WASSP data processing in Echoview

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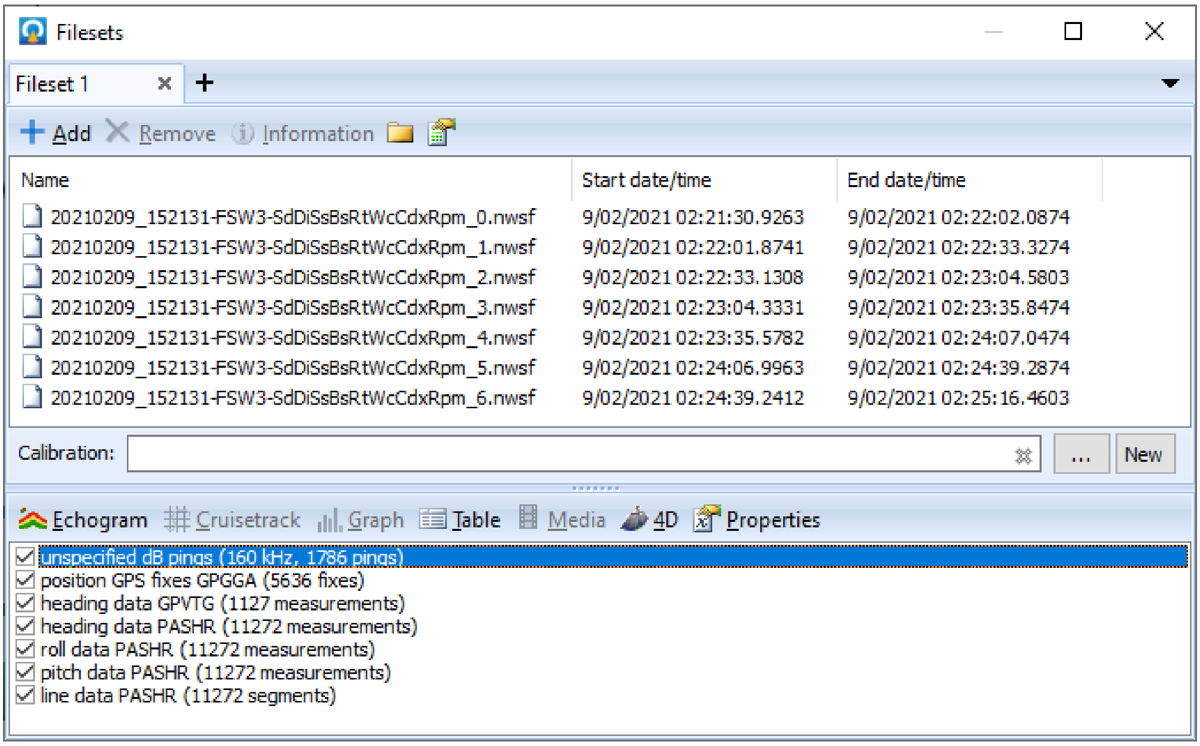
Echoview can load and analyze WASSP data files stored in the *.**nwsf** format.

Echoview version 6.1 or newer must be used for WASSP compatibility - however we recommend using the very latest version available for the best performance and the widest range of features that can be used in WASSP data processing, which is Echoview 12 at the time of writing. All of the features described below are available in Echoview 12, but some are not available in older versions. Future versions of Echoview are likely to have even more features that are relevant to WASSP data processing.

Initially, Echoview's compatibility was with the WMB-3250 model only, but in more recent times WASSP have provided an option for other models to convert data to this same format. File export to *.nwsf requires the purchase of a software license option from WASSP.

For WASSP data files, Echoview will derive:

- **Unspecified dB multibeam pings**
    - This is uncalibrated backscatter, but dB offsets can optionally be applied to individual beams and/or all samples in Echoview, if corrections have been calculated by the user.
- **GPS**, **heading**, **pitch**, **roll**, and **depth** measurements that are recorded to file, if available.



