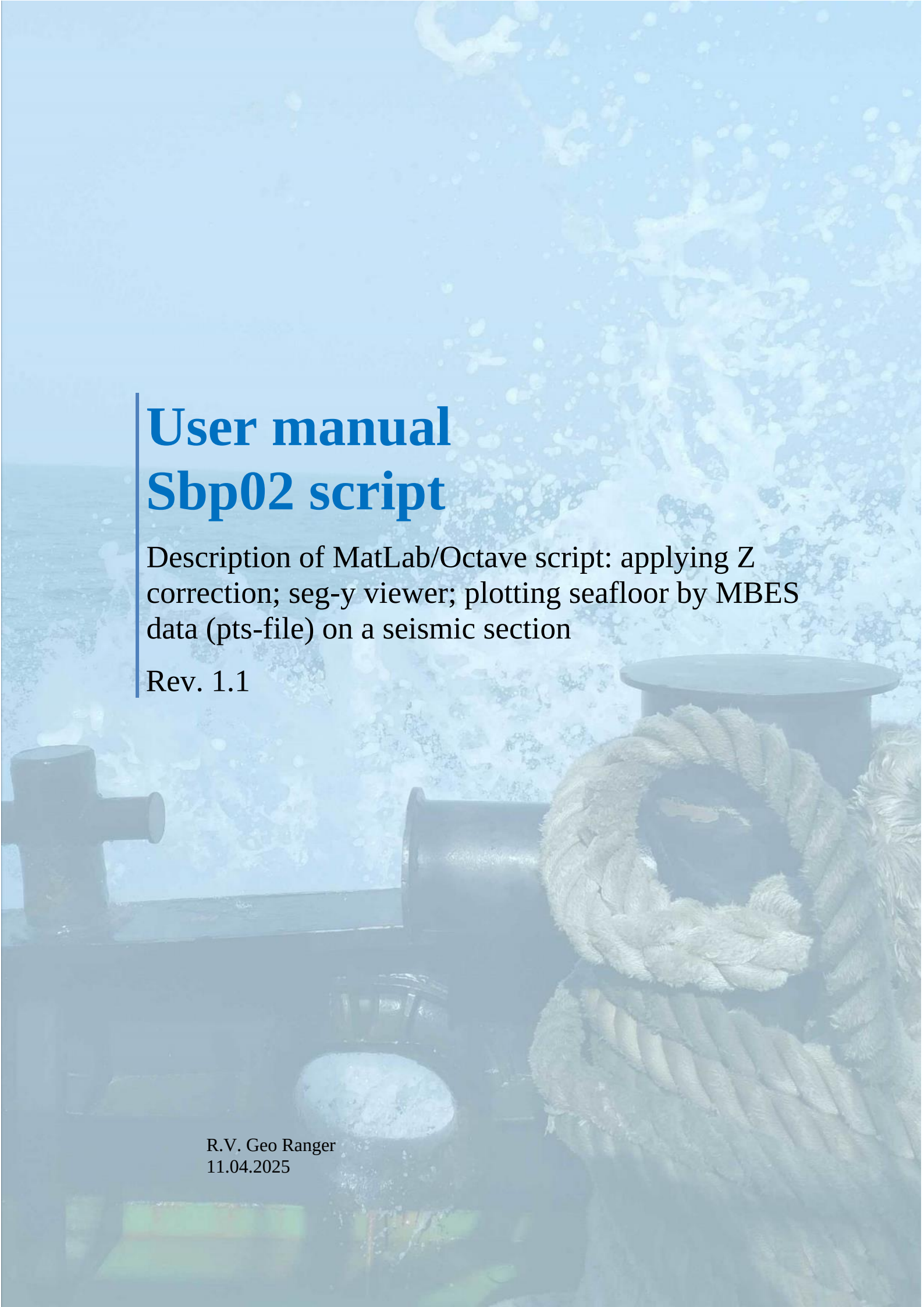


User manual
Sbp02 script

Description of MatLab/Octave script: applying Z correction; seg-y viewer; plotting seafloor by MBES data (pts-file) on a seismic section

Rev. 1.1

R.V. Geo Ranger
11.04.2025

SEA

Contents

History of changes

Revision	Date	Description of changes
1.0	2025-03-03	Document created // Ivan D.
1.1	2025-04-11	Text corrected // Ivan D.

List of Figures

1. Introduction

The document discusses the “Sbp02” script, designed for applying Z corrections (SBP transmitter height or “tides”) to sgy files (*Figure 1.1*).

The script allows you to perform the following actions:

-- Apply Z corrections from text files to seg-y files;

-- Apply shift for “Delay Recording Time” (range correction) to the seismic section;

-- Select a seismic section to view on the SBP track-plot;

-- View a seismic section with “MBES seafloor” (interpolation of coordinates from pts-file to seismic trace coordinates), while simultaneously viewing MBES data. It is possible to set the sound speed for each SBP section, which will affect the position of the seafloor.

The script requires three types of files as inputs:

-- MBES data in pts format for the survey area;

-- sgy-files to which Z corrections should be applied;

-- txt-files with Z corrections that also include time stamps or FFID numbers.

