G_Seis

Release 1.0.2

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CONTENTS

CHAPTER

ONE

ABOUT

Simple 2D-Seismic data processing GUI application

1.1 Functionality

1. SEGY read/write (reads to binary file of format single)
2. visualize data with three keys sorting
3. surface-consistent first arrival (or amplitude) decomposition according to 2, 3, 4 factor model
4. interactively build velocity model based on decomposed arrival picks
5. perform static, amplitude and spectrum correction (deconvolution)
6. perform some basic header and data arithmetic

1.2 Usage

The main file is **G_Seis.m**

Before running the application one should:

1. set path to the root folder and include all the folders inside it
2. build mex function in /g_other folder. Commands **>> mex -setup** and **>> mex typecastx.c** (or **>> mex g_other/typecastx.c** depending on current path) may help
3. run the app: **>> G_Seis**

CHAPTER

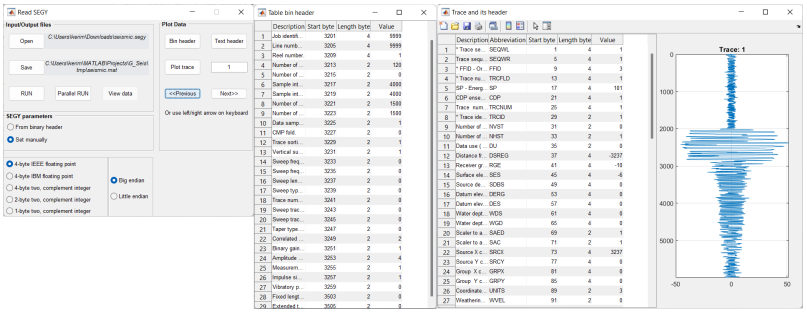
TWO

API

API is presented for each GUI window

2.1 Read SEGY

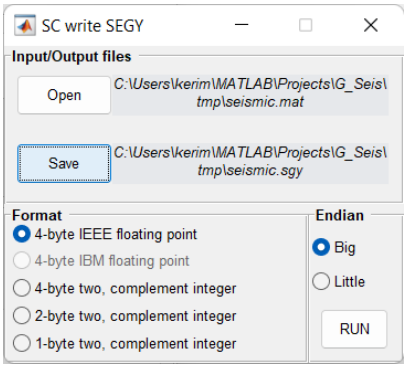
SEGY reader translates SEGY files to **G_Seis** internal format: binary header is presented as Matlab's *.mat*-file and traces along with trace headers are in *.bin*-file of type **float32**.



Note: Use **View data** to check if SEGY parameters are correct.

2.2 Write SEGY

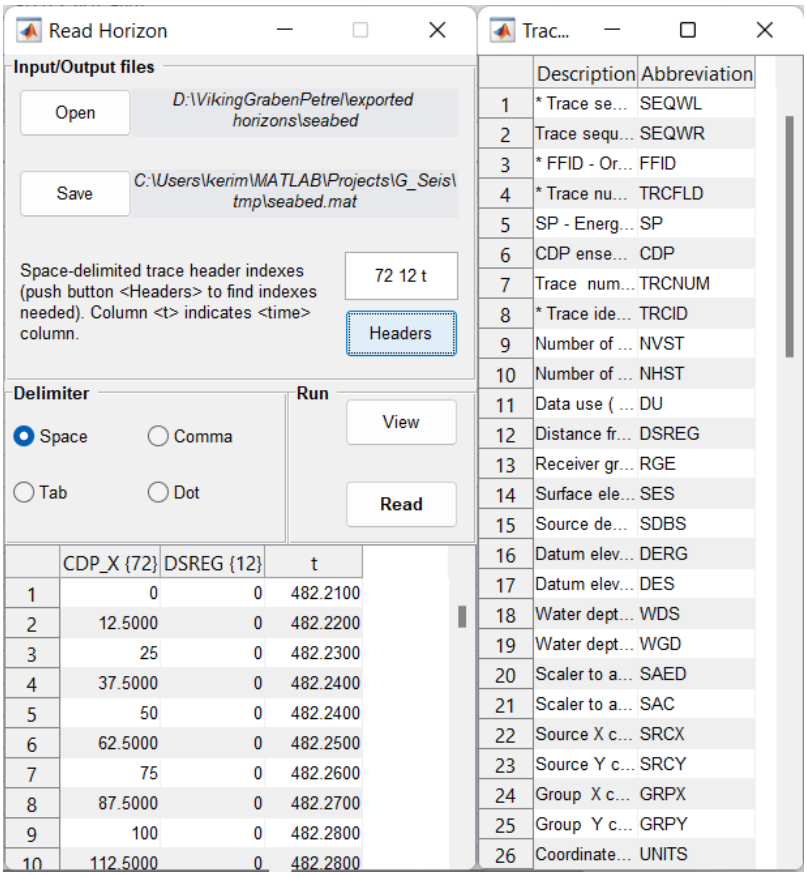
SEGY writer translates **G_Seis** internal format to SEGY.



