

ECSeePro



Energy Research LLC

<https://energy-craft.com/>

User manual

Table of contents

Purpose of the software	2
System requirements	2
General information about the program.....	2
User interface overview	3
Opening a file	4
Visualization tab.....	4
"Wiggle" display mode	5
Zooming the display	6
Sorting traces	7
Data preprocessing.....	8
Header plots	9
General information tab	9
Text header tab	10
Import and export of text header.....	10
Binary Header tab.....	10
Trace headers tab.....	11
Export and import of trace headers.....	12
Import coordinates from a Shapefile (available in the Pro version of the program)	13
Header calculator	14
Highlighting duplicate coordinate pairs.....	14
Traces tab	15
Saving a file.....	15

Fourier Spectra	17
Amplitude histogram.....	17
File conversion (available in the Pro version of the program).....	18

Purpose of the software

The ECSeePro software is designed to view information contained in seismic files in the SEG-Y (including version 2.0) and SEG-D (all versions) formats and working with this information, including editing headers and the files themselves in general.

System requirements

This software is designed for use on 64-bit Windows operating systems 7, 8, 8.1, 10, 11.

General information about the program

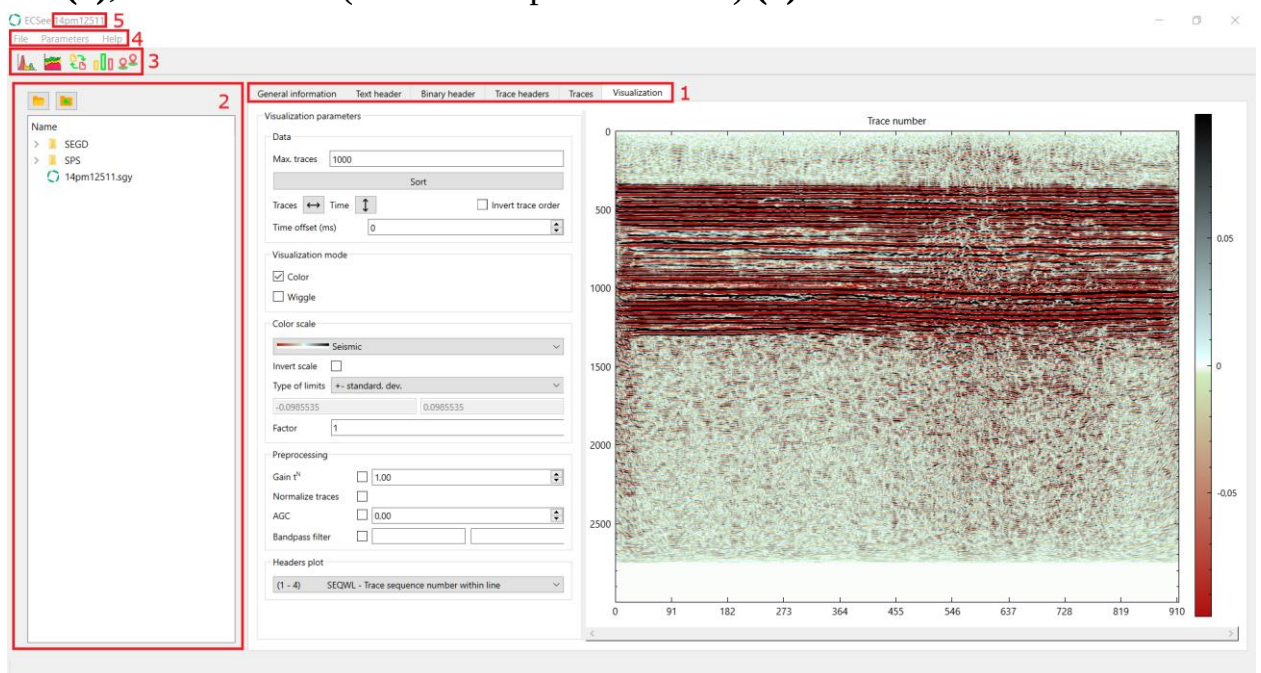
The software provides the user with the following features:

- open and visualize seismic files of various revisions with the .sgy (.segy) and .segd (.sgd) extensions in different modes;
- quick view of files in a folder on disk;
- support for standard data formats: integer (2, 4 bytes), IBM 32-bit float, IEEE 32-bit float;
- data visualization in Variable Density and Wiggle modes;
- bandpass filter;
- automatic gain control (AGC);
- sorting traces by different headers and in different order;
- view and edit the text and binary headers of the SEG-Y file;
- view information from the headers of SEG-D files;
- import a text header from a file and export it to a file;
- changing the trace headers based on the calculated expression;
- import and export trace headers;
- import coordinates from Shapefile into headers;
- changing a separate element of the trace header;
- highlighting duplicate coordinate pairs in file headers;
- displaying a graph of trace headers;
- view the values of trace samples;
- conversion of coordinate systems (CRS) in file headers;

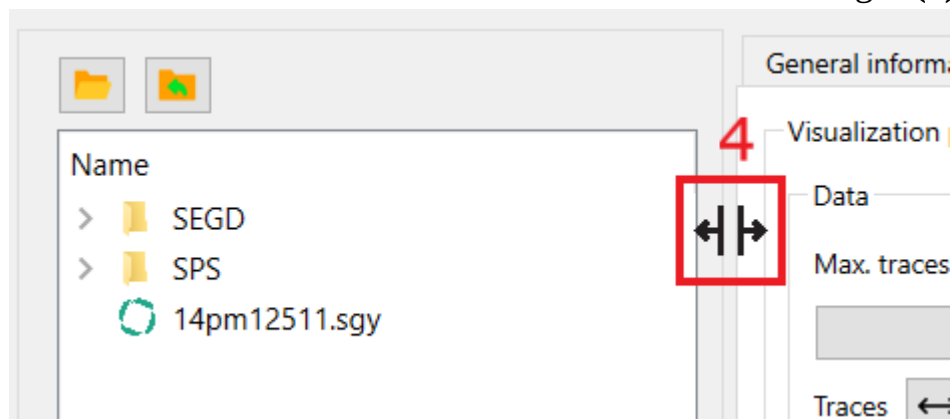
- conversion of sample format (IBM 32-bit float or IEEE 32-bit float);
- Fourier spectrum;
- view a histogram of amplitudes of data from files;
- save the entire SEG-Y file or part of it to disk in SEG-Y format (IBM 32-bit float / IEEE 32-bit float) with the ability to select data based on trace numbers and a specified time interval.

User interface overview

The program interface consists of five main tabs **(1)**, a folder tree (directory listing) on the left **(2)**, a toolbar with buttons for additional functionality **(3)**, a menu bar **(4)**, and a title bar (shows the open file name) **(5)**.