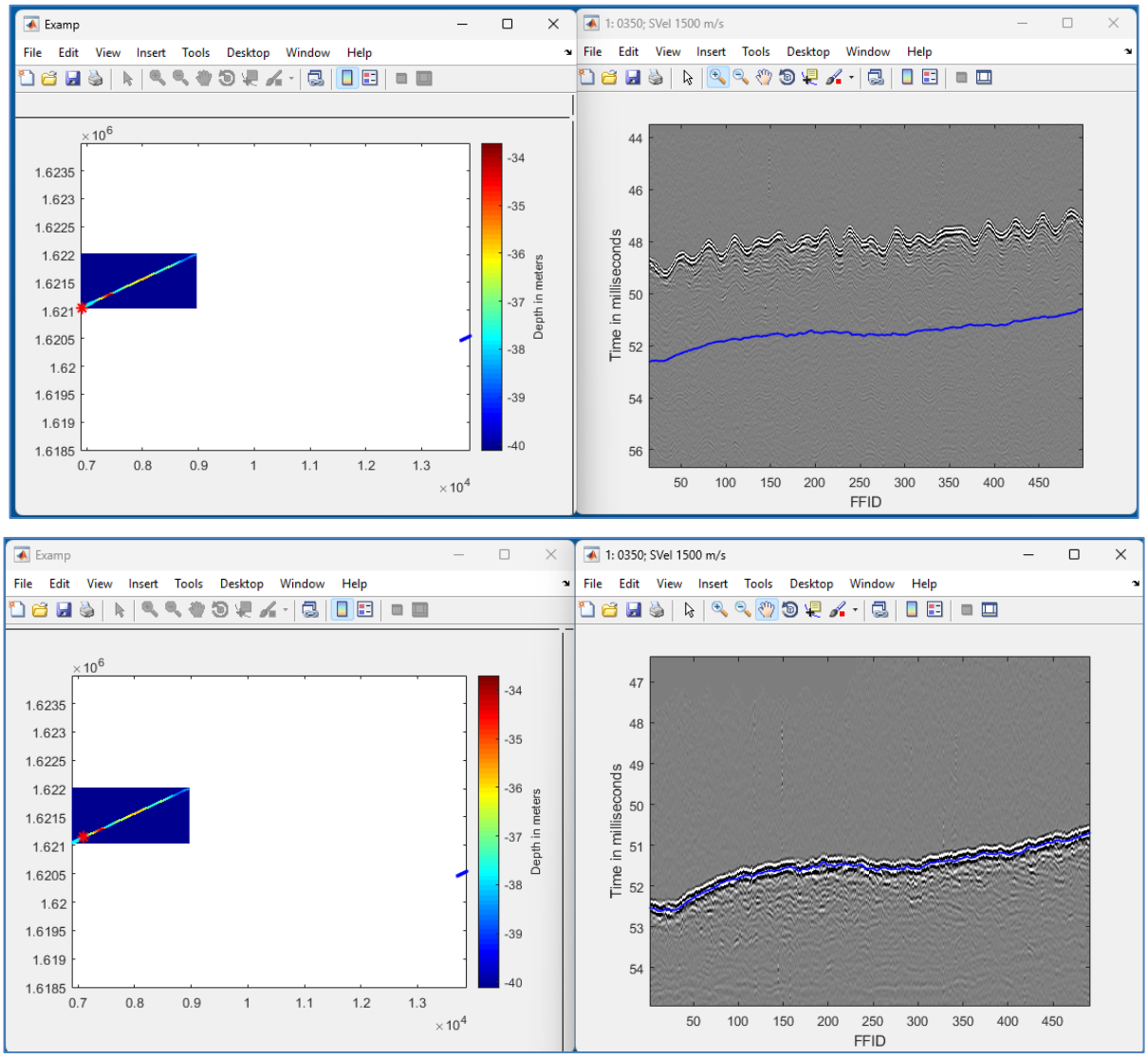


Figure 1.1 Seg-y before and after applying Z correction

2. GUI interface

You can work with the script from a line in the command window or by sending commands using GUI (*Figure 2.1*). Within the GUI, each button corresponds to a specific action that is performed by the script (i.e. a script command). The settings required to execute the command are located to the right of the button.

The following commands correspond to the buttons:

(1) SUSet – set the initial settings for running the script (root folder);

(2) BtLoad – load the pts-file;

(3) SgyLoad – load seg-y files from the specified folder;

(4) Zload – load text files with Z values from the specified folder;

(5) ZApply – perform Z-correction (apply the loaded Z values to the seismic sections);

(6) SgyDraw – start the interface for viewing the seismic sections;

(7) SgySave – save the seismic sections in seg-y files;

(8) Restart – delete the loaded data from the computer memory and restart the GUI;

Flow:1-2-3-6-4-5-6-7 – script performs the command sequence defined for buttons 1-2-3-6-4-5-6-7.

