acceptable file size.

START/ STOP LOGGING

When the survey starts Hypack is still not logging (the End logging icon is grayed).



You have to start the logging so that the program starts recording the data.

Logging > Start logging or 



The End logging icon turns red.

If you want to start a new file:

Logging > Restart logging or 

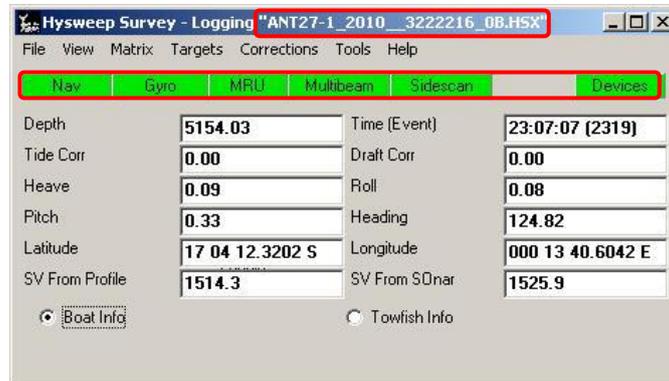
If you want to stop the logging (end file, wait before recording again or stop system):

Logging > End logging or 

If you want to exit the program then stop the logging, exit the survey and exit Hypack (save your project in order to be able to visualize the data within your matrices later on).

HYSWEEP SURVEY WINDOW

This window allows you to control if the main sensors are working and to setup additional parameters. The window title shows you the **name of the file** where data are being recorded (here ANT27-1_2010_3222216_OB.HSX).



Nav, Gyro, MRU, Multibeam, Sidescan and Devices should be green.

Nevertheless it can happen that the connection to an instrument gets lost a short time. **Do not panic** if some turn red for some seconds, they are very likely to turn green again without you touching anything!!! If it lasts you might have to restart the program or turn the system off and on again.

You can also display additional windows:
View > Choose the windows you would like to add.

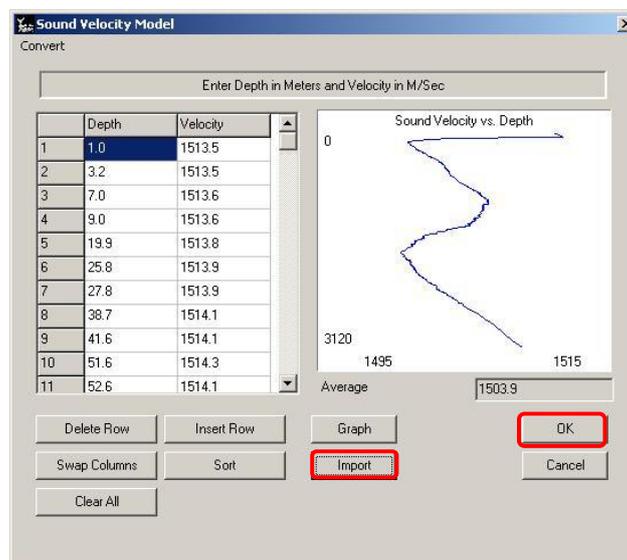
INCLUDE A SOUND VELOCITY PROFILE IN HYSWEEP SURVEY

You need to add your sound velocity profile again in order to integrate it to your data (real time display).

Corrections > Sound Velocity

You get a window very similar to the one for SVP in your project.

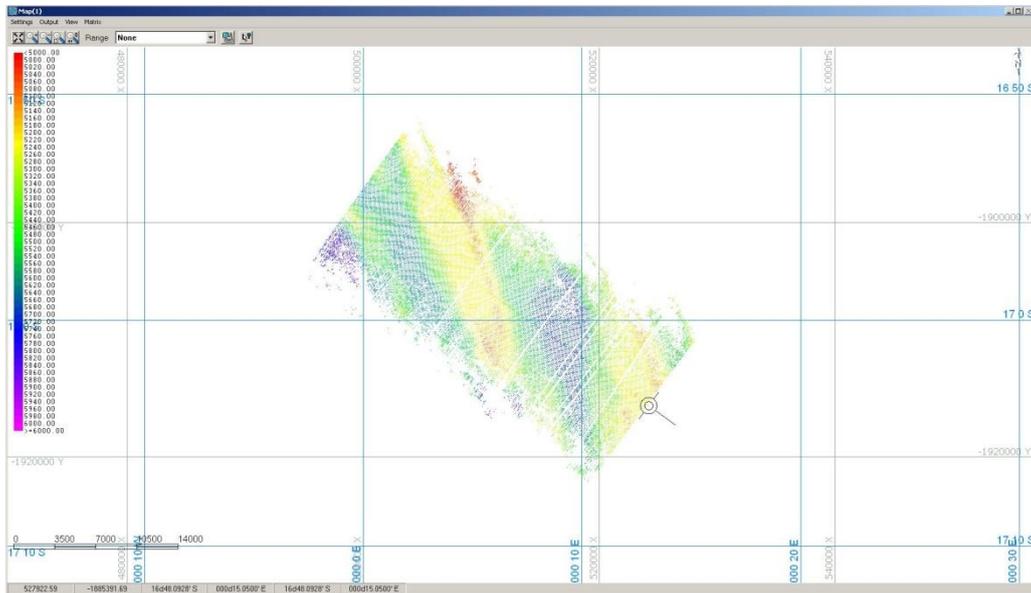
Import your SVP file (.vel, .000 or .cnv), check it and then click OK.



Your SVP is integrated to the calculation of your online data.

MAP WINDOW

The map window displays a real time map of the portion of seafloor included in the matrix (and only in the matrix!!!) where you are recording.



The cursor :  represents the position and heading of your vessel.

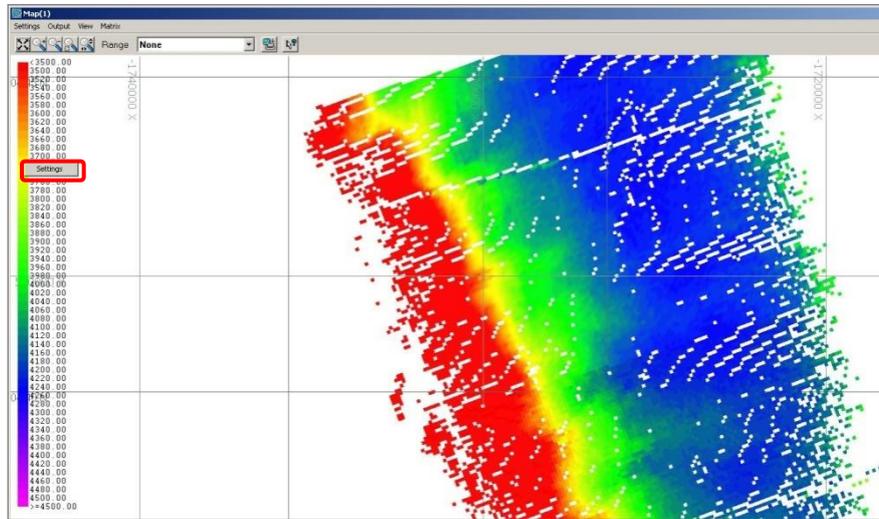
ADD GRID

You can add a grid to the map:
Setting > Grid Properties

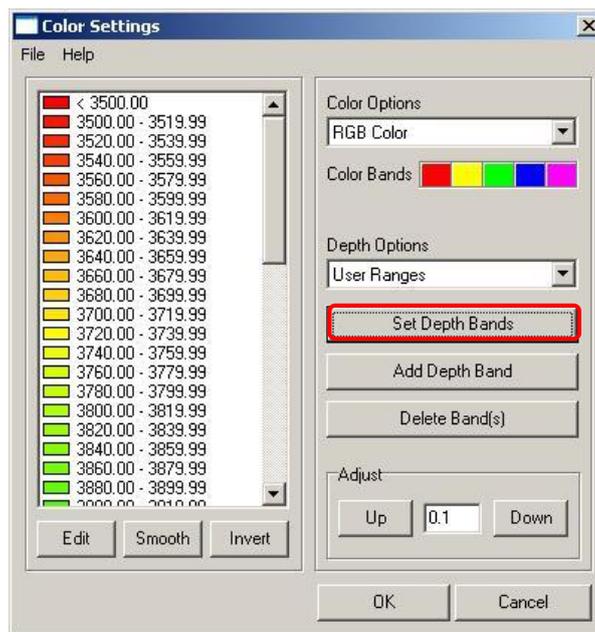


ADAPT THE COLOR SCALE

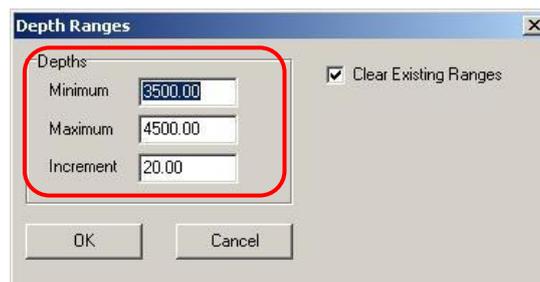
You can change the depth scale by right clicking on it.