Note: **IBM32** is known only in seismic exploration. Translation it to **IEEE32** is pretty painful: that is why there is no support for writing it.

2.3 Read Horizon

Horizon reader translates textual column oriented files to Matlab's *.mat*-files.



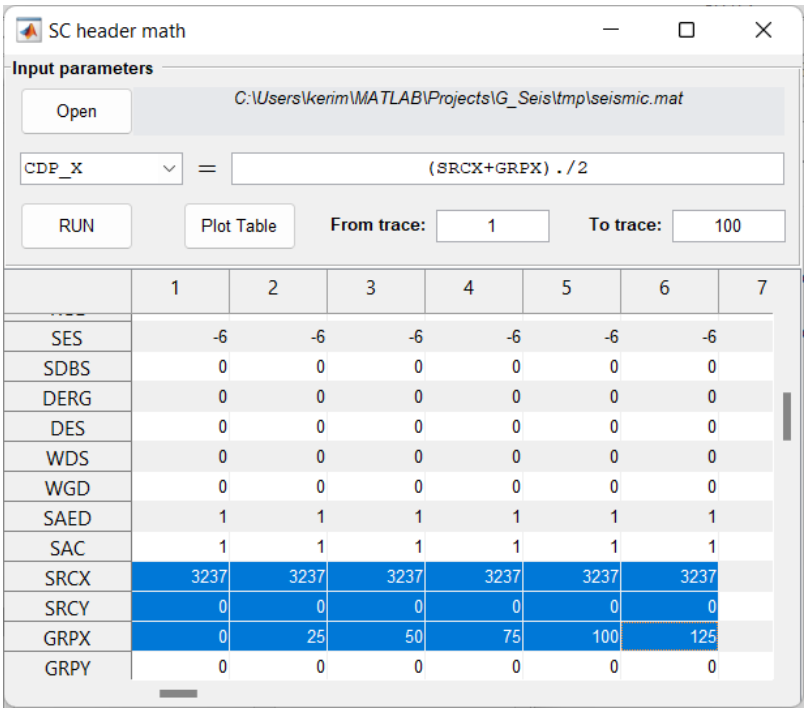
Horizon files may be used when selecting areas for computing factors.

Use LineEdit widget to set trace header index for each column. For **Z** values use letter **t**.

Note: Use **View** button before reading.

2.4 Header Math

This module is dedicated to trace header calculations.



	1	2	3	4	5	6	7
SES	-6	-6	-6	-6	-6	-6	
SDBS	0	0	0	0	0	0	
DERG	0	0	0	0	0	0	
DES	0	0	0	0	0	0	
WDS	0	0	0	0	0	0	
WGD	0	0	0	0	0	0	
SAED	1	1	1	1	1	1	
SAC	1	1	1	1	1	1	
SRCX	3237	3237	3237	3237	3237	3237	
SRCY	0	0	0	0	0	0	
GRPX	0	25	50	75	100	125	
GRPY	0	0	0	0	0	0	

Use ComboBox to choose trace header that should be edited.

In LineEdit type a mathematical function using Matlab syntax for vectors.

