

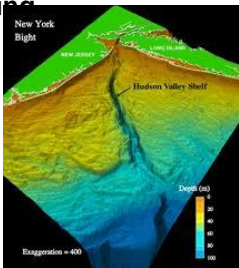
Collecting & Processing Hydrographic Data



12. Ports & harbors



11. Coastal Engineering



10. Marine Geology



13. Offshore Ops



1. Nautical Charting



2. Defense



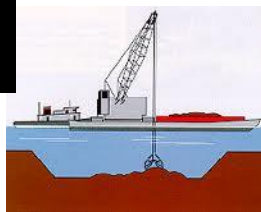
3. Dredging



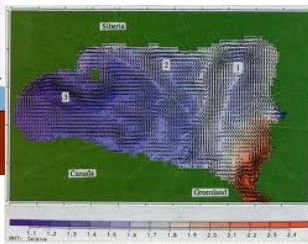
4. Dams & Reservoirs



5. Riverine



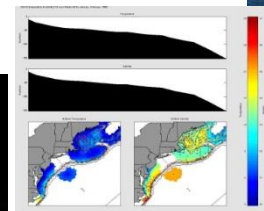
9. Mining



8. Oceanography



7. Ecology & Marine Biology



6. Scientific Research



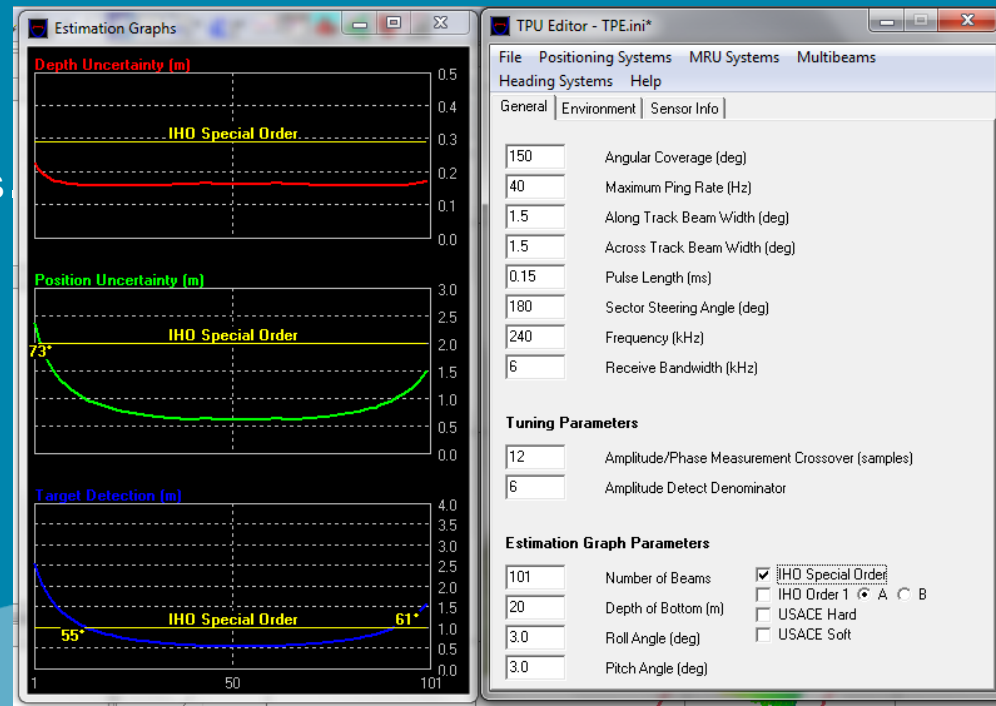
HYPACK
a xylem brand

Survey Design

Geodesy Hardware Configuration

Which Sensors?
Where are located?
Calibration procedures?

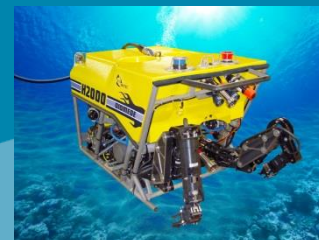
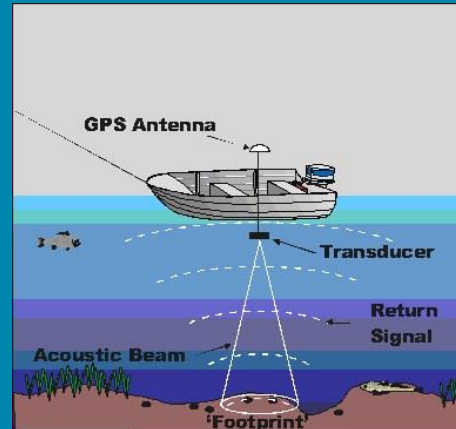
Planned Lines and other considerations
QC & QA - TPU



