



Echoview Tutorial: Introduction to Integration

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Overview

This tutorial is optimized for Echoview 15 and provides an introduction to integration in Echoview.

This tutorial is not intended as a comprehensive user manual.

Further information on Echoview tools and topics can be found in the latest version of the Echoview help file. This can be viewed online and is installed with Echoview. Press F1 when using Echoview to open the help file and read context-sensitive information.

Throughout this tutorial further reading is referred to the Echoview help file or other Echoview learning materials: <https://www.echoview.com/support>

Prerequisites

This tutorial assumes you have Echoview installed, and the following skills and knowledge:

- Familiarity with the basic operation of Echoview. We strongly recommend that you complete the "Getting Started with Echoview" tutorial before beginning this tutorial.
- Familiarity with a supported Microsoft Windows™ operating system. For more information refer to the Echoview Help file page: Computer requirements.
- A basic understanding of echosounding techniques and hydroacoustic surveying. For more information, see texts such as *Fisheries Acoustics* (Simmonds and MacLennan, 2005, Blackwell Science, Oxford.).
- Microsoft Excel or a similar viewer for spreadsheets.

Echoview modules

This tutorial requires a license with the Essentials module. If you do not yet have access to an Echoview license with this module, please contact info@echoview.com to request an evaluation license. Solution files are also included in the tutorial package to allow you to see the results of module-protected capabilities. Within the solution EV file, Marker regions indicate tutorial selection areas.

Contacting Echoview

For assistance with this tutorial please contact support@echoview.com.

Set up

We recommend extracting or copying the tutorial files to C:\Echoview Software\Tutorials\. If the files are not in this folder, use Windows Explorer to search for them. If they are not loaded on your machine, download and reinstall the tutorial from www.echoview.com or from the Echoview USB drive.

Troubleshooting

If you receive a message saying that the version of Echoview you are running cannot read the file you have opened, you may be running an old version of Echoview. You can download the latest version of Echoview from www.echoview.com.

Topic 1: About Integration

Overview of integration

In Echoview, integration refers to the calculation of the echo integral (mean volume backscattering strength) over a set of data points defined by a region, selection, or cell. Other variables may be calculated at the same time, such as Nautical Area Scatter Coefficient (NASC), Area Backscattering Coefficient (ABC) or average depth of integrated data points.

Integration methods

Echoview provides two methods of generating integration results:

Method	Description
On-screen integration	Displays integration results (and other predefined variables) for a single selection, region, or cell within Echoview.
Export integration	<p>The Echogram menu, Export sub-menu, Analysis export options include integration exports (and other user-selectable variables) for all cells, all analysis regions, a subset of analysis regions, or region-cell intersections.</p> <p>The data are exported to comma-separated value files (*.csv) and can be opened in most spreadsheet applications.</p> <p>This tutorial demonstrates Echogram menu, Export, Analysis by cells, Sv integration.</p> <p>An Sv analysis or ICES analysis exporter object on the Dataflow window, allows you to customize, remember and annotate supported integration exports. For further information refer to the Echoview Help page, About Exporter objects.</p>

Excluding data from integration calculations

Echoview allows you to exclude data from integration calculations, for example to exclude the effects of transducer ringing or bottom echoes. You can exclude data from integration calculations in the following ways:

Method	Description
Defining Exclude above and/or Exclude below lines	<p>Data above the Exclude above line will be excluded from integration calculations.</p> <p>Data below the Exclude below line will be excluded from integration calculations.</p>
Defining Exclude above and/or Exclude below surfaces	<p>Data above the Exclude above surface will be excluded from integration calculations.</p> <p>Data below the Exclude below surface will be excluded from integration calculations.</p>
Bad data (no data) regions	A Bad data (no data) region defines data points that you wish to exclude from your analysis (e.g. off transect, below target layer etc.) or whose values have known or suspected problems (e.g. noise contribution, bad weather, interference, ghost bottoms, echosounder malfunction etc.).

Virtual variables	Virtual variables created using Echoview operators can exclude data in a number of ways. Bitmaps, subsets, logical operations and custom algorithms are some of the ways you can exclude data. Refer to the Echoview Help file for information about available operators.
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Topic 2: On-screen Integration

1. Start Echoview by selecting it from the **Start** menu or by double-clicking the shortcut on the desktop.
2. Open the `Integration_Topic2.EV` file. Echoview displays the **50 kHz Fileset1: Sv pings** echogram as shown in Figure 1.