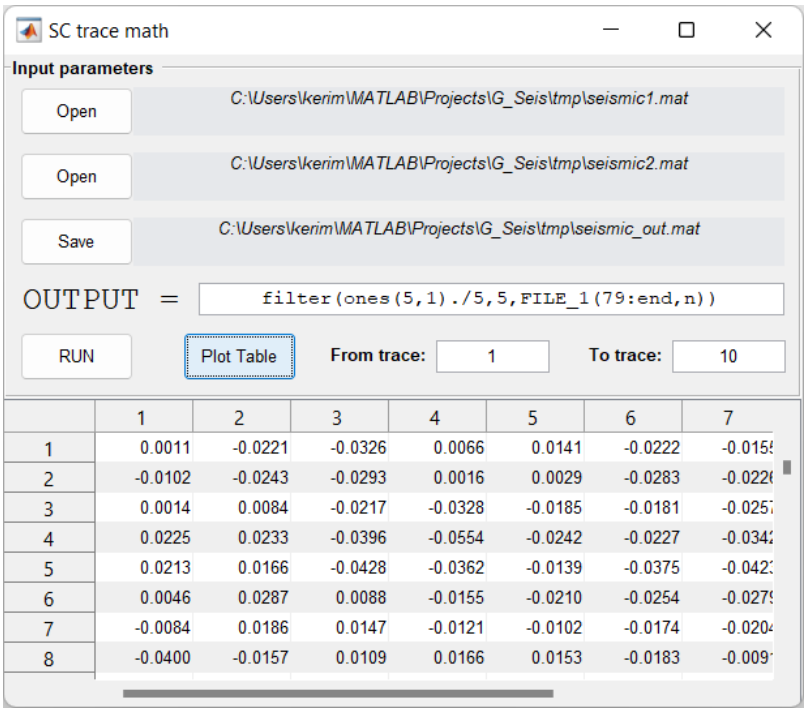
Select **From trace** and **To trace** LineEdits before displaying values in the table.

Examples:

1. compute **CDP_X**: *(SRCX+GRPX)./2*
2. make **DSREG** (offsets) absolute: *abs(DSREG)*

2.5 Trace Math

This module is dedicated to trace calculations.



In LineEdit type a mathematical function using Matlab syntax for column-vector.

Variables **FILE_1** and **FILE_2** may be used to perform caomputations on selected datasets.

Examples:

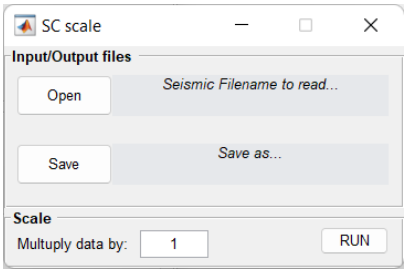
1. sum each trace from **FILE_1** with **FILE_2**: *FILE_1(79:end,n)+FILE_2(79:end,n)*
2. filter **FILE_1** with moving average filter: *filter(ones(5,1)./5,5,FILE_1(79:end,n))*

Note: **78** is the number of trace headers (they are skipped when computation starts with **79** index). **n** is the iterator used in loop by traces.

Note: **FILE_1** and **FILE_2** must have the same number of samples and traces.