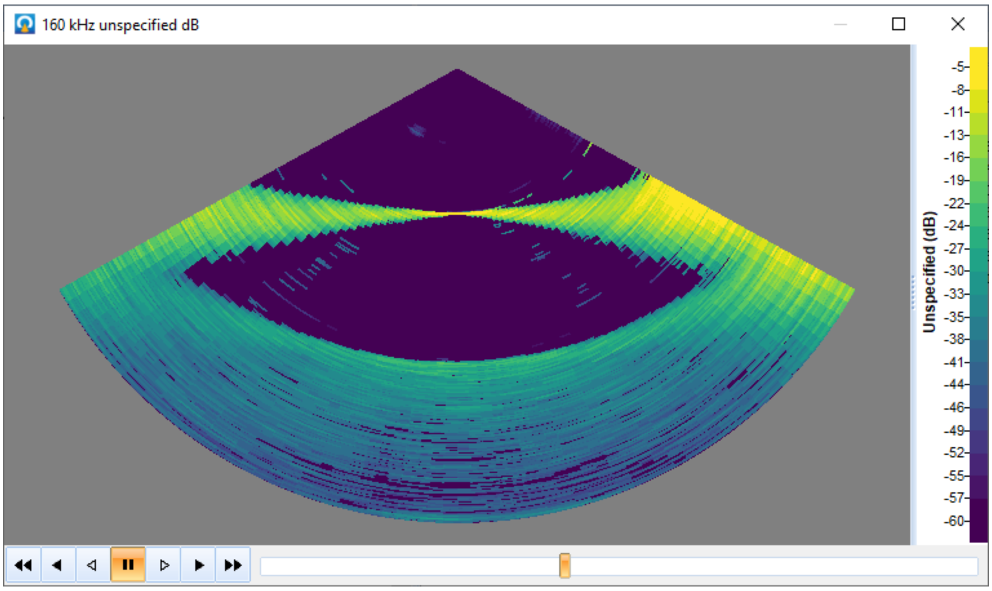
**.nwsf files are added to Echoview's Filesets window, which lists the information and variables derived from this type of data.*

Echoview capabilities

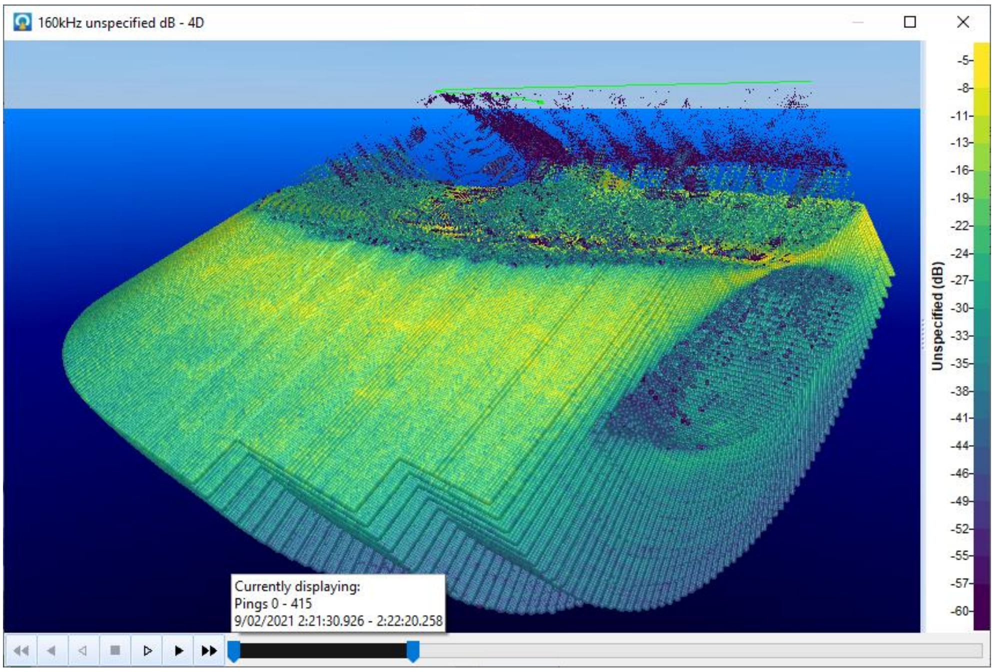
Echoview provides the following features for WASSP multibeam data processing. Unless otherwise specified in *italics*, the Essentials module is required to use these features.