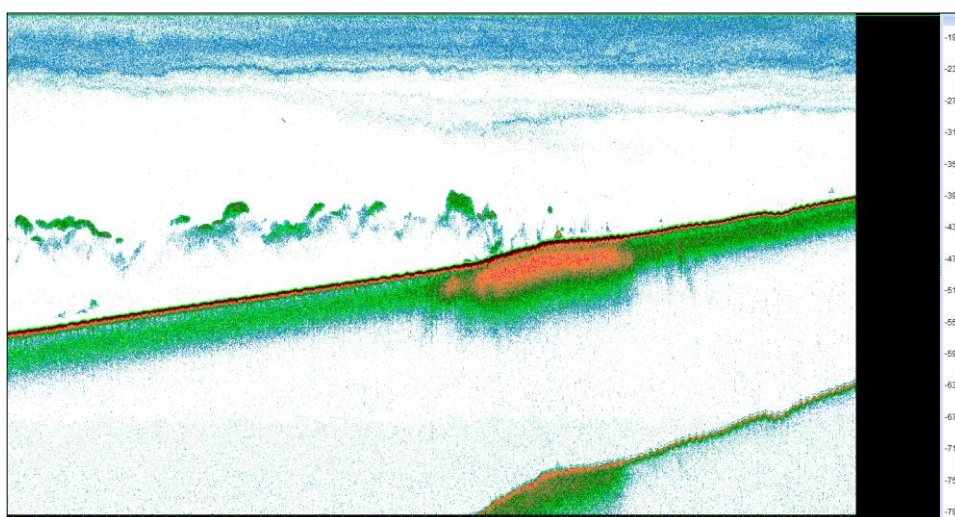


Figure 1. The 50 kHz Fileset1: Sv pings echogram from `Integration_Topic2.EV`.

Defining Exclude above and below lines

Before you perform an on-screen integration, you will look at how to define Exclude above and Exclude below lines.

3. On the **Echogram** menu, click **Variable Properties** (or press **F8**). The Variable Properties dialog box is displayed.
4. Click the **Analysis** page. **Note:** Exclude above and Exclude below lines have already been selected for this variable. To change the exclude above or exclude below lines you would select a different line in the relevant Exclude list. Do not change the selections for this exercise, they have been pre-set to remove data affected by transducer ringing and bottom echoes from the calculations.