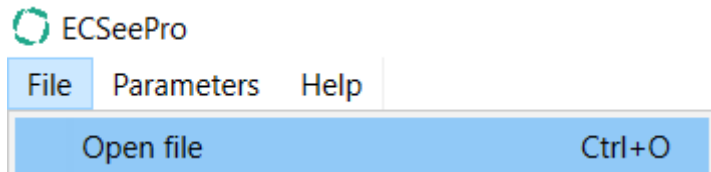
By switching between tabs, you can view different types of information from the file. You can resize the folders/files pane (collapse to zero width) by hovering over the border between the tab area and the folder area and moving it **(4)**:



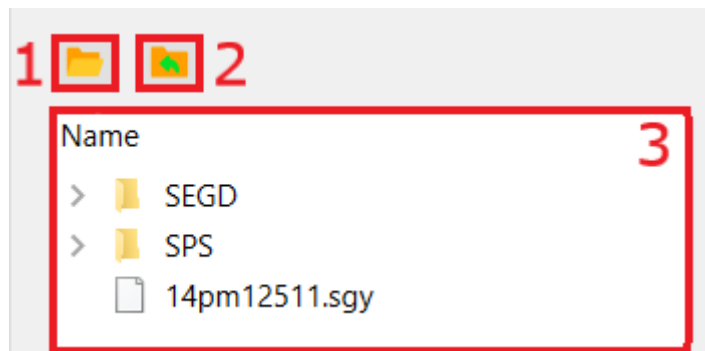
Opening a file

There are several ways to open a file:

- In the upper-left corner of the window, click "File" → "Open file";



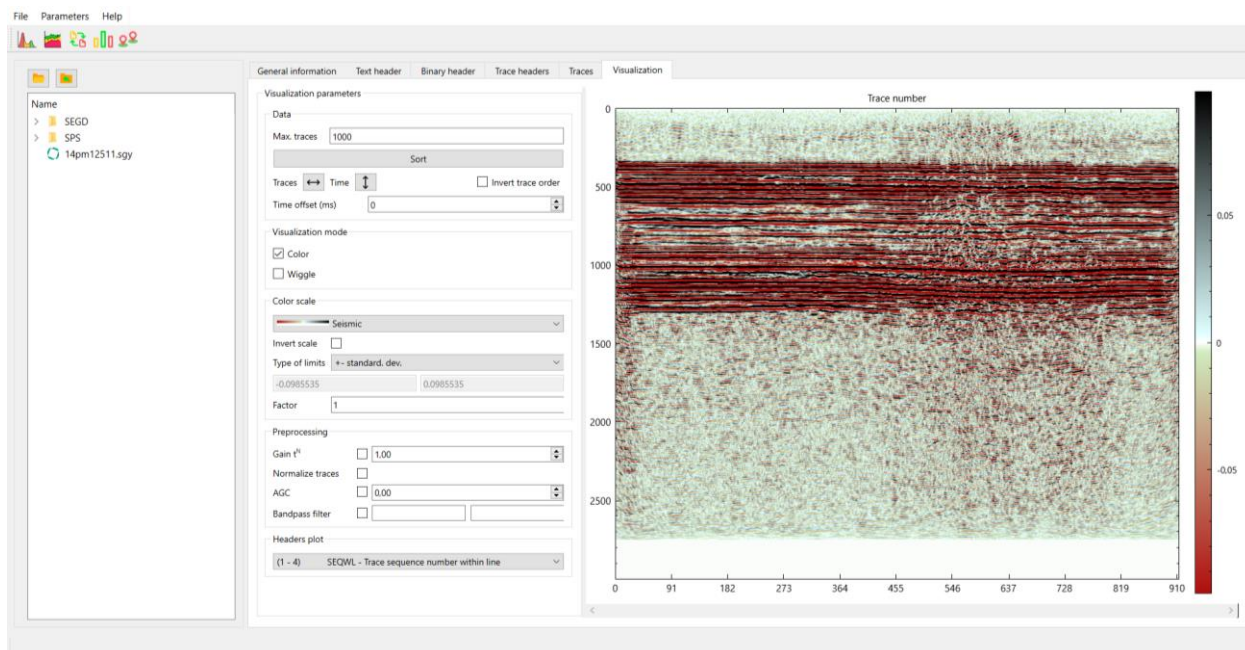
- Use the Ctrl+O key combination;
- By clicking **(1)** in the folders and files area on the left, or by clicking on a file on the left in area (3), click the file with the left mouse button (LMB). To make it easier to search for a file in this area, you can use the button **(2)** to move up directories and click on existing folders to view their contents.



The folder area on the left shows the directory of the currently opened file.

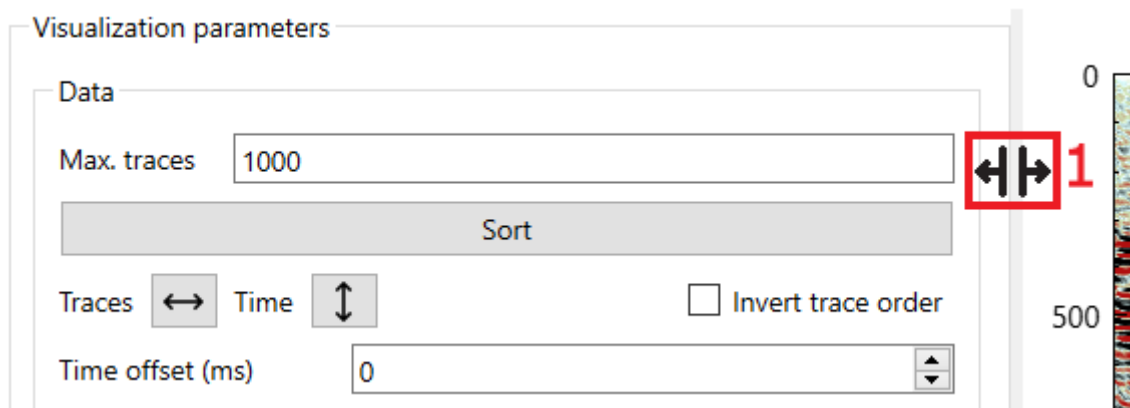
Visualization tab

By default, the "Visualization" tab is open, designed for viewing seismic files in various modes and for preprocessing.



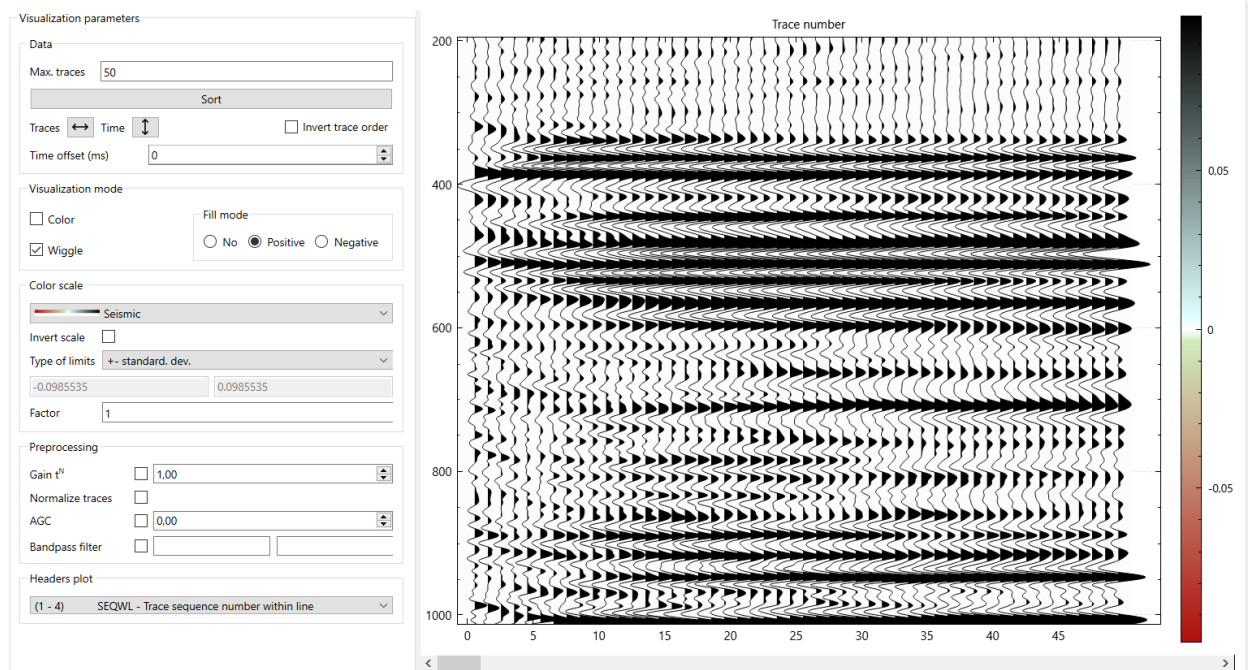
Here you can select the maximum number of traces displayed in the window (increasing this number requires more computing resources to render the display), invert the display horizontally, adjust the color scale and its mode (by default, Seismic), and an amplitude scale factor that changes the section display, increasing or decreasing the values depending on the selected factor (by default, 1).