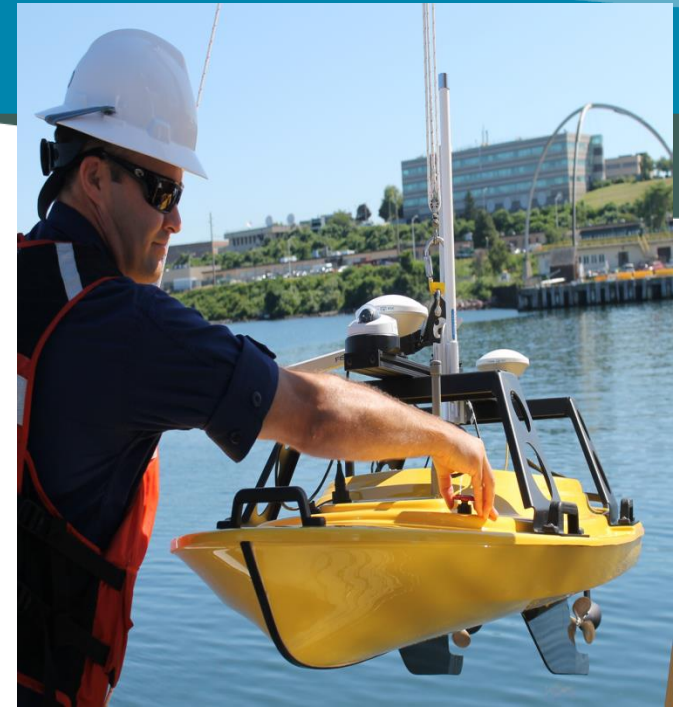


HYPACK

a xylem brand

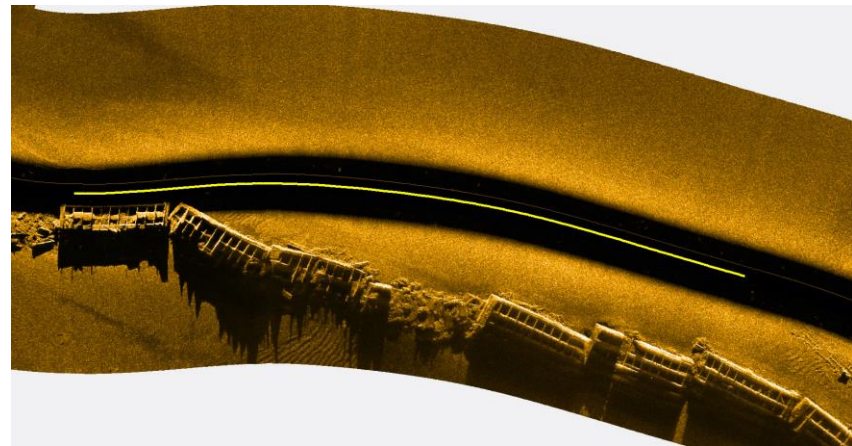
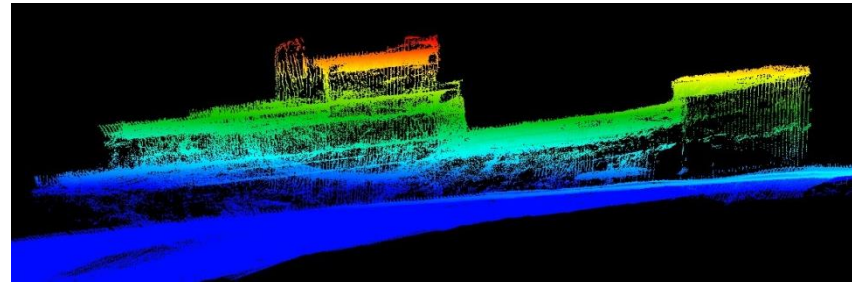
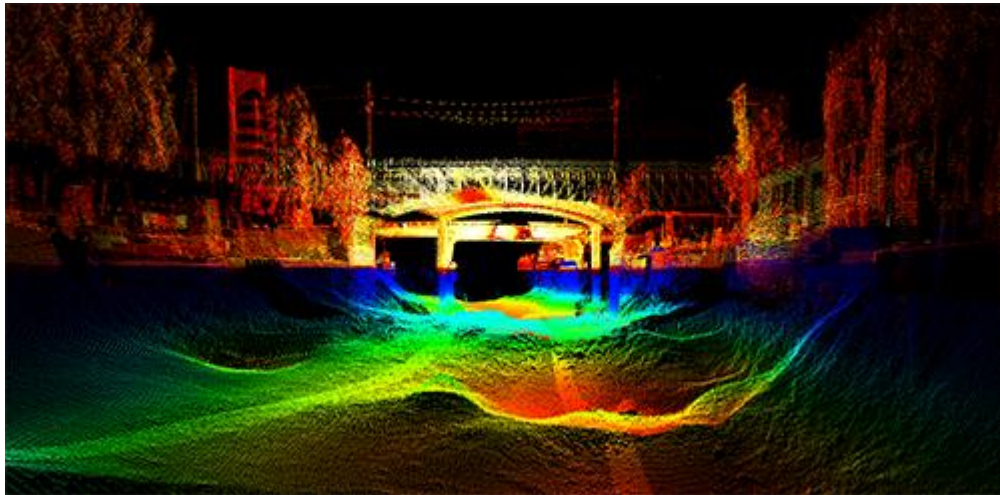
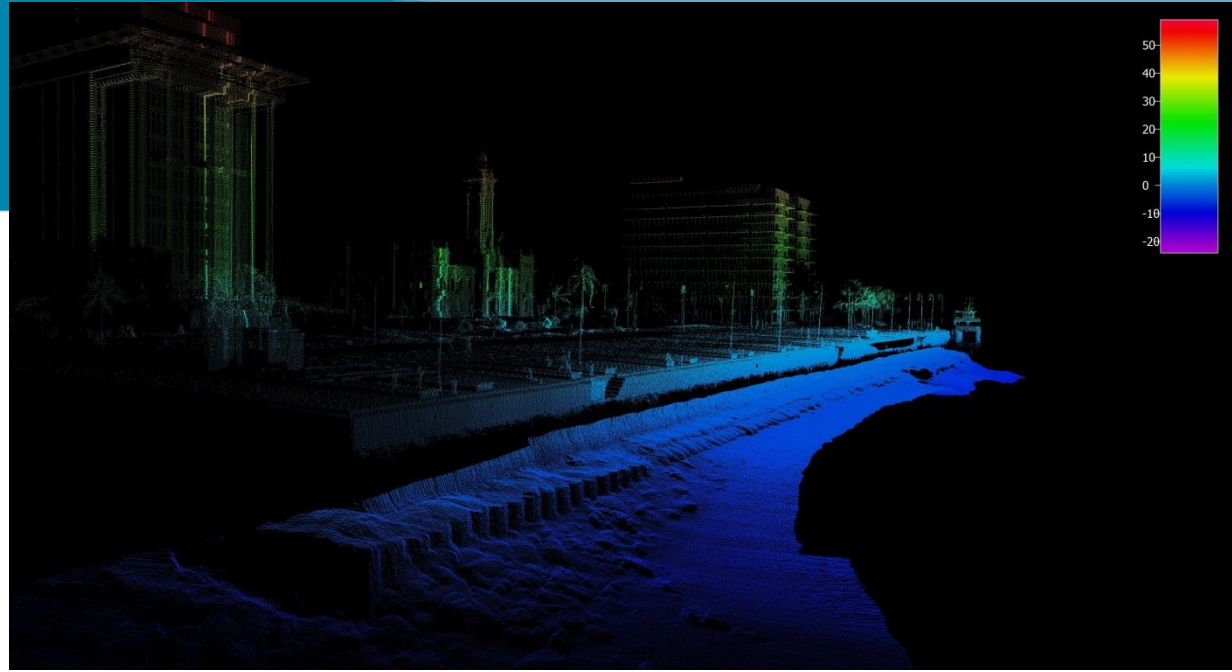
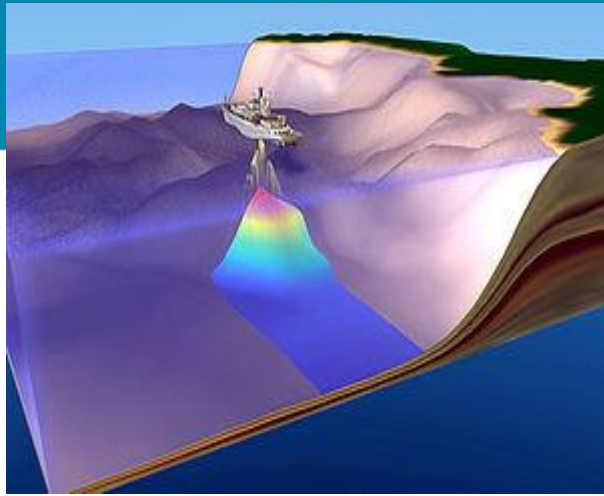


Unmanned Systems

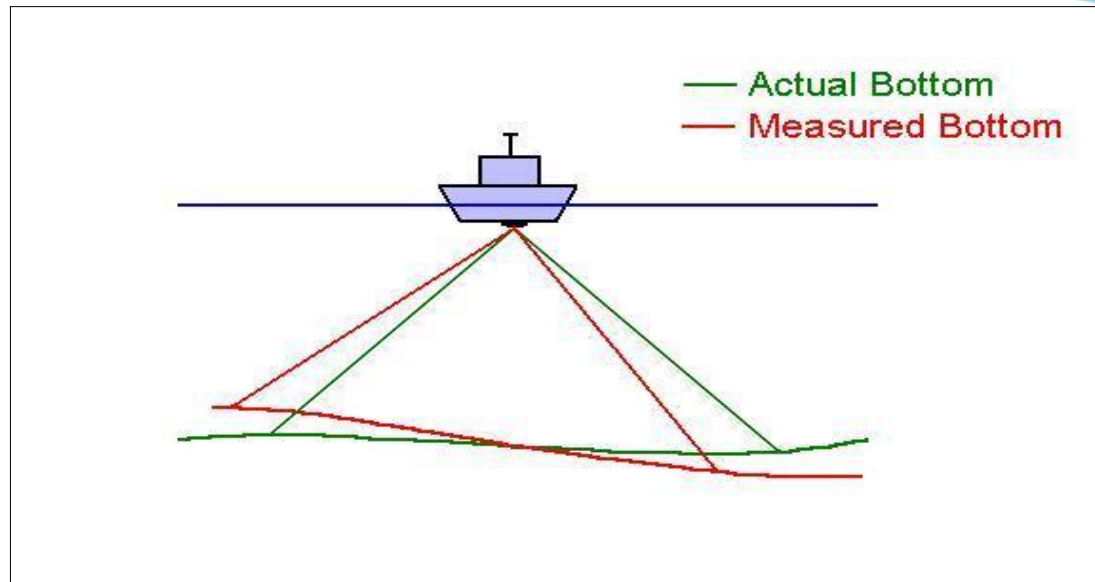








Multibeam Patch Testing



Patch Test Offsets

Head 1		Head 2		GPS	
Yaw	0.00	Yaw	0.00	Latency	0.000
Pitch	3.00	Pitch	3.00		
Roll	1.10	Roll	3.30		