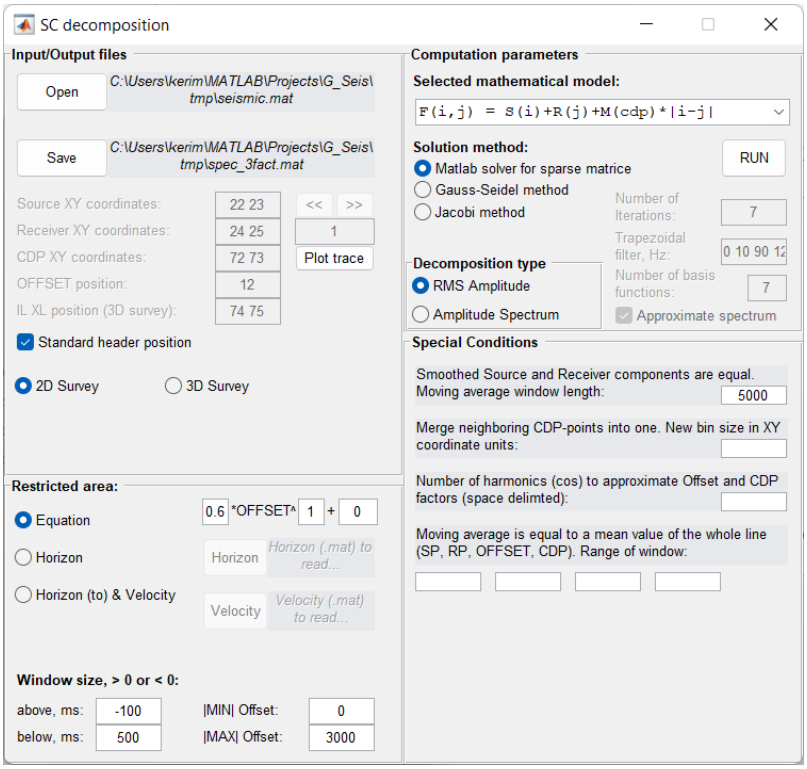
2.6 Scale Data

Performs traces multiplications by scalar.



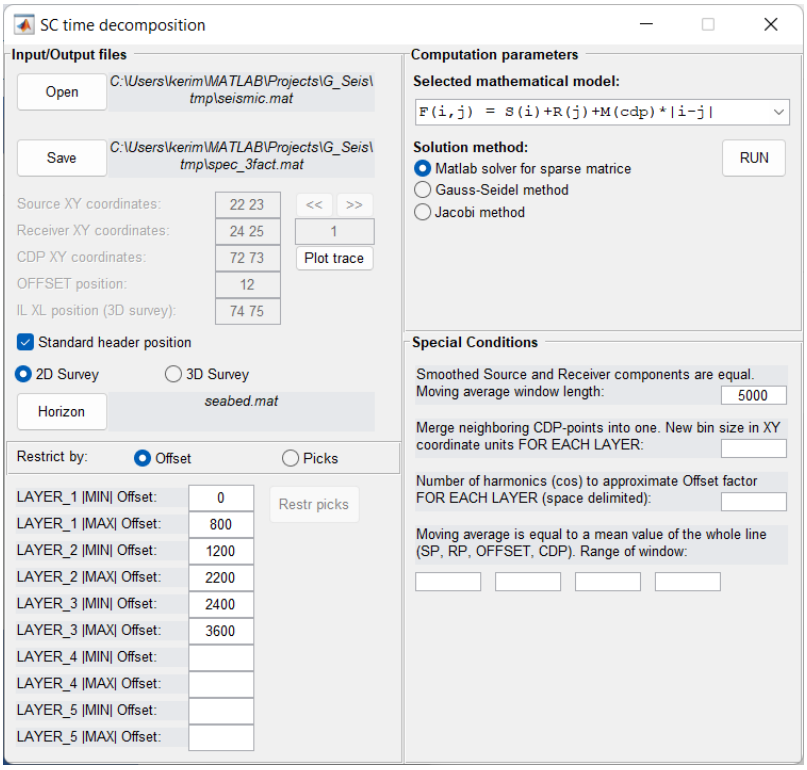
2.7 SC Decomposition

Solves system of linear equations to decompose amplitudes or spectrums by factors. Computed factors then used by *SC Apply* module to apply amplitude correction or deconvolution.



2.8 SC Time Decomposition

Solves system of linear equations to decompose timefield by factors. Computed S (source) and R (receiver) factors then used by *SC Apply* module to apply static shifts and by *SC Build Vel Model* to perform interactive corrections.



Choose horizon with first break picks.

Set the limits by offsets or by picks for each layer.

There are two mathematical models:

1. F(i,j) = S(i)+R(j)+M(cdp)*|i-j| for refracted waves
2. F(i,j) = S(i)+R(j)+M(cdp)*|i-j|^2 for relfected waves

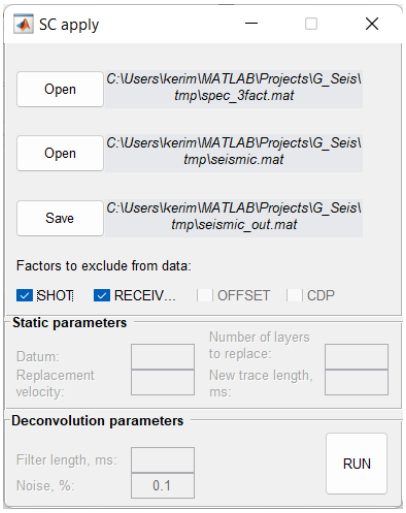
In **Special Conditions** section set the parameters to regularize the solution.