You can load existing scales (File > Load) or set a new one



There you have to enter your depth range and the steps for the color scale.



SWITCH THE MATRIX

It is sometimes necessary to load a new matrix during your survey if you are going out of the first one. You first need to prepare the new matrix (see previous chapter about creating a matrix).

You then have to unload the old matrix from your map window (if you don't then Hypack might keep trying to display in the old matrix).

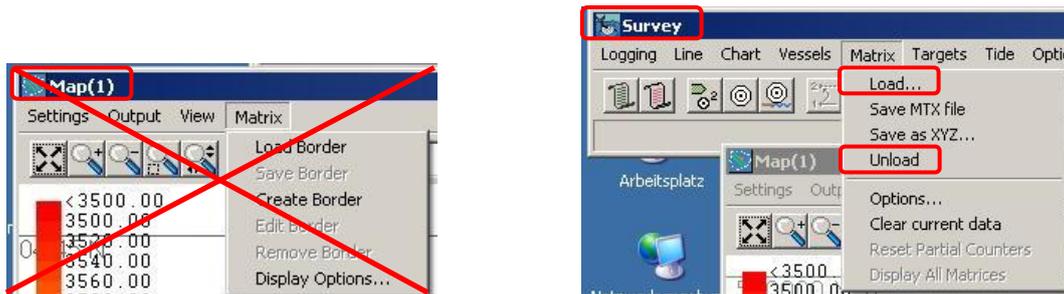
For this do not use the Matrix button in the Map window...but the **Matrix button in the Survey window!!!**

Matrix > Unload

You can then load your new matrix file.

Matrix > Load

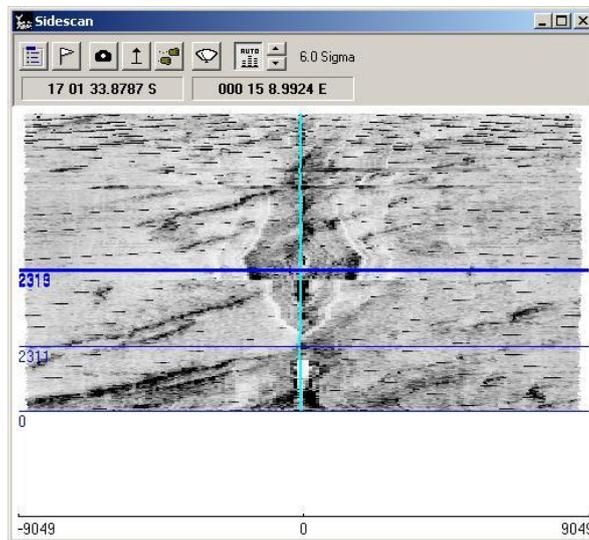
Choose your new file.



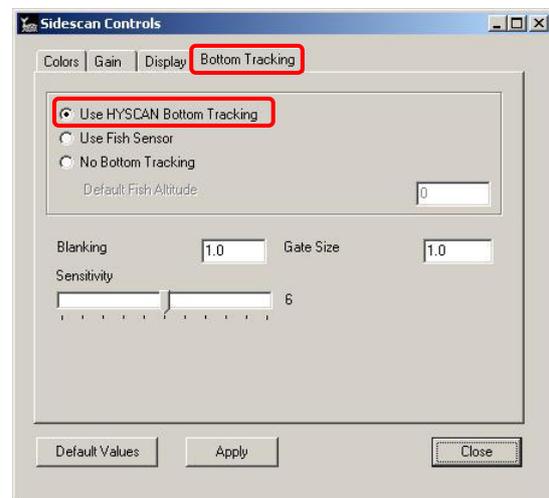
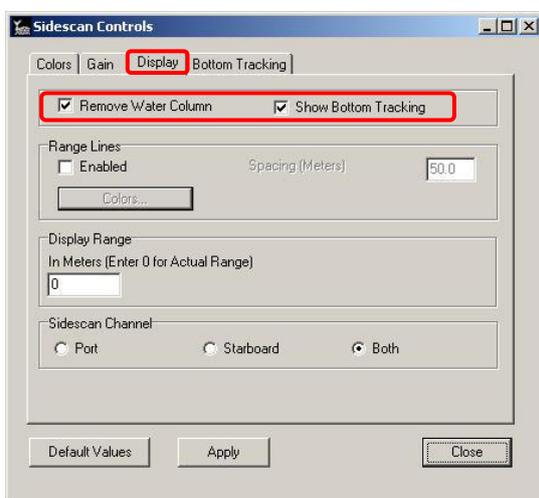
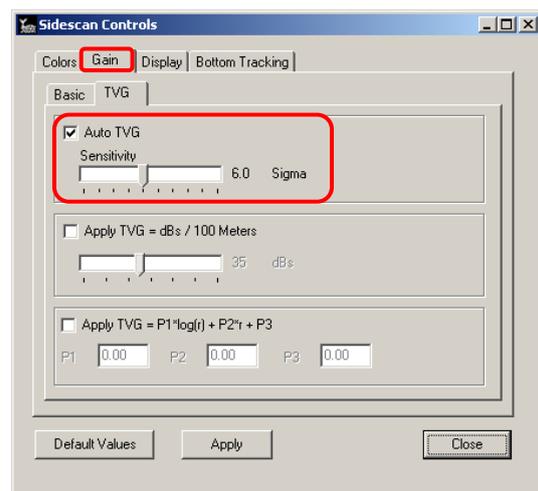
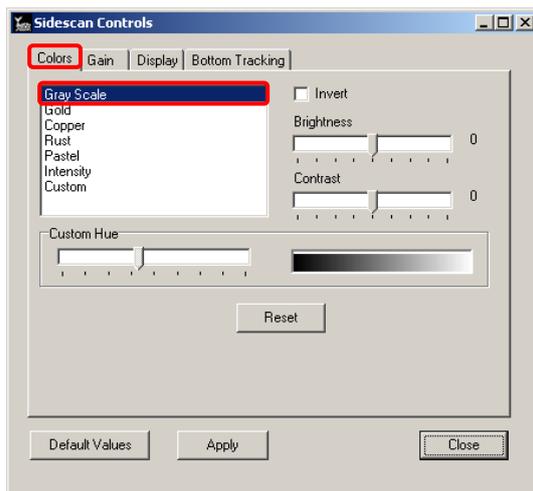
Wait a little for the logging to start in the newly loaded matrix. It can sometimes be necessary to shortly stop and restart the logging for the program to start drawing in the new matrix.

SIDESCAN WINDOW

The sidescan window represents an 'acoustic picture' of the seafloor.



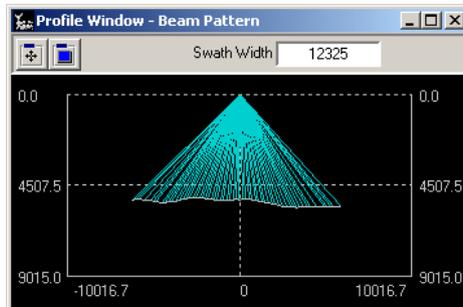
You can setup  the display parameters as follow:



OTHER WINDOWS

PROFILE WINDOW

The profile window shows the dispersion of the signals and visualizes the holes where the depth is interpolated.

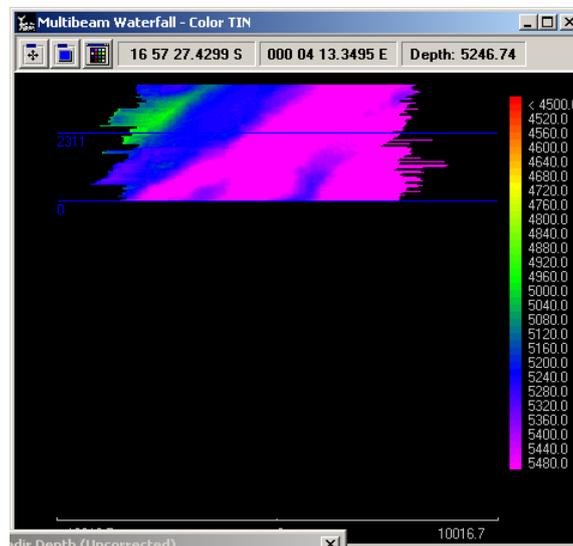


NADIR DEPTH

This window displays the depth under the ship. Uncorrected means that the SVP and ship draught are not taken into account for this display).



MULTIBEAM WATERFALL



OPEN FILES AFTER THE SURVEY

Data in G:\Hypack_projects\nameofmyproject\Raw

HYSWEEP EDITOR: OPEN BATHYMETRY DATA

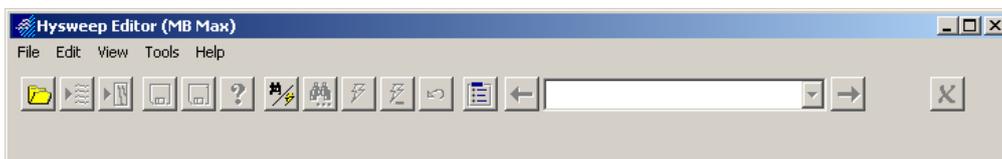
If you need to visualize your recorded data again, you can of course activate your matrices in your project in Hypack (if you saved your online data before exiting the survey).