Patch Test History... OK Cancel

Corrections to Soundings

Static Draft

Dynamic Draft

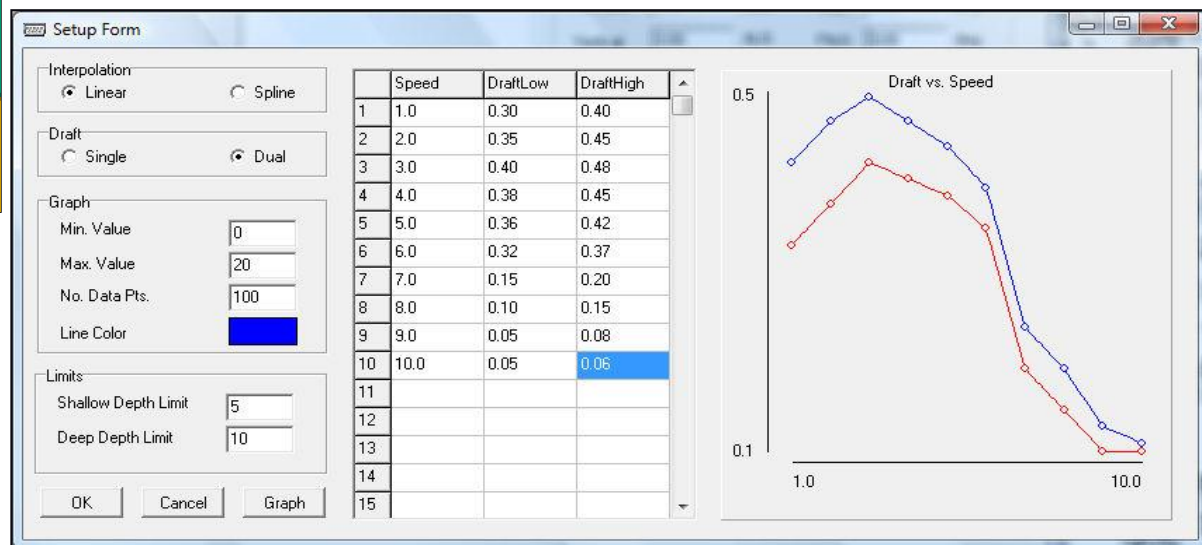
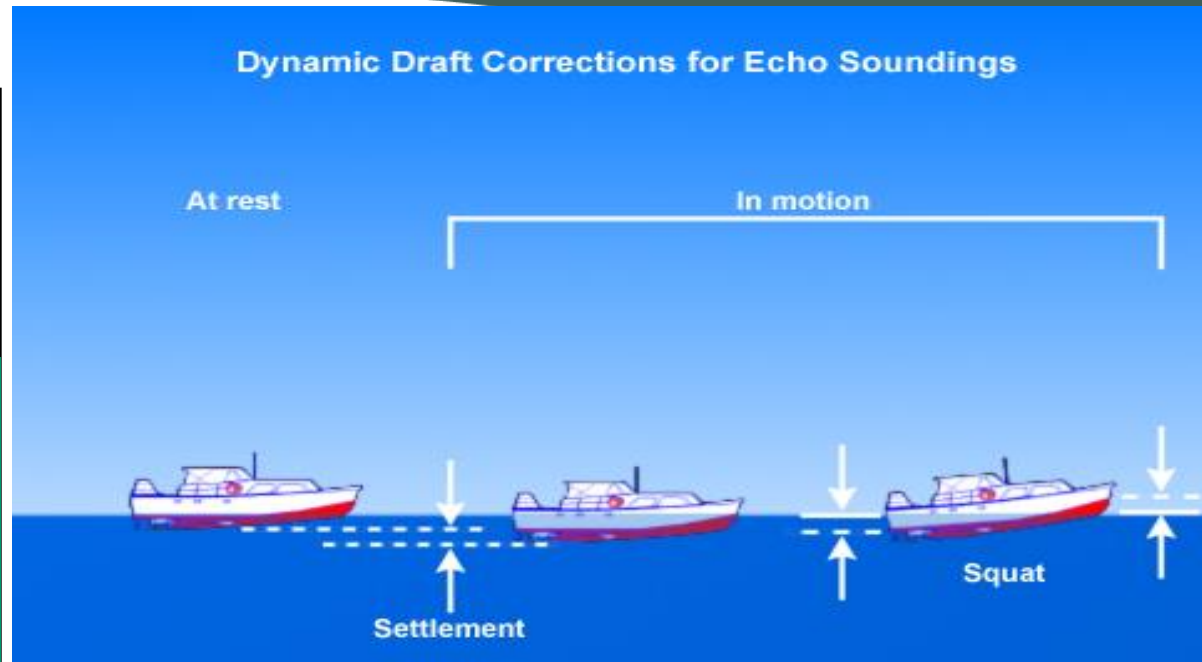
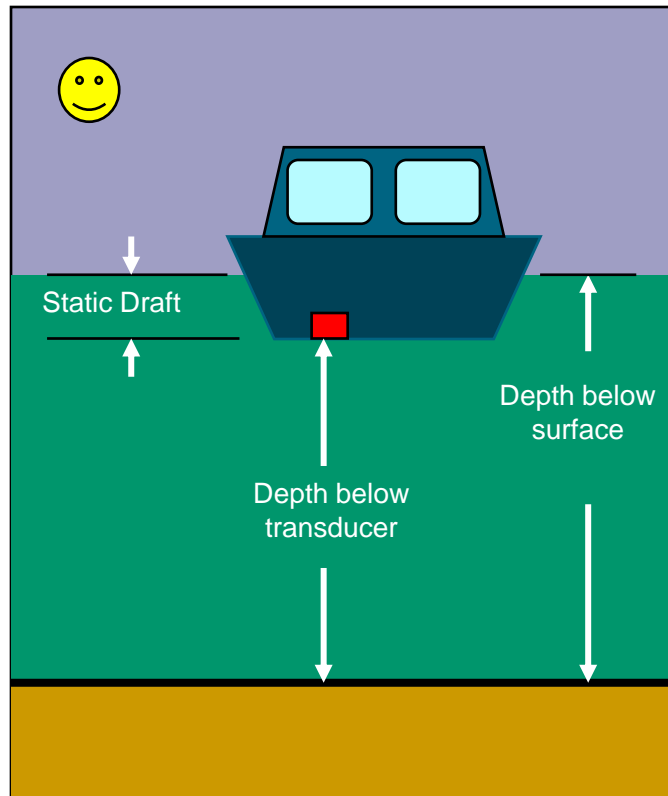
Heave

Sound Velocity

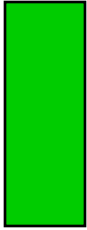
Tide (Water Level)

STATIC DRAFT

DYNAMIC DRAFT



MOTION REFERENCE UNITS (MRUs)



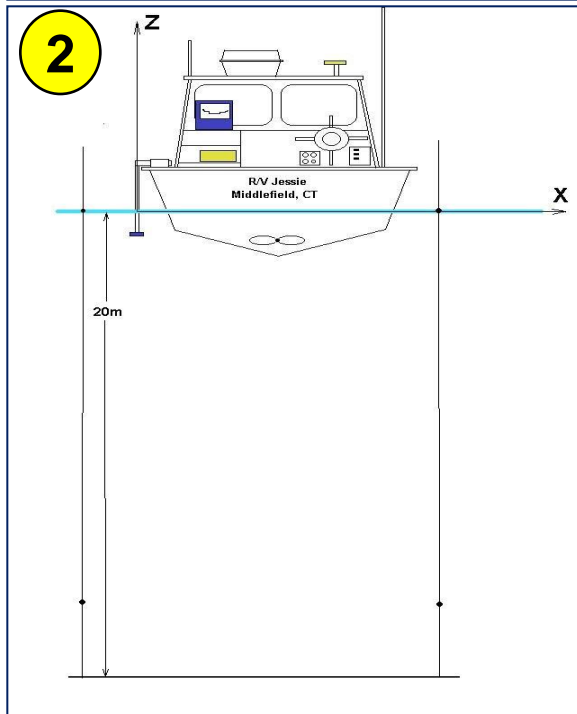
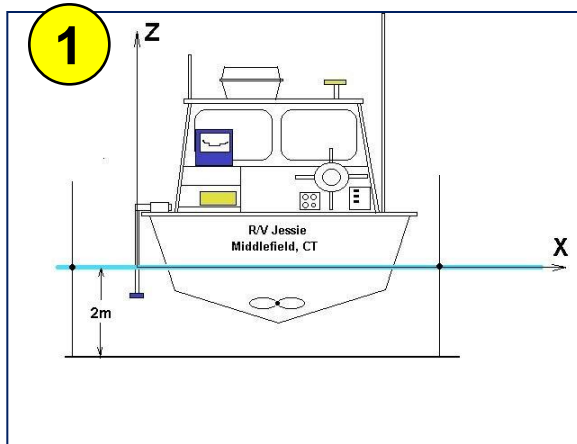
Heave Vertical Reference

- A heave sensor (or MRU) outputs its height above or below its current vertical reference.
- The vertical reference slowly changes based on the range of motion of the sensor.

SOUND VELOCITY CORRECTIONS

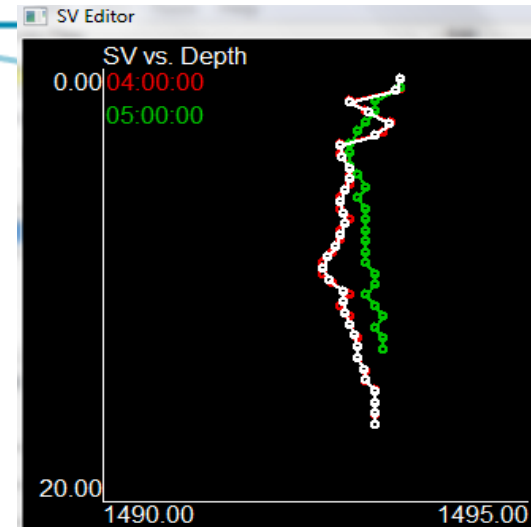
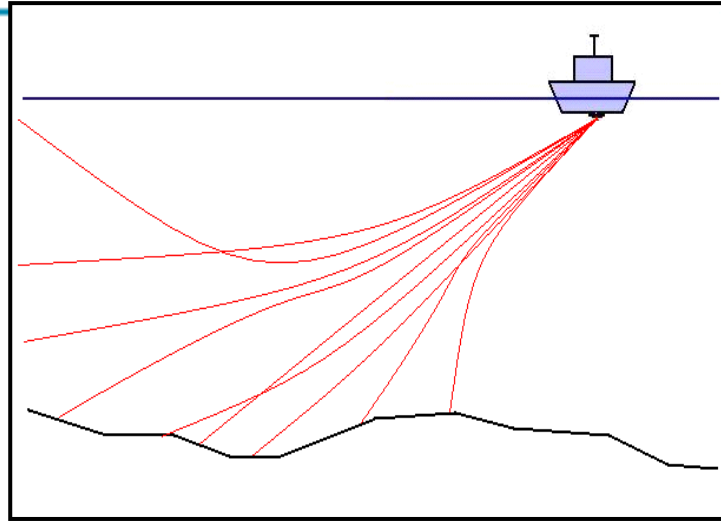
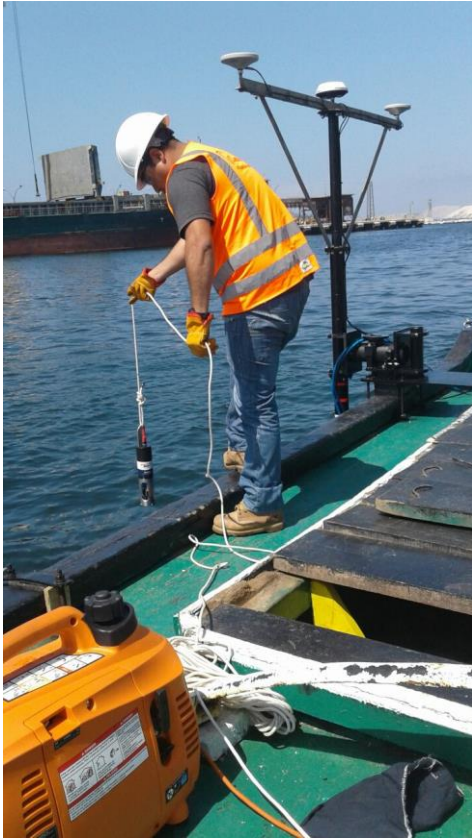
Method	Usage	Program
Calibrating your echosounder with a bar check.	Single Beam	None.
Correcting with a Sound Velocity Speed profile.	Multibeam and Single Beam	SOUND VELOCITY
Correcting for sound velocity based on measured errors at each depth.	Single Beam	SOUNDING ADJUSTMENT Separate program or built into SBMAX

The Bar Check



1. Lower a bar or plate 5' or 2m beneath the surface.
 - Adjust the 'zero' or 'draft' or 'tide' on your echosounder until you read that value.
2. Lower the bar to your deepest Project depth to be measured.
 - Adjust the sound velocity speed until you read that value.
3. Repeat steps 1 and 2 until you don't have to make any adjustments.
 - Your echosounder will now output soundings that have sound velocity speed corrections factored into the output depth.