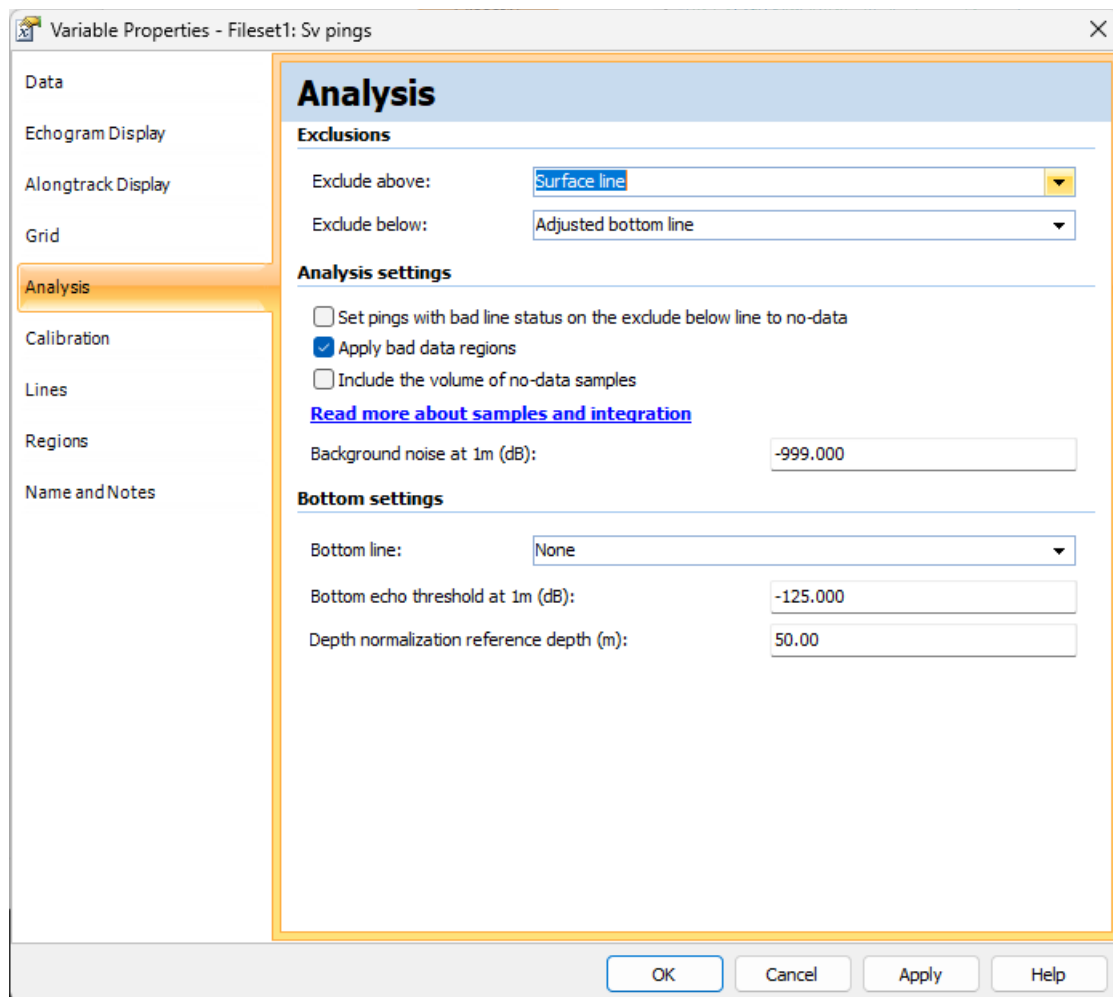



Figure 2. Analysis page of Variable Properties dialog box.

5. Click **Cancel**. The Variable Properties dialog box closes without making any changes.

Integrating a selection

In this exercise, you will generate on-screen integration results for a selection. The process of integrating a region or cell is nearly identical.

6. Using the **Rectangle tool** , make a selection similar to the one shown in Figure 3.

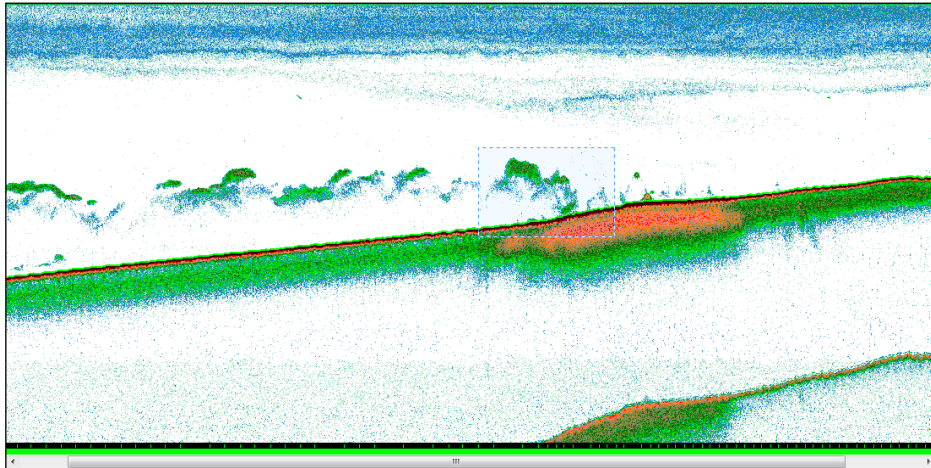


Figure 3. Echogram showing selection.

- On the **Shortcut** (right click) menu, click **Integrate Selection**. The integration results are displayed in the Integration Results dialog box.

Name	Value
General	
Sv mean (dB)	-62.61
Sv minimum (dB)	-91.39
Sv maximum (dB)	-38.33
NASC (m ² /n.mi. ²)	1696.32
ABC (m ² /m ²)	0.000039356
Domain	
Height mean (m)	71.74
Range mean (m)	209.36
Depth mean (m)	209.36
Beam volume sum (m ³)	4040390.13
Exclude-below line depth mean (m)	244.97
Counts	
Good_samples	31422
Bad_data_no_data_samples	0
Bad_data_empty_water_samples	0
No_data_samples	0
Samples_Above_Surface_Exclusion	0
Samples_Below_Bottom_Exclusion	7504
Samples_In_Domain	38926
Pings	146

Figure 4. Integration Results dialog box Selection page.