But you can also get nicer maps from the editor.

Setups described here are intended for you to get a map quickly. If you want you can play around with the parameters as the raw data aren't modified.

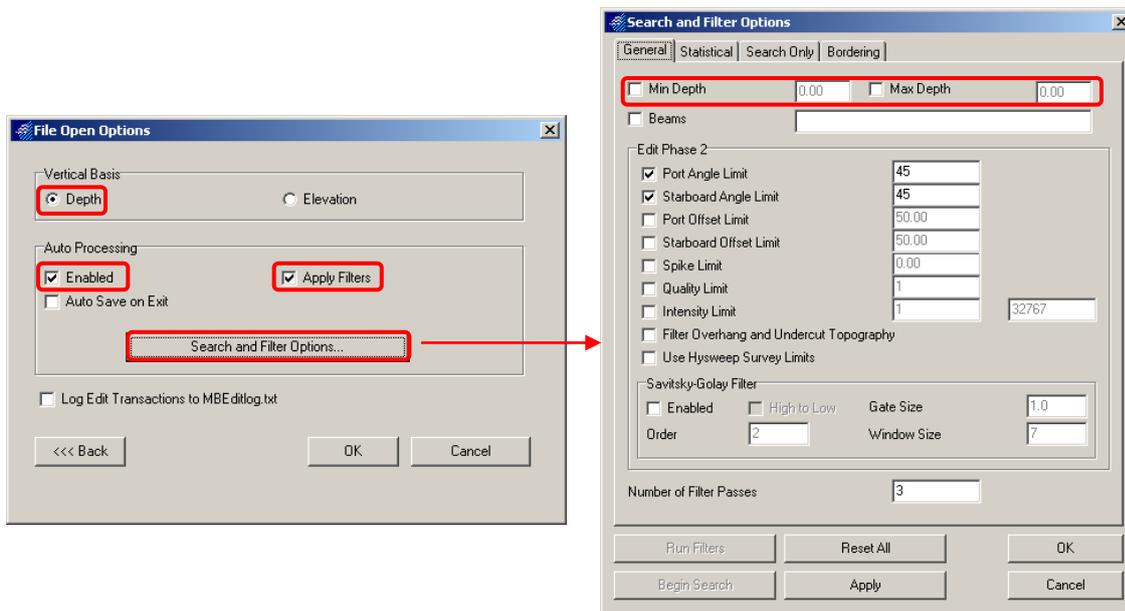
In Hypack (Administrator):

Hysweep > Hysweep Editor (MB Max)

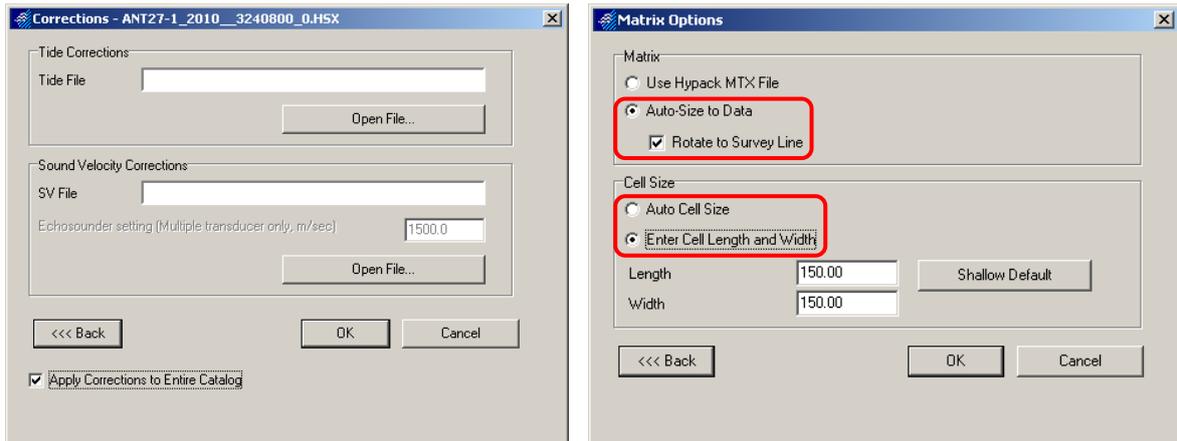


File > Open

Select one or several HSX files from your raw data folder.

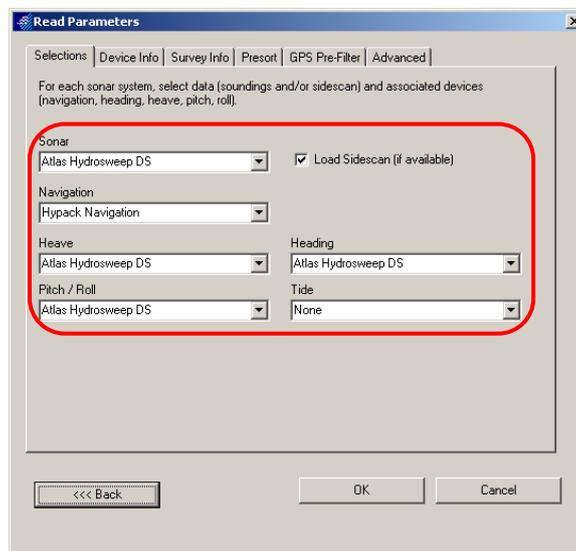


You can set a minimum and a maximum depth (all signals outside the range will be ignored). Then click OK.

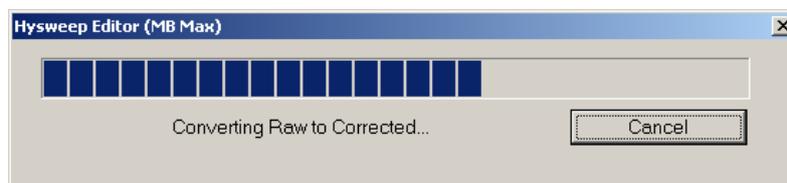


You can add a tide model and a SVP files. Then click OK.

You can either ask the program to determine the cell size by itself (usually quite big, so resolution is low) or set the cell size you want (the same as your matrix for example). Then click OK.



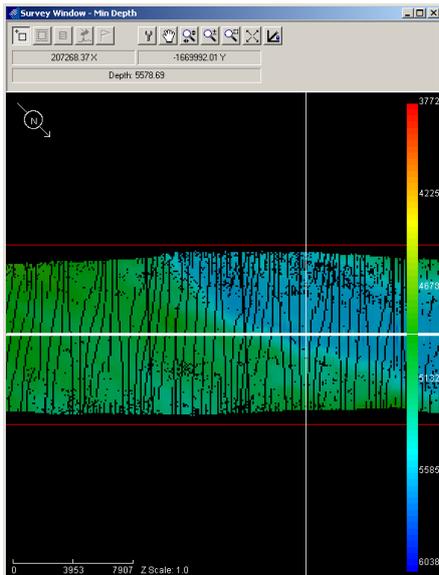
Check the devices are selected as above. Then click OK. The processing starts.



It takes some time, depending on the size of your data. If the processing window disappears and nothing happens then the processing has failed:

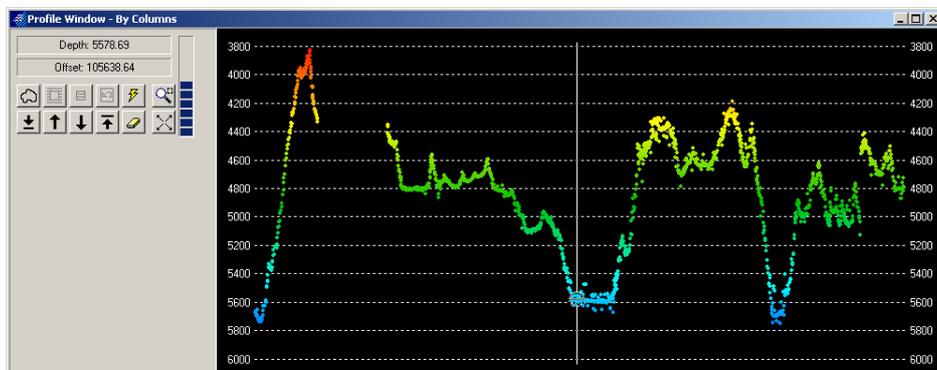
- You chose too many files and the memory needed is too large (reduce your file number and/or the cell size)
- One or several of your files contain errors (test each file individually)

But if everything works alright then you get those three windows:

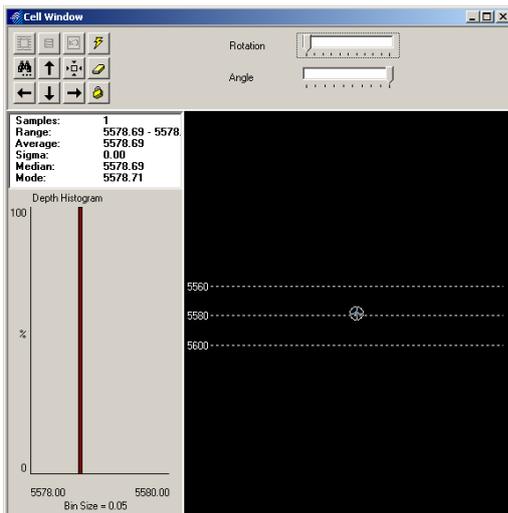


The survey window containing a map of the seafloor along the chosen transects.