Using Data from a Velocity Probe

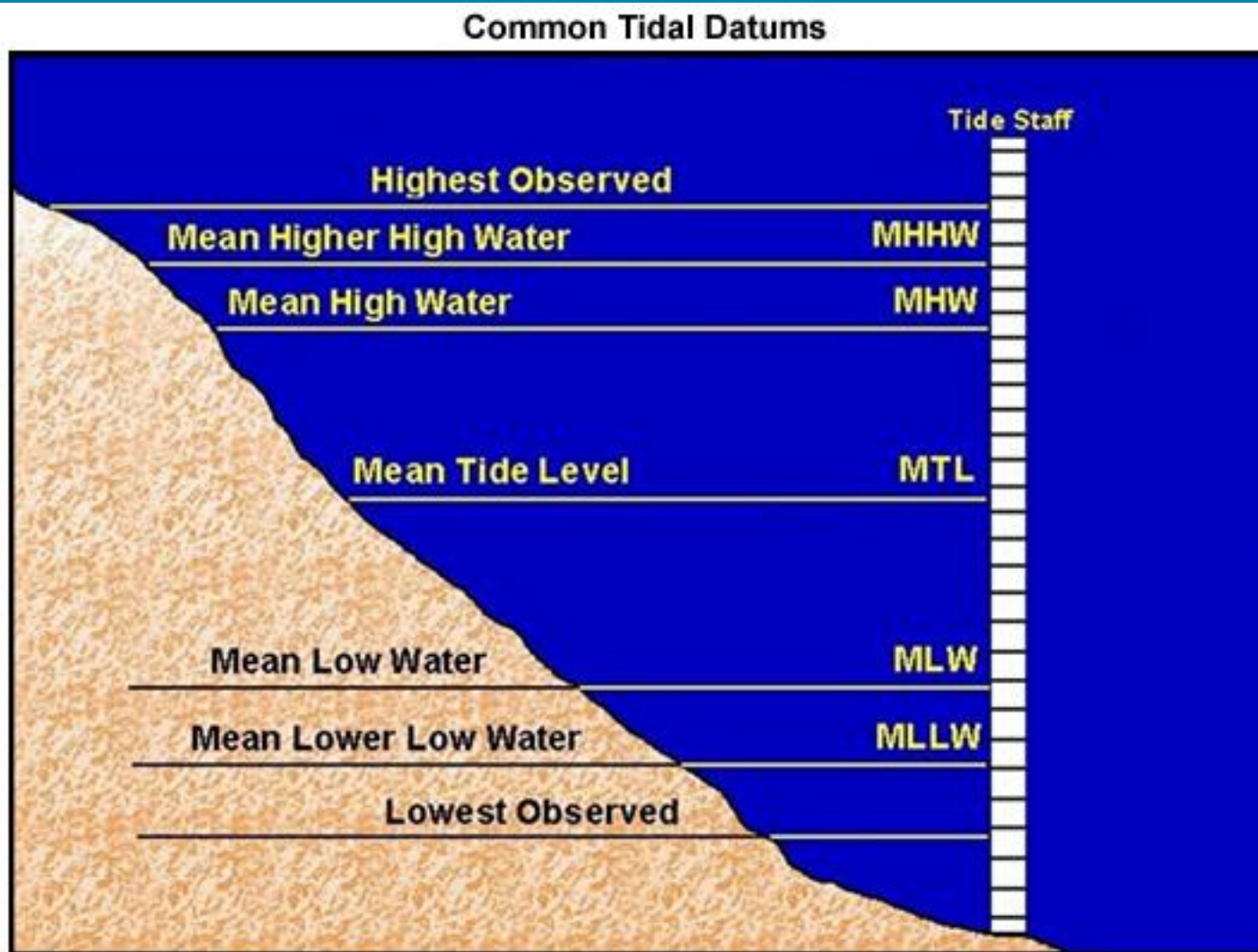
A screenshot of the 'Multi SVP' software window. The title bar says 'Multi SVP'. The window contains several radio buttons for 'Interpolation Method': 'None' (selected), 'Time', 'Time and Position', 'Use Most Recent', 'Use Nearest in Time' (selected), and 'Use Nearest in Position'. Below this is a section titled 'Enter Cast Time (24 Hour)' containing a table with two rows of data. At the bottom are buttons for 'Get File Create Times', 'Get File Write Times', 'OK', and 'Cancel'.

	Time	Date	X	Y	File
1	04:00	04/21/2015	442586.0	109158.0	Cast150417_1341.vel
2	05:00	05/11/2015	443000.0	109300.0	vel 3.vel

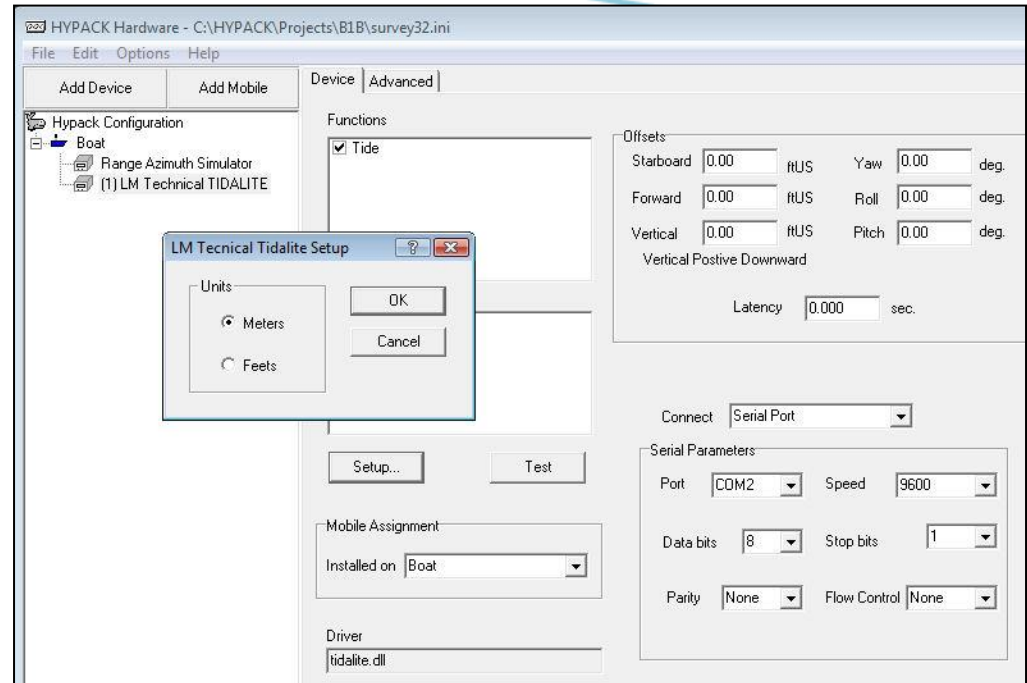
TIDE CORRECTIONS

Method	Program
Telemetry Tide Gauge	SURVEY with telemetry tide driver
Manual Entry During SURVEY	SURVEY
RTK TIDES	SURVEY using GPS.DLL, POSMV.DLL, or F180.DLL
Manual Entry During Post- Processing	MANUAL TIDES
Prediction from High & Low Water Times and Heights	MANUAL TIDES
Harmonic Predictions	HARMONIC TIDES
Interpolating Between Stations	Tide Adjustments routine in SBMAX
Tidal Zoning	TIDAL ZONING

What is my Vertical Reference or Vert Datum?