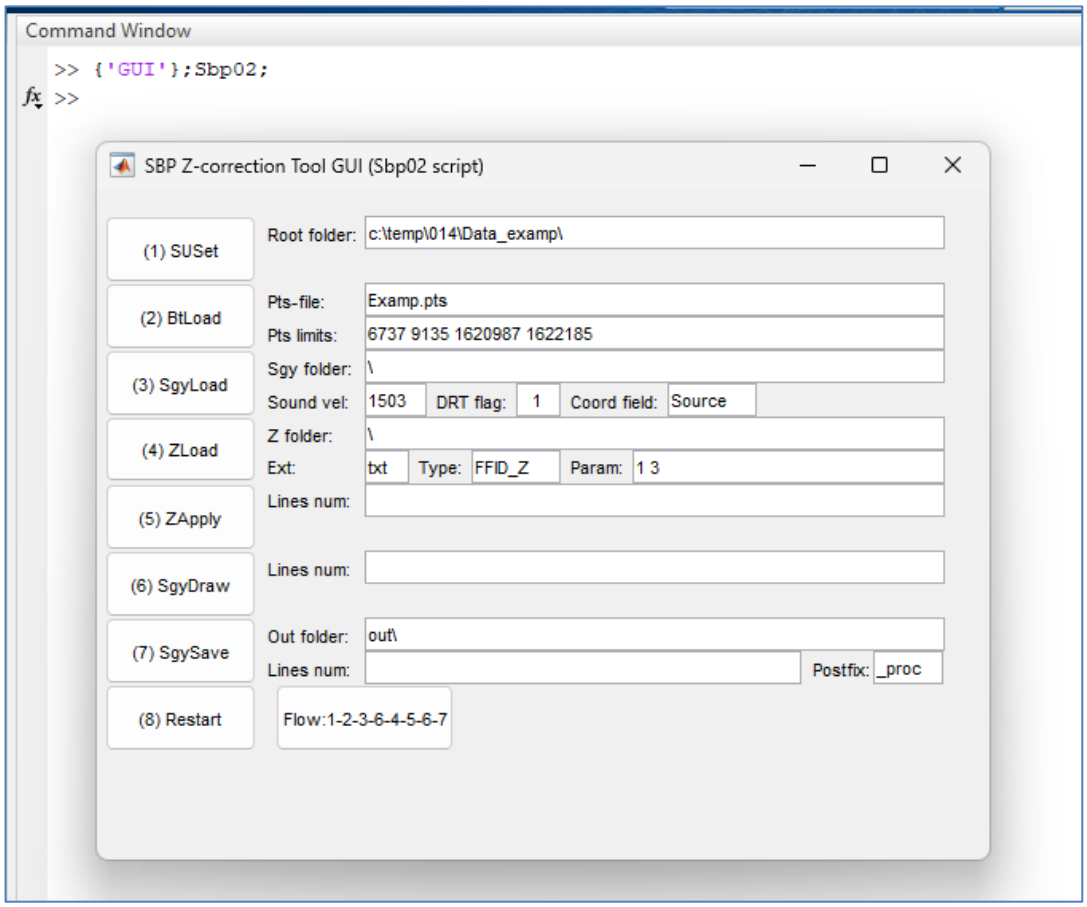


Figure 2.1 The GUI window

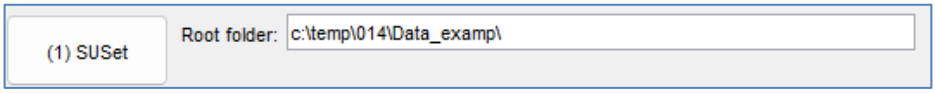
3. Script commands

Before running the script, you can specify the initial settings, that will be displayed in the GUI by default (*Figure 3.1*).

```
32
33 -    gKey=ans;
34 -    if strcmp(gKey{1},'GUI') %create Setup values for the GUI
35          %{'GUI'};Sbp02;
36 -        GUI.gui.RootD='c:\temp\014\Data_examp\';
37 -        GUI.gui.BtFile='Examp.pts';
38 -        GUI.gui.BtLimits='6737 9135 1620987 1622185';
39 -        GUI.gui.SgyFold='\';
40 -        GUI.gui.SgyVel='1503';
41 -        GUI.gui.SgyDkey='1';
42 -        GUI.gui.CoordSgyField='Source';
43 -        GUI.gui.ZFold='\';
44 -        GUI.gui.ZExt='txt';
45 -        GUI.gui.ZId='FFID_Z';
46 -        GUI.gui.ZPar='1 3';
47 -        GUI.gui.ZAppl='';
48 -        GUI.gui.SgyDraw='';
49 -        GUI.gui.OutFold='out\';
50 -        GUI.gui.OutSgy='';
51 -        GUI.gui.OutPostfix='_proc';
52 -        GUI.fh=figure(100);set(GUI.fh,'MenuBar','none','ToolBar','none','Nar
53 -        uicontrol('style','pushbutton','units','normalized','position',[0.01
54 -        uicontrol('style','text','units','normalized','position',[0.19 0.90
```

Figure 3.1 Settings displayed in the GUI by default

SUSet command // button (1) SUSet



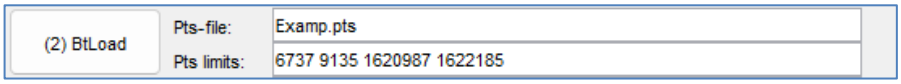
The command sets the initial settings for the script. Example:

{'SUSet','c:\temp\004\Data_examp\'};Sbp02;

where

'c:\temp\004\Data_examp\' – the name of the root folder where the data to be processed is located.

BtLoad command // button (2) BtLoad



The command loads a pts-file from a disk into memory, then converts it into a matrix (raster) for displaying on the screen. Example:

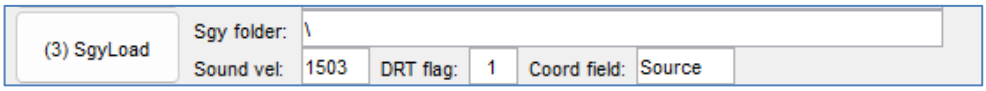
{'BtLoad','Examp.pts',[6737 9135 1620987 1622185]};Sbp02;

where

'Examp.pts' – the pts-file name, relative to the root folder;

[6737 9135 1620987 1622185] – the boundaries [E_left E_right N_down N_up], beyond which values from the pts-file will be deleted and will not be used for creating the grid.

SgyLoad command // button (3) SgyLoad



The command loads sgy-files from a disk into computer memory. Interpolation of the depths from the pts-file to the seismic trace coordinates is performed. The speed of sound in water must be set for each loaded file, as this will affect the seabed position within the seismic section. In addition, a key is established, the value of which determines whether or not the seismic section is brought to a single "Delay Recording Time" value. Example:

{'SgyLoad','Sgy2\',1503,1,'Source'};Sbp02;

where

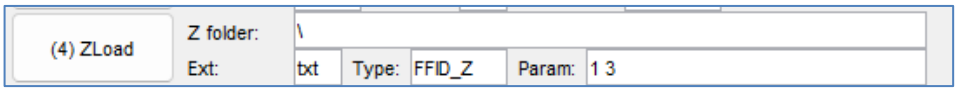
'Sgy2\' – the path to the folder with sgy files, relative to the root folder;

1500 – the speed of sound in water in meters per second;

1 – a flag for making the shift for "Delay Recording Time" (range correction) in the seismic section; 0 - do not perform range correction; 1 - perform range correction;

Source – the name of the field in seg-y files with the coordinates of seismic traces. Possible options: Source, Group, and cdp.

Zload command // button (4) ZLoad



The command loads text files with Z values from the hard disk. The command parameters specify the type of file to be loaded (e.g. FFID and Z or time and Z). After loading, Z values are interpolated to the time of the seismic traces. Example:

{'ZLoad','\','txt','FFID_D',[1 3]};Sbp02;

where

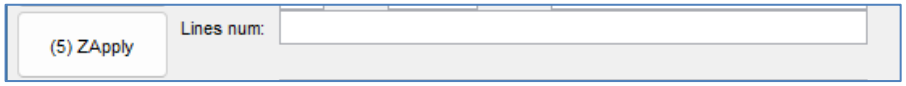
'Sgy2\' – the path to the folder (relative to the root folder) with txt-files containing Z values;

'txt' – the extension of text files containing Z values;

{'FFID_D',[1 3]} – the key for reading Z values from files; the first parameter of the key encodes the type of recording in the file ('FFID_D' denotes a file including columns with FFID and Z values);

[1 3] – parameters encoding how the data will be read from the file with the specified key ([1 3] denotes that FFID is contained in the first column and Z in the third one).

