

caris[®] APP NOTE

MULTIBEAM PROCESSING

EM3002

1. INTRODUCTION

This appnote details how to process a multibeam dataset from the EM3002 Multibeam Echo Sounder using CARIS software.

CARIS is a hydrographic data processing package capable of processing both bathymetric and sidescan sonar data. The software is vendor independent and supports sonar data from all major equipment manufacturers as well as most exchange formats used in the hydrographic industry.

NTNU AUR Lab holds an academic license consisting of 5 dongles. The latest software can be downloaded from the CARIS support website using the following login credentials. The software is under continuous development and it is integral to always use the latest version.

CARIS

Website: <http://support.caris.com/>
Account name: christian.malmquist@ntnu.no
Password: Lopheliapertusa%2016

Please contact christian.malmquist@ntnu.no if you have issues gaining access to the software download site.

NOTE:

CARIS can be frustrating as the menus are context dependent.
CARIS is very powerful and this exercise is merely scratching the surface.

2. CARIS SUPPORT DOCUMENTATION

This appnote introduces MBES processing with CARIS. The complete training material for the CARIS modules are available to NTNU students and should be consulted for in-depth knowledge of the different processing modules. The complete training documentation is attached with this document:

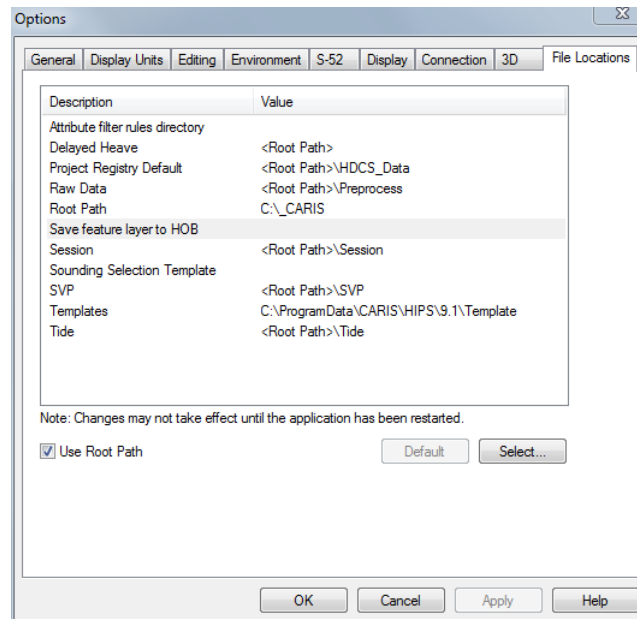
- 01 - HIPS and SIPS 9.1 Multibeam Data Processing.pdf
- 02 - HIPS and SIPS 9.1 Backscatter Processing.pdf
- 03 - HIPS and SIPS 9.1 Side Scan Processing.pdf
- 04 - HIPS and SIPS 9.1 WCI Processing.pdf
- 05 - HIPS and SIPS 9.1 MBES Calibration Processing.pdf
- 06 - HIPS_and_SIPS_Glossary.pdf
- 07 - Pitch-Roll-Yaw Sign Conventions.pdf