For more information see:

Taner T.M., Wagner D.E., Baysal E., Lu L. A unified method for 2-D and 3-D refraction statics // Geophysics, 1998, vol. 63 (1), pp. 260-274.

2.9 SC Apply

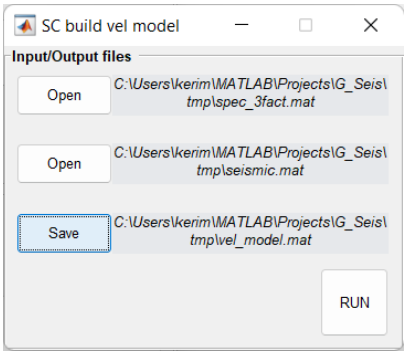
Exclude computed factors (amplitude or static shifts) from the data.



Note: Factors file is a *.mat*-file computed with *SC Decomposition* or *SC Time Decomposition*

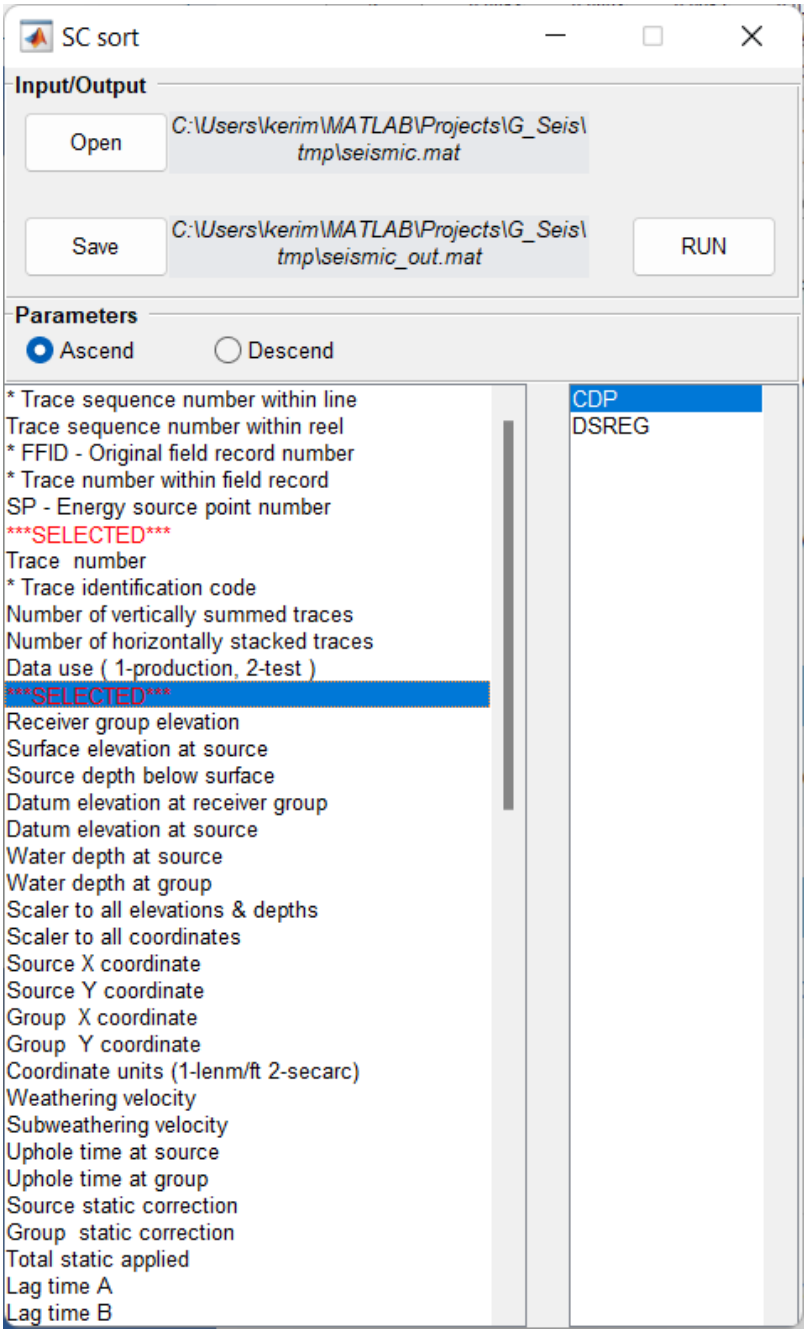
2.10 SC Build Vel Model

Interactive tool for building and editing layered velocity model from computed time factors.



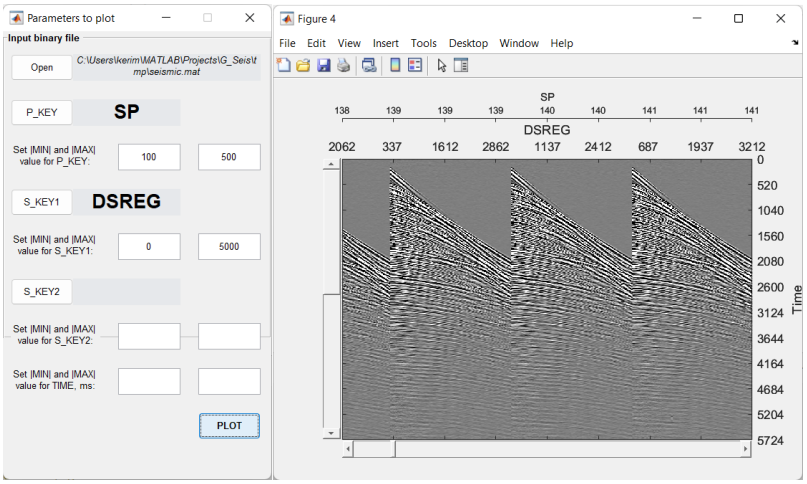
2.11 Sort Traces

Sorts traces in ascending or descending order


SC sort
Input/Output
Open
C:\Users\kerim\MATLAB\Projects\G_Seis\tmp\seismic.mat
Save
C:\Users\kerim\MATLAB\Projects\G_Seis\tmp\seismic_out.mat
RUN
Parameters
Ascend
Descend
* Trace sequence number within line
Trace sequence number within reel
* FFID - Original field record number
* Trace number within field record
SP - Energy source point number
SELECTED
Trace number
* Trace identification code
Number of vertically summed traces
Number of horizontally stacked traces
Data use (1-production, 2-test)
SELECTED
Receiver group elevation
Surface elevation at source
Source depth below surface
Datum elevation at receiver group
Datum elevation at source
Water depth at source
Water depth at group
Scaler to all elevations & depths