ZApply command // button (5) ZApply



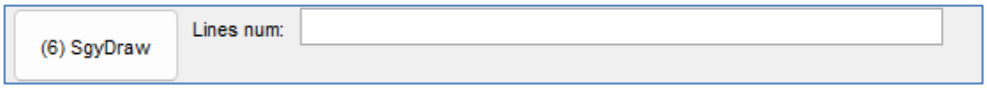
The command applies Z values to seismic traces and then assigns them a zero value to avoid accidental reapplication. Example:

{'ZApply',[]};Sbp02;

where

[] – numbers of seismic sections to which Z values will be applied (e.g., [1 2 3 4 5]); an empty vector signifies that Z values will be applied to all sections.

SgyDraw command // button (6) SgyDraw



The command starts the graphical interface for viewing seismic sections with mapped seafloor from a pts-file. Example:

{'SgyDraw',[]};Sbp02;

where

[] – numbers of seismic sections to be drawn within the GUI (e.g., [1 2 3 4 5]); an empty vector signifies that all sections will be drawn.

SgySave command // button (7) SgySave

The command saves seismic sections in sgy-files. The sections are saved with the entered Z correction (if it was applied) and with a single “Delay Recording Time” value (if the flag value was set to “1” when loading the sgy files). Example:

{'SgySave','out\',[],'_proc'};Sbp02;

where

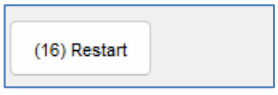
'Sgy2\' – the path to the folder in which seg-y files will be saved (relative to the root folder);

[] – numbers of seismic sections to be saved in sgy-files (e.g., [1 2 3 4 5]); an empty vector signifies that all sections will be saved;

'_proc' – the postfix to the names of seg-y files to be saved.

Button (8) Restart

When the button is pressed, all graphical windows are closed, all variables with processed data are deleted from the computer RAM and the GUI is restarted.

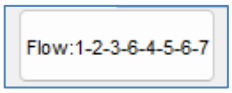


Example of the command:

clear all;close all;clc;{'GUI'};Sbp02;

The button can be used to clear the computer RAM after processing the profile with magnetometry data.

Кнопка Flow:1-2-3-6-4-5-6-7



When the button is pressed, script performs the command sequence defined for buttons 1-2-3-6-4-5-6-7. The same command sequence can be executed in the MatLab window without using GUI (*Figure 3.2*).

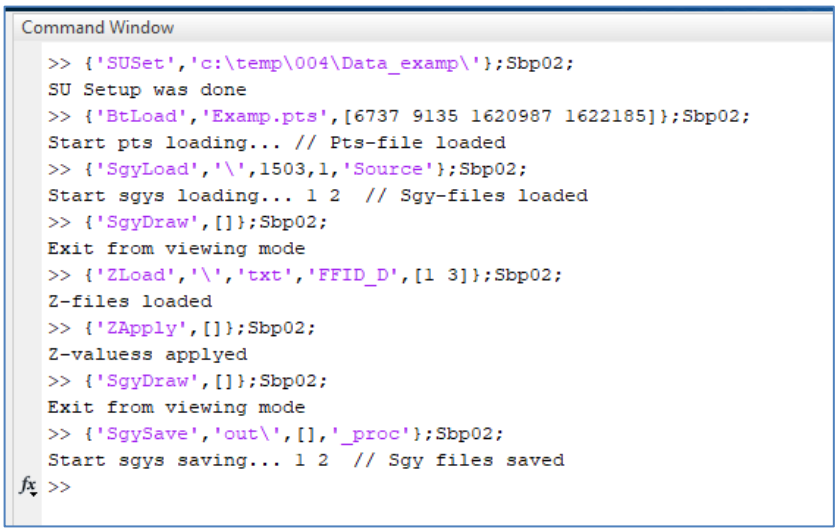


Figure 3.2 MatLab command window with executed sequence of the script commands

The following sequence of actions is performed (each action corresponds to a specific command in the MatLab window):

-- initial settings have been set;

-- pts-file has been loaded and trimmed within the specified boundaries to reduce the volume;

-- sgy-files have been loaded from the specified folder;

-- seismic sections from the loaded files have been viewed within the GUI;

-- txt-files with Z corrections have been loaded;

-- Z values have been applied to seismic sections;

-- sections with applied corrections have been viewed (within the GUI);

-- sections have been saved in sgy-files in the specified folder.

4. Exporting data from *.ses3 files (Innomar 2000) to apply Z

The “SES Convert Version 2.3.4.0” file converter (and its earlier versions) does not correctly apply Z corrections to Innomar files with *.ses3 extension. To apply Z corrections properly, you need to perform the following sequence of actions.

1) Export Z values from *.ses3 file to a text file.

To do this, the converter must be set up so that Z values will “substitute” one of the coordinates (*Figure 4.1*).

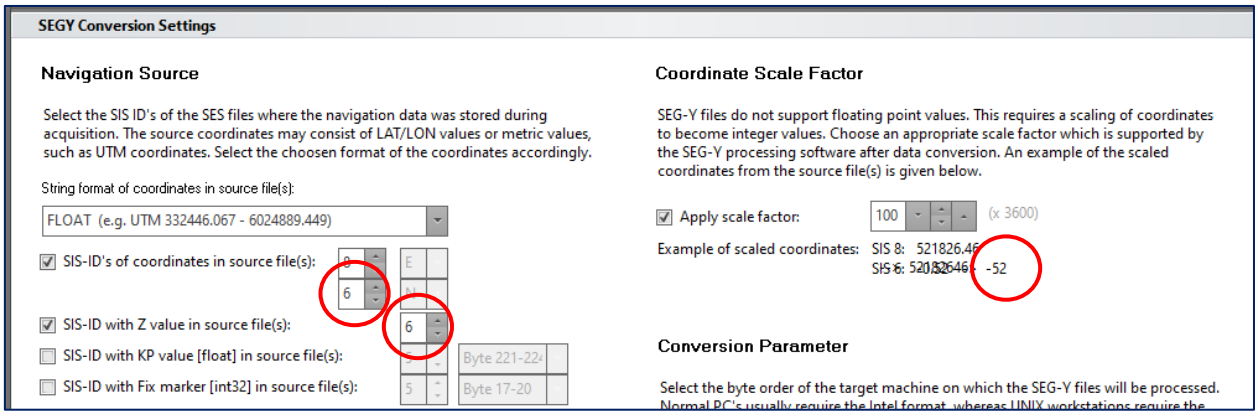


Figure 4.1 SES Convert settings, to substitute a coordinate with Z value

Export the file with coordinates (*Figure 4.2*).