You can change the size of the area with visualization settings (up to zero) by hovering the cursor over the border between the chart area and the area with settings and moving it **(1)**:



"Wiggle" display mode

In addition to the color display of data in the "Visualization" tab, you can choose the "Wiggle" display mode with the ability to select the fill mode (positive or negative amplitudes). This mode is turned off by default and is enabled by the "Wiggle" checkbox, superimposed on a color plot, which can be turned off by the corresponding checkbox for more convenient visual perception.



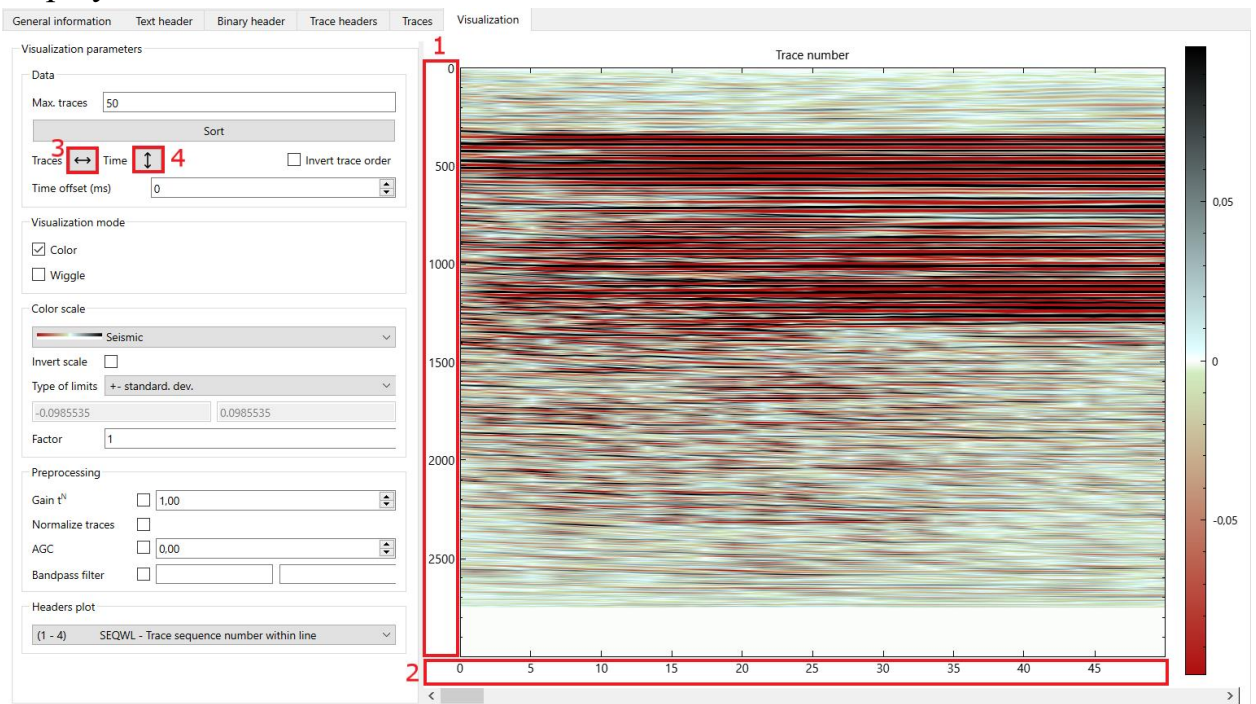
Zooming the display

You can zoom in and out of the displayed cross-section by moving the mouse wheel over the graph. You can select an area of interest for displaying on the plot with the LMB held down. To return to the original scale on both axes, press the RMB (right mouse button) + Unzoom:



You can also change the zoom on each axis by hovering the mouse cursor over the time axis **(1)** or traces axis **(2)** and rotating the mouse wheel. To reset the scale along the axis of the traces, use the button **(3)** for traces and button **(4)** for time. When you hover over the buttons, hints with descriptions of their functions also are

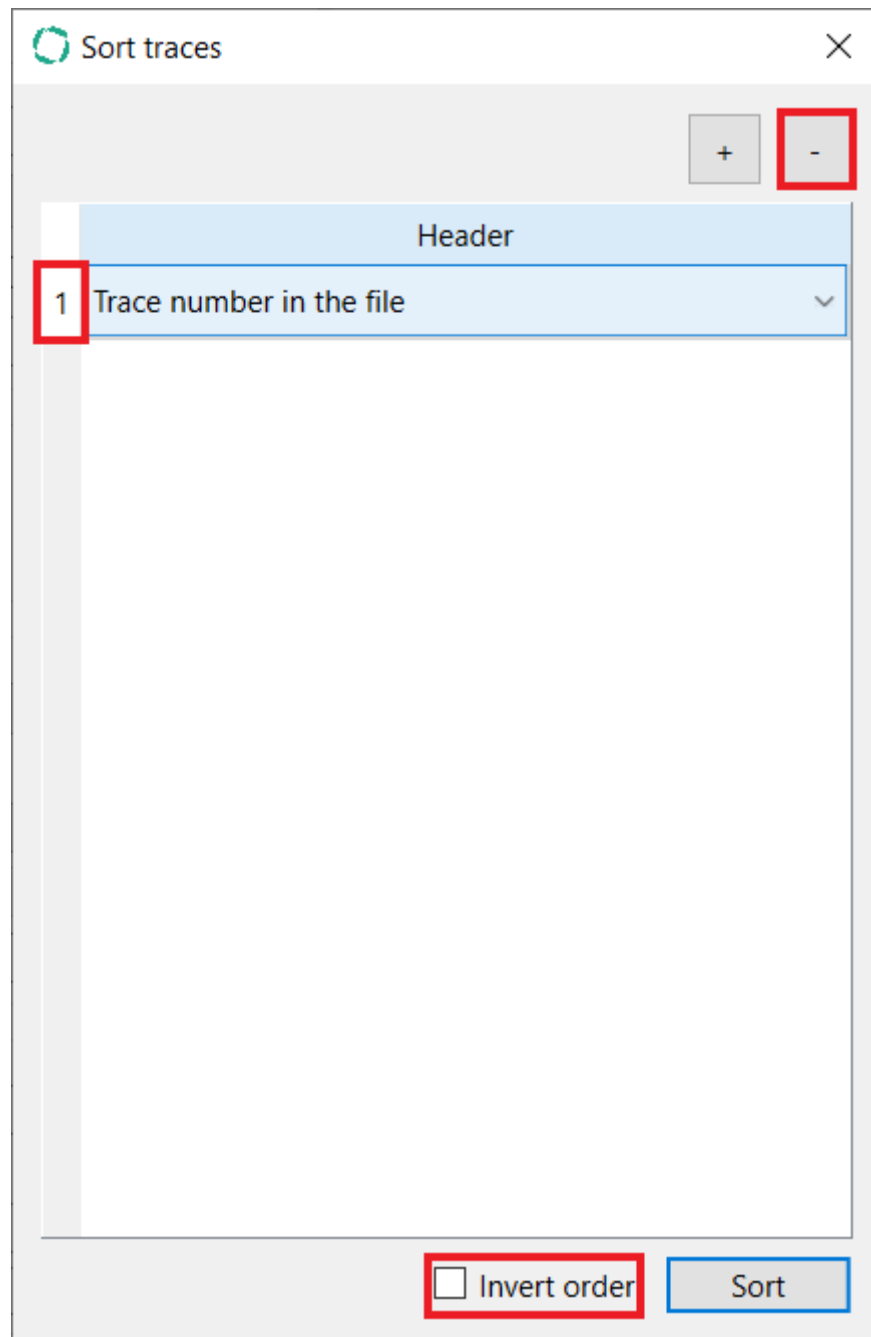
displayed.