Notes:

- For an explanation of each analysis variable press the Help button on the dialog box.
- Select the Linked setting on the Results dialog box to show results for subsequent selections.

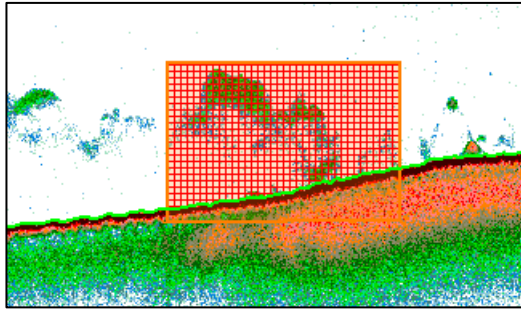



Figure 5. Echogram showing an integrated selection that omits the samples below the exclude below line.

Note: The analysis hatching shows the samples that were used in the integration calculations. In this example, data samples that were in the selection but were below the Exclude below line were excluded from the calculation.

8. Press **ESC** to clear the analysis hatching.
9. Close the Integration Results dialog box.

Using bad data regions to exclude data from integration calculations

In this exercise you will integrate another selection but this time will use Bad data regions to exclude data from the integration calculations.

10. Using the **Vertical band tool** , create a Bad data (no data) region similar to the one shown below. Creating regions is covered in the "Getting Started" tutorial. Bad data regions can be any shape, and can partially or completely overlap an analysis region.

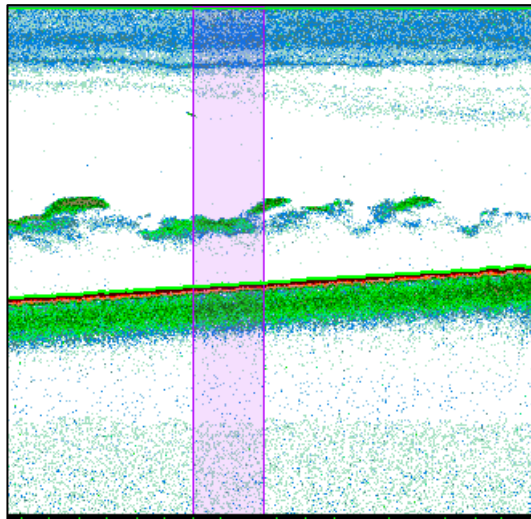



Figure 6. Echogram showing Bad data (no data) region.

11. Use the **Rectangle tool**  to make a selection that spans the bad data region and includes samples on both sides of the bottom line.

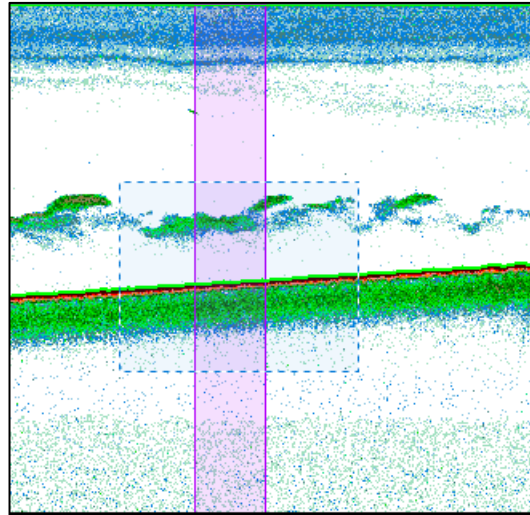


Figure 7. Echogram showing selection over a Bad data (no data) region.

12. On the **Shortcut** (right-click) menu, click **Integrate Selection**. The Integration Results dialog box is displayed. The analysis hatching in Figure 8 shows the samples that were used in the integration calculations. In this example, data samples that were in the selection but were also in the Bad data region or were below the Exclude below line were excluded from the calculation.