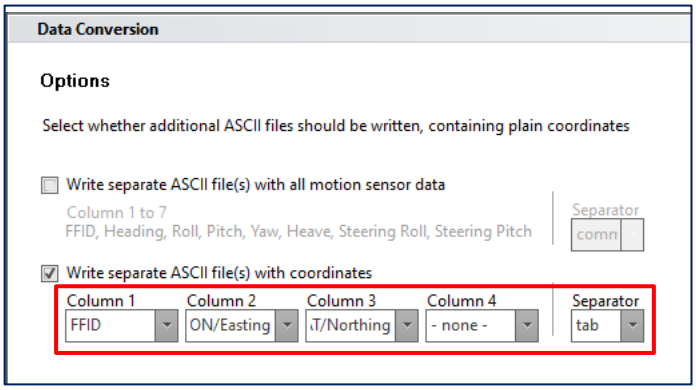


Figure 4.2 SES Convert settings, to export a txt-file

The exported file has the FFID value in the first column and the Z value in the third (*Figure 4.3*).

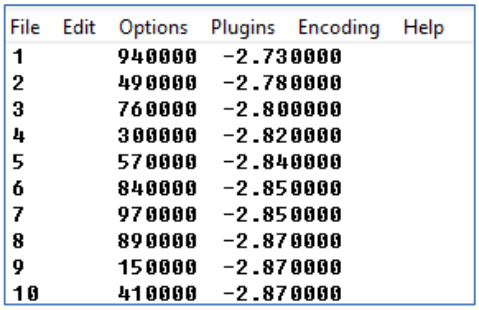


Figure 4.3 Contents of exported text file with coordinates

2) Export sgy file without Z corrections.

In order to export, it is necessary to remove substitution of N-coordinate by Z value (*Figure 4.4*).

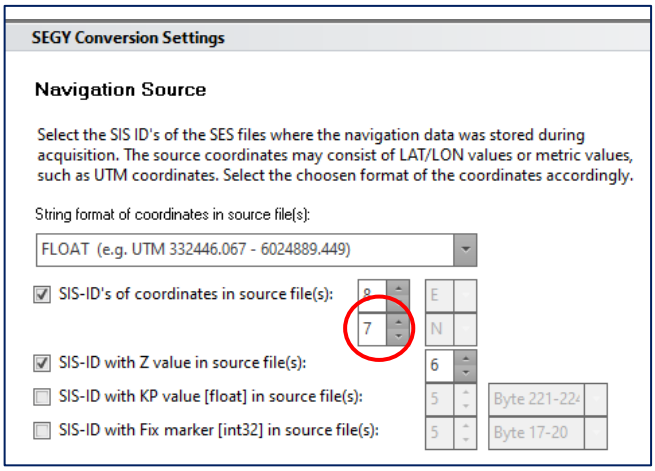


Figure 4.4 SES Convert settings, without substitution of coordinate by Z value

When exporting, the Z correction checkboxes should be disabled and the DelayRecordingTime correction checkbox (Apply range correction; *Figure 4.5*) should be enabled. If this checkbox is not enabled, artefacts may appear on the seismic section due to changes in the DelayRecordingTime value.

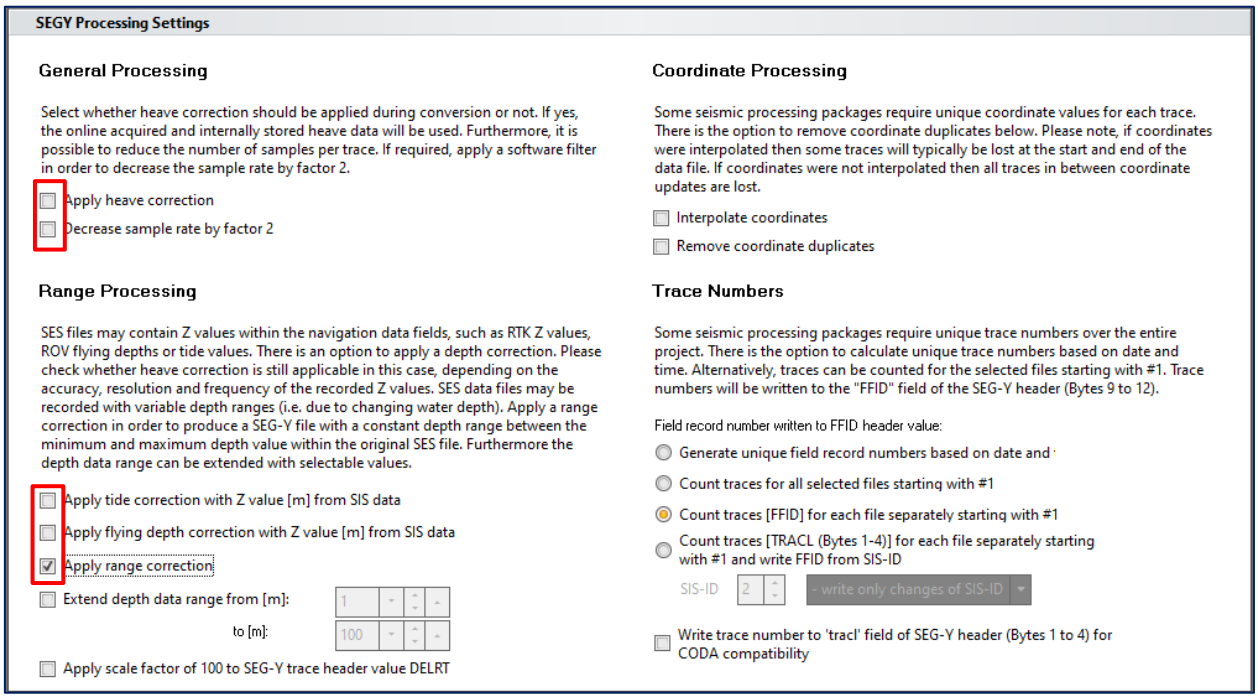


Figure 4.5 Settings for exporting the sgy file

Disable text log writing (*Figure 4.6*).