When this icon  is selected then you can chose locations in your survey window which will be displayed in details in the two other windows.



The profile window shows you the topography as a transversal cut along or across your transect (depending on your selection) at the location selected in the survey window.



The cell window summarizes the statistics used to determine the value of the cell selected in your survey window.

Here the cell size has been chosen so small that only one value is available per cell.

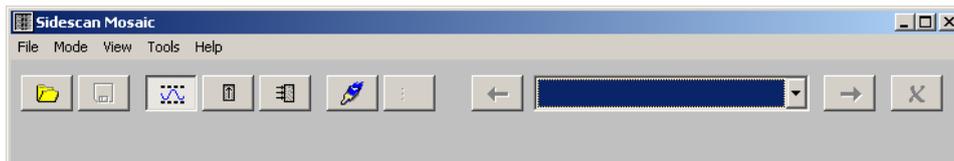
SIDE SCAN EDITOR: SAVE SIDE SCAN DATA AS A GEOTIF

You can create a georeferenced picture (.tif) from your side scan data (contained in your HSX file from your Hysweep survey).

The data processing is quite long so we recommend you to work on small files and to process one after the other. It is better for most software to have several smaller pictures than a single bigger one.

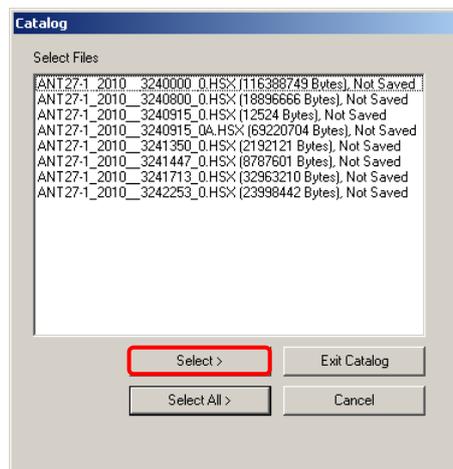
In Hypack (Administrator):

Side Scan > Side Scan Targeting and Mosaicing

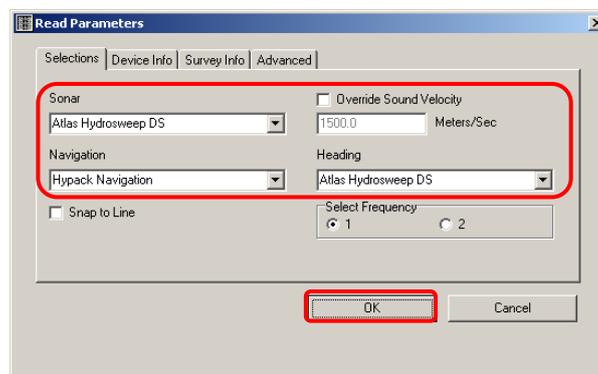


File > Open

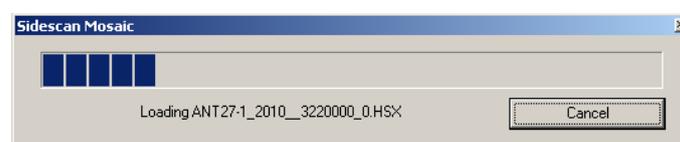
Chose one or several HSX_xxxx.LOG (Catalog File .log). You can then select one or several HSX files (Hysweep Raw ASCII, .hsx).



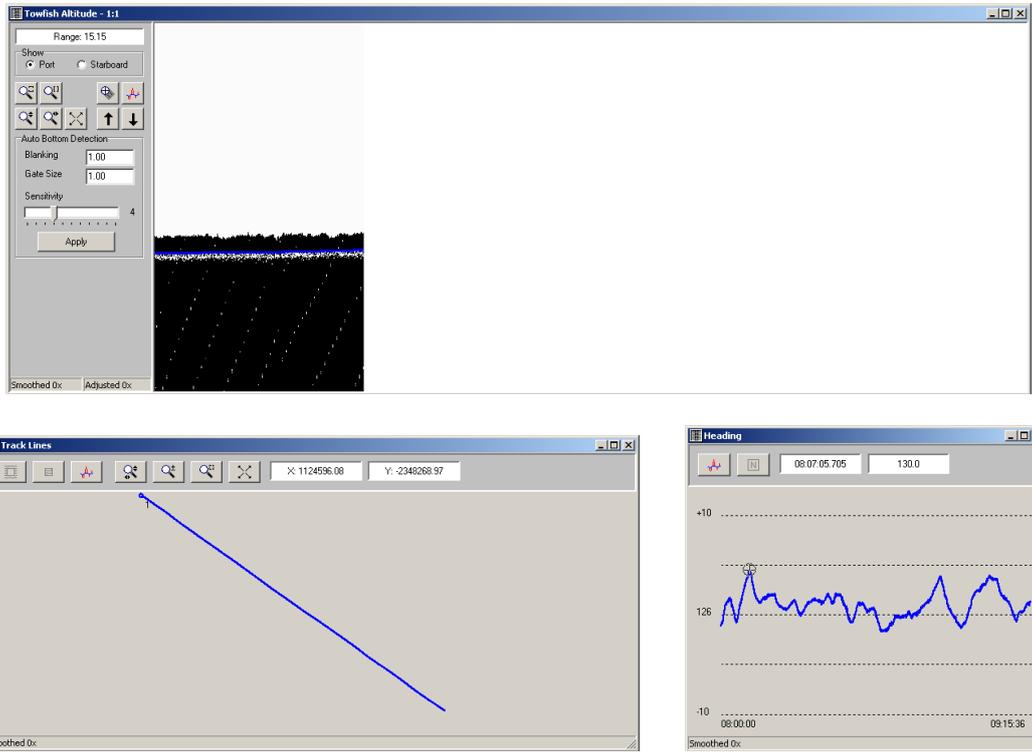
Smaller single files are easier and quicker to process.



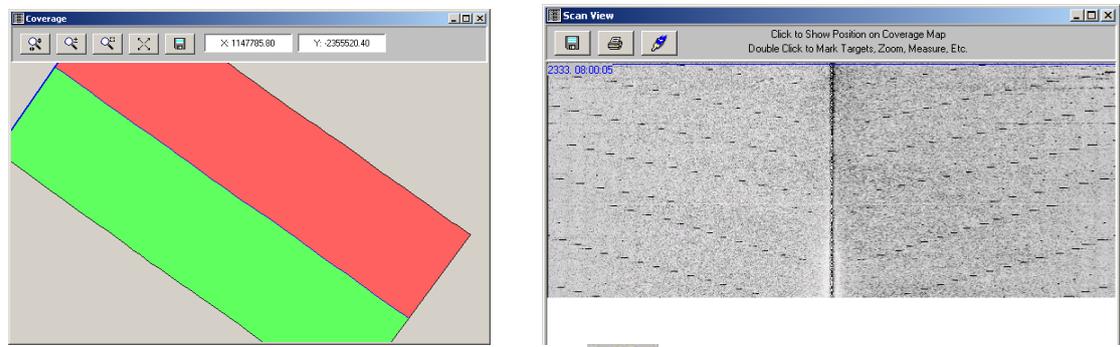
The processing starts.