Sorting traces

When you click the "Sort" button in the "Visualization" tab, a window opens with a selection of headers for sorting. By default, it is sorted according to the order of traces in the file. You can add a header for sorting by clicking "+" and selecting the desired header from the drop-down list.

To remove a header from sorting, click on the header number on the left **(1)**, and then "-" **(2)**.



You can also set the reverse sorting order **(3)**. After selecting all the headers for sorting, you need to click the "Sort" button to apply sorting, and then you can close the sorting window.

Data preprocessing

The preprocessing tab contains various functions. To enable them, click the checkbox next to the function name. You can change the values in gain and AGC by rotating the mouse wheel with the cursor hovering over the input field (the step for gain is 0.1, for AGC it is 1) or manually entering them in the fields (use a comma as the decimal separator). When you finish entering values in the fields for the bandpass filter, you must press Enter to apply the function.

Preprocessing

Gain t^N ☐ 1,00

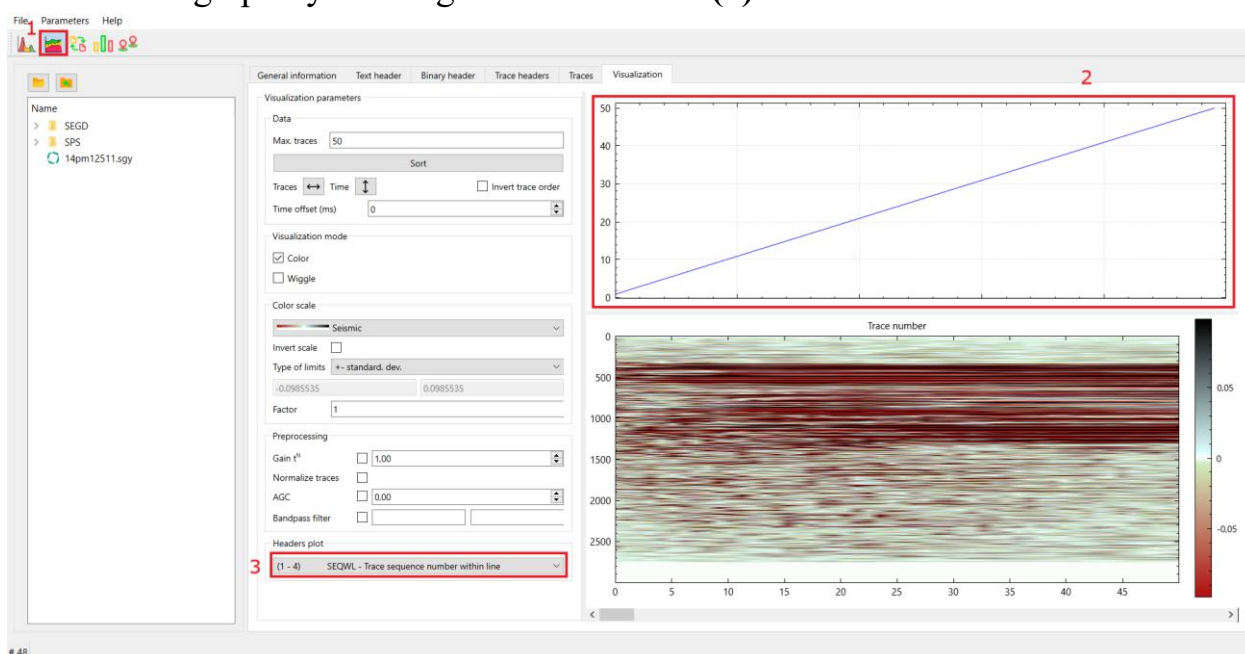
Normalize traces ☐

AGC ☐ 0,00

Bandpass filter ☐

Header plots

Also, in the "Visualization" tab, when you click the button with graphs (1), a header plot appears (2). You can select the displayed header in the list (3). You can turn off this graph by clicking the same button (1).



General information tab

General information | Text header | Binary header | Trace headers | Traces | Visualization

File SEG-Y: C:/Работа/SEG-D/14pm12511.sgy

Text Header Encoding: EBCDIC
Byte order: Big Endian
Sample format: 1

Traces: 913
Trace samples: 3000
Sample interval (μs): 1000
Time length (mS): 2999

Header values

Header	First trace	Last trace
FFID	1	913
SP	0	0
CDP	1	913

In this tab, you can see the full path to the open file, its sample format and encoding, the number of traces and samples, the sampling interval, and the length of the entire recording. The FFID, SP, and CDP header values for the first and last traces are also displayed.

Text header tab

The "Text header" tab displays information from the file's text header, which can be encoded in either ASCII or EBCDIC (40 lines of 80 characters each). If you change the text header, you can immediately write it to the currently open file by clicking the corresponding button at the bottom of the tab. When saving, unknown characters will be replaced with spaces.

General information	Text header	Binary header	Trace headers	Traces	Visualization
C 1 CLIENT	COMPANY	CREW NO.			
C 2 LINE	AREA	MAP ID.			
C 3 REEL NO.	DAY-START OF REEL	YEAR	OBSERVER		
C 4 INSTRUMENT: MFG	MODEL	SERIAL NO.			
C 5 DATA TRACES/RECORD	AUXILIARY TRACES/RECORD	CDP FOLD			
C 6 SAMPLE INTERVAL	MS	SAMPLES/TRACE	BITS/IN	BYTES/SAMPLE	
C 7 RECORDING FORMAT	FORMAT THIS REEL	MEASUREMENT SYSTEM			
C 8 SAMPLE CODE: FLOATING PT	FIXED PT	FIXED PT-GAIN	CORRELATED		
C 9 GAIN	TYPE: FIXED	BINARY	FLOATING POINT	OTHER	
C10 FILTERS: ALIAS	HZ	NOTCH	HZ	BAND	HZ SLOPE
C11 SOURCE: TYPE	NUMBER/POINT	POINT INTERVAL			
C12	PATTERN	LENGTH	WIDTH		
C13 SWEEP: START	HZ	END	HZ	LENGTH	MS CHANNEL NO. TYPE
C14 TAPER: START LENGTH	MS	END LENGTH	MS	TYPE	
C15 SPREAD: OFFSET	MAX DISTANCE	GROUP INTERVAL			
C16 GEOPHONES: PER GROUP	SPACING	FREQUENCY	MFG	MODEL	
C17	PATTERN	LENGTH	WIDTH		
C18 TRACES SORTED BY: RECORD	CDP	OTHER			
C19 MAP PROJECTION	ZONE ID	COORDINATE UNITS			
C20 BEGINNING SHOTPOINT (OBSERVER'S):					
C21 ENDING SHOTPOINT (OBSERVER'S):					
C22 DIRECTION OF LINE:					
C23 COUNTY	STATE	SURVEY NO.			
C24					
C25					
C26					
C27					
C28					
C29					
C30					
C31					
C32					
C33					
C34					
C35					
C36					
C37					
C38					
C39					
C40					

Export text header
Import text header
Save

Import and export of text header

You can also export or import a text header in a text file format (.txt). To do this, click the appropriate buttons at the bottom of the "Text header" tab and select the file.

Binary Header tab

In the "Binary header" tab, you can view and change some values from the binary header. To edit a value, double-click it, change the value, and press Enter.