1) Visualize and explore ping data:

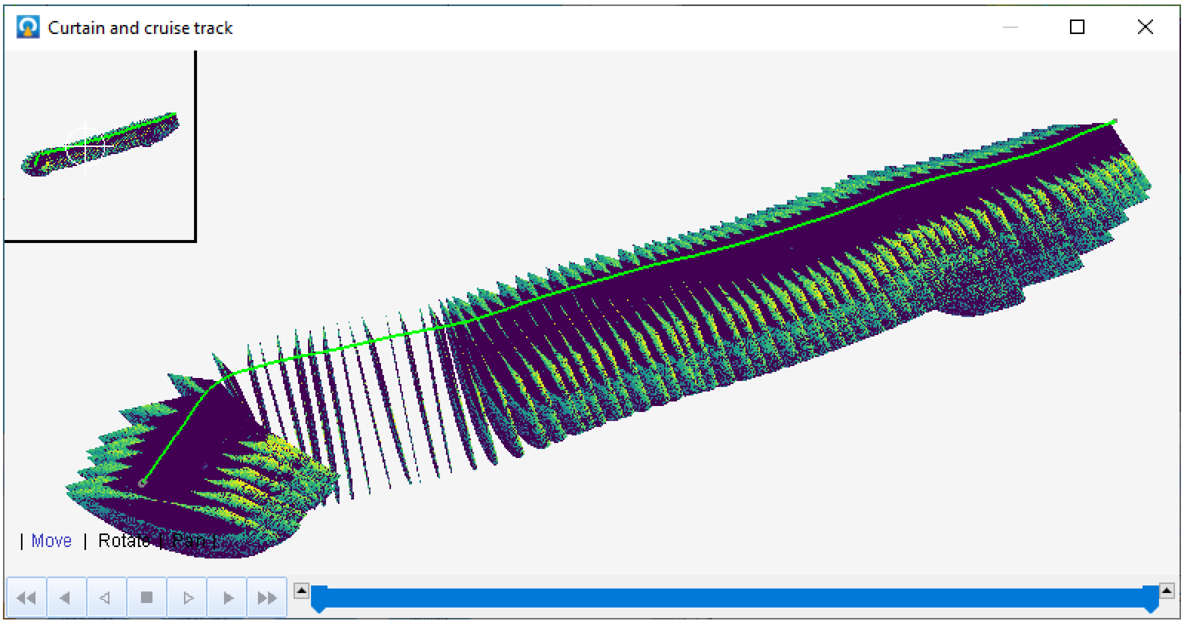
   a) As ping-based echograms (with a variety of configurable display tools and options):



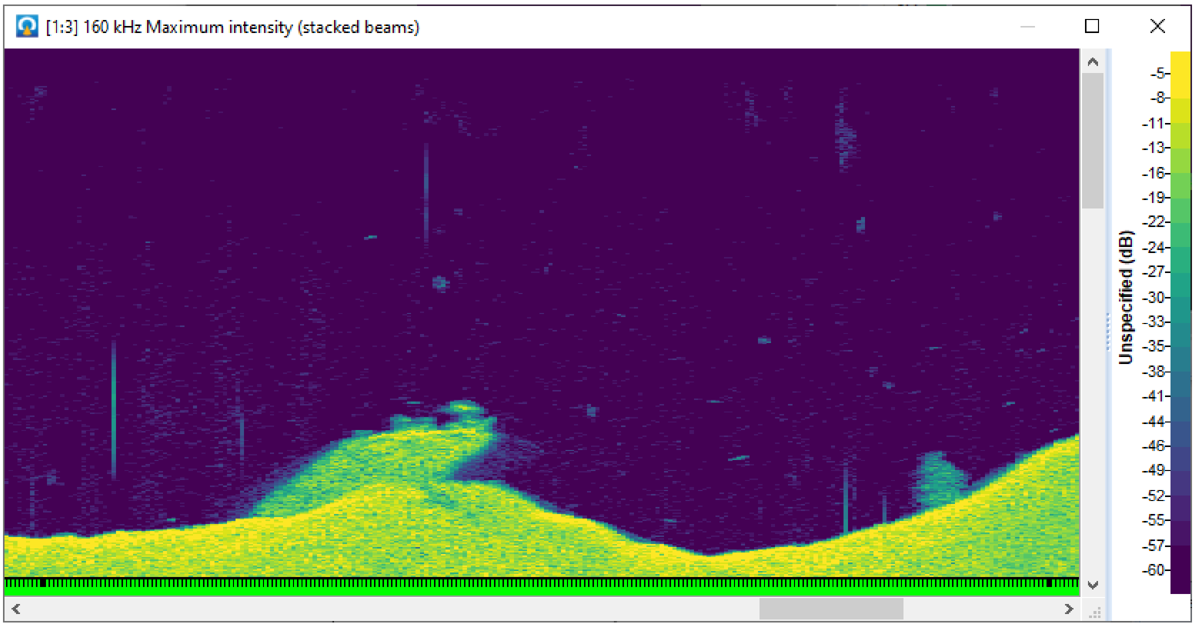
   b) Using the 4D view to view georeferenced samples:



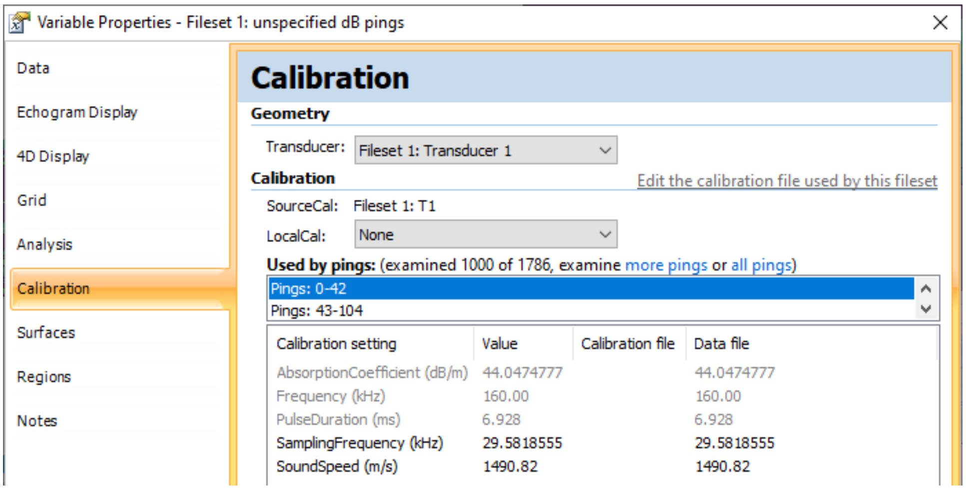
c) By creating 3D curtains and viewing them in the 3D Scene window:



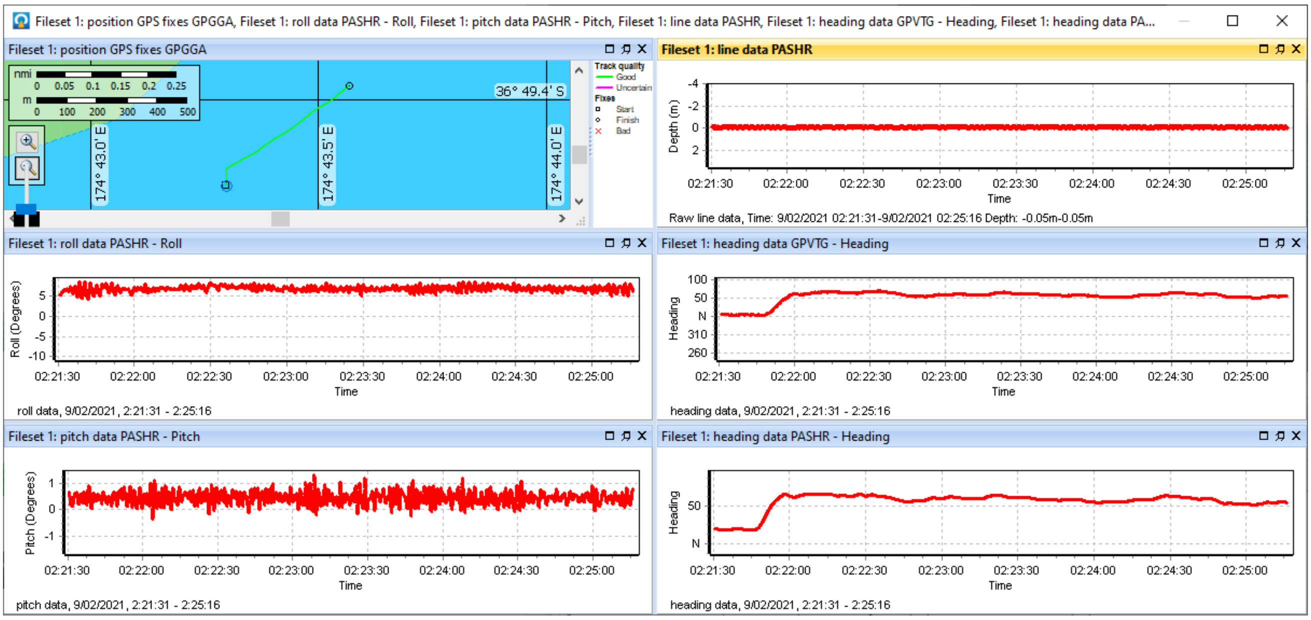
d) Using the Maximum Intensity operator to view “stacked beams”, where each sample at range *R* contains the maximum value of all corresponding multibeam samples that are also at range *R*, which gives a helpful overview of data throughout the survey.