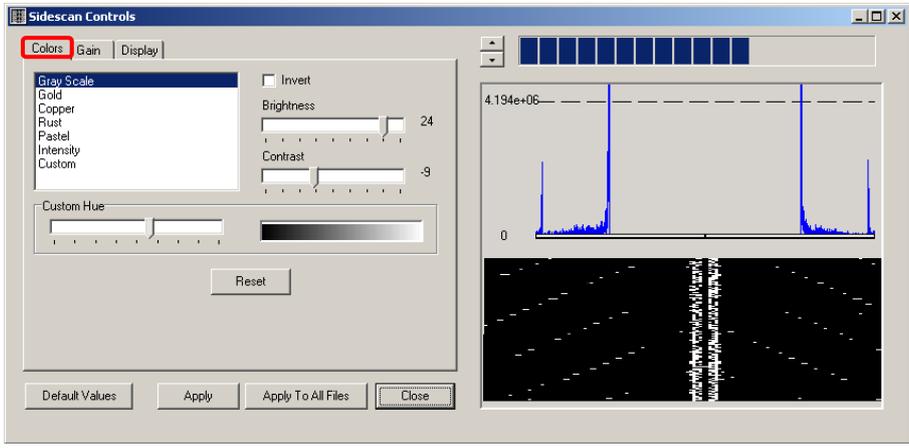
Data display in 3 windows (Raw Data mode) 

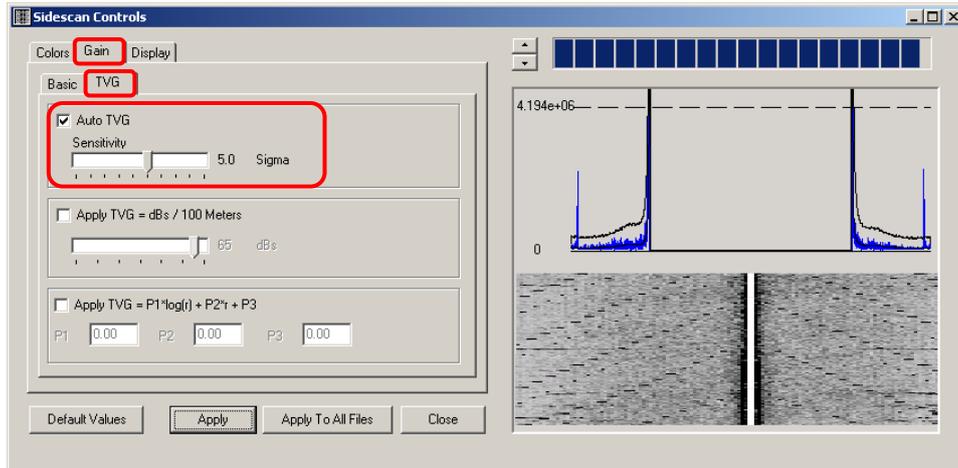


Go to the Scan View Mode 
Data display in 2 windows

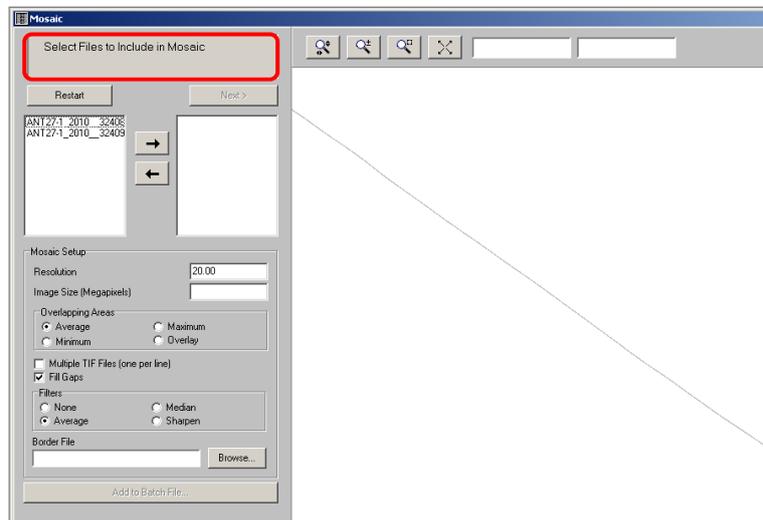


Setup your display options with View > Sidescan Controls 

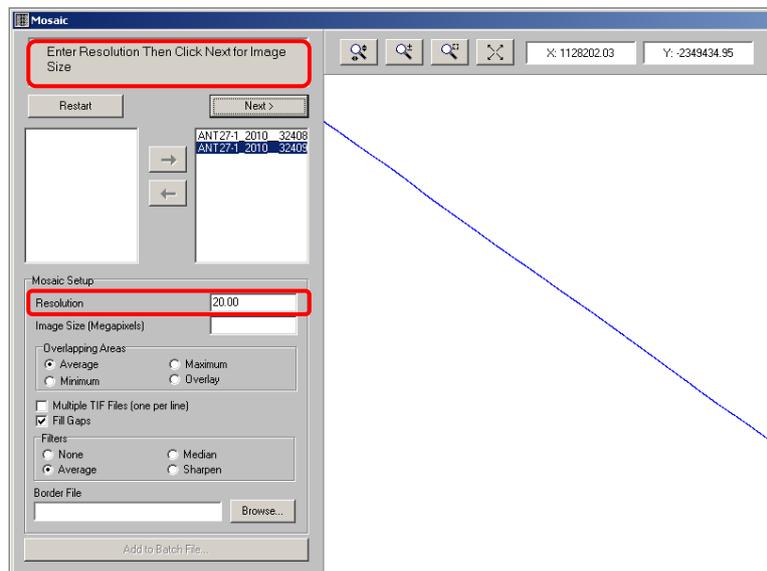




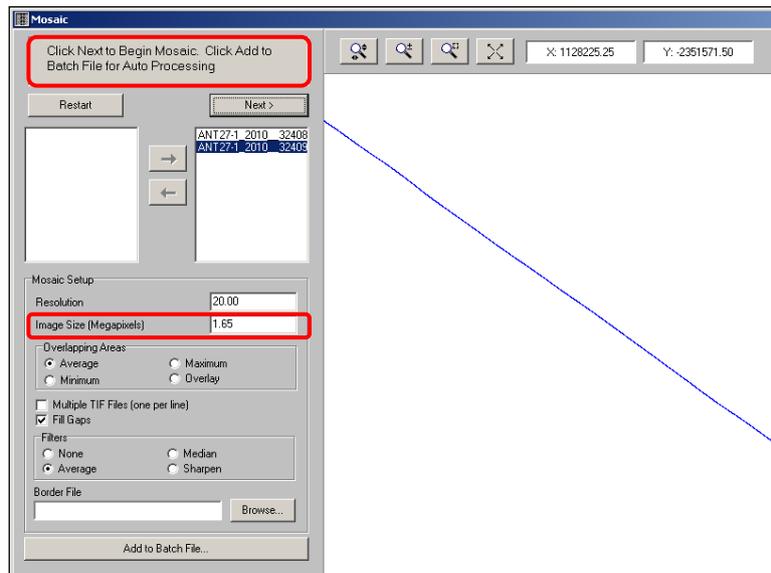
Got to the Mosaic Mode 



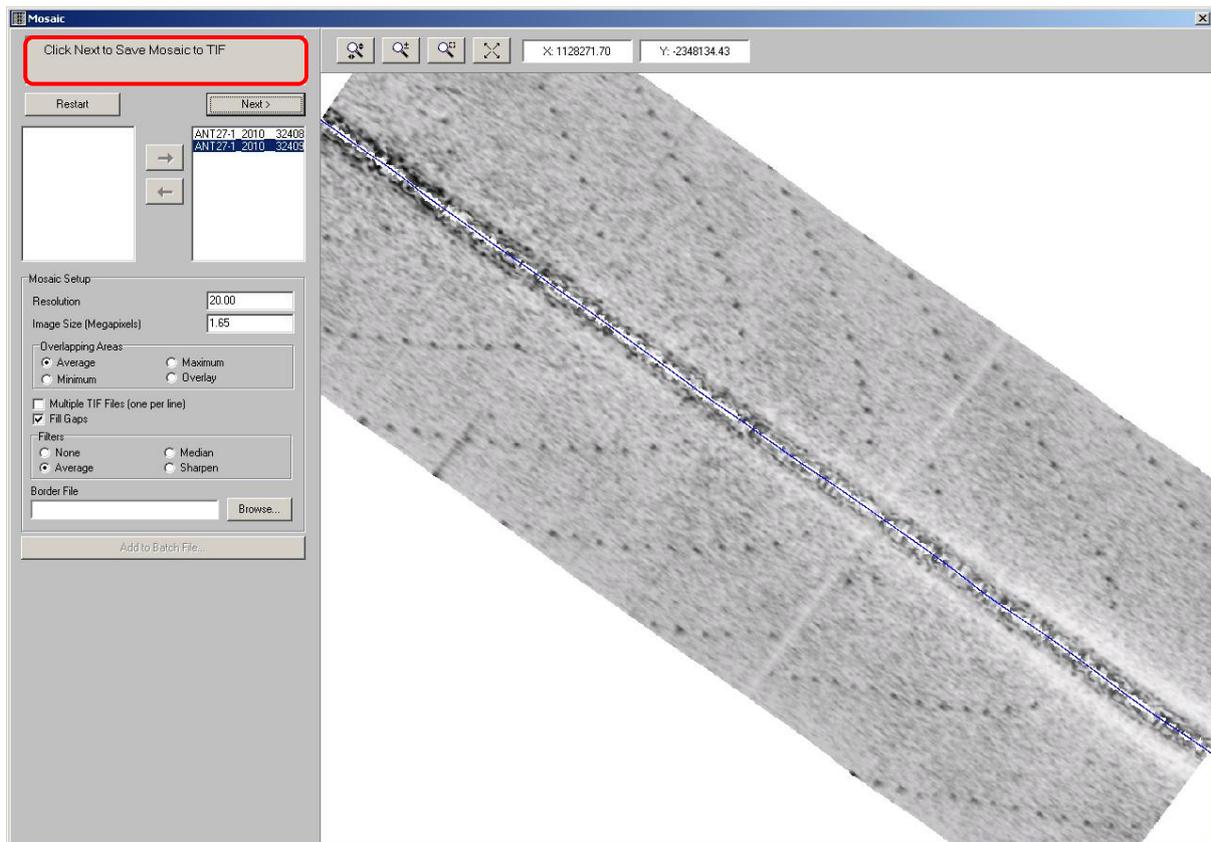
Select your files by bringing them from the left to the right column with the arrow . Then click Next.