General information				Text header	Binary header	Trace header
	Байты	Описание	Значение			
1	1 - 4	Job identification number	0			
2	5 - 8	Line number	518			
3	9 - 12	Reel number	1			
4	13 - 14	# data traces per record	120			
5	15 - 16	# aux traces per record	0			
6	17 - 18	Sample interval for reel (microseconds)	2000			
7	19 - 20	Sample interval for field (microseconds)	0			
8	21 - 22	Number samples per data trace for reel	1501			
9	23 - 24	Number samples per data trace for field	0			
10	25 - 26	Data sample format code	1			
11	27 - 28	CDP fold	120			
12	29 - 30	Trace sorting fold	1			
13	31 - 32	Vertical sum code	0			
14	33 - 34	Sweep frequency at start	0			
15	35 - 36	Sweep frequency at end	0			
16	37 - 38	Sweep length (milliseconds)	0			
17	39 - 40	Sweep type code	0			
18	41 - 42	Trace number of sweep channel	0			
19	43 - 44	Sweep trace taper length at start (ms)	0			
20	45 - 46	Serrp trace taper length at end (ms)	0			
21	47 - 48	Taper type	0			

Trace headers tab

This tab displays the trace headers selected in the list on the left side of the tab (the selection is remembered and saved when the program is restarted) and allows you to edit them.

General information								Text header	Binary header	Trace header	Traces	Visualization
Select all								(1 - 4) SEQWL - Trace sequence number within line				
☒	(1 - 4)	SEQWL - Trace sequence number										
☐	(5 - 8)	SEQWR - Trace sequence number										
☐	(9 - 12)	FFID - Original field record number										
☐	(13 - 16)	TRCFLD - Trace number within										
☐	(17 - 20)	SP - Energy source point number										
☒	(21 - 24)	CDP - CDP ensemble number										
☐	(25 - 28)	TRCNUM - Trace number										
☐	(29 - 30)	TRCID - Trace identification code										
☐	(31 - 32)	NVST - Number of vertically stacked										
☐	(33 - 34)	NHST - Number of horizontal										
☐	(35 - 36)	DU - Data use (1-production, 2-rep)										
☐	(37 - 40)	DSREG - Distance from source										
☐	(41 - 44)	RGE - Receiver group elevation										
☐	(45 - 48)	SES - Surface elevation at source										
☐	(49 - 52)	SDBS - Source depth below surface										
☐	(53 - 56)	DERG - Datum elevation at record										
☐	(57 - 60)	DES - Datum elevation at source										
☐	(61 - 64)	WDS - Water depth at source										
☐	(65 - 68)	WGD - Water depth at group										
☐	(69 - 70)	SAED - Scaler to all elevations										
☐	(71 - 72)	SAC - Scaler to all coordinates										
☒	(73 - 76)	SRCX - Source X coordinate										
☒	(77 - 80)	SRCY - Source Y coordinate										
☐	(81 - 84)	GRPX - Group X coordinate										
☐	(85 - 88)	GRPY - Group Y coordinate										
☒	(89 - 90)	UNITS - Coordinate units (1-feet, 2-meters)										
☐	(91 - 92)	WVEL - Weathering velocity										
☐	(93 - 94)	SVEL - Subweathering velocity										
☒	(95 - 96)	UTSRC - Uphole time at source										
☐	(97 - 98)	UTGRP - Uphole time at group										
☐	(99 - 100)	SESCOR - Source static correction										
☐	(101 - 102)	GRPCOR - Group static correction										
☐	(103 - 104)	TSA - Total static applied										
☐	(105 - 106)	LAGTA - Lag time A										
☐	(107 - 108)	LAGTB - Lag time B										

The displayed values can be copied by selecting the required area with the LMB pressed and then using the key combination Ctrl+C:

	CDP	TRCNUM	SRCX	SRCY	INLINE	
1	1	1	171	171	0	0
2	2	1	171	171	0	0
3	3	1	171	171	0	0
4	4	1	171	171	0	0
5	5	1	170	170	0	0

You can also copy the entire row, i.e. the values of all the headers for certain traces, by clicking on their number in the column on the left. If you want to select several non-consecutive traces, then you can hold down Ctrl and select the necessary lines. You can also copy the header values for all traces by selecting the corresponding columns in the same way as the rows:

	CDP	TRCNUM	SRCX	SRCY	INLINE	XLINE	SP#	SPS
1	1	1	171	171	0	0	1	0
2	2	1	171	171	0	0	1	0
3	3	1	171	171	0	0	2	0
4	4	1	171	171	0	0	2	0
5	5	1	170	170	0	0	3	0

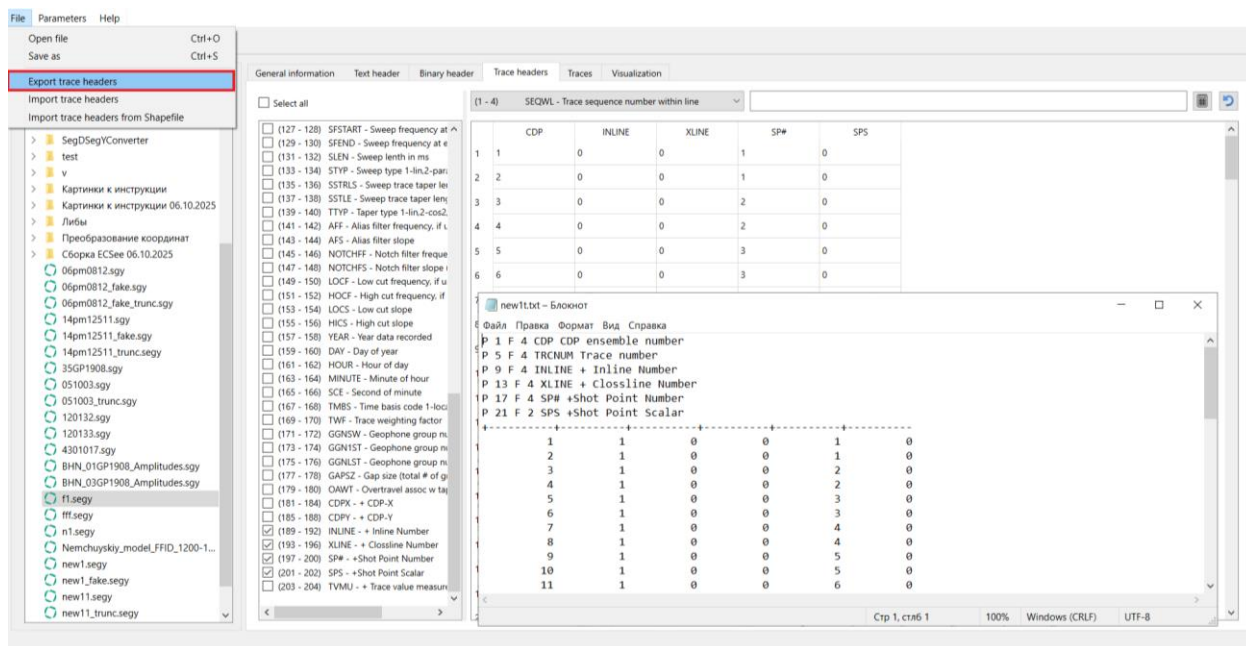
When copying, data in a row is separated by tabs. When copying the entire column, its name is also copied:

FFID	SRCY
171	591
171	591
170	591
170	591
169	591
169	591
168	591
168	591

Data should be pasted in the same format as copied. Select the upper-left cell of the insertion area and press Ctrl+V. For more convenient editing of headers, you can export them.

Export and import of trace headers

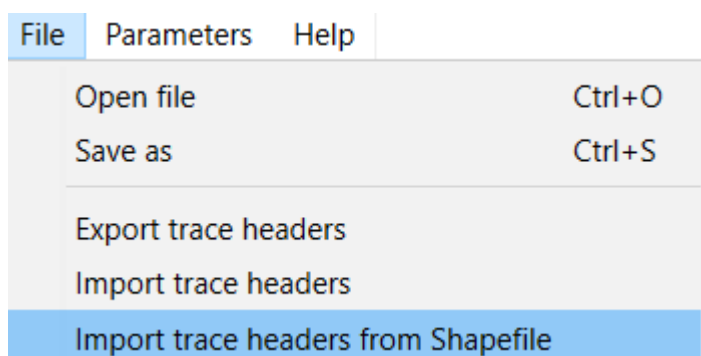
To export headers, click the appropriate button in the "File" menu tab and select the name and directory of the file for export. The headers that are opened in the "Trace headers" tab will be exported to the text file.