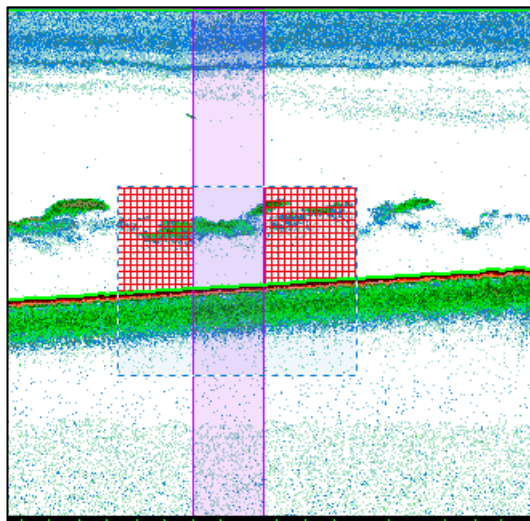


Figure 8. Echogram showing integration selection with bad data region excluded from analysis.

13. Press **ESC** to clear analysis hatching on the selection.
14. Close the Integration Results dialog box.

Further information

- The Echoview help file topics that provide information about Analysis settings and Echoview echo-integration:
 - “About samples and echo integration”
 - “About analysis domains”.

Before moving onto the next topic you should close `Integration_Topic2.EV` file.



If you wish to save the changes, it is recommended that you save the file with a different name so you can repeat this topic at a future date if required.

1. On the **File** menu, click **Save As**.
2. Select the folder in which the tutorial data have been saved.
3. In the **Filename** box, enter a name for the EV file.
4. Click **Save**.
5. On the **File** menu, click **Close**.

Topic 3: Exporting Integration Results

Overview of exporting integration results

You learned how to integrate one analysis domain at a time. In many cases, you will have large amounts of data and integrating analysis domains one at a time would be inefficient. Furthermore, on-screen integration does not provide you with an easy way to export data to other applications for further analysis.

Echoview provides Export, Analysis features that export to a file the integration results for multiple analysis domains. The results are more detailed than displayed for on-screen integration. Echoview allows you to export integration results for:

- all analysis regions on an echogram
- all cells in the grid defined on an echogram
- all region-cell intersections on an echogram (this is not covered further in this tutorial, see the Help file About region-cell intersections.)

The techniques you used previously to exclude data, also apply to exported integration results, i.e. data in an analysis domain that includes a Bad data region is treated differently when the Analysis tab setting **Apply bad data regions** is used while integrating (refer to Figure 2). Similarly, data affected by an Exclude below line, or above the Exclude above line is treated in a specific way while integrating.

Integration results are exported to comma-separated value (*.csv) files which can be opened in most spreadsheet applications. Some analysis exports can be export in database format.

Tips

- Calibration settings for analysis exports are specific to each variable and are not included in export data.
- To keep a permanent record of the calibration settings for your export, you can create a read-only folder to store your export data and place a copy of the EV file's calibration file (*.ecs) there.
- To keep a permanent record of the EV file settings for your export, you can save a copy of the EV file at the time of export.

Exporting integration results by cells

You will now complete an exercise in which you export integration results by cells.

1. Open the `Integration_Topic3.EV` file.

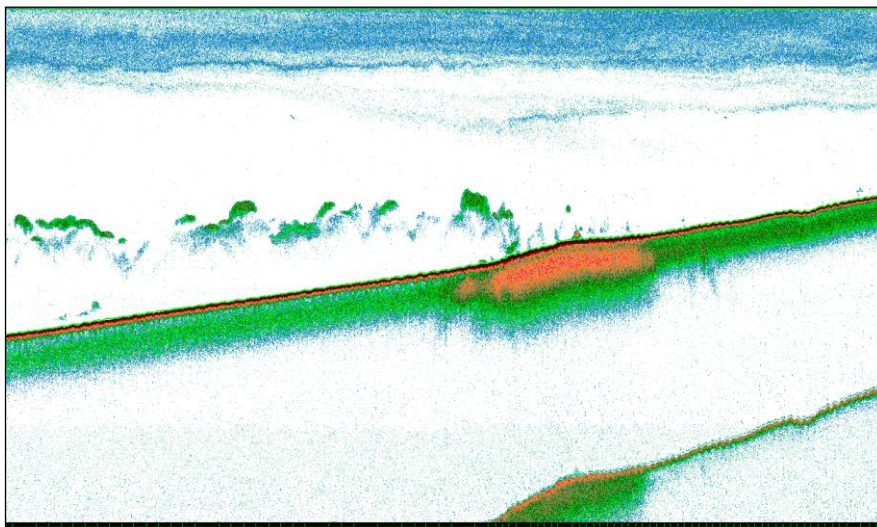


Figure 9. Echogram showing `Integration_Topic3.EV` file.