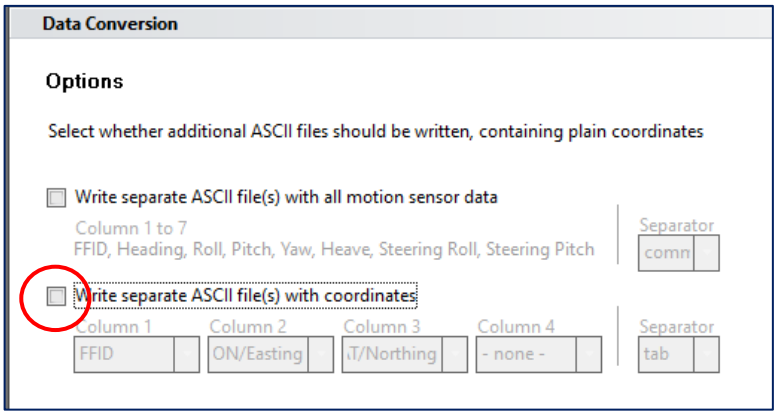
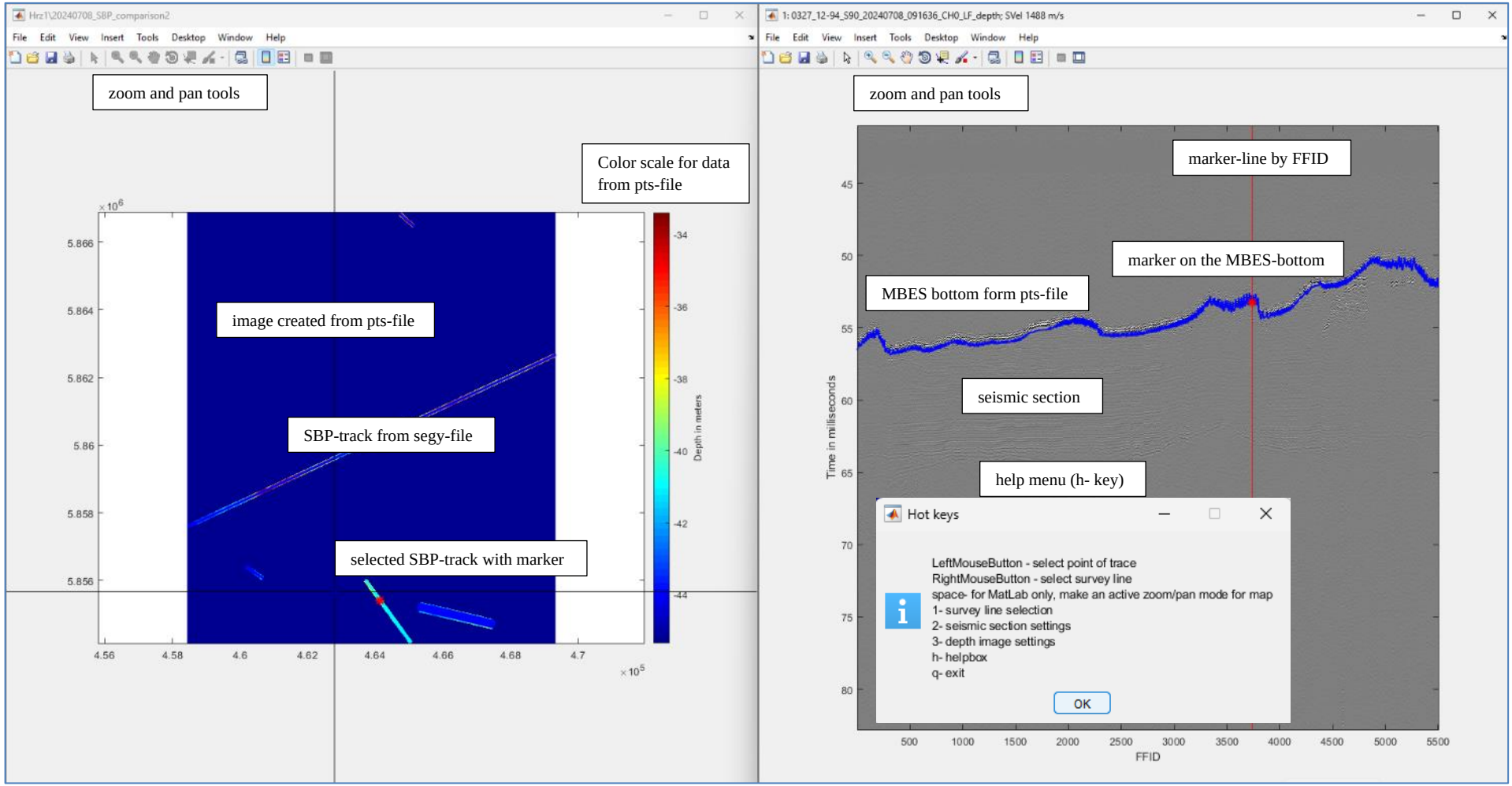


Figure 4.6 Disable text log writing

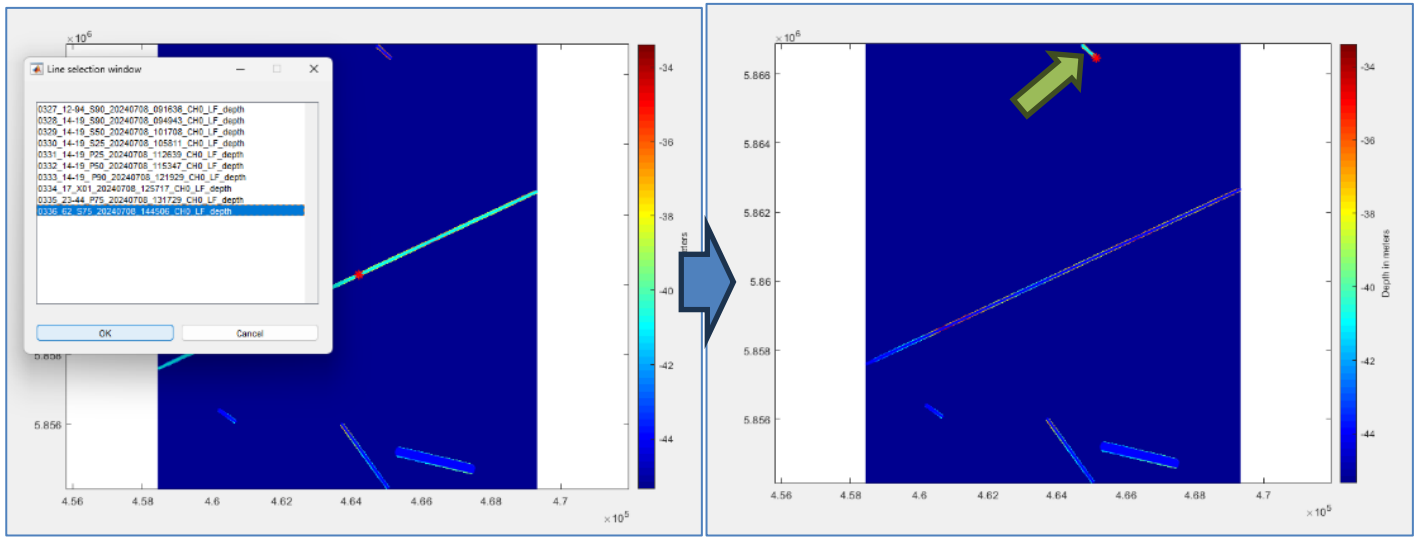
Following the conversion, the folder will contain files with *.sgy and files with *.txt extension; the latter will contain FFID in the first column and Z value in the third one. The resulting files will then be used by the “Sbp02” script to make corrections for Z.