Enter the wished resolution the click Next. The size of the picture is calculated.



If the file size is ok then click Next. (If not change first the resolution, the file size will be calculated again.) You mosaic appears in the window.



Click Next to save the picture displayed as a geotif.

You have created a georeferenced tif picture that can be displayed on your Hypack project or in a GIS software.

AT THE END OF THE CRUISE

Copy your files to bring them back to your institute.

Data in G:\Hypack_projects\nameofmyproject

The most important are the raw data:

Raw data in G:\Hypack_projects\nameofmyproject\Raw

- HSX
- RAW
- HSX.LOG
- RAW.LOG

For a description of the different formats check in the appendix of the Hypack manual (in Hypack help).

You also have to [give your data to the system manager](#) for the AWI archives.

For this, log in as bathyuse on PC1, 2 or 3. This gives you access to the following network:

hydrosweep auf "polsrv1\data01"(R:)

There create a folder for your cruise containing a folder for each of your projects where you only need to copy the raw data.

Example:

```
hydrosweep auf "polsrv1\data01"(R:)
  Folder ANT27_1
    Folder project1
      Folder Raw
        raw file 1
        raw file 2
    Folder project2
      Folder Raw
        raw file 1
        raw file 2
    Folder project3
      Folder Raw
        raw file 1
        raw file 2
```

APPENDIX

HYPACK DISPLAYED ON THE BRIDGE OR IN THE WINCH ROOM

You have the possibility to get your bathymetry measurements displayed on a computer on the bridge and in the winch room.

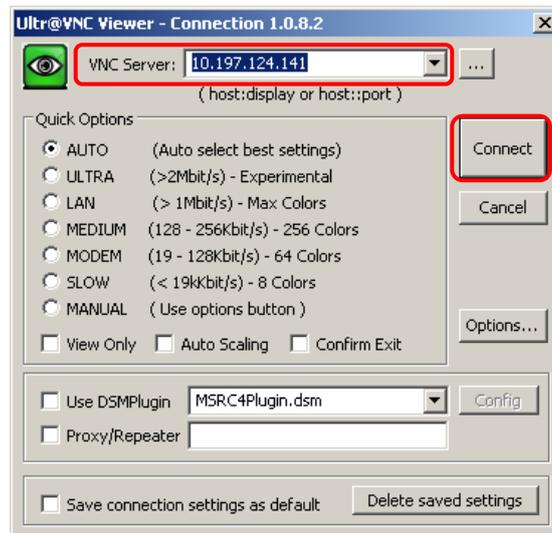
The technique described here allows you to mirror your screens from the E-550 room (bathymetry lab), computer mcpc1ds3 or mcpc2ds3 to the dedicated computers on the bridge or in the winch room (ask the crew to identify the monitors!). It is more or less as if you were adding more screens to the bathymetry computers. The data are still recorded in the bathymetry lab.

You get exactly what is displayed on the connected computer and you have the possibility to remotely act on them, this means you can change the settings.

We recommend you the setup the whole system in the bathymetry room first and then to move to the other computers.

To get the display from the bridge (or the winch room):

Start UltraVNC Viewer on the computer where the data has to be displayed (bridge or winch room).



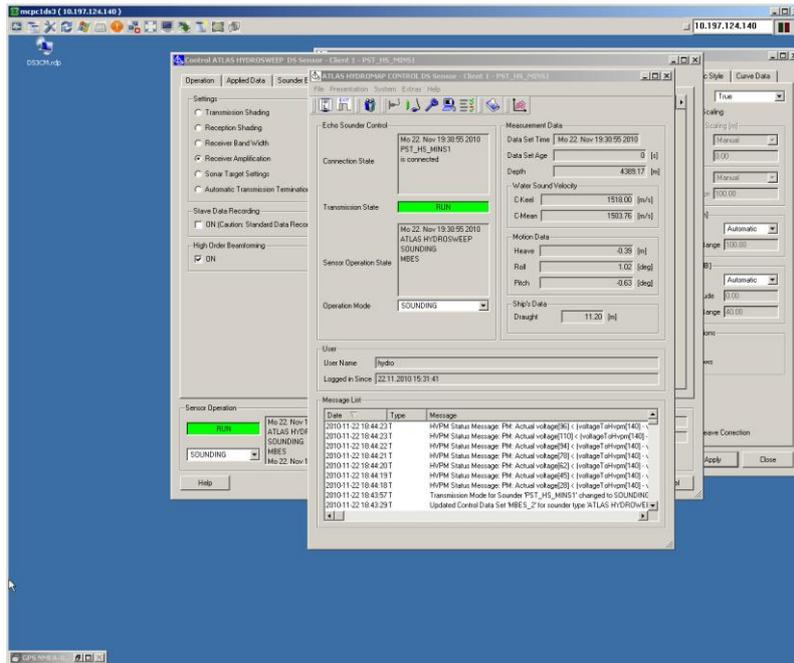
Choose the server:

- mcpc1ds3: 10.197.124.140 (main server, 3 screens)
- mcpc2ds3: 10.197.124.141 (recommended, 1 screen)

Then click Connect.

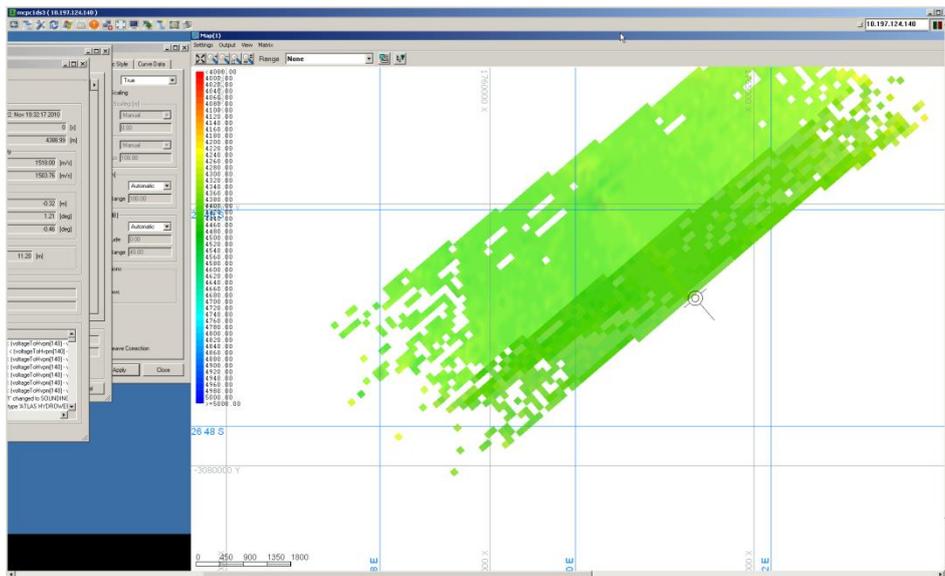


Password: SALTA



If you are displaying from mcpc2ds3: 10.197.124.141 (recommended), then you're finished.

If you are displaying from mcpc1ds3: 10.197.124.140 (main server) click **twice** on the Select full desktop icon  to make all three screens reachable through the scroll left/right bar.



N.B.: You also have the possibility to draw the Hypack license to those computers but this bring the risk to lose track of your data (which are by default saved on the computer where Hypack is running)

POSSIBLE SOURCES OF ERRORS

Feel free to add anything that happened to you!!!

ATLAS HYDROMAP SERVER

- Atlas Hydromap Server has lost the connection/stopped: start it again by clicking on the icon on the desktop

ATLAS HYDROMAP CONTROL

- The pigging doesn't start: first be patient...it can take some time. If nothing happens then go through the whole procedure again (disconnect or stop the multibeam)
- If it doesn't start after 5 minutes, try again (switch OFF then back ON) or ask the ship technician for help!!!

HYPACK

- You are logging but do not get any data displayed in the map window: Do you have a matrix? Are you within the matrix?
- You only get a really narrow track: right click on the Multibeam Waterfall window and check your Range (min, max depth and width)
- The data doesn't display in your new matrix: did you unload the old one?
- The display is slow or blocked: try closing some windows
- The program doesn't seem to log anymore: restart the survey or Hypack
- Your matrix has moved: did you change the geodesy after having started the survey?