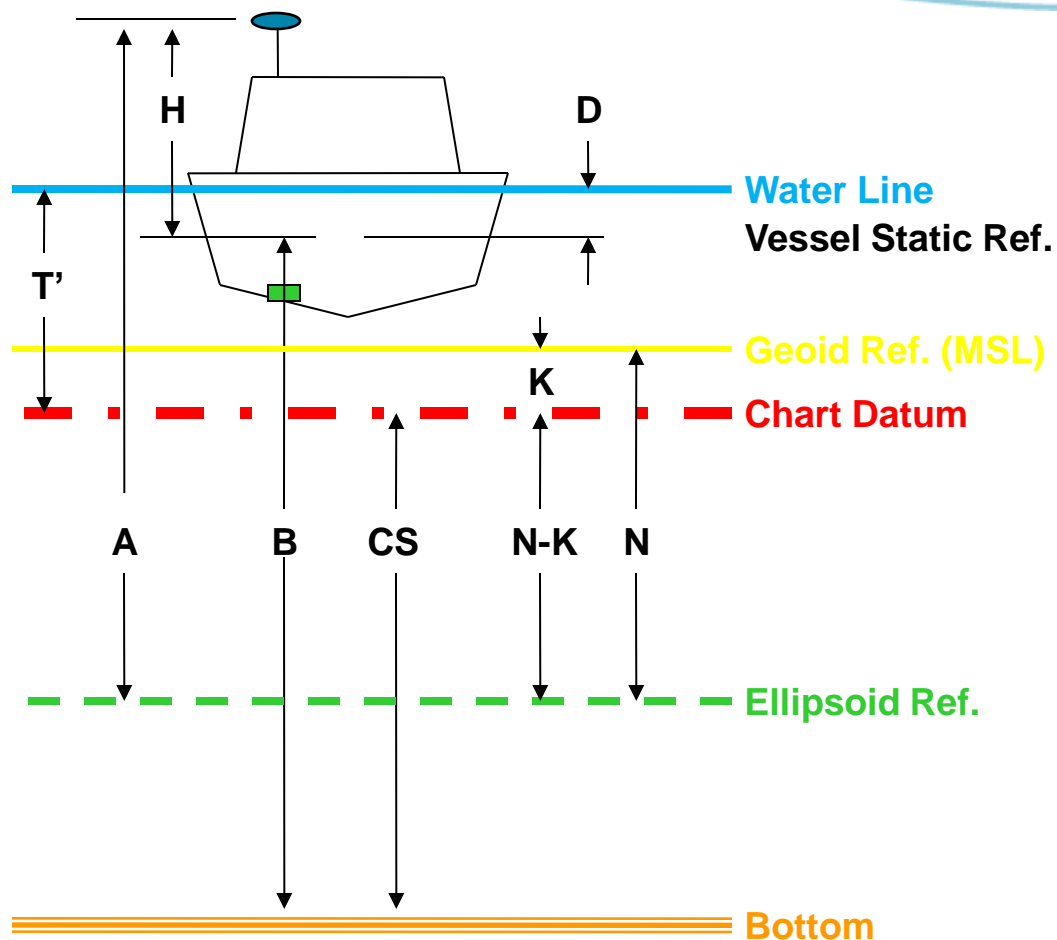


Telemetry Tide Devices



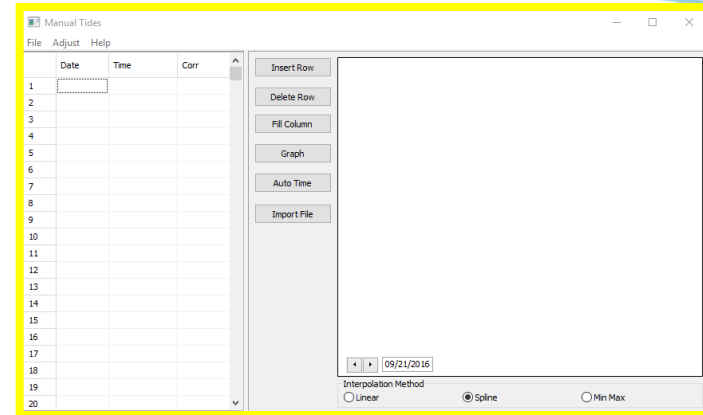
RTK Tides

- Height of WGS-84 Ellipsoid Above the Chart Datum:
 - $= K - N$
- Height of WGS-84 Ellipsoid Above the Water Line:
 - $= -A - H - D$
- Height of Water Line Above Chart Datum:
 - $T' = K - N + A + H + D$
- HYPACK Tide Correction:
 - $T = N - K - A - H - D$
- Chart Sounding:
 - $CS = B + D + T$
 - $CS = B + N - K - A - H$

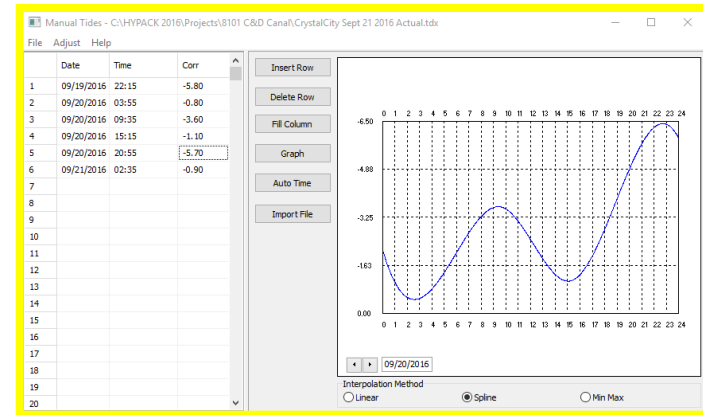


- **Note:** The Dynamic Draft cancels out in formula for Chart Soundings.
- You only need to measure the dynamic draft if you want your RTK Tide to be equivalent to your normal tide correction

Manual Entry in Post-Processing



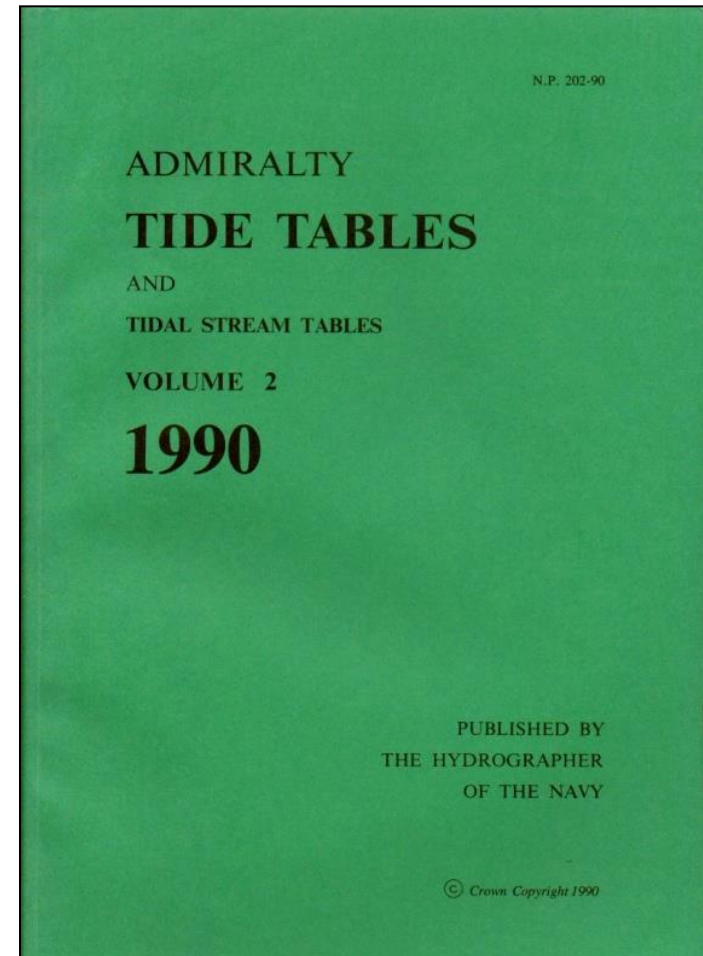
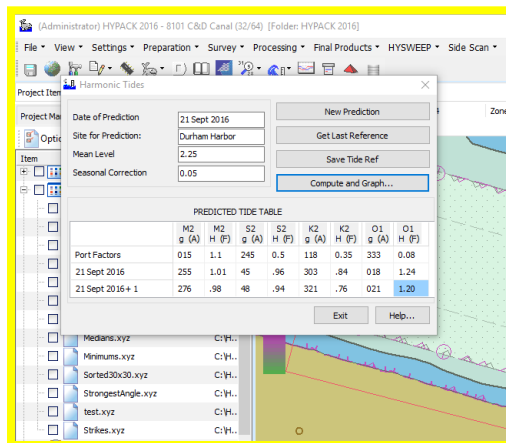
MANUAL TIDES: Example



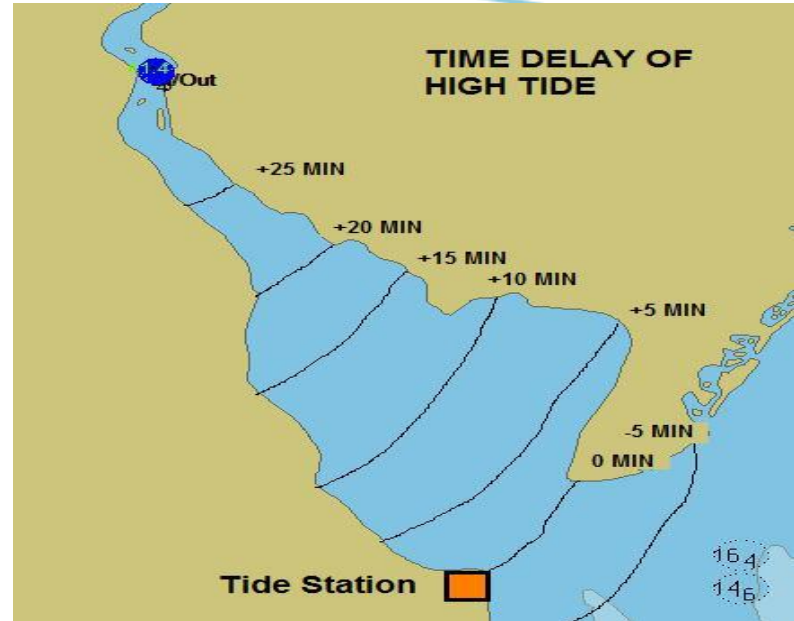
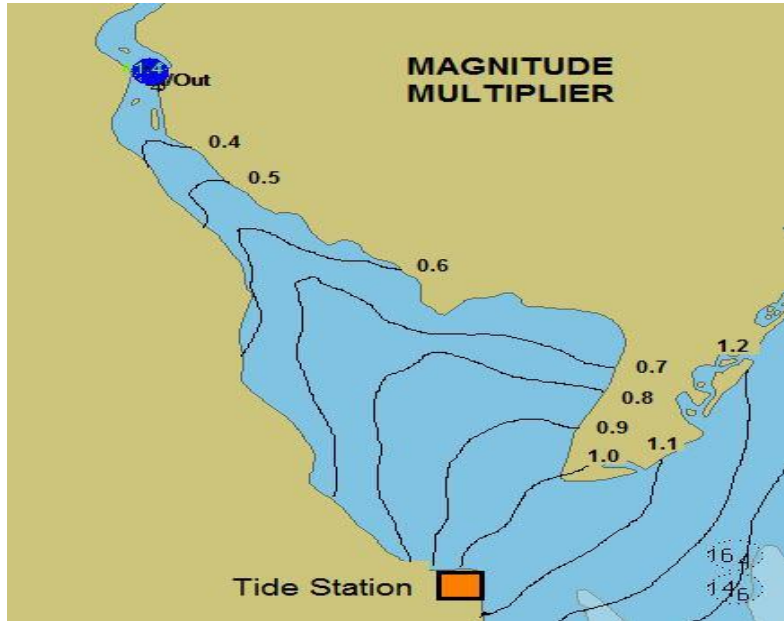
MANUAL TIDES: Predictions from High and Low Water Times and Heights