Scaler to all coordinates
Source X coordinate
Source Y coordinate
Group X coordinate
Group Y coordinate
Coordinate units (1-lenm/ft 2-secarc)
Weathering velocity
Subweathering velocity
Uphole time at source
Uphole time at group
Source static correction
Group static correction
Total static applied
Lag time A
Lag time B
CDP
DSREG

2.12 Plot Data

Plotting is for traces and computed factors visualization.



P_KEY - is primary key.

S_KEY1 and **S_KEY2** - secondary keys.

Keys are needed to sort data before displaying.

Absolute values of **MIN** and **MAX** values are helpful to restrict the desired data.

In case of displaying factors only **P_KEY** is used wich should be set to **SEQWL**.

To display **S** (shot) factor for first layer choose **MIN** and **MAX** equal to 1. For the second layer use 11. For the third layer use 21.

To display **R** (receiver) factor for first layer choose **MIN** and **MAX** equal to 2. For the second layer use 12. For the third layer use 22.

To display **M** (offset) factor for first layer choose **MIN** and **MAX** equal to 3. For the second layer use 13. For the third layer use 23.

To display **G** (cdp) factor for first layer choose **MIN** and **MAX** equal to 4. For the second layer use 14. For the third layer use 24.

Note: Use *Header Math* module to view headers of computed factors.

CHAPTER

THREE

INDEXES AND TABLES

- genindex
- modindex
- search