3. SOFTWARE SETUP

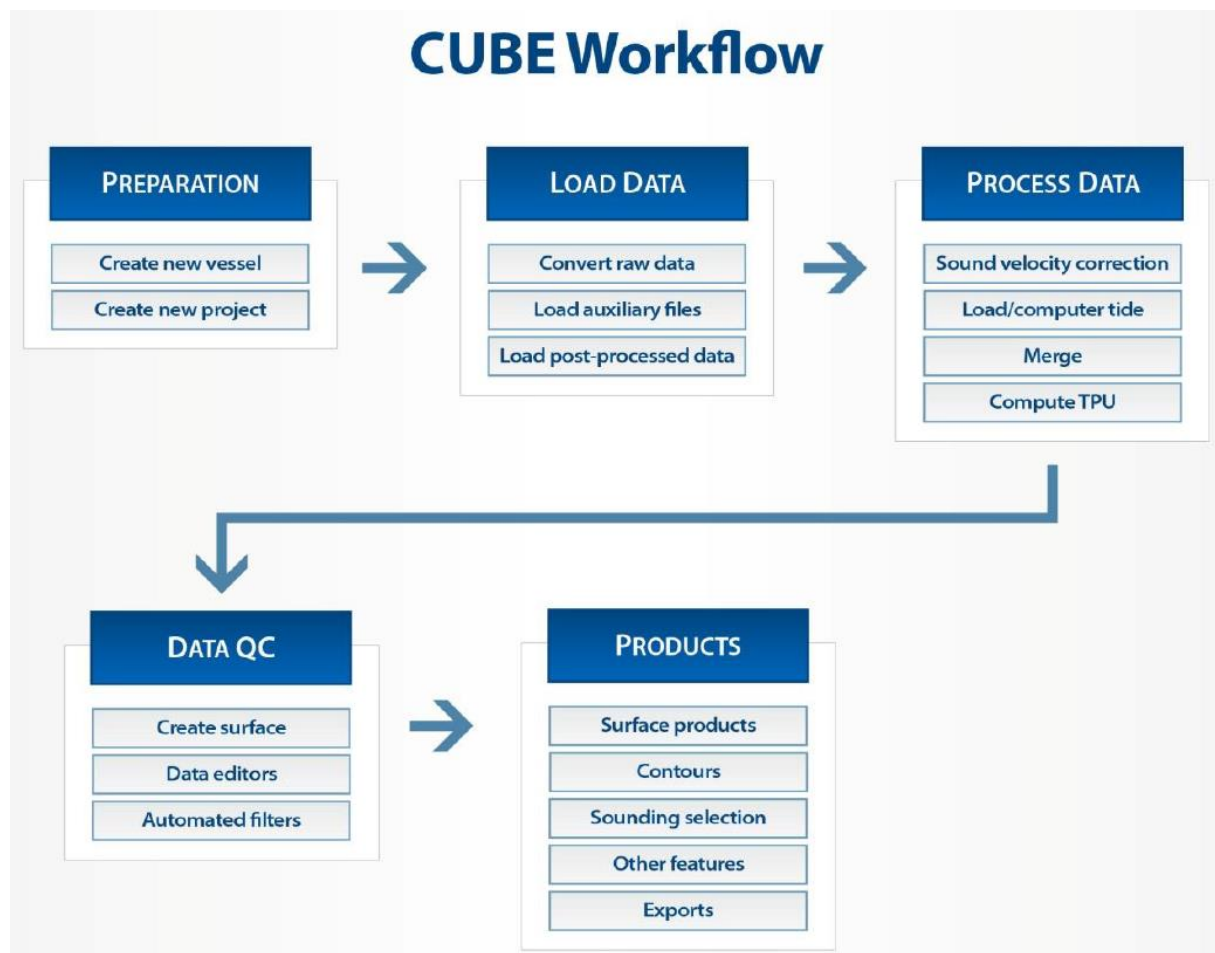
- Install software
- Insert USB dongle and let drivers load
- Start HIPS/SIPS and check that license is read from key: | Tools | Licenced Components |
HIPS, SIPS and Singlebeam should show status "licenced"
Caris licenses are renewed every 6 month. Contact christian.malmquist@ntnu.no for info on how to update HW dongle.

4. FOLDER SETUP

- Create the following folder structure:
X:/_CARIS
X:/_CARIS_DATA
X:/_CARIS_DROPBOX
- Set root path to x:/_CARIS
|Tools|Options| -> “File Locations” -> Check “Use Root Path” -> Mark “Root Path” and select X:/_CARIS



- Copy and unzip the training raw file to _CARIS_DROPBOX and unzip.
The training files are:
ZeroTide.tid – Tide file with zero tide
KongsbergAllZero.hvf - Vessel definition files for Kongsberg EM3002 All File
*.ALL Files - RAW MBES Soundings



5. PREPARATION / CREATE VESSEL

All sensor offsets and sensor alignment angles are recorded in the Kongsberg ALL MBES logging file and we will only require a zero offset vehicle to process the dataset.