Harmonic Predictions

- Uses Port Factors and Day Factors from British Admiralty Publication NP 203.
- Computes a predicted tide, based on harmonic constituents.
- Saves result to a *.TID file.
- Do not use French constituents, as they are not 'combined'.



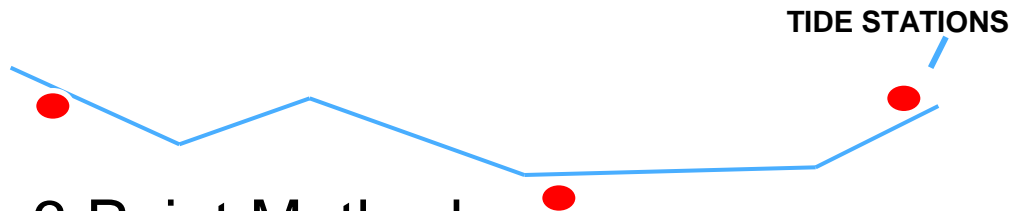
Tidal Zoning



Tide Adjustments

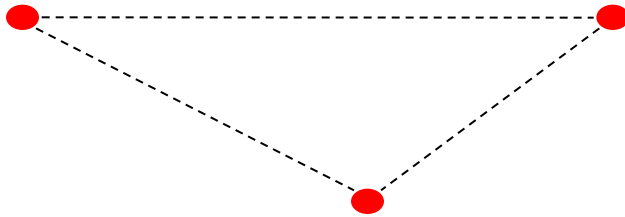
Centerline Method:

- Interpolates a tide correction based on the position of the sounding along a centerline and the distance from gauges referenced to the centerline. Two or more gauges.



3 Point Method:

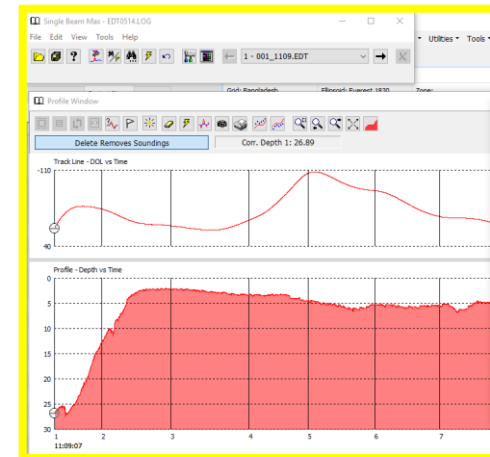
- Interpolates a tide correction based on the position of the sounding and a triangular tide surface created between three tide stations. Three gauges.



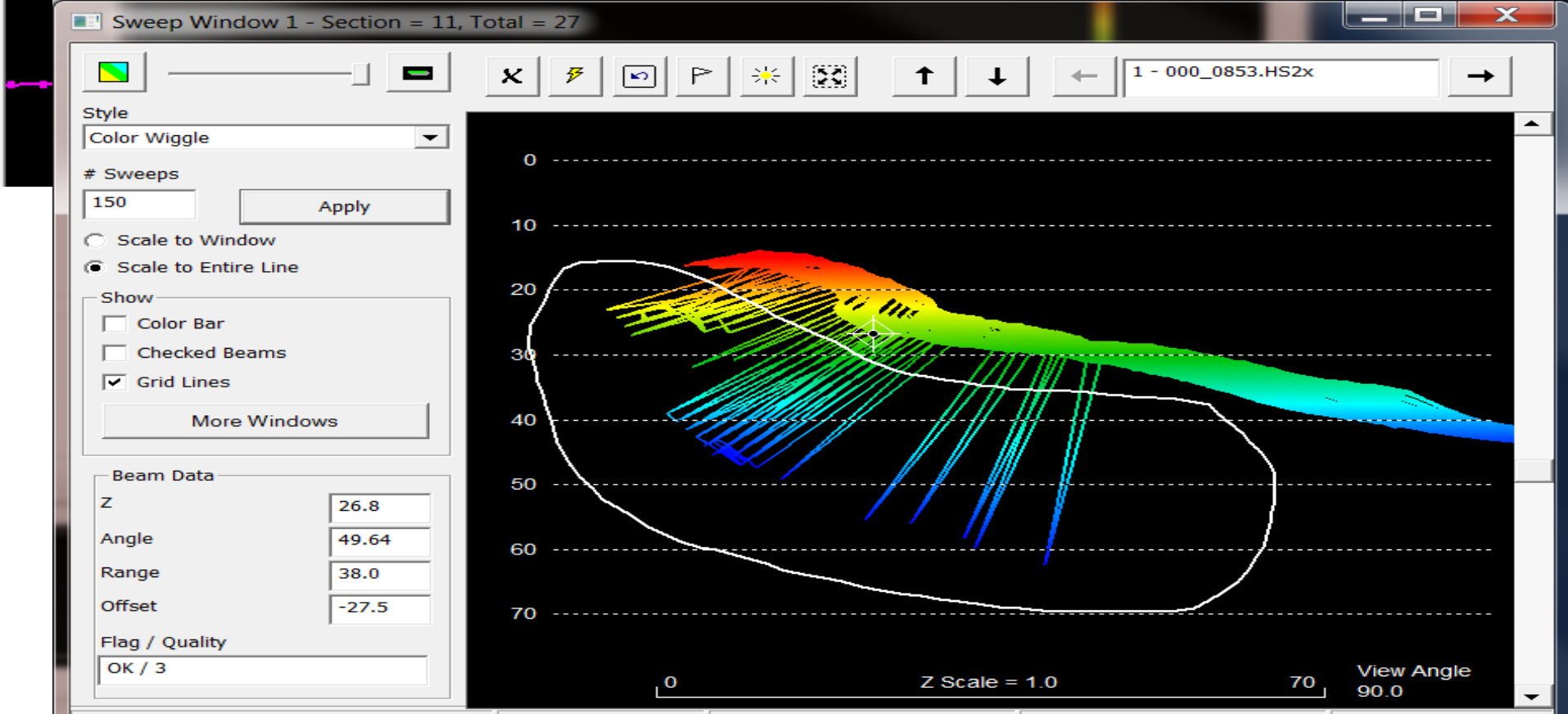
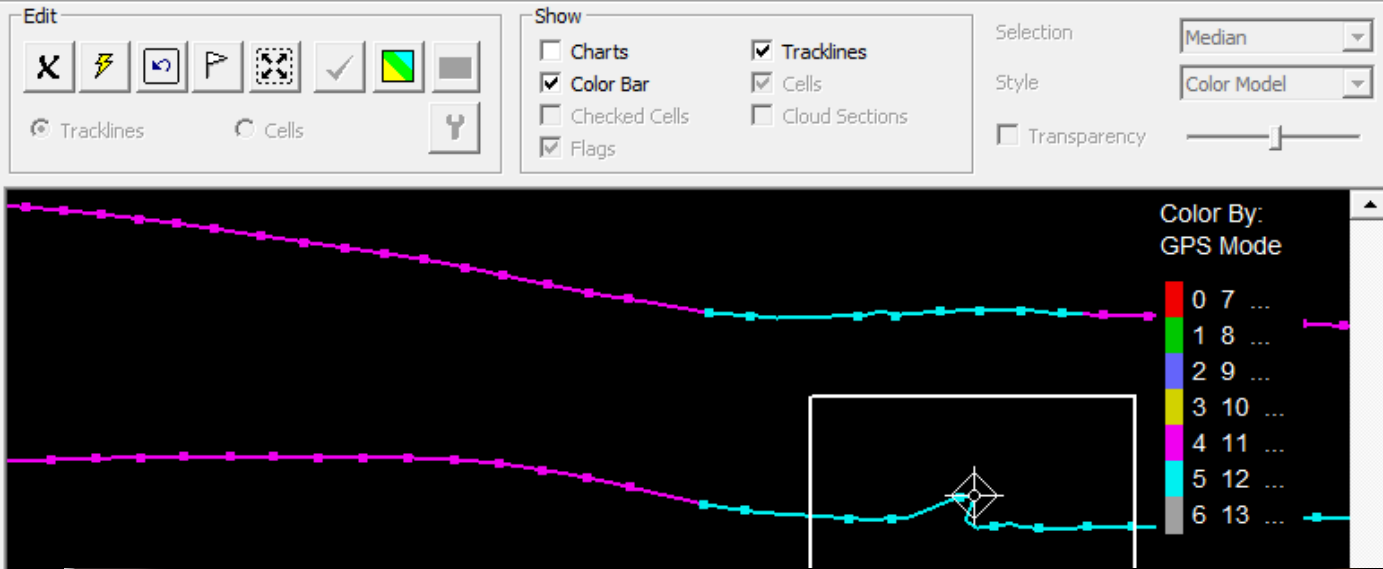
Spreadsheet showing tide correction data for the Centerline Method. The table includes columns for Record, Raw Depth, Tide Corr, SV Corr, Corr. Depth, Time, Y, Y, and GPS Mode.

Record	Raw Depth	Tide Corr	SV Corr	Corr. Depth	Time	Y	Y	GPS Mode
1	9.92	0.00	0.00	9.92	11:41:01.45	822384.16	2597831.33	
2	9.81	0.00	0.00	9.81	11:41:01.50	822384.11	2597831.52	
3	9.84	0.00	0.00	9.84	11:41:01.56	822384.06	2597831.72	
4	9.86	0.00	0.00	9.86	11:41:01.63	822384.00	2597831.97	
5	9.87	0.00	0.00	9.87	11:41:01.68	822383.95	2597832.17	
6	9.85	0.00	0.00	9.85	11:41:01.74	822383.89	2597832.37	
7	9.84	0.00	0.00	9.84	11:41:01.80	822383.84	2597832.57	
8	9.76	0.00	0.00	9.86	11:41:01.85	822383.79	2597832.76	
9	9.76	0.00	0.00	9.86	11:41:01.92	822383.73	2597833.00	
10	9.79	0.00	0.00	9.89	11:41:01.97	822383.68	2597833.19	
11	9.82	0.00	0.00	9.92	11:41:02.03	822383.63	2597833.39	
12	9.86	0.00	0.00	9.96	11:41:02.08	822383.58	2597833.58	
13	9.64	0.00	0.00	9.74	11:41:02.26	822383.46	2597834.11	
14	9.84	0.00	0.00	9.94	11:41:02.31	822383.43	2597834.27	
15	9.50	0.00	0.00	9.60	11:41:02.60	822383.24	2597835.11	

Centerline Method










3 Point Method



Edit

I	II
Speed	Sweep 1
Heave / Tide	Profile
HPR	Cloud
SV	More Windows

Toolbox





☒ Fast Delete

☒ Inside
☐ Outside

☐ Above
☒ Below

☐ Large Dots
☐ Wide Lines

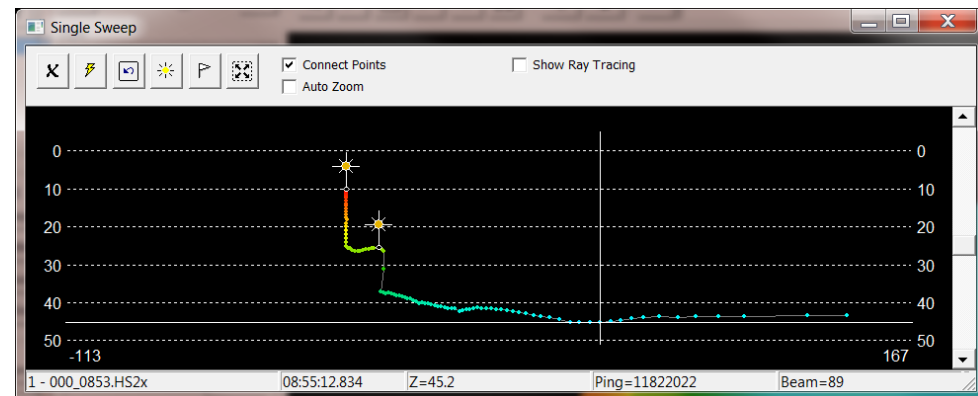
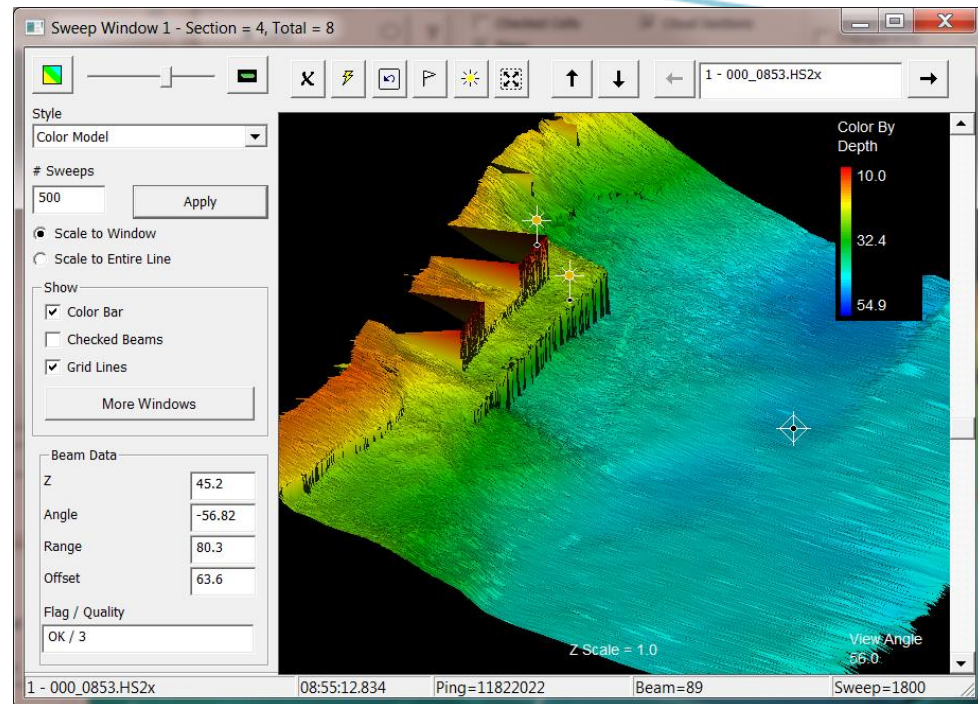
☐ Filter Preview
☐ Show Deleted

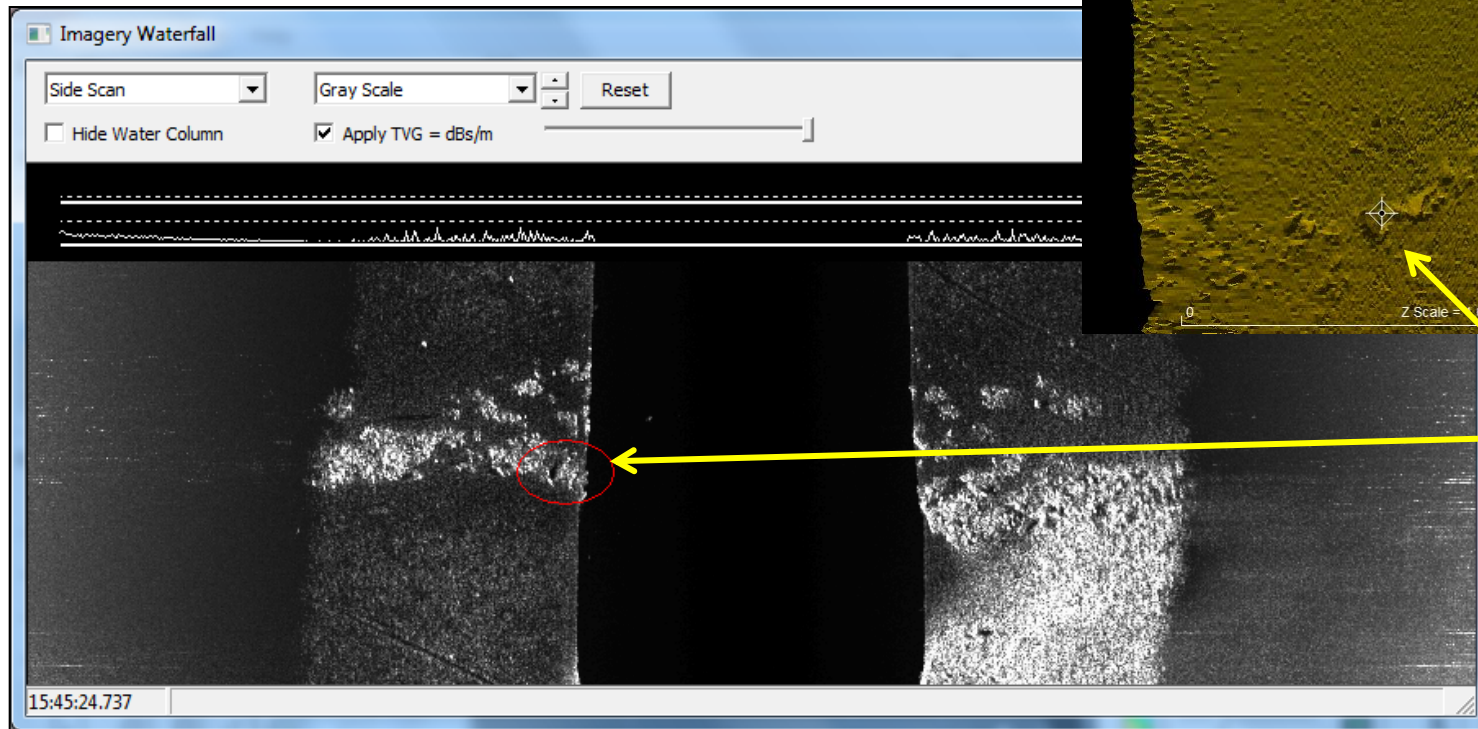
Up to Date

☐ Floating Toolbar

Done



Imagery Window



**Matching Up
Bathy and Side
Scan.**

**Example shows
mussel beds on
seafloor**

- Choose From: Sidescan or Average Backscatter (Beam Intensity).
- TVG Level and Color Saturation Limits (Slide Bars) to Optimize Display.
 - Object Cursor (Red Ellipse) Synchronized With Depth Windows.