2) View and adjust data collection and calibration settings:



3) View GPS, heading, pitch, roll, and depth measurements:

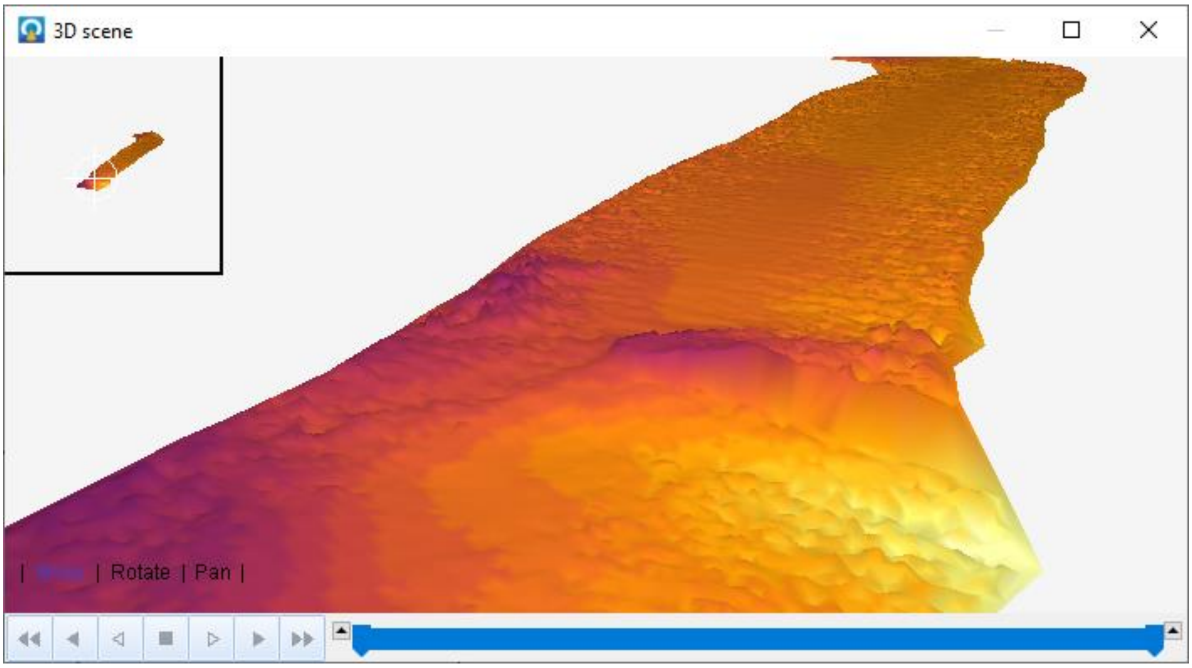


4) Detect the seafloor or bottom as a surface and then:

   a) View it as an intersection overlaid on the echogram, and use it to exclude data from further analysis of watercolumn data

   b) Resample the surface, to smooth the detected bottom

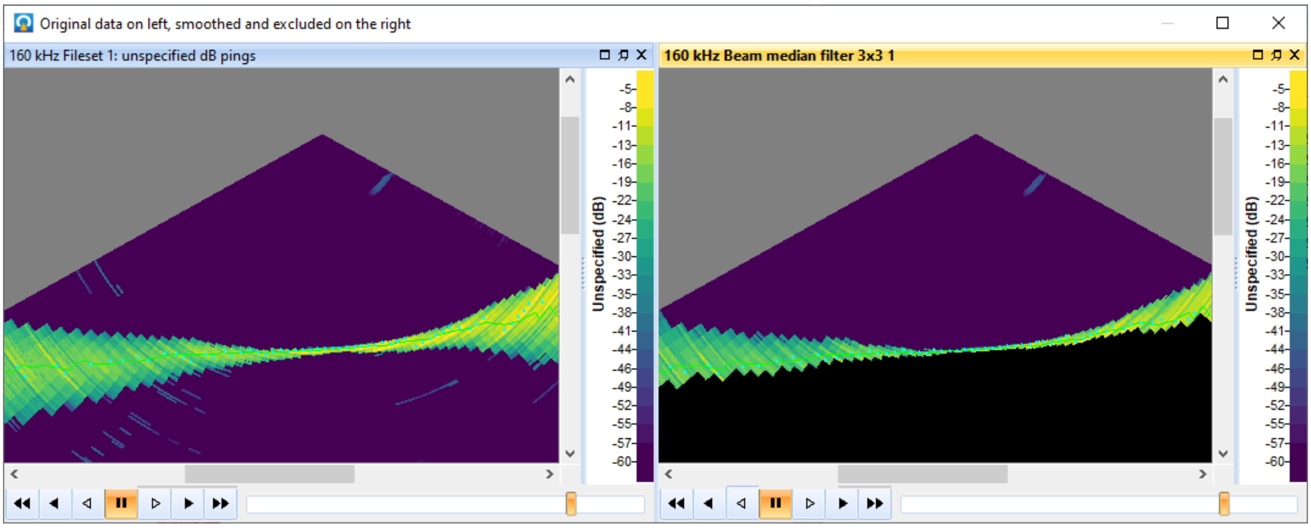
   c) View the surface in a 3D scene:



   d) Export depth measurements (XYZ) for use in other software:

	A	B	C
1	Latitude	Longitude	Depth
2	-36.8231	174.7263	13.536
3	-36.8231	174.7262	13.465
4	-36.8231	174.7262	13.107
5	-36.8231	174.7262	13.773
6	-36.8231	174.7262	13.362
7	-36.8231	174.7262	13.853
8	-36.8231	174.7262	13.095
9	-36.8231	174.7262	13.189
10	-36.8231	174.7262	13.731
11	-36.8231	174.7262	13.731
12	-36.8231	174.7262	14.004
13	-36.8231	174.7262	13.229
14	-36.8231	174.7262	12.868
15	-36.8231	174.7262	13.085

5) Smooth data using a 3x3 median filter convolution, e.g., to remove stochastic and other noise effects:



6) Perform other data manipulations using virtual variables (*some operators require Advanced Operators*). Examples include:

a) Selecting a subset of pings to test algorithms on, before applying to the entire dataset

b) Removing background noise, spikes of impulse noise, suppressing side lobes

c) Applying other convolution algorithms

d) Masking data that pass or fail specific criteria

e) Writing custom sample data manipulation algorithms using a Python-based interface

f) …and much more - see [this help file page] for a comprehensive list

7) Export echogram data values to ping-based CSV files, or sample-based georeferenced CSV files:

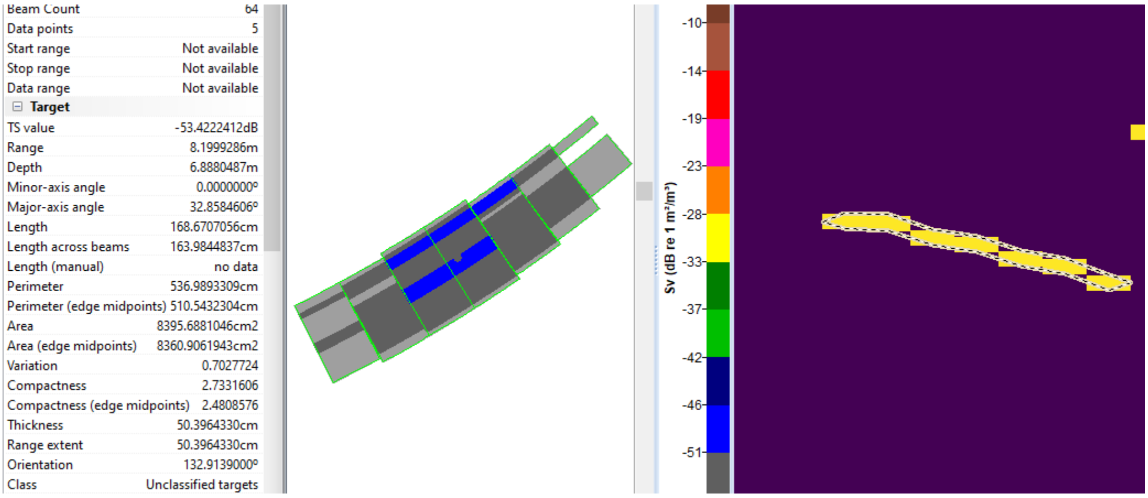
Ping_index	Beam_index	Latitude	Longitude	Altitude	Depth	unspecified dB
100	0	-36.82560915	174.7216209	0.033105341	-0.033105341	-79.7
100	0	-36.82560914	174.7216206	0.019316018	-0.019316018	-250.57
100	0	-36.82560913	174.7216204	0.005526696	-0.005526696	-250.57
100	0	-36.82560912	174.7216201	-0.008262625	0.008262625	-119.54
100	0	-36.82560911	174.7216198	-0.022051945	0.022051945	-114.17
100	0	-36.82560909	174.7216196	-0.035841267	0.035841267	-138.7
100	0	-36.82560908	174.7216193	-0.049630588	0.049630588	-106.68
100	0	-36.82560907	174.721619	-0.063419907	0.063419907	-105.46
100	0	-36.82560906	174.7216187	-0.077209229	0.077209229	-100.4
100	0	-36.82560905	174.7216185	-0.090998549	0.090998549	-91.64
100	0	-36.82560903	174.7216182	-0.10478787	0.10478787	-90.42
100	0	-36.82560902	174.7216179	-0.11857719	0.11857719	-100.78