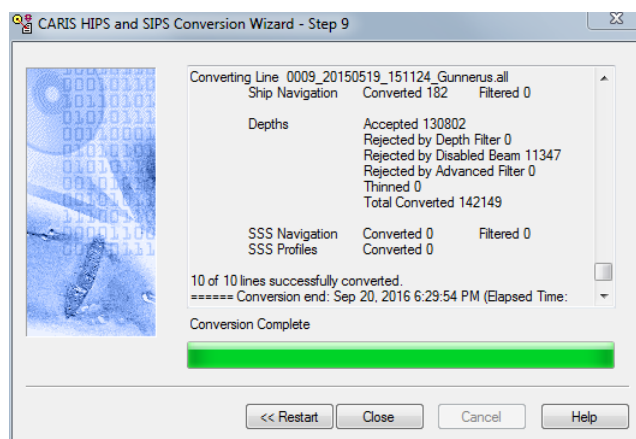
- Copy KongsbergAllZero.hvf from X:/_CARIS_DROPBOX to X:/_CARIS_DATA/VesselConfig/

6. PREPARATION / CREATE NEW PROJECT

- |File|New Project|
- Setup Storage
Name = TRAINING
Folder = X:/_CARIS_DATA
- Step1 Add Project = NTNU
Add Vessel = KongsbergALLZero
Add Day = 19 Mai 2015
- Step2 No change
- Step3 Select UTM automatically
- Step4 Do not alter extent
- Finish

7. LOAD DATA / CONVERT RAW DATA

- |File|Import|Conversion Wizard|
One import per day!
- Step1: Choose Simrad
- Step2: "Create New Surveylines"
- Step3: Choose RawData and select *.ALL files from X:/_CARIS_DROPBOX (do not select the 9999.all file!)
- Step4: Assign to survey date in project created earlier
- Step5: Keep Geographic
- Step6: Keep Navigation and Depth unchecked (all soundings will be imported)
- Step7: Check Reference .all data directly
- Step8: Leave all options default
- Step9: Convert!
Make sure that the converter registers records for "Ship Navigation" and "Depths"
Close converter.
- |File|Open| X:/_CARIS_DATA/NTNU/NTNU.hips to load project



8. LOAD DATA / LOAD AUXILIARY FILES

Not needed for this exercise.

9. LOAD DATA / LOAD POST-PROCESSED DATA

Not needed for this exercise.

10. PROCESS DATA / SOUND VELOCITY CORRECTION

Not needed for this exercise.

11. PROCESS DATA / LOAD and COMPUTE TIDE

The vertical reference (zero level) in the ALL files is the vessel waterline. A tide file, detailing time vs height above fixed vertical reference must be used in order to reference the soundings to the same vertical datum. In this exercise we will, for simplicity, use a zero tide file. For actual tides visit <http://www.kartverket.no/sehavniva/>.

- Select All Lines in Project Browser
- |Process|Load|Tide|
In X:/_CARIS_DROPBOX/ choose ZeroTide.tid
- Save Session in X:/_CARIS/Session

12. PROCESS DATA / MERGE

In this process, CARIS computes soundings coordinates from all defining sensors (position, attitude, etc)

- Select All Lines in Project Browser
- |Process|Merge|
Unselect all options
- Save Session

13. PROCESS DATA / COMPUTE TPU

When creating a seabed surface, CARIS can use a statistical algorithm called CUBE. In order for CUBE to work, we must calculate the total propagated uncertainty for each sounding. This is done by propagating the variances for all sensors using the standard deviations set in the vessel file and error models for the sounder type in use.