Appendix 1. Description of the Viewer interface

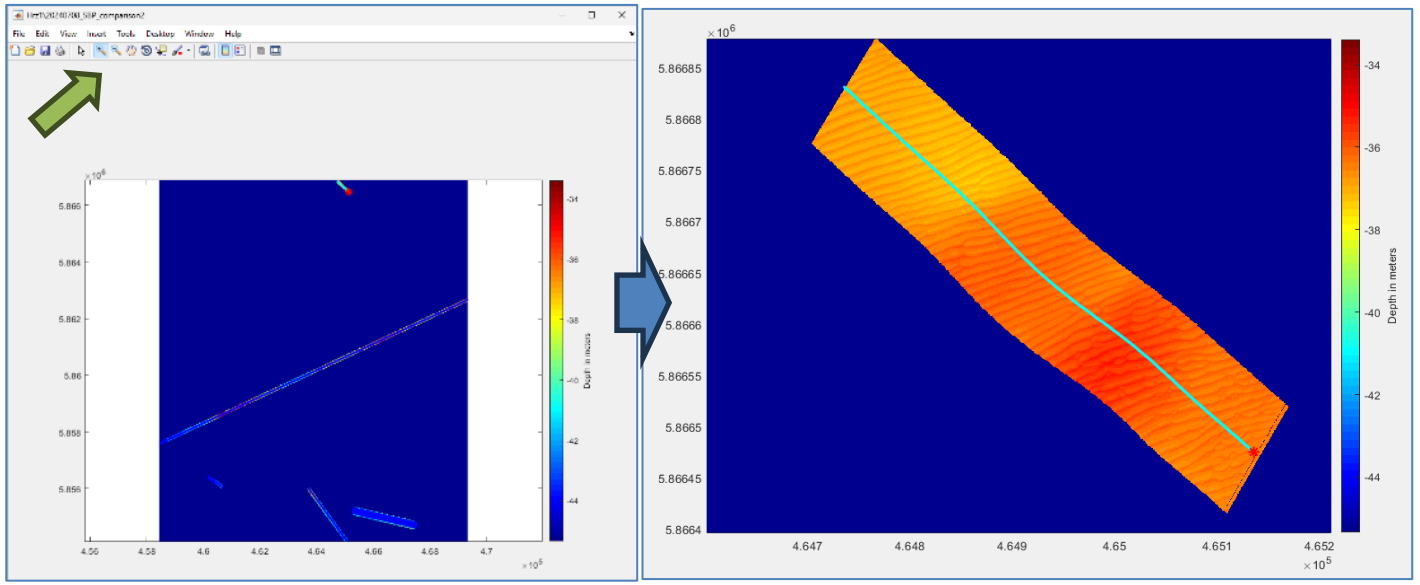


View of the windows with line plan and seismic section

Controls: LMB – to move a marker, RMB – to select a line, spacebar – to access the zoom and pan tools, h – help, q – to exit from the GUI. Menu call: 1 – SBP track selection, 2 – seismic section settings, 3 – display settings for bottom surface (pts-file).

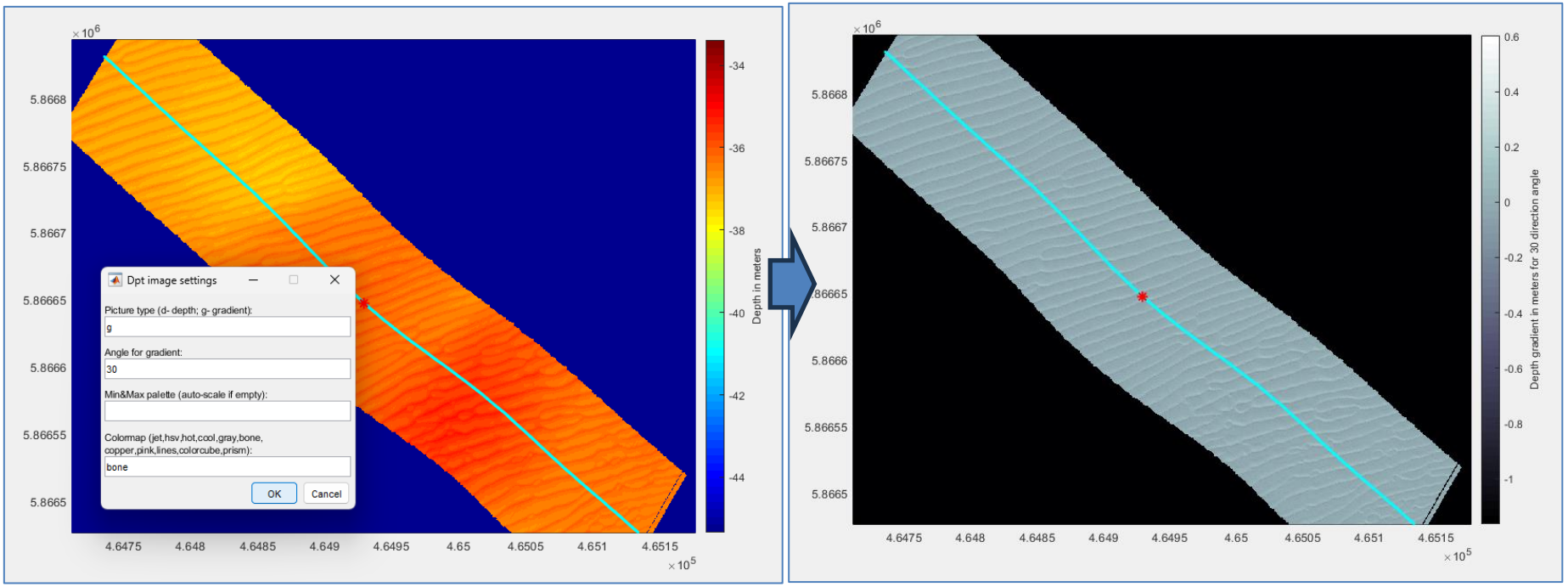


Menu by key “1”:
selecting the SBP file from the list, to be displayed on the line plan and seismic section