Stage 1 Filters

The screenshot shows the 'Search and Filter Options' dialog box with the 'Basic' tab selected. The 'Corrected Depth or Elevation' section has two checkboxes, 'Minimum' and 'Maximum', both of which are unchecked. The 'Speed Over Ground (Kts)' section has two checkboxes, 'Minimum' and 'Maximum', both of which are checked. The 'Minimum' speed is set to 1.0 and the 'Maximum' speed is set to 25.0.

Section	Option	Value
Corrected Depth or Elevation	Minimum	0.0
	Maximum	0.0
Speed Over Ground (Kts)	Minimum	1.0
	Maximum	25.0

Use Edit Menu or Toolbar to Setup Filters.

Basic Tab:

- Speed Over Ground: Filter on Boat Speed. Good For Removing Large Position Spikes.

The screenshot shows the 'Search and Filter Options' dialog box with the 'GPS' tab selected. The 'Position' section has three checkboxes: 'Accepted GPS Modes' (checked), 'Minimum Number of Satellites' (checked), and 'Maximum HDOP' (unchecked). The values are 4 5, 5, and 2.5 respectively. The 'Tide' section has the same three checkboxes and values.

Section	Option	Value
Position	Accepted GPS Modes	4 5
	Minimum Number of Satellites	5
	Maximum HDOP	2.5
Tide	Accepted GPS Modes	4
	Minimum Number of Satellites	5
	Maximum HDOP	2.5

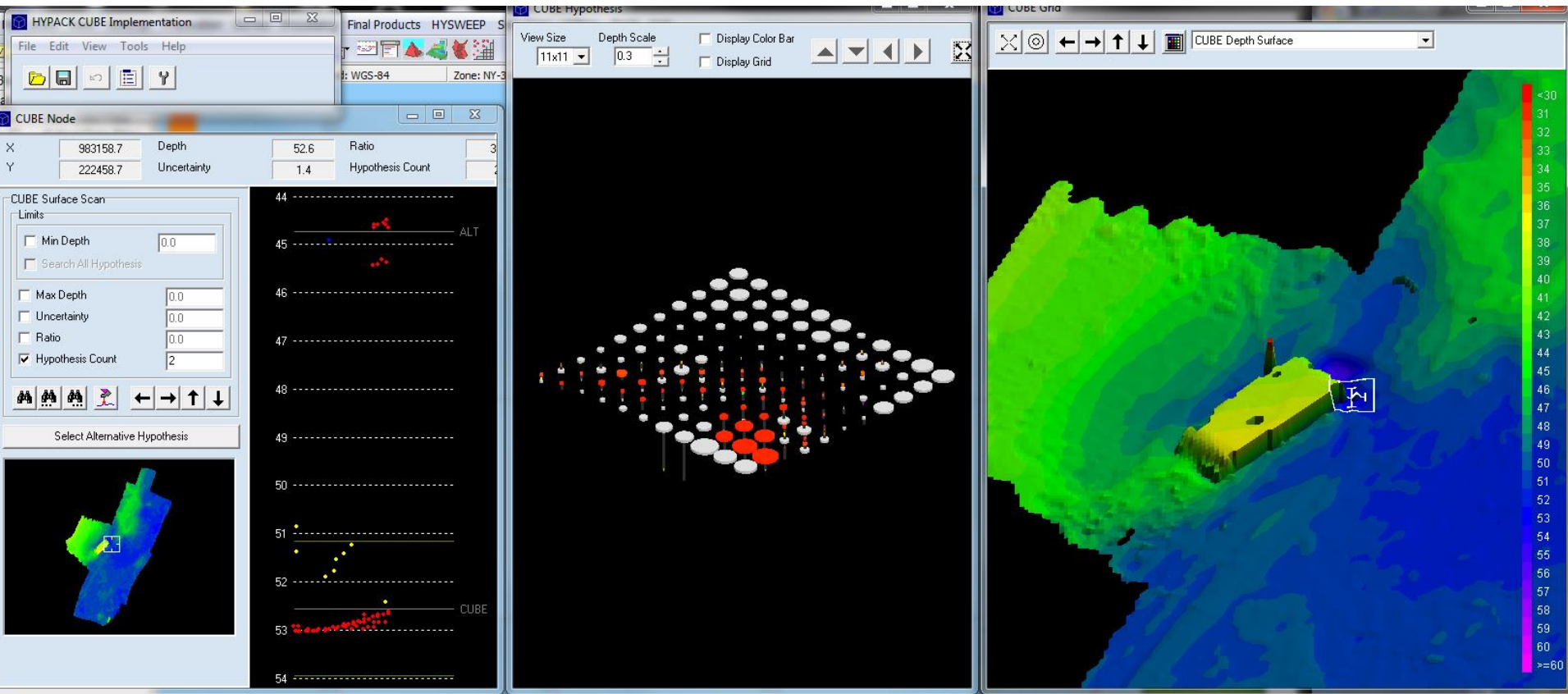
GPS Tab:

- Filter Based on Status From GPS.

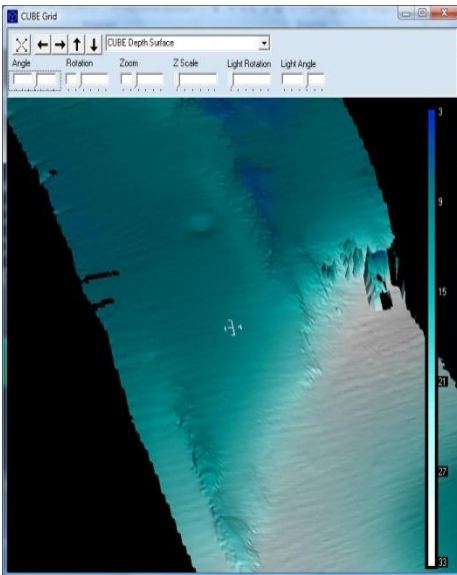
- Example:

- Require GPS Mode 4 or 5 For Positions.
- Require Mode 4 For Tides.
- Require 5 Satellites for Either.

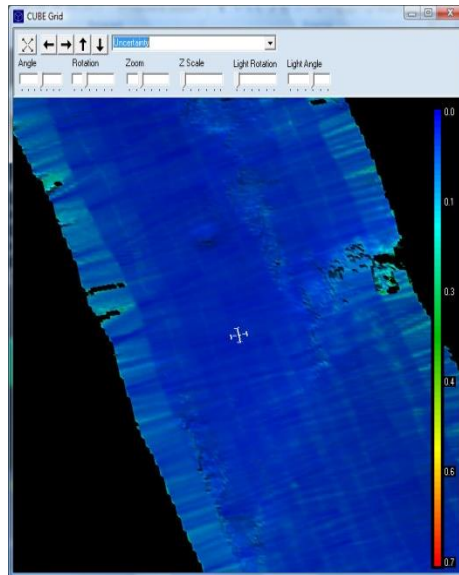
Combined Uncertainty and Bathymetric Estimator



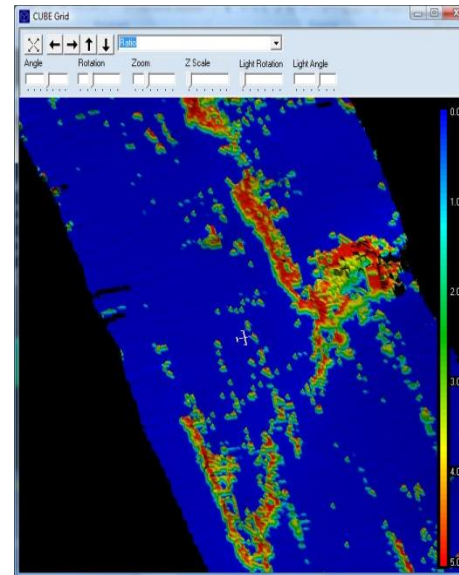
CUBE Screens



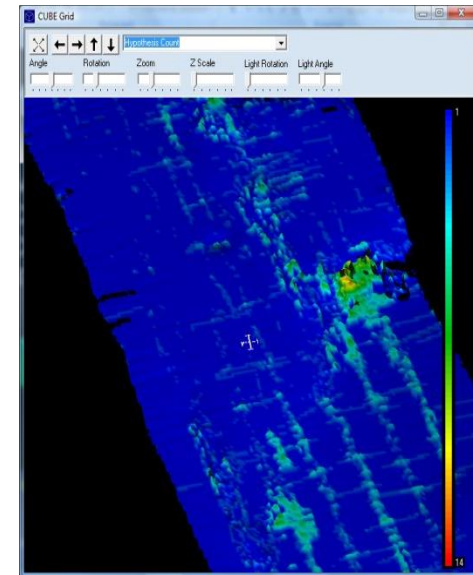
Z-Values



Uncertainty



Ratio



of Hypotheses

Cloud