- Select All Lines in Project Browser
- |Process|Compute|Total Propagated Uncertainty|
Leave TPU parameters as default
- Save Session

14. DATA QC / CREATE SURFACE

Create the initial surface to be used in the data cleaning process:

- Step0: |View|Overview| (F9) and zoom out
- Step1: Select All Lines
- Step2: |Tools|Surfaces|New|
- Step3: Set filenavn in folder X:/_CARIS/Grids/ -> Zoom to Extents (PC screen icon) -> Set resolution (2) and Surface Type = Cube -> Default

- Step4: |View|Refresh| (F5)
----> Play with resolution until match with sensor beam spacing
- Use 3D mode to fly through Bathymetry
- Save Session

15. DATA QC / DATA EDITORS

A variety of editors can be used to clean the various sensors:

- Attitude Editor – Clean Pitch, Roll, Heading, Heave, ...
- Navigation Editor – Clean Easting, North, ...
- Swath Editor – Clean soundings in time domain
- Subset Editor – Clean soundings in XYZ

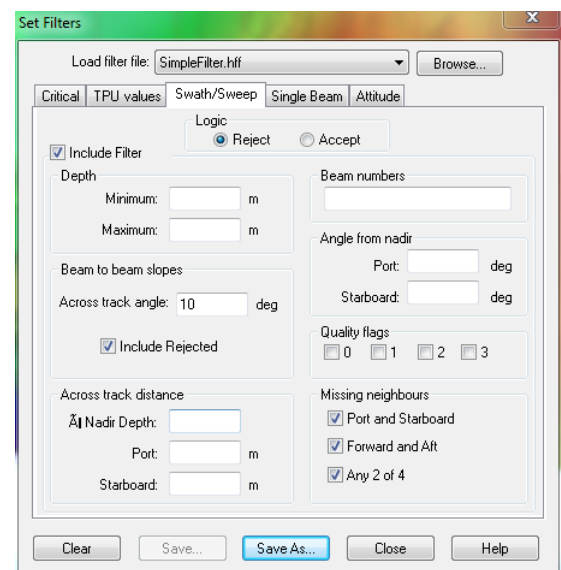
The most powerful editor is the Subset Editor.

- In Project / Project, select all runlines
- |Tools|Editors|Subset|Open|
- Choose desired area for investigation
- CTRL key can be used to turn the investigation box
- From Subset Editor Menu bar, choose Load data
- Now possible to reject soundings manually or by ping.
Please refer to main training documentation for tool descriptions.
- Close Editor |Tools|Editors|Subset|Open|
- Save Session

16. DATA QC / AUTOMATED FILTERS

Simple sounding filter example:

- In Project / Project, select All Lines
- |Tools|HIPS Data Filters|Settings|
Save as SimpleFilter.hff in X:/_CARIS/Session/
- |Tools|HIPS Data Filters|Apply|Bathymetry|
- Layer needs to be recomputed as defining soundings are changed
Rightclick on layer “FirstCubeSurface” and choose
recompute
Middleclick or F9 to see change
- Save Session



17. PRODUCTS / SURFACE PRODUCTS

Create final surface. Same procedure as for the creation of CUBE surface under point 14, but choose “Swath Angle” as Surface Type. Deselect Cube surface and enable Swath Angle surface to see difference.

Possible to further manipulate surface by interpolation and generalization.

18. PRODUCTS / CONTOURS

- |Create|New Feature Layer|
Give name “NTNU Feature Layer”
- Rightclick surface layer and click “Contouring”
- Select “Depth”, “Grid” and Outputlayer = “NTNU Feature Layer”, NEXT
- Change suggested values to whole numbers and 5m intervals, NEXT
- Check “Create Areas”, Uncheck “Automatic Populate SORIND”, (ENC coding options)
- Mark NTNU Feature Layer and |Select|All|
- |File|Export|Selection to Shape File|, select filename

19. PRODUCTS / SOUNDING SELECTION

Not applicable for this exercise

20. PRODUCTS / OTHER FEATURES

Not applicable for this exercise

21. PRODUCTS / EXPORTS

Export CARIS grids to GIS compatible format

- Select Layer / SubLayer (Mean) to export
- |File|Export|Raster Product|
- For raster to be used for further analysis choose Output: “Raster DEMs / GeoTIFF”
- For raster to be used in visualization, choose Output: “Raster Images / GeoTIFF”