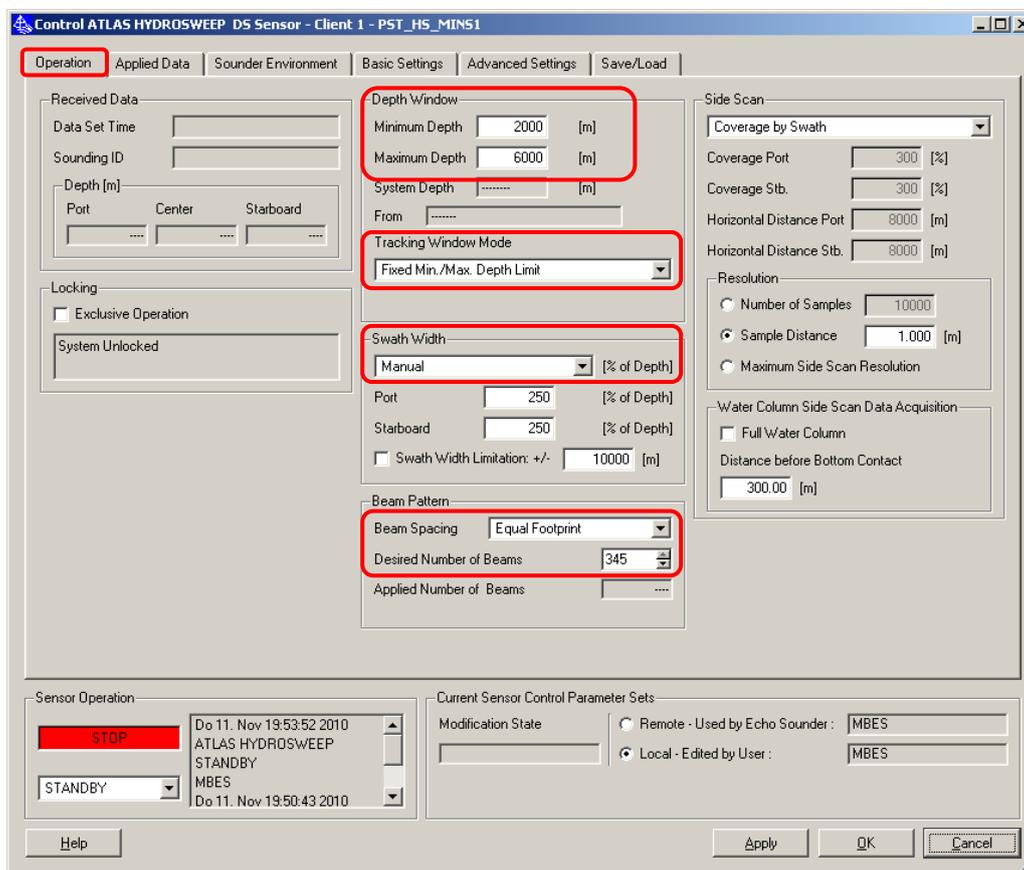
ULTRAVNC VIEWER

- You cannot connect from the bridge or the winch room to the computers in E-550 with UltraVNC Viewer: check that UltraVNC Viewer and Ultra VNC Server are not already running on both computers (you might have to force them to stop with the task manager)

ATLAS HYDROMAP CONTROL SETTINGS

System > Control echosounder

OPERATION: SETUP MIN AND MAX DEPTHS AND SWATH WIDTH



- You must set your minimum and maximum depth.
 - Tracking window mode: fixed min/max depth limit (variable limit would also work but has trouble dealing with steep slopes)
 - Swath width: 400 (4 times water depth)
 - Beam spacing: equal footprint
- Desired number of beams must always be 345!!!!**

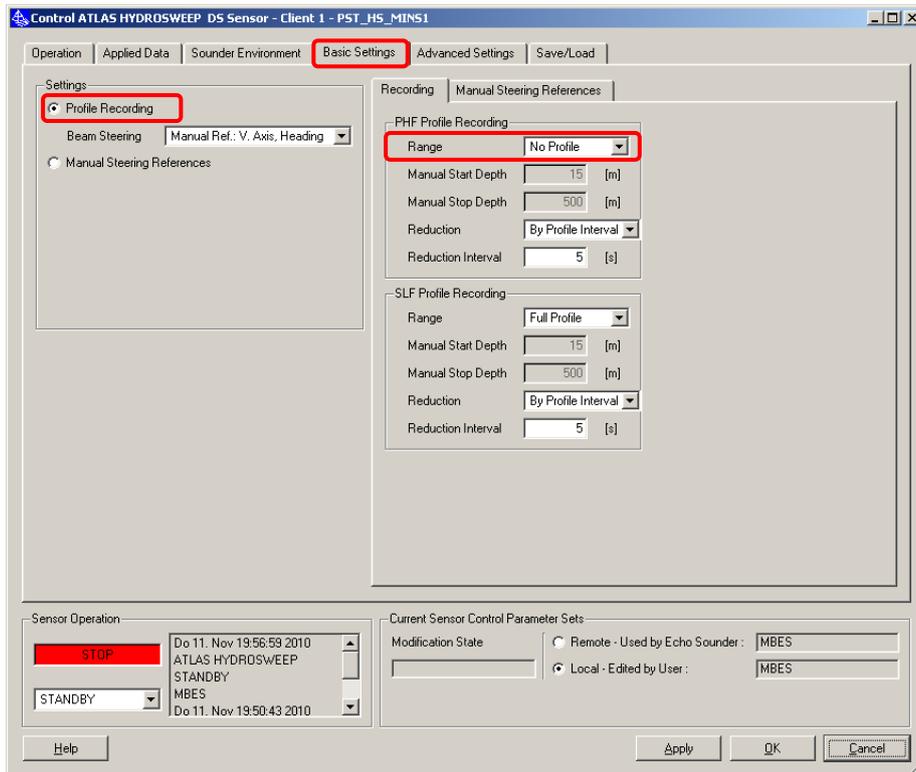
APPLIED DATA

Don't touch anything!!

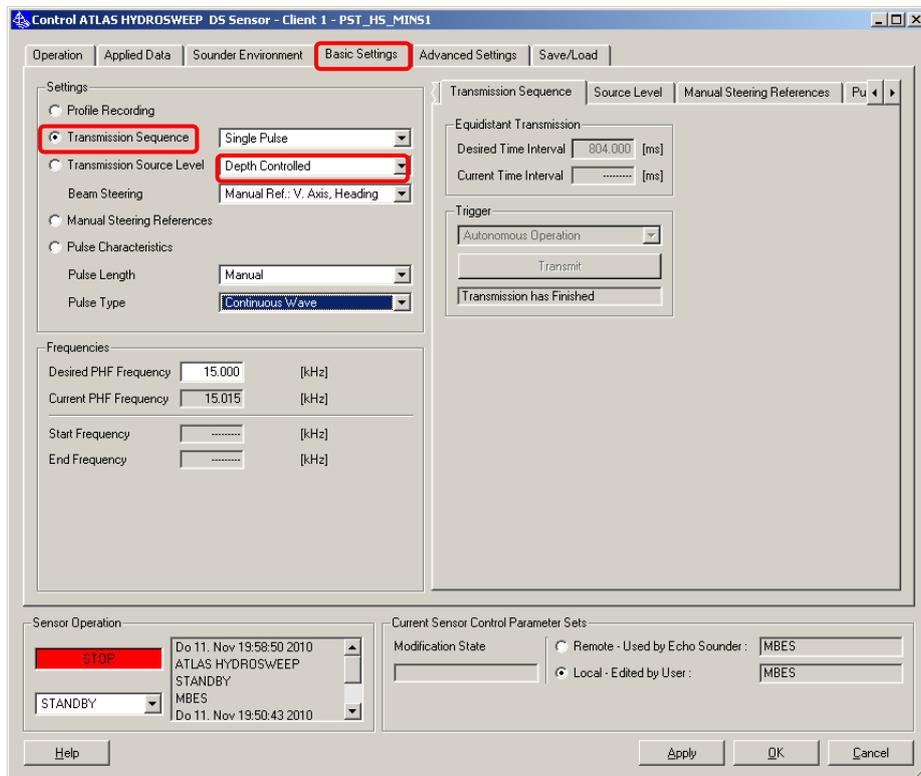
SOUNDER ENVIRONMENT: CHECK SVP INTEGRATION

- C-Keel Source: system C-Keel
- C-Mean Source: Manual when no SVP integrated via Atlas Sensor Manager (1500m/s)
System C-Profile when SVP integrated via Atlas Sensor Manager