8) Detect individual fish, bubbles or other targets using the Multibeam Target Detection operator (*requires Multibeam Fish Tracking*), and then:

a) Convert detected targets to a 2D "echogram" which shows targets at the range that they were detected for each ping

b) Filter targets based on properties (e.g., minimum target length)

c) Detect fish tracks from targets



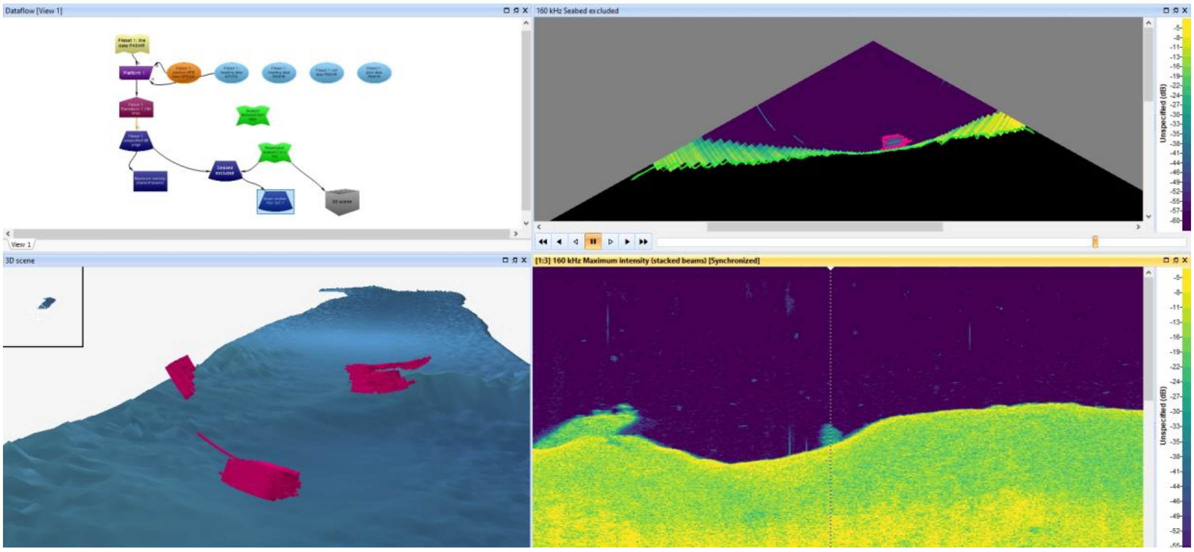
Target properties on left, target on multibeam variable in centre, fish track detected from targets on right.

d) Calculate and export metrics for the targets and tracks:

Region_ID	Height_m	Date_M	Time_M	Lat_M	Lon_M	Num_targ	TS_mean	Target_rai	Speed_4D	Fish_track	Time_in_t	Distance_	Thickness
5	0.056806	20210209	02:21:31.3	-36.8258	174.7216	4	-50.7415	11.17702	2.3132	0.022679	0.4131	0.9556	0.056806
7	0.056806	20210209	02:21:32.1	-36.8258	174.7216	4	-57.3589	16.78899	41.0472	0.041059	0.31	12.7246	0.056806
8	0.056806	20210209	02:21:32.4	-36.8258	174.7216	6	-46.6991	15.61764	2.7737	-0.03355	0.5166	1.4329	0.056806
9	0.056806	20210209	02:21:33.7	-36.8258	174.7216	3	-57.5618	15.49301	2.965	0.005322	0.2066	0.6126	0.056806
10	0.056806	20210209	02:21:33.7	-36.8258	174.7216	4	-57.434	16.21014	3.2882	-0.04938	0.3098	1.0187	0.056806
11	0.056806	20210209	02:21:33.7	-36.8258	174.7216	4	-56.5798	12.44966	2.4263	0.025189	0.3098	0.7517	0.056806

9) Detect aggregations of fish, gas plumes, or other targets (*requires Multibeam School Detection*), and then:

a) View detected school intersections on the echogram, and the 3D schools in Scene window:



Detected schools are highlighted in pink

b) Calculate and export metrics for the detected schools:

Region_class	Unclassified regions	Unclassified regions	Unclassified regions	Unclassified regions
Region_name	3D Region1	3D Region2	3D Region3	3D Region4
Region_id	1	2	3	4
Vertices	6988	6983	1064	2970
Triangles	14140	14204	2128	5992
Surface_area	309.781	336.968	34.549	172.061
Length_NS	8.17	12.132	3.738	8.04
Length_EW	15.122	10.002	2.293	6.2
Depth_minimum	13.314	13.029	7.55	12.394
Depth_maximum	16.635	16.606	11.724	17.361
Height	3.32	3.576	4.174	4.967
Volume	38.446	27.336	3.182	25.147
Geometric_center_latitude	-36.82369878	-36.82365664	-36.82362524	-36.82350859
Geometric_center_longitude	174.7246587	174.7248058	174.7251787	174.7251934
Geometric_center_depth	15.013	14.296	9.329	15.734
OBB_length1	15.09	12.202	3.838	9.162
OBB_length2	8.433	8.411	2.9	5.906
OBB_length3	2.308	3.453	2.271	3.289
OBB_axis1_elevation	4.314	8.412	67.756	15.7
OBB_axis1_azimuth	86.004	203.426	159.941	138.517
OBB_axis2_rotation	17.255	176.727	79.992	16.055
Intersection_area_first_ping	0	0	0	0
Intersection_area_last_ping	0	0	0	0
Intersection_area_first_beam	0	0	0	0
Intersection_area_last_beam	0	0	1.549	0
Intersection_area_maximum_range	0	0	0	0
Roughness	8.057	12.327	10.856	6.842
Acquisition_start_date	9/02/2021	9/02/2021	9/02/2021	9/02/2021
Acquisition_start_time	2:24:11	2:24:16	2:24:31	2:24:33

10) Automate data processing using scripts (*requires Automation*), which can save manual data processing time – simply review the results of the above techniques once calculations and detections are completed.

a) See the “Introduction to COM scripting” tutorial here and example scripts here.

Please contact support@echoview.com with any technical questions.

Echoview licensing

Echoview’s licensing is modular. The specific Echoview modules that a WASSP user needs to purchase will depend on the nature of the data that’s been recorded, and their research goals. Essentials is required, one or both of Multibeam Fish Tracking and Multibeam School Detection are likely, and Advanced Operators and Automation are worth considering.

We’re always happy to review some customer example data to provide more definitive suggestions for both licensing requirements and data processing approaches.

License prices are available from info@echoview.com, with options including perpetual licenses, annual subscriptions, and short-term leases.

Example research using WASSP and Echoview

LIMNOLOGY
and
OCEANOGRAPHY: METHODS

Limnol. Oceanogr.: Methods 2021

doi: 10.1002/lom3.10427

Characterizing the three-dimensional distribution of schooling reef fish with a portable multibeam echosounder

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Abstract

Multispecies schools of small planktivorous fishes are important constituents of reefs and coastal infrastructure; however, determining the extent and distribution of these schools is challenging. Here, we describe a novel use of a low-cost portable multibeam echosounder from a small vessel, which can concurrently measure detailed bathymetry and the distribution of mid-water targets with high spatial accuracy, regardless of light availability or water clarity. Fish abundance and biomass are not easily quantified by multibeam echosounders, so we developed a new metric for delineating the gridded horizontal distribution of school thickness, and assessed the metric's efficacy by examining its correlation with mean volume backscattering strength derived from a calibrated 38 kHz split-beam echosounder ($R = 0.67$). We measured the distribution of fish school thickness around clusters of large concrete modules of an artificial reef using a multibeam echosounder, complemented with underwater video to aid species identification. The mean distribution of school thickness was mapped around the reef field with generalized additive mixed models. Model spatial predictions indicated schools aggregated around module clusters, rather than individual modules. Dynamic schools of fish in relatively shallow coastal waters (~ 30 m) can be surveyed over 400,000 m^2 at 3 m s^{-1} in just 60 min. Portable multibeam echosounders are an accessible and valuable addition to quantifying the dynamic distributions of coastal fishes around features with high vertical relief.

https://aslopubs.onlinelibrary.wiley.com/doi/abs/10.1002/lom3.10427