Create a grid

Before you can export integration results for cells (or generate on-screen integration results for a cell) you must define a grid on the echogram.

You can define the horizontal axis of the grid using the following units:

- time (minutes)
- distance according to GPS (nmi or m)
- distance according to the vessel log (nmi or m)
- ping number.

You can define the vertical axis of the grid in depth/range (m) units. See the "About depth and range" topic in the help file for more information about the difference between depth and range.

2. On the Echogram menu, click **Variable Properties** (or press **F8**). The Variable Properties dialog box is displayed.
3. Click the **Grid** page.

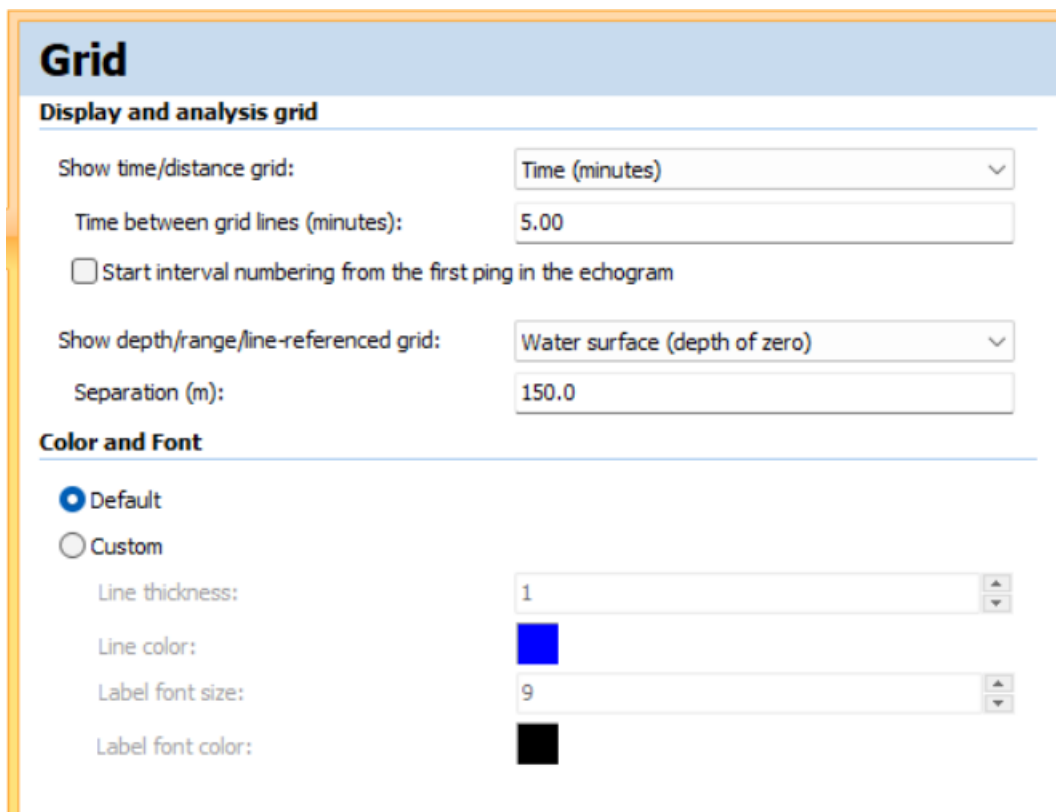


Figure 10. The Grid page of the Variable Properties dialog box.

4. In the Show time/distance grid box, click **Time (minutes)**.
5. In the **Time between grid lines (minutes)** box type 5.00.
6. In the Show depth/range grid list, click Water surface (depth of zero).
7. In the **Separation (m)** box, type: 150.
8. Click **OK** to close the Variable Properties dialog box. The grid is displayed on the echogram as shown in Figure 11.