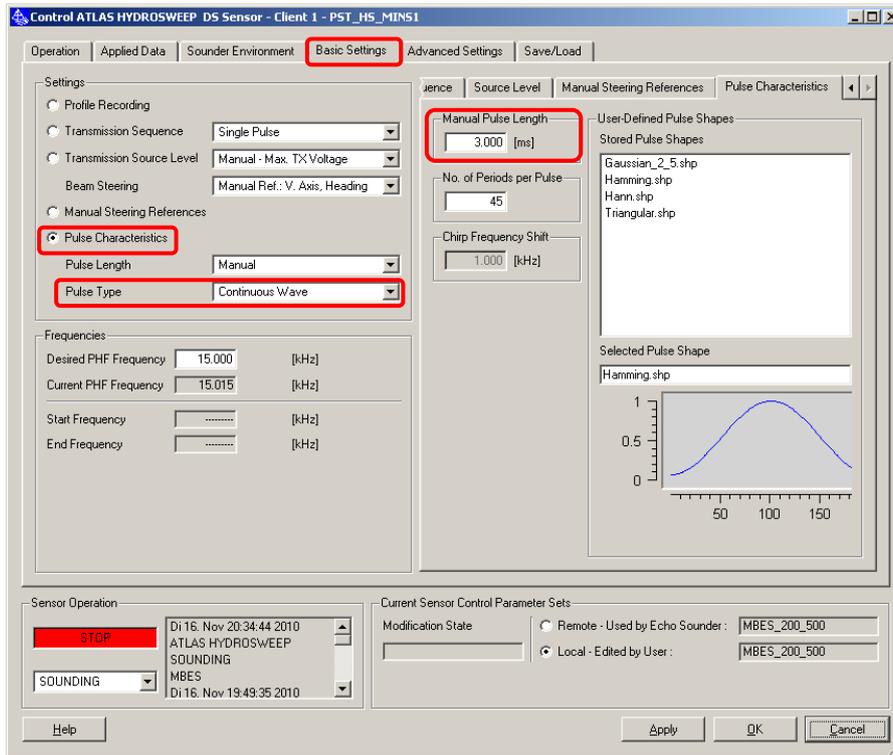
BASIC SETTINGS: SETUP PULSE LENGTH



- Range: No profile

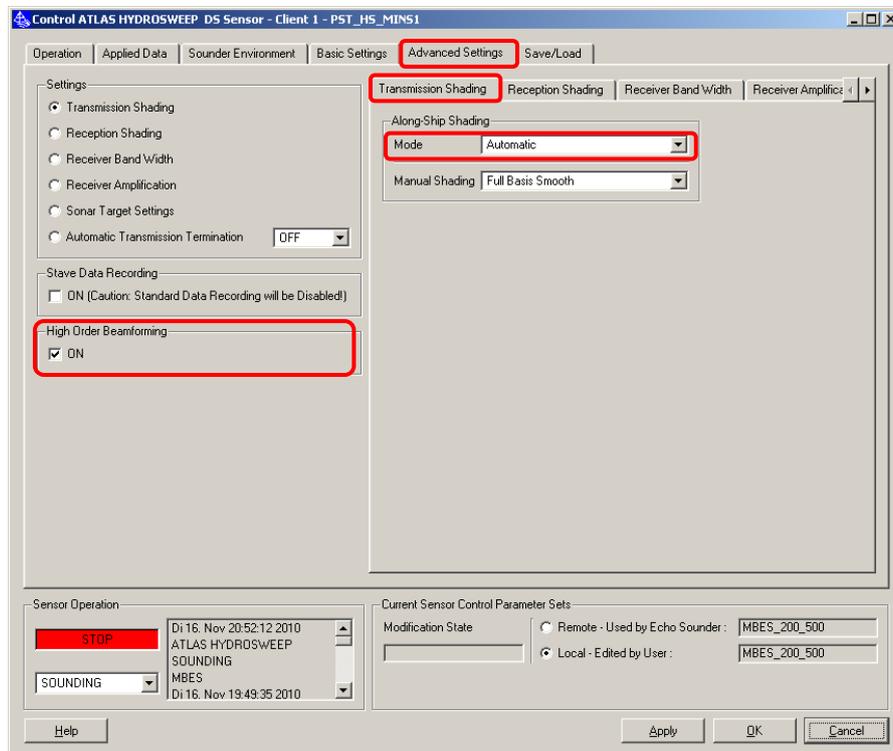


- Transmission source level: Depth controlled

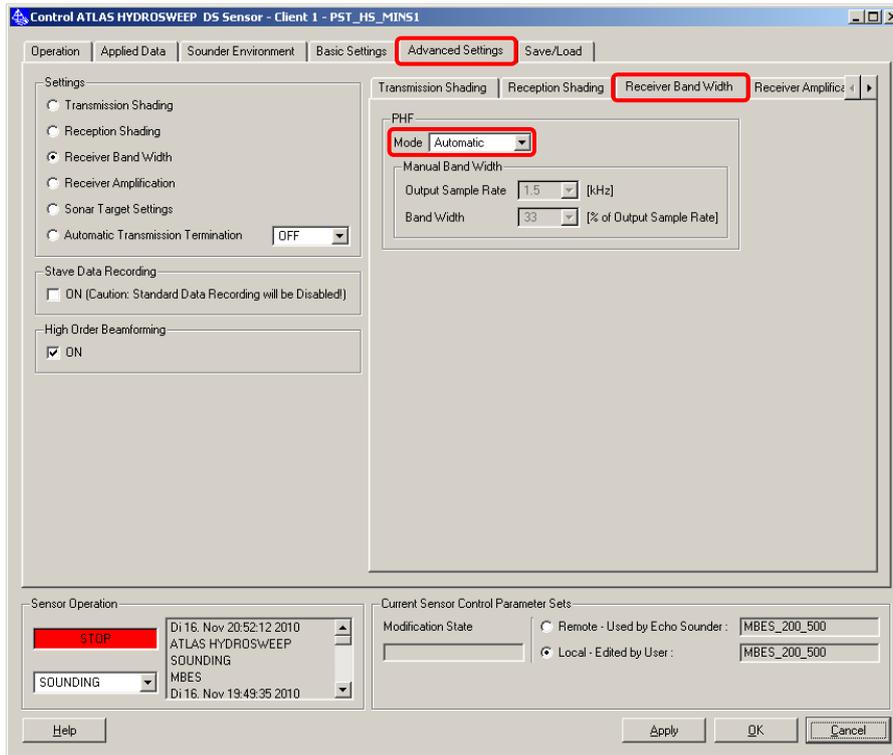


- Set your pulse length
- Pulse type: continuous wave

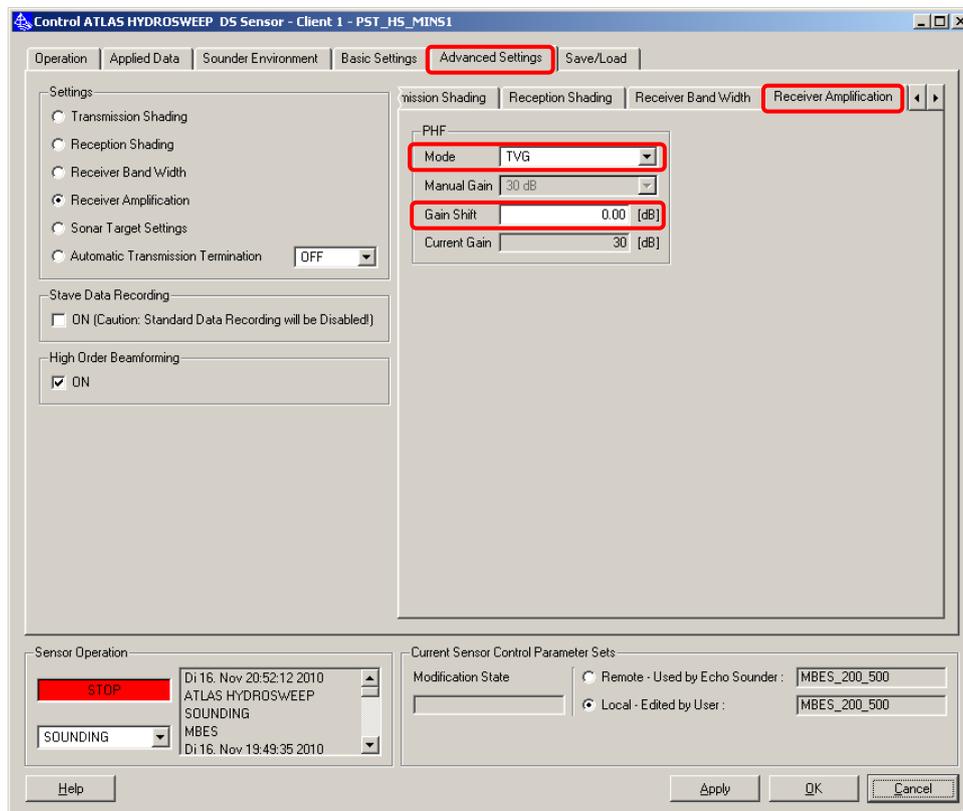
ADVANCED SETTINGS



- Alongside shading, mode: automatic
- High Order Beamforming: checked



- PHF, mode: automatic



- PHF, mode: TVG
- Gain shift: 0