The “spacebar” key:
Access to the zoom and pan tools in MatLab (using Zoom to an area on a line plan)

In Octave, the zoom and pan tools can be accessed without pressing the “spacebar”.



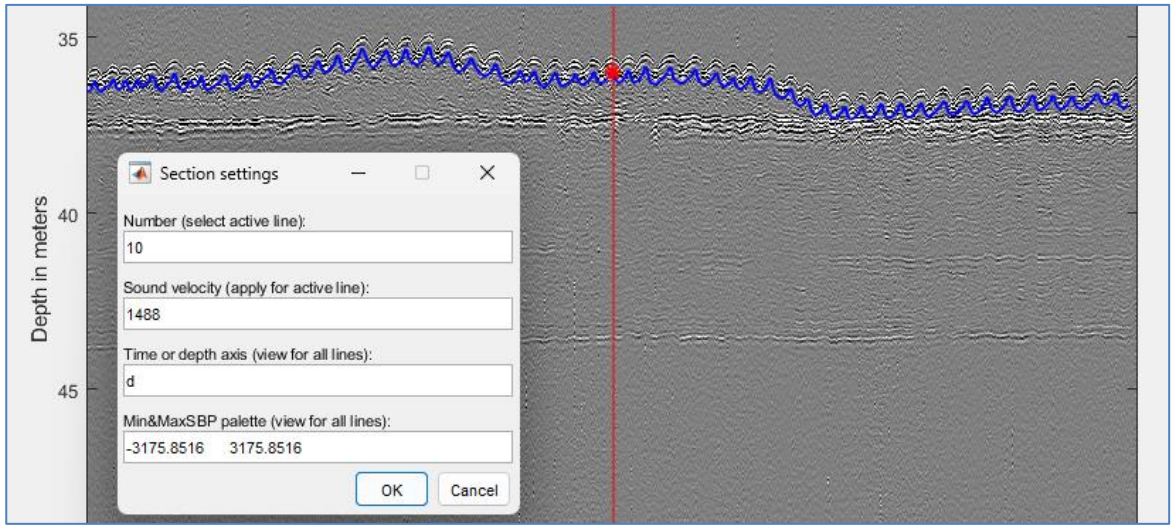
Menu by key “3”:

-- selecting whether to display a depth map or a gradient map (for data from a pts-file);

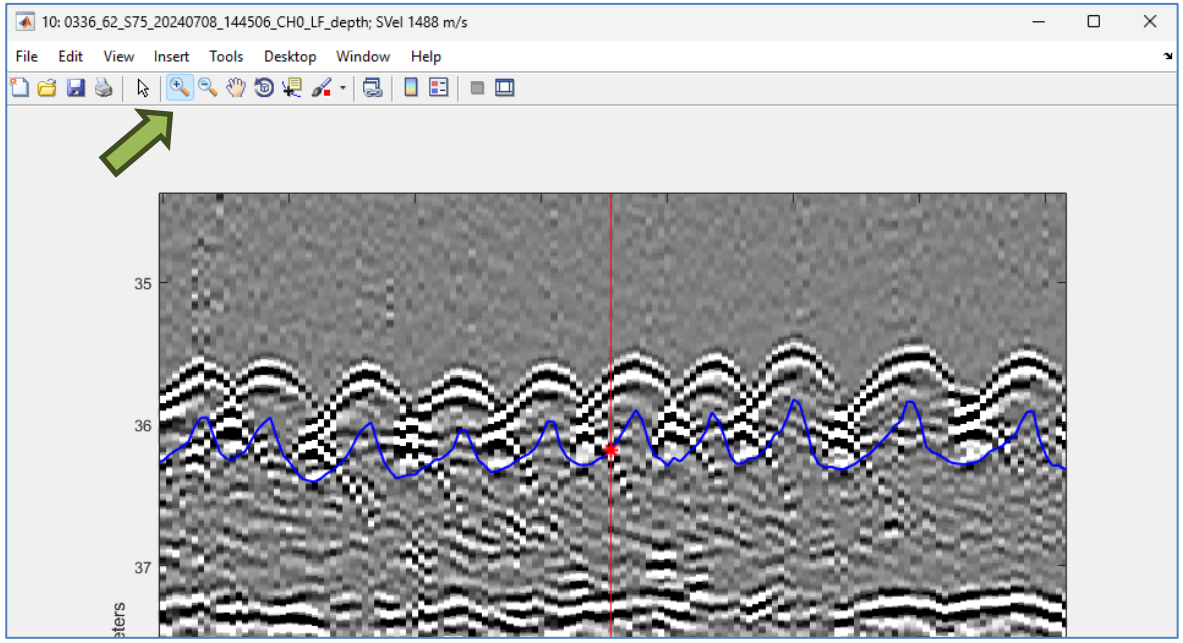
-- setting the gradient calculation direction (30 degrees is shown in the figure);

-- setting the minimum and maximum scale value for the gradient or depth raster (blank line for minimum and maximum values);

-- changing the color palette (the figure shows the change from “jet” to “bone”).



Menu by key "2":
-- selecting the SBP file number to be displayed (track and seismic section) via the seismic section setup menu;
-- entering the sound speed for drawing the seabed from the pts-file (on the time axis) and the seismic section (on the depth axis); the sound speed is set individually for each seismic section;
-- selecting the depth axis or time axis to display the seismic section;
-- selecting the color scale boundaries for displaying the seismic section (if an empty value is entered, the [min max]/8 boundaries are automatically selected).



Using Zoom to the seismic section