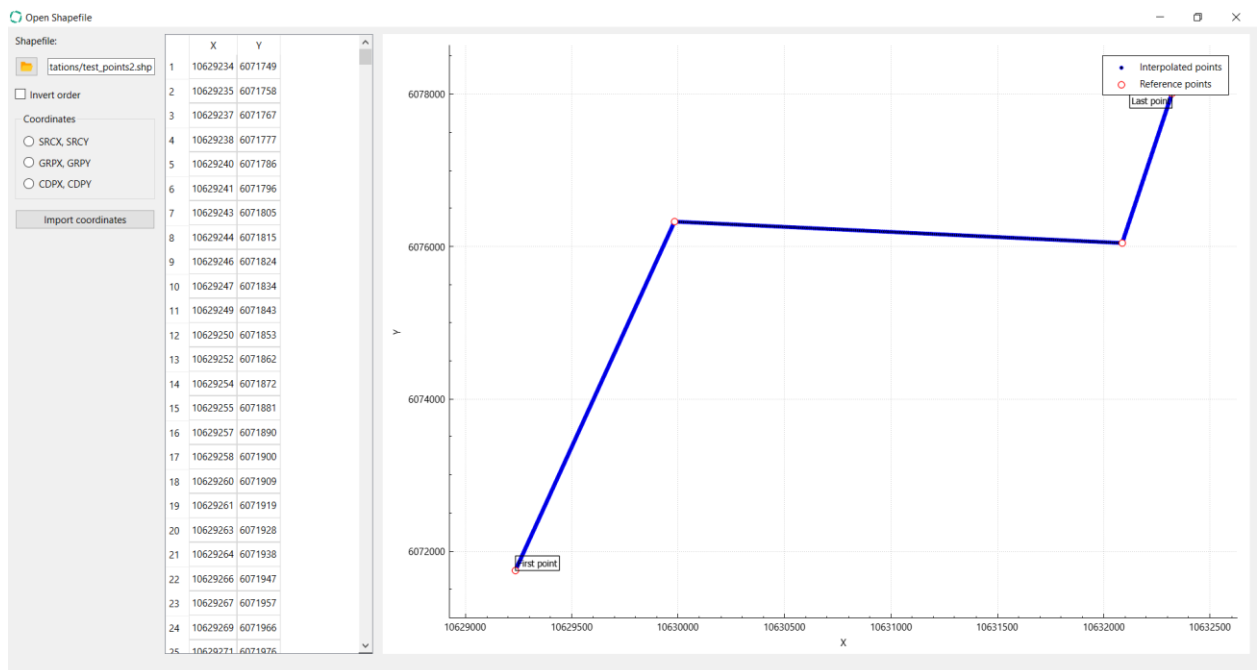
You can also import trace headers. To do this, the import file must be in the same format as the exported file. The first lines of the import file must contain the header names for correct import into the SEG-Y file. At the same time, headers imported from the file do not have to be opened in the "Trace headers" tab. The import is based on header information (metadata) from the file.

Import coordinates from a Shapefile (available in the Pro version of the program)

You can also import headers with coordinates from Shapefile containing reference points, which are used to linearly interpolate values for the headers of all traces. When you select a file in a directory other than the file with the extension .shp must contain 3 more files with the same name, but with the extensions .shx, .dbf, .prj.



After selecting the file, the import settings window opens, where you can change the Shapefile, invert the coordinate order, and look at the calculated coordinates, which will be assigned to the trace headers. The graph shows the resulting profile, with reference points highlighted separately and the first and last points of the profile marked.



In this window, select which coordinates will be changed and click "Import coordinates". After that, the trace headers will be changed. If you need to cancel changes to coordinates, you can click the corresponding button  in the "Trace headers" tab.

Header calculator

Headers can be edited by double-clicking the value with LMB, as was done in binary headers. However, if you need to edit the header for all traces, it is better to use the calculator: on the left side of the list, select the header you want to edit, and write the expression in the input field: all standard mathematical operations are supported +, -, *, /, ** (exponentiation), % (remainder of division) to use in header calculations, you must specify their letter code, then the calculator button is pressed and the calculation is performed. You can cancel the calculation by clicking the next "Back" button.

{181 - 184} CDPX - + CDP-X  

Quick help for operations pops up when you hover over the value input field:

(1 - 4)		SEQWL - Trace sequence number within line				
	CDP	INLINE	XLINE	SF		
1	1	0	0	0		
2	2	0	0	0		
3	3	0	0	0		
4	4	0	0	0		

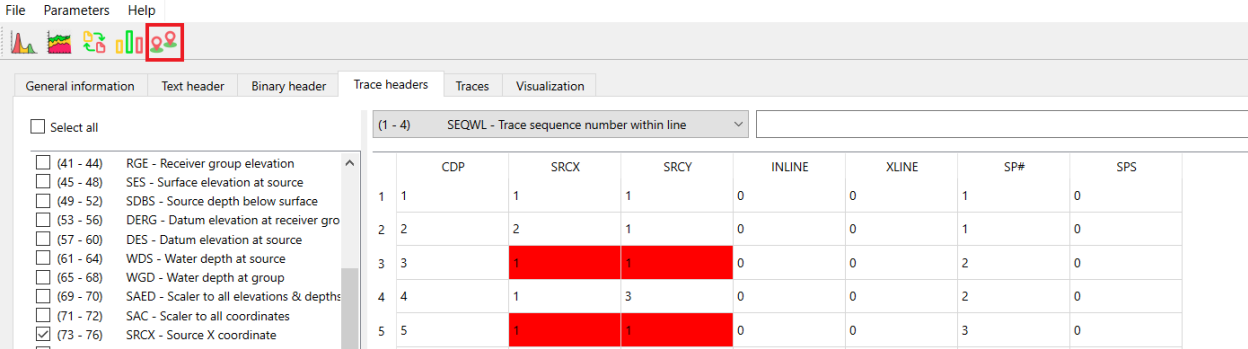
The expression to write to the header selected on the left. Headers are written in their own letter abbreviations. Basic mathematical operations are available: +, -, *, /, **. Logical operations are also available: >, <, ==, !=.