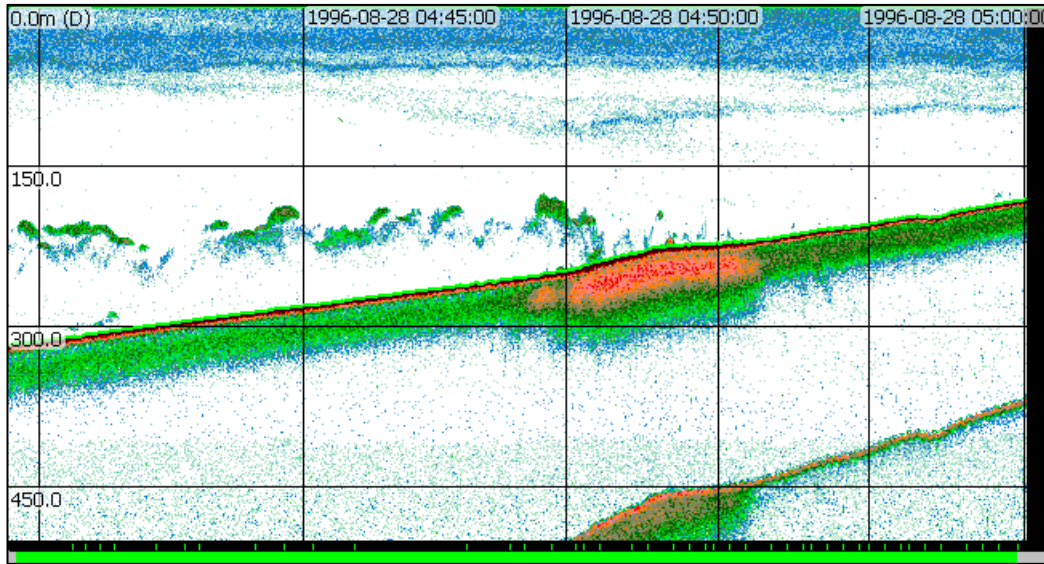


Figure 11. Echogram showing time and depth grid.

Exporting integration by cells

Now that you have defined the grid, you can export the integration results for all cells in the grid.

9. On the **Echogram** menu, point to **Export**, point to **Analysis by Cells**, and then click **Integration**. The Export Integration by Cells window is displayed.
10. In the **File name** box, browse to a folder and enter a name for the export file. You should take note of this, as you will need to open the file in the next exercise.
11. Click **Save**.

Viewing exported integration results

You can now look at the integration results that were exported by Echoview.

12. Start Microsoft Excel (or another spreadsheet application that can read .csv files).
13. Open the file you created in the spreadsheet application.
14. Take a moment to review the contents of the export file. For a description of each analysis variables, refer to the Echoview Help file page "About Analysis Variables".

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Process_ID	Interval	Layer	Sv_mean	NASC	Height_mean	Depth_mean	Ping_S	Ping_E	Dist_M	Date_M	Time_M	Lat_M	Lon_M
2	626	2804024	1	-76.336485	147.953695	147.666667	76.166667	0	39	0.009145	19960828	04:39:41.33	-42.24998295	145.3002046
3	626	2804024	2	-66.228975	1540.58491	150	225	0	39	0.009145	19960828	04:39:41.33	-42.24998295	145.3002046
4	626	2804024	3	-94.087534	0.267945	15.933333	308.002789	0	39	0.009145	19960828	04:39:41.33	-42.24998295	145.3002046
5	626	2804025	1	-76.727137	135.226135	147.666667	76.166667	40	369	0.176724	19960828	04:42:30.11	-42.2507881	145.3037446
6	626	2804025	2	-67.020565	1236.464733	144.459596	222.364413	40	369	0.176724	19960828	04:42:30.11	-42.2507881	145.3037446
7	626	2804025	3	-82.868493	0.665956	2.990909	304.810931	40	369	0.176724	19960828	04:42:30.11	-42.2507881	145.3037446
8	626	2804026	1	-76.087089	156.698693	147.666667	76.166667	370	697	0.534376	19960828	04:47:28.69	-42.25502611	145.3092404
9	626	2804026	2	-68.471089	706.119609	115.211382	207.99082	370	697	0.534376	19960828	04:47:28.69	-42.25502611	145.3092404
10	626	2804027	1	-75.208978	191.812326	147.666667	76.166667	698	886	0.95595	19960828	04:52:29.62	-42.26117449	145.3137331
11	626	2804027	2	-62.847022	1835.217574	82.015873	191.382803	698	886	0.95595	19960828	04:52:29.62	-42.26117449	145.3137331
12	626	2804028	1	-74.792942	211.096065	147.666667	76.166667	887	1075	1.331997	19960828	04:57:30.18	-42.26602376	145.3190592
13	626	2804028	2	-81.064597	21.748611	64.47619	182.474306	887	1075	1.331997	19960828	04:57:30.18	-42.26602376	145.3190592
14	626	2804029	1	-75.015358	200.557333	147.666667	76.166667	1076	1268	1.744808	19960828	05:02:33.86	-42.27186231	145.3238405
15	626	2804029	2	-89.881871	1.942024	43.848014	172.394832	1076	1268	1.744808	19960828	05:02:33.86	-42.27186231	145.3238405
16	626	2804030	1	-74.583832	221.508879	147.666667	76.166667	1269	1271	1.980627	19960828	05:05:02.05	999	999
17	626	2804030	2	-100.469564	0.12379	32	166.001157	1269	1271	1.980627	19960828	05:05:02.05	999	999

Figure 12. IntegrationByCells.csv file opened in Microsoft Excel.

15. Close the spreadsheet file.

Exporting integration results by regions

Exporting integration results for analysis regions is very similar to exporting integration for cells – the main difference is that you must have defined the required analysis region(s) rather than a grid before you can run the export.

You will now complete an exercise in which you will define regions then export their integration results.

16. Using the **Rectangle tool** , define two analysis regions¹.

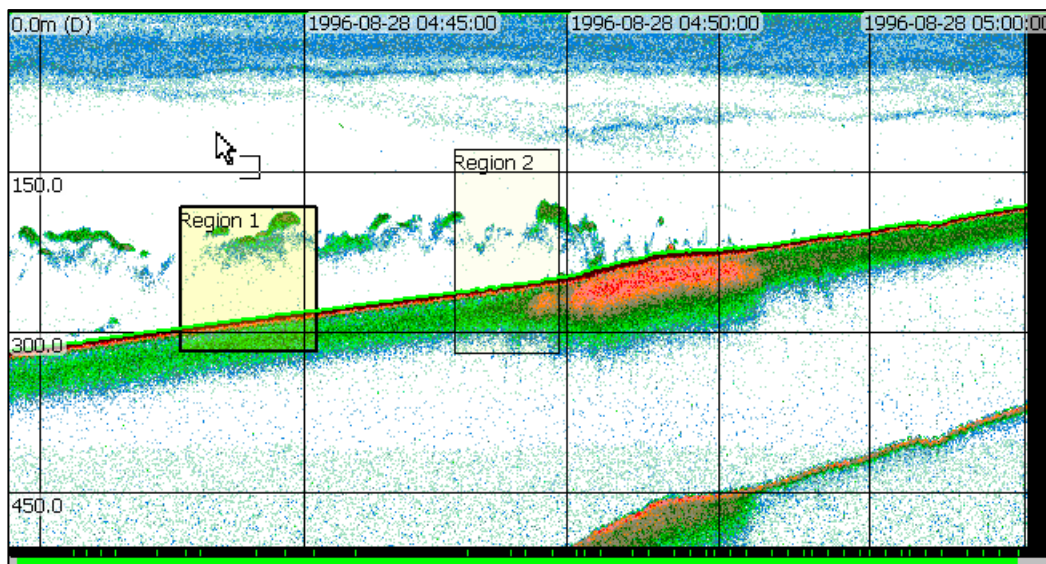


Figure 13. Echogram with two analysis regions.

17. On the **Echogram** menu, point to **Export**, point to **Analysis by Regions**, and then click **Integration**. The Export Integrated Regions – Select Classes window is displayed.
Region classes to export: allows you to specify the region class, but this exercise only has one class type. Click **Export**
18. In the **File name** box, browse to a folder and enter a name for the export file.
19. Click **Save**.
20. Open the file you created in the spreadsheet application.
21. Take a moment to look at the results and compare them to the results that were exported for the integration by cells exercise. **Note:** The main difference between the files (other than the values) is that the first export file comprises one line per cell and contains variables that identify the cells, while the second file comprises one line per region and contains variables that identify the regions.

You should close `Integration_Topic3.EV` file. If you wish to save the changes, it is recommended that you save the file with a different name so you can repeat this topic at a future date if required.

¹ Getting Started tutorial: Working with Regions.
 Echoview Tutorial: Introduction to Integration