Example: **SRCX + 10000**

Highlighting duplicate coordinate pairs

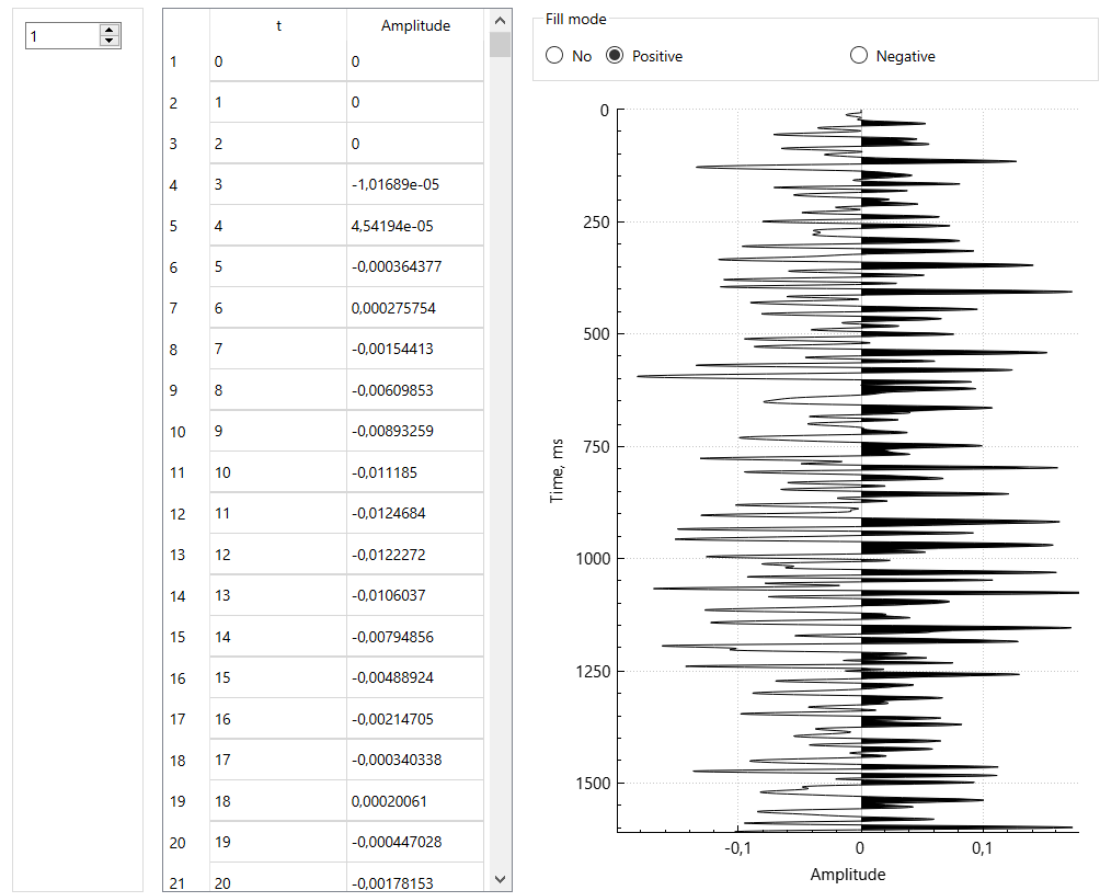
If you need to check the coordinate pairs (headers (SRCX, SRCY), (GRPX, GRPY), and (CDPX, CDPY)) for duplication, you can click the button highlighted

in the screenshot in the toolbar and duplicate coordinate pairs will be highlighted in red:



Traces tab

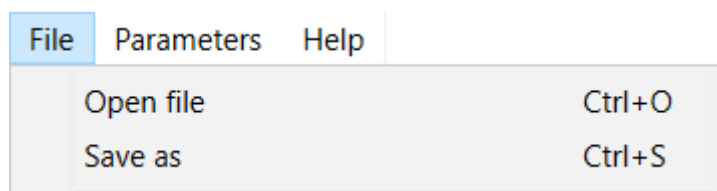
In the "Traces" tab, you can select the trace number and view its values:



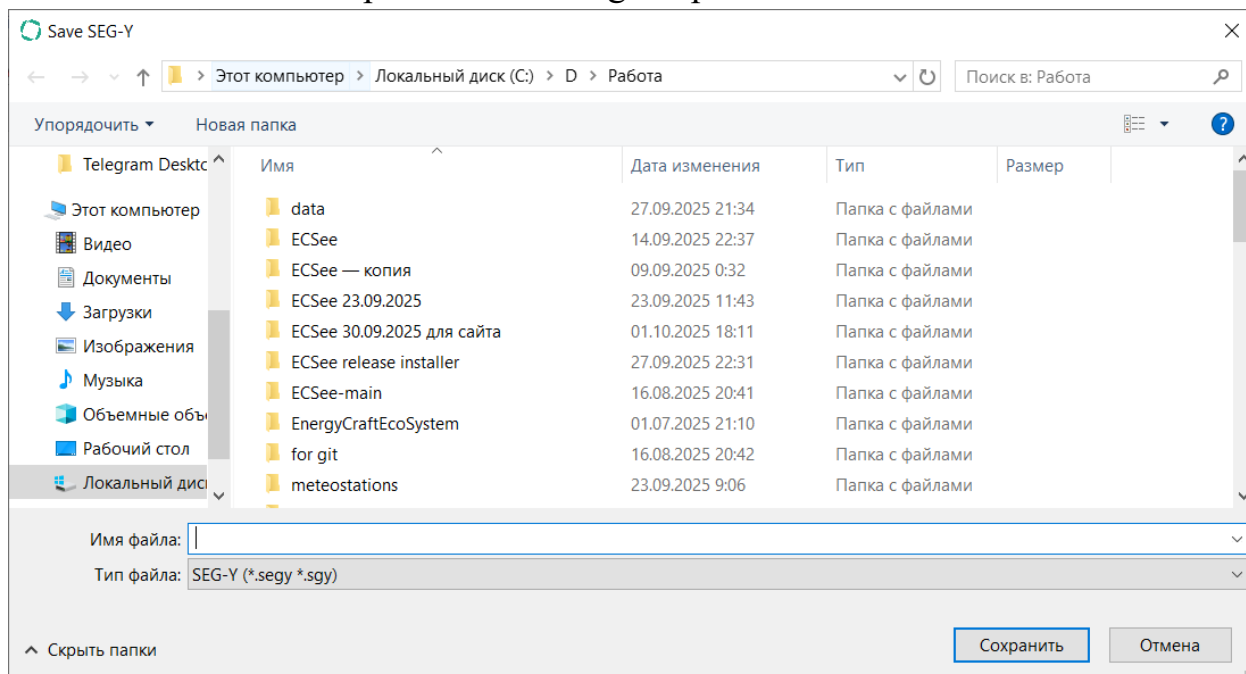
It also displays the trace graph in "Wiggle" format with the option to select the fill mode.

Saving a file

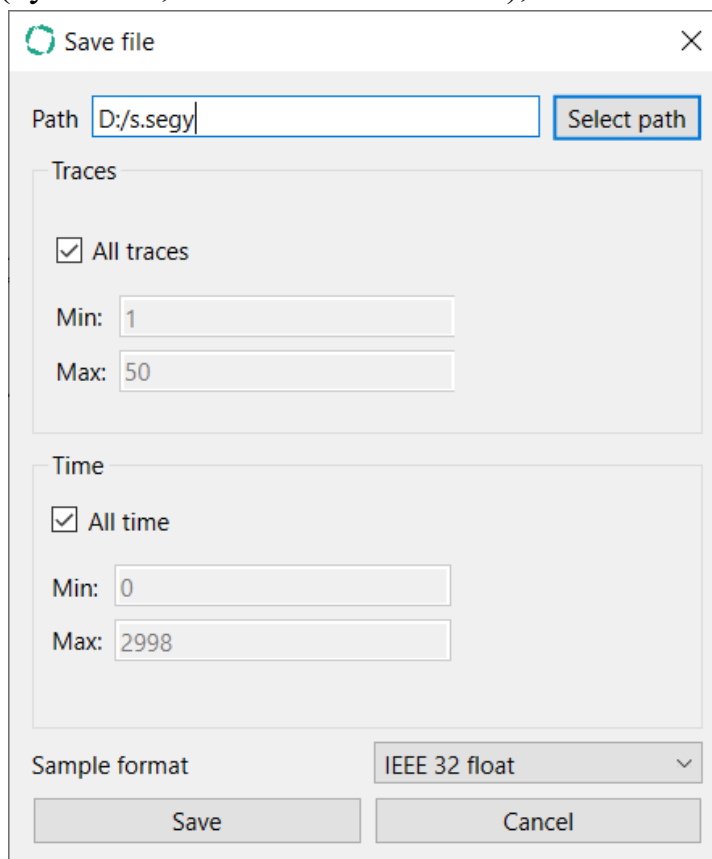
You can save the file by clicking "File" → "Save As" in the upper-left corner, or by pressing Ctrl+S:



Then a window opens for selecting the path and file name to save:

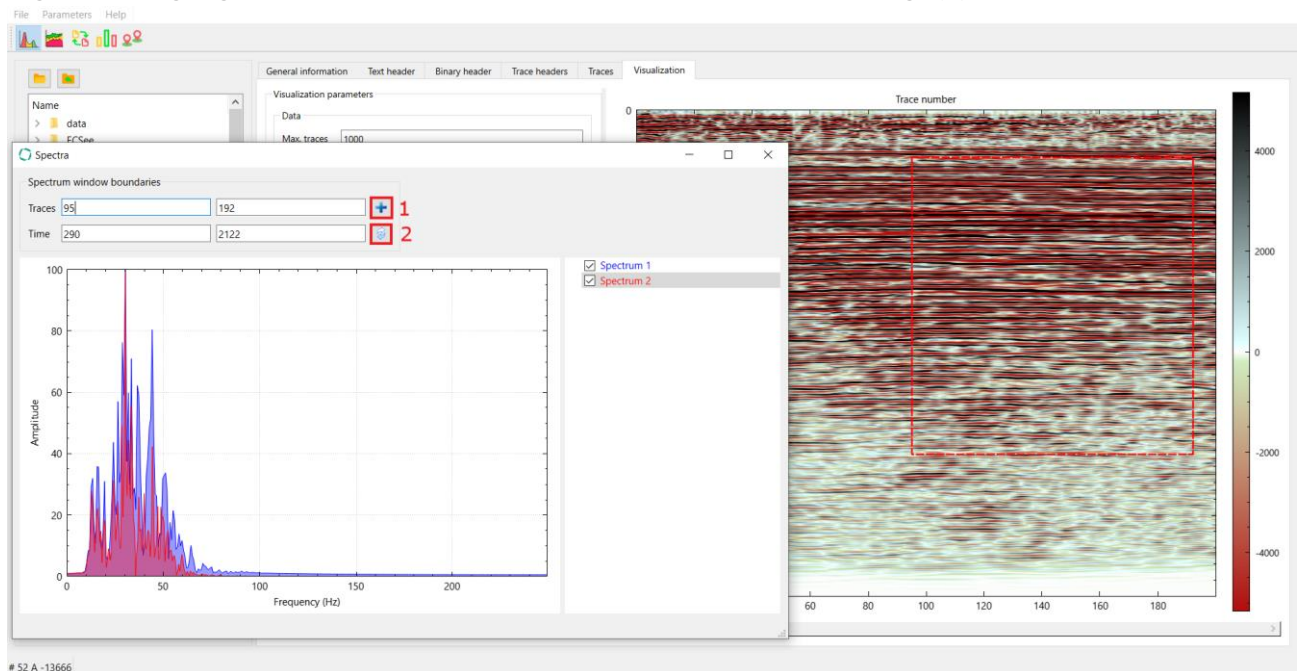


Next, a window opens that allows you to edit the save path, the range of traces and time to save (by default, the entire file is saved), and the sample format:



Fourier Spectra

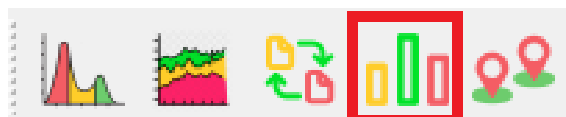
When you click the spectra button in the upper-left corner, a window with Fourier spectra opens. To display the spectrum, it is necessary to select an area while holding the LMB on the section graph. You can also manually enter values for the area for which you want to get the spectrum. After entering the values, click **(1)**. The resulting selected data area for the spectrum is highlighted on the trace graph. You can hide the spectrum display by clicking the corresponding checkbox on the right side of the spectrum window. You can also update it by selecting it in the list on the right, changing the values in the text fields, and then clicking **(2)**.



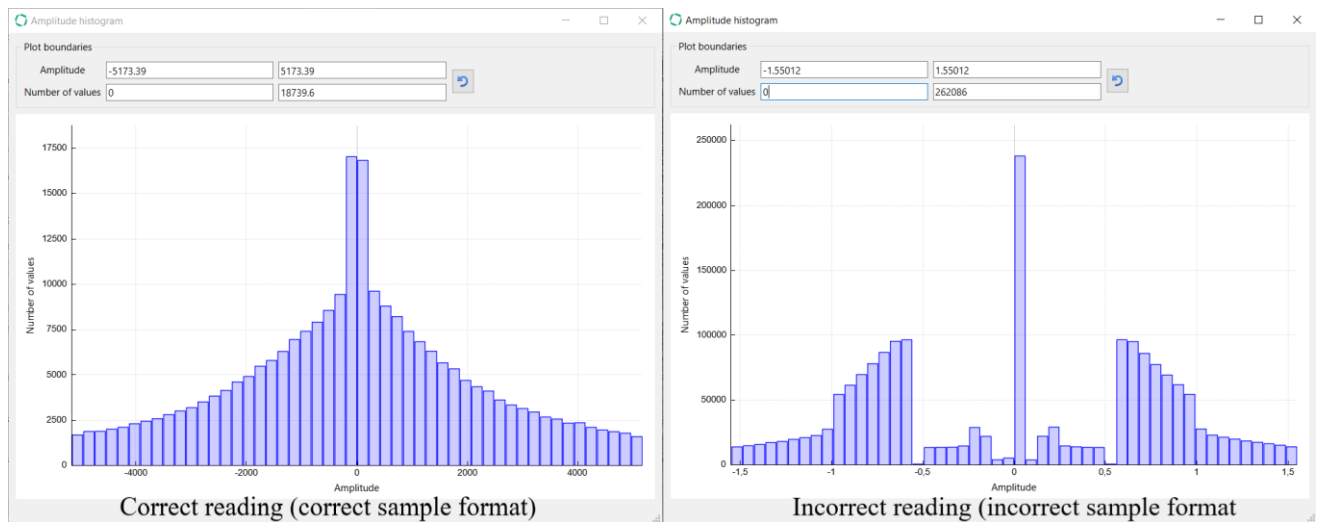
When you add a spectrum by entering the values of the window borders, the program checks whether the selected trace range is valid that should be within the limits of the trace displayed on the graph are valid.

Amplitude histogram

To check that the data from the SEG-Y file is read correctly, you can use the amplitude histogram, which can be opened using the corresponding button on the toolbar:



Correctly read data in the histogram will be close to a normal distribution, but incorrectly read data will create a different picture:



File conversion (available in the Pro version of the program)

The program also includes a file conversion window, which can be opened by clicking the icon in  the upper-left corner. The window contains 2 types of conversions: coordinate systems (CRS) and sample format (IBM 32-bit float / IEEE 32-bit float). Conversion can be performed for several files at once, which can be selected by clicking button **(1)**:

The "File converting" window has two tabs: "CRS" and "Sample format". The "CRS" tab is selected.

On the left, under "Files to convert:", there is a folder icon labeled **1** and a list of files: "051003.sgy" and "f1.segy".

On the right, there are fields for "Source CRS:" and "Target CRS:", each with a search icon and a dropdown menu.

Below these fields is a section titled "Converted bytes" with four checkboxes:

- ☐ Select all
- ☐ (73-76) SRCX, (77-80) SRCY
- ☐ (81-84) GRPX, (85-88) GRPY
- ☐ (181-184) CDPX, (185-188) CDPY

At the bottom right, there is a "Save path:" field with a folder icon and a text input box.

A large "Convert" button is located at the bottom center of the window.

The names of the selected files will be displayed in the list on the left side. Then you need to select the source and target CRS from the drop-down list. You can use the search fields that are located above the lists to simplify your search. Next, select the byte positions where coordinate values are stored, and select the file save path. A directory with the target CRS name will be created in this path. After clicking the "Convert" button, if the conversion is successful, the corresponding information window will appear, or an error message will be displayed.

The sample format conversion tab looks similar, but you need to select the output formats and the write mode:

