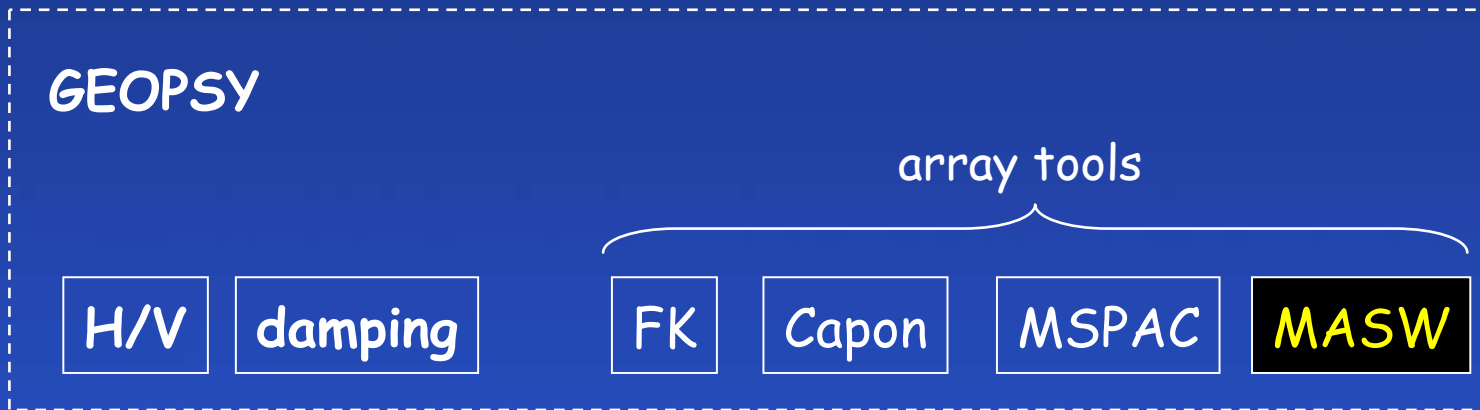


Processing MASW experiments with geopsy

SESARRAY PACKAGE



figure

figures

gp tools

*Dispersion curves
 Ellipticity curves
 Autocorr. Curves*

...

build_array

Array response

Post-processing

max2curve

spac2disp

DINVER

inversion

Load Geopsy database containing all signals

The screenshot displays the Geopsy software interface. The main window title is "Geopsy - /home/mwathele/courses/meees/exercises/masw/masw.gpy". The "File" menu is open, showing options like "Open", "Save", "Import signals", and "Quit". The "Open a database" dialog box is in the foreground, showing the "Look in:" path as "/home/mwathele/cou...ees/exercises/masw". The file list contains "signals" and "masw.gpy". The "File name:" field is filled with "masw.gpy" and "Files of type:" is set to "Geopsy database (*.gpy *.sdb)". The background window shows a "Groups" list with items like "East offset (hammer)", "East offset (black powder)", "East shot", "West shot", "West offset (hammer)", and "West offset (black powder)". The status bar at the bottom indicates "216 signals, 9 files, free cache 1024 Mb" and "0%".

Scheme of the experiment

24-channel
 4.5 Hz vertical geophones
 spacing = 2.5 m
 Hammer shots: 15, 16, 17, 18, 20, 21, 22
 Black powder shots: 19 and 23

S19
S15



West

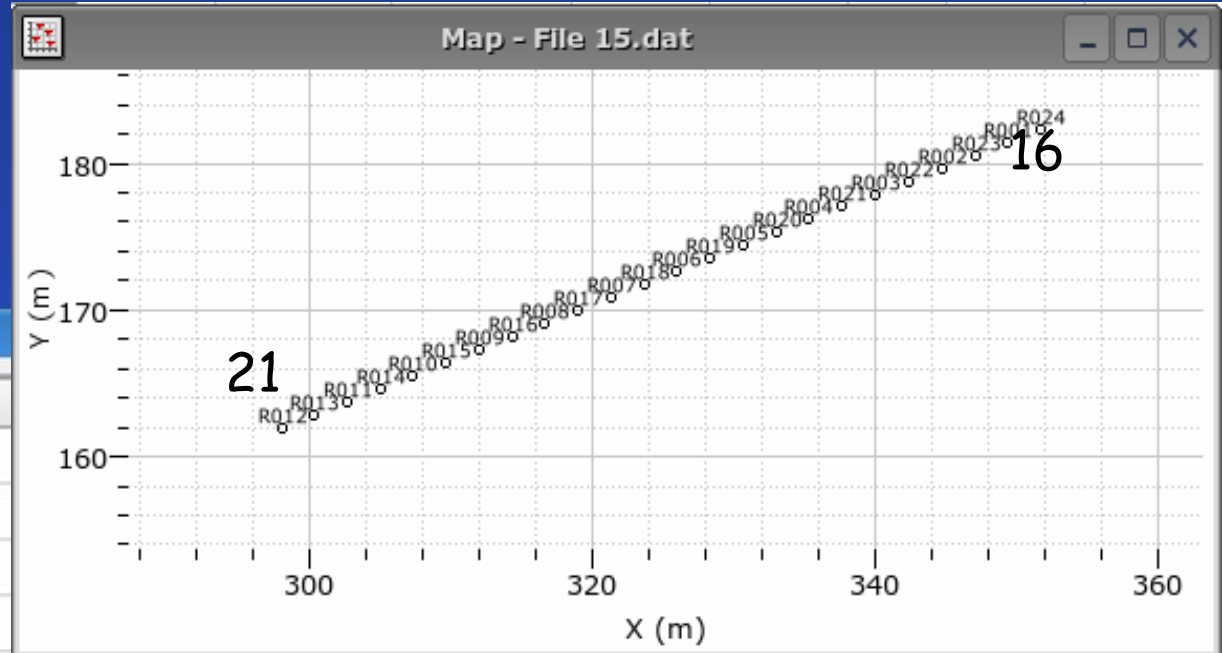
- Usually MASW combined with refraction
- Shots 17, 18 and 20 are not used here

View coordinates in a map

Source coordinates

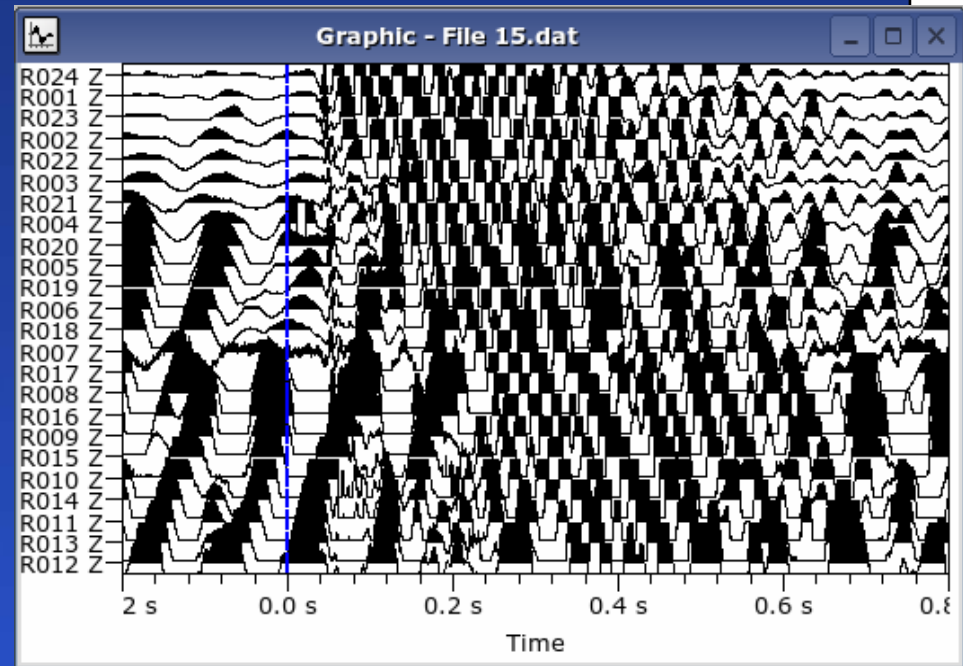
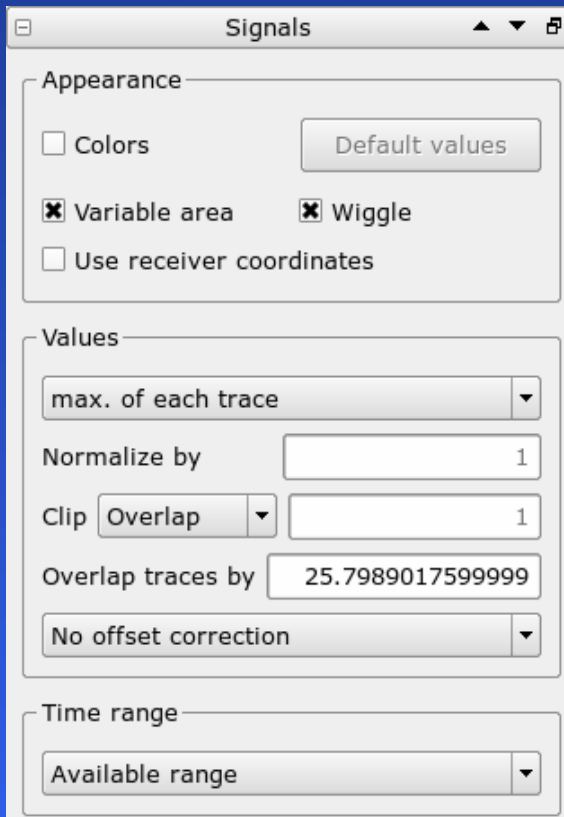
	Name	X	Y	
1	Shot_15	370.502	189.214	
2	Shot_16	351.752	182.255	
3	Shot_17	340.033	177.906	
4	Shot_18	325.97	172.687	
5	Shot_19	370.502	189.214	0
6	Shot_20	311.972	167.295	0
7	Shot_21	297.98	161.891	0
8	Shot_22	279.322	154.686	0
9	Shot_23	279.322	154.686	0

Source name pattern: `Shot_{Return=left(ShortFileName,length(ShortFileName)-4);}`

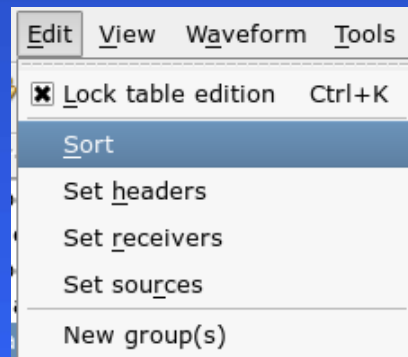


Viewing shot signals: parameters and sort

Common parameters to view signals from MASW:

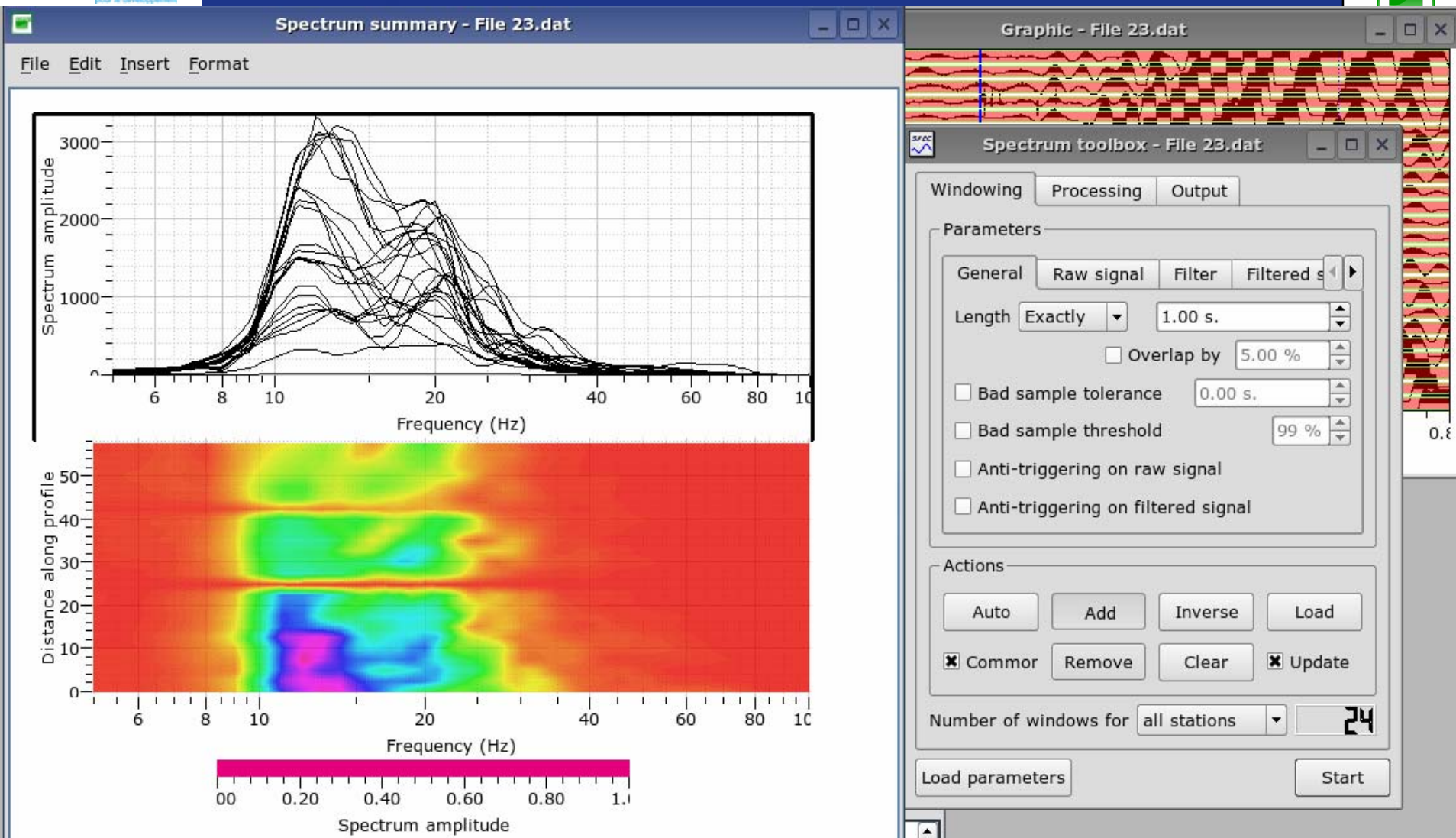


Sort signals by increasing distance to source



Properties, tab "Layers"

Spectrum of recorded signals



Set output range from 5 Hz to 100 Hz

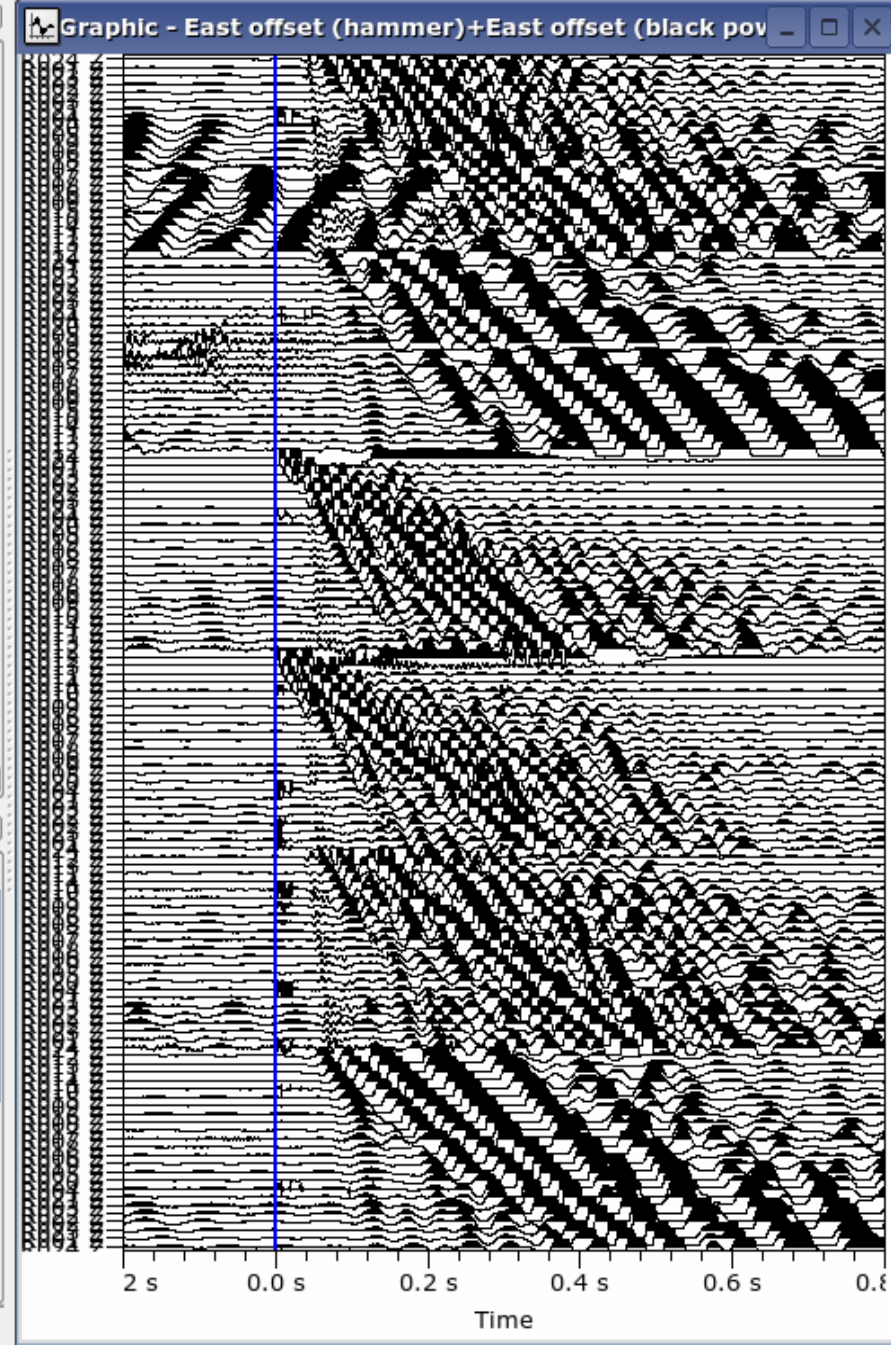
Files

- All signals
- Temporary signals
- All files
- Temporary files
- Permanent files
- 15.dat
- 16.dat
- 17.dat
- 18.dat
- 19.dat
- 20.dat
- 21.dat
- 22.dat
- 23.dat

Groups

- East offset (hammer)
- East offset (black powder)
- East shot
- West shot
- West offset (hammer)
- West offset (black powder)

Log Groups

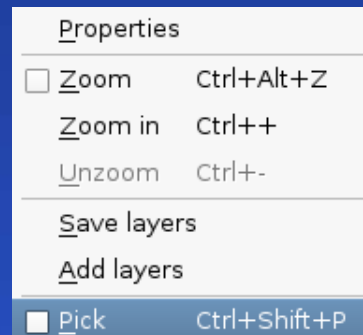


Create a graphic with all shots

Enable zoom along Y axis (Properties, tab "Y Axis")

Ctrl + central mouse button to zoom/unzoom

Rough pick of first arrival if not already done after refraction
Left mouse button on graph contents:

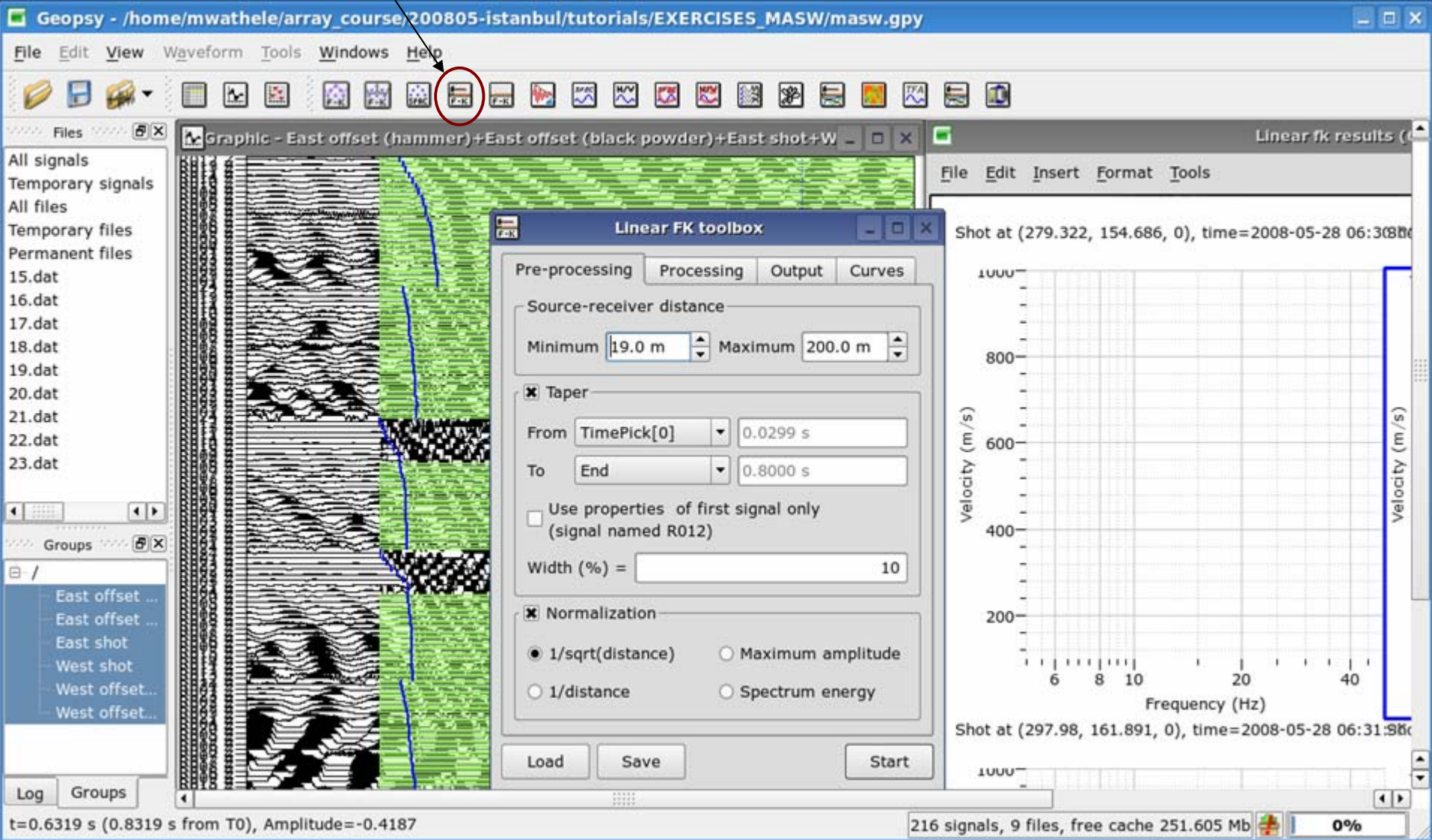


Up, down arrows to change current signal

Ctrl + left mouse button : change current signal and pick

Left, right arrows: change TimePick to pick (from 0 to ...)

Linear FK tool for active sources



Geopsy - /home/mwathele/array_course/200805-istanbul/tutorials/EXERCISES_MASW/masw.gpy

File Edit View Waveform Tools Windows Help

Files: All signals, Temporary signals, All files, Temporary files, Permanent files, 15.dat, 16.dat, 17.dat, 18.dat, 19.dat, 20.dat, 21.dat, 22.dat, 23.dat

Groups: East offset, East offset, East shot, West shot, West offset, West offset

Linear FK toolbox

- Pre-processing | Processing | Output | Curves
- Source-receiver distance: Minimum 19.0 m, Maximum 200.0 m
- Taper
 - From: TimePick[0] (0.0299 s)
 - To: End (0.8000 s)
 - Use properties of first signal only (signal named R012)
 - Width (%) = 10
- Normalization
 - 1/sqrt(distance) | Maximum amplitude
 - 1/distance | Spectrum energy
- Buttons: Load, Save, Start

Linear fk results

- Shot at (279.322, 154.686, 0), time=2008-05-28 06:30:86
- Velocity (m/s) vs Frequency (Hz) plot
- Shot at (297.98, 161.891, 0), time=2008-05-28 06:31:86

t=0.6319 s (0.8319 s from T0), Amplitude=-0.4187

216 signals, 9 files, free cache 251.605 Mb | 0%

Parameters

Linear FK toolbox

Pre-processing Processing Output Curves

Source-receiver distance

Minimum Maximum

Taper

From

To

Use properties of first signal only (signal named R012)

Width (%) =

Normalization

1/sqrt(distance) Maximum amplitude
 1/distance Spectrum energy

Linear FK toolbox

Pre-processing Processing Output Curves

Time limits

From

To

Frequency band width (ratio)

High resolution

Damping factor

Linear FK toolbox

Pre-processing Processing Output Curves

X axis sampling

From to

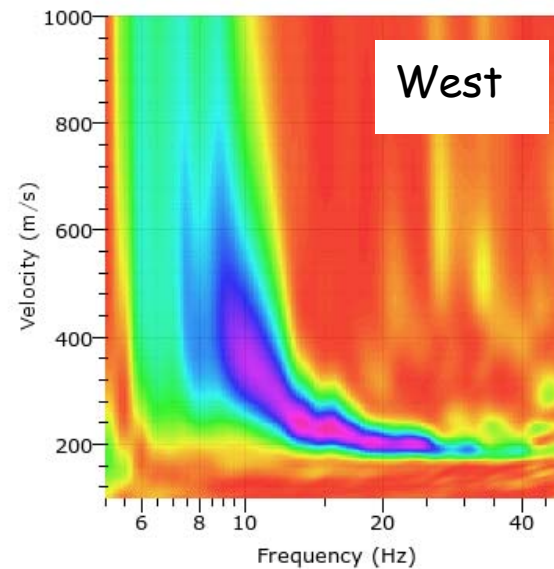
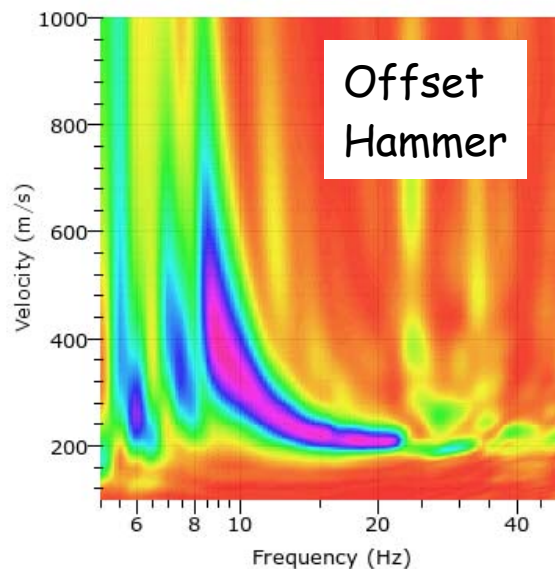
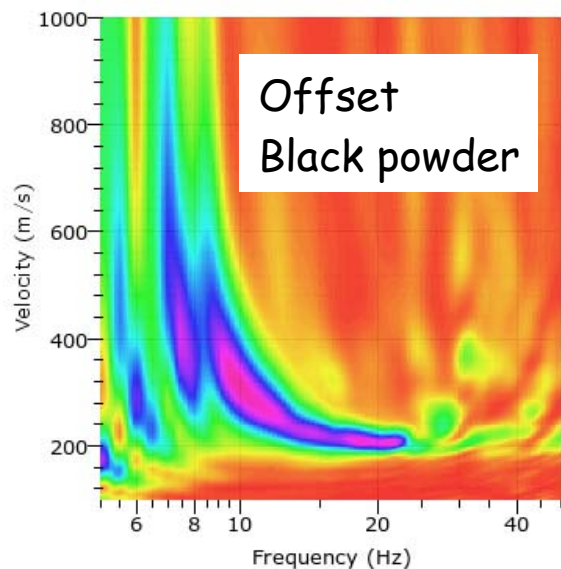
Step Number of samples

Y axis sampling

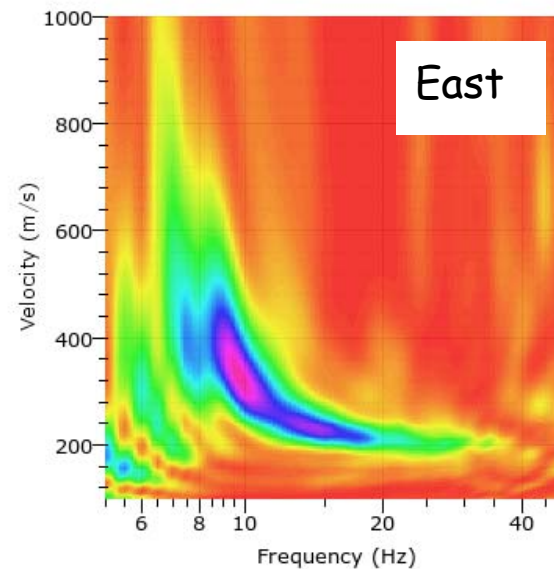
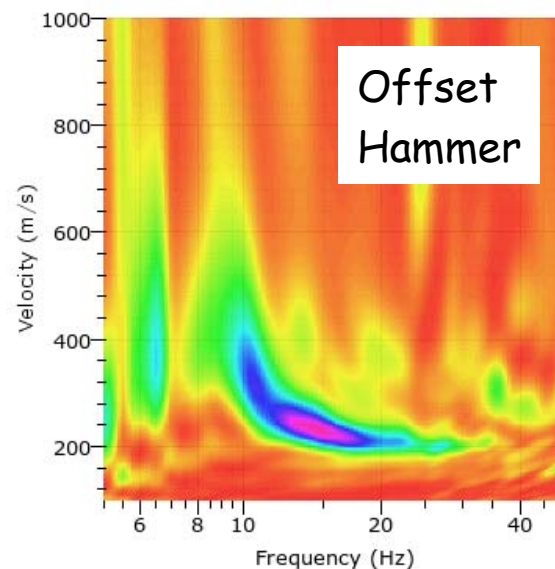
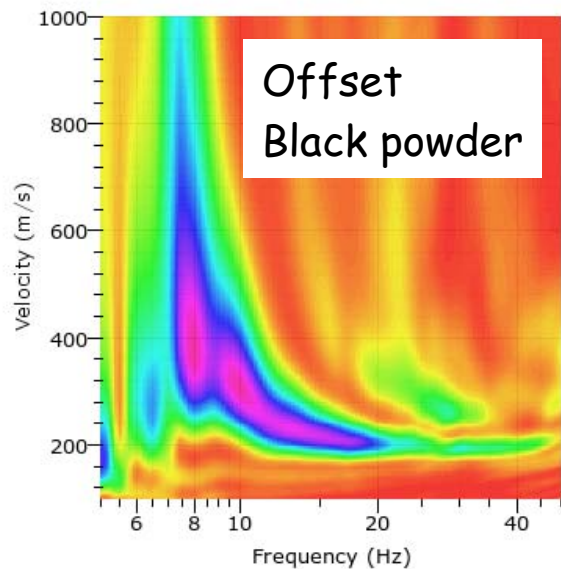
From to

Step Number of samples

Shot at (279.322, 154.686, 0), time=2008-05-28 06:30:00 Shot at (279.322, 154.686, 0), time=2008-05-28 06:31:46 Shot at (297.98, 161.891, 0), time=2008-05-28 06:31:46

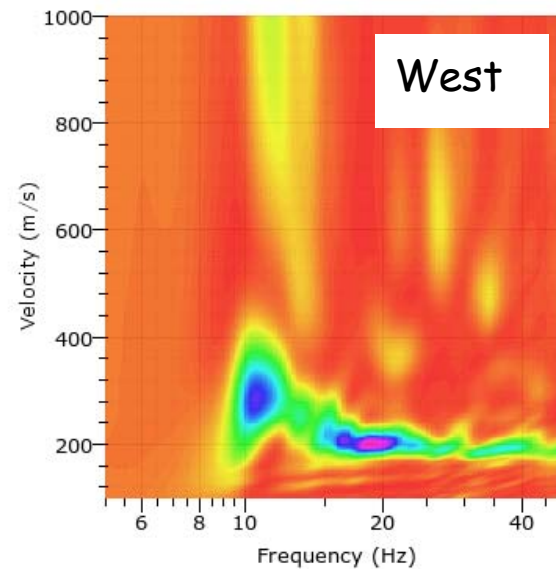
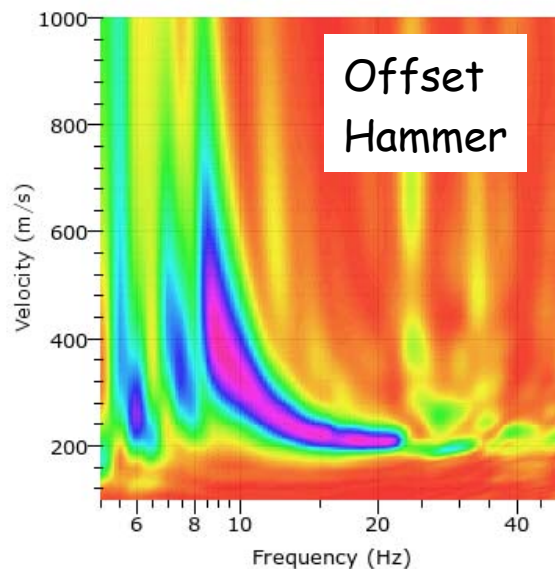
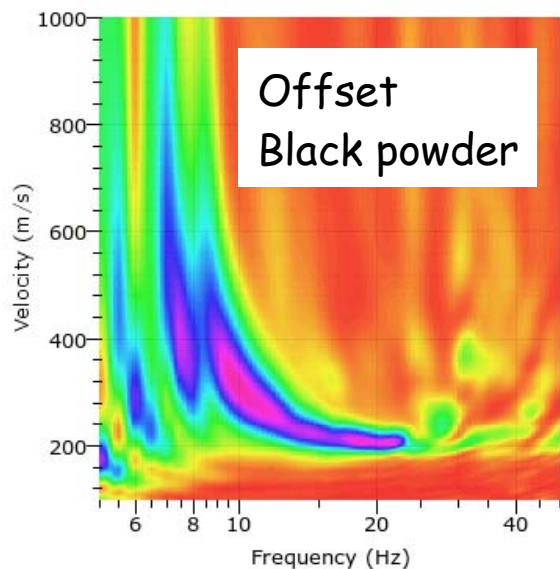


Shot at (351.752, 182.255, 0), time=2008-05-28 06:31:46 Shot at (370.502, 189.214, 0), time=2008-05-28 06:30:00 Shot at (370.502, 189.214, 0), time=2008-05-28 06:31:46

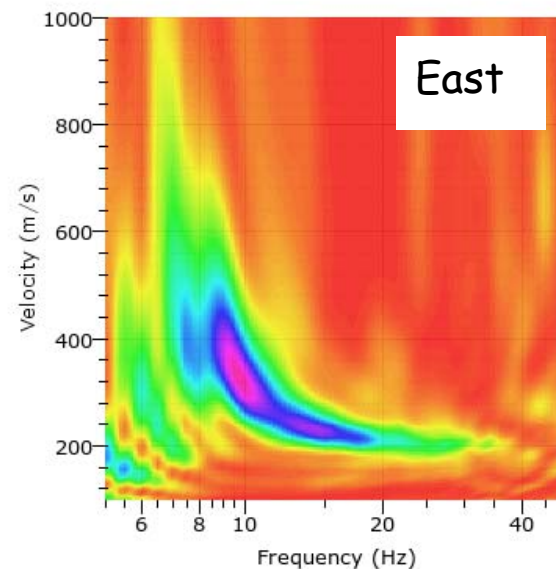
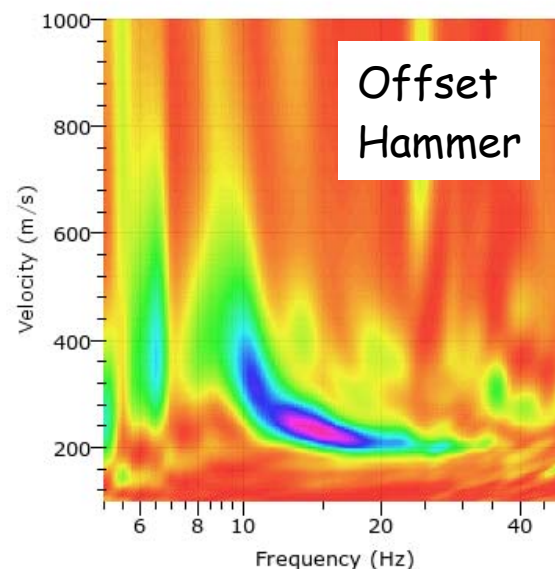
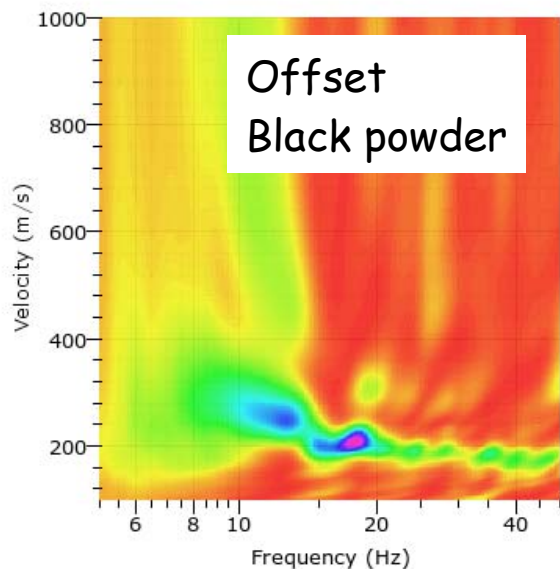


Change the minimal source-to-distance

Shot at (279.322, 154.686, 0), time=2008-05-28 06:30:00 Shot at (279.322, 154.686, 0), time=2008-05-28 06:31:46 Shot at (297.98, 161.891, 0), time=2008-05-28 06:31:46



Shot at (351.752, 182.255, 0), time=2008-05-28 06:31:46 Shot at (370.502, 189.214, 0), time=2008-05-28 06:30:00 Shot at (370.502, 189.214, 0), time=2008-05-28 06:31:46



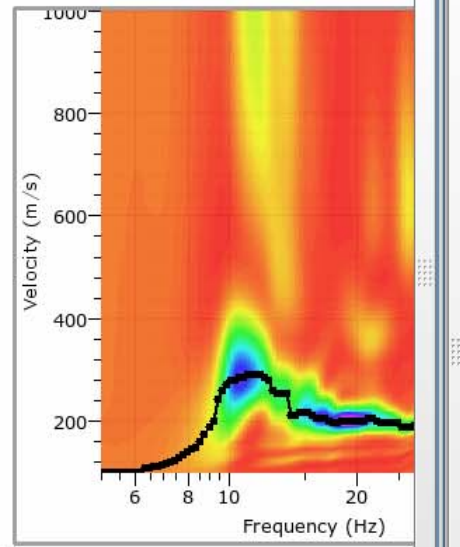
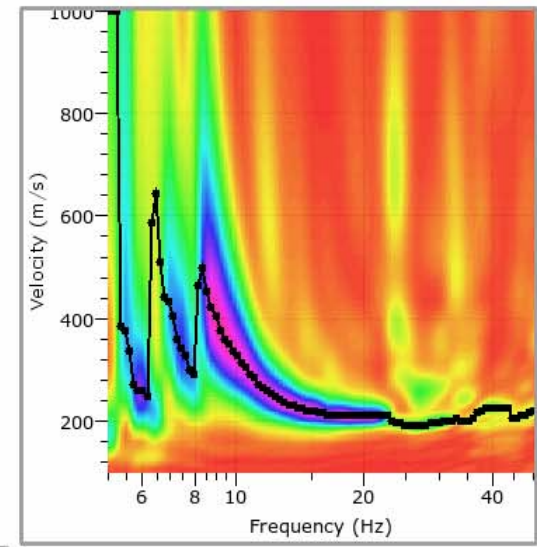
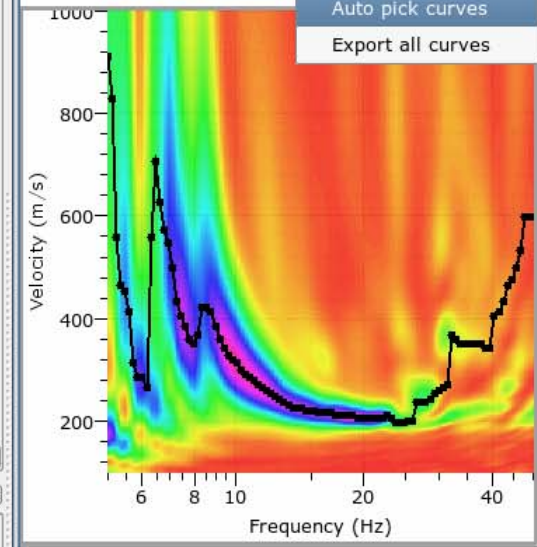
- All signals
- Temporary signals
- All files
- Temporary files
- Permanent files
- 15.dat
- 16.dat
- 17.dat
- 18.dat
- 19.dat
- 20.dat
- 21.dat
- 22.dat
- 23.dat

Groups

- East offset (hammer)
- East offset (black pow...)
- East shot
- West shot
- West offset (hammer)
- West offset (black pow...)

- Stack selected plots
- Pick curves
- Auto pick curves
- Export all curves

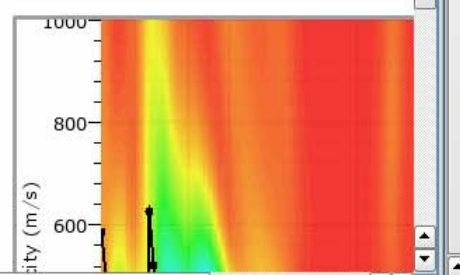
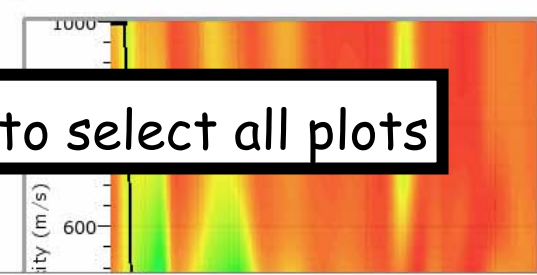
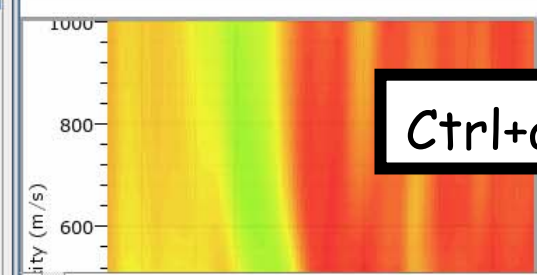
Shot at (279.322, 154.686, 0) :00 Shot at (279.322, 154.686, 0), time=2008-05-28 06:31:46 Shot at (297.98, 161.891, 0), time=2008-



Shot at (351.752, 182.255, 0), time=2008-05-28 06:31:46

Shot at (370.502, 189.214, 0), time=2008-05-28 06:30:00

Shot at (370.502, 189.214, 0), time=2008



Ctrl+a to select all plots

Geopsy - /home/mwathele/array_course/200805-istanbul/tutorials/EXERCISES_MASW/masw.gpy

File Edit View Waveform Tools Windows Help

Linear fk results (6 arrays)

Shot at (279.322, 154.686, 0), time=2008-05-28 06:30:00 Shot at (279.322, 154.686, 0),

Shot at (351.752, 182.255, 0), time=2008-05-28 06:31:46 Shot at (370.502, 189.214, 0),

Linear FK toolbox

Pre-processing Processing Output Curves

Shot at (279.322, 154.686, 0), time=2008-05-28 06:30:00

Load Clear Legend Average

Curve data

Curve 1 of 1

	Frequency	Period	Valid	Average	Std dev	W
1	5	0.2	<input checked="" type="checkbox"/>	0.0010...	0	
2	5.11766	0.19...	<input checked="" type="checkbox"/>	0.0012...	0	
3	5.23808	0.19...	<input checked="" type="checkbox"/>	0.0017...	0	
4	5.36134	0.18...	<input checked="" type="checkbox"/>	0.0021...	0	
5	5.48749	0.18...	<input checked="" type="checkbox"/>	0.0022...	0	
6	5.61662	0.17...	<input checked="" type="checkbox"/>	0.0024...	0	
7	5.74878	0.17...	<input checked="" type="checkbox"/>	0.0031...	0	
8	5.88406	0.16...	<input checked="" type="checkbox"/>	0.0035...	0	
9	6.02252	0.16...	<input checked="" type="checkbox"/>	0.0035...	0	
10	6.16423	0.16...	<input checked="" type="checkbox"/>	0.0037...	0	
11	6.30928	0.15...	<input checked="" type="checkbox"/>	0.0017...	0	
12	6.45775	0.15...	<input checked="" type="checkbox"/>	0.0014...	0	

Name Curve #1 Visible Actions

Load Save Start

Properties Ctrl+Alt+P
 Zoom Ctrl+Alt+Z
 Zoom in Ctrl++
 Unzoom Ctrl+-
 Save layers
 Add layers
 Export values
 Pick
 Pick ordered
 Edit

Stack Frequency-Velocity grids

Geopsy - /home/mwathele/array_course/200805-istanbul/tutorials/EXERCISES_MASW/masw.gpy

File Edit View Waveform Tools Windows Help

Files

- All signals
- Temporary signals
- All files
- Temporary files
- Permanent files
- 15.dat
- 16.dat
- 17.dat
- 18.dat
- 19.dat
- 20.dat
- 21.dat
- 22.dat
- 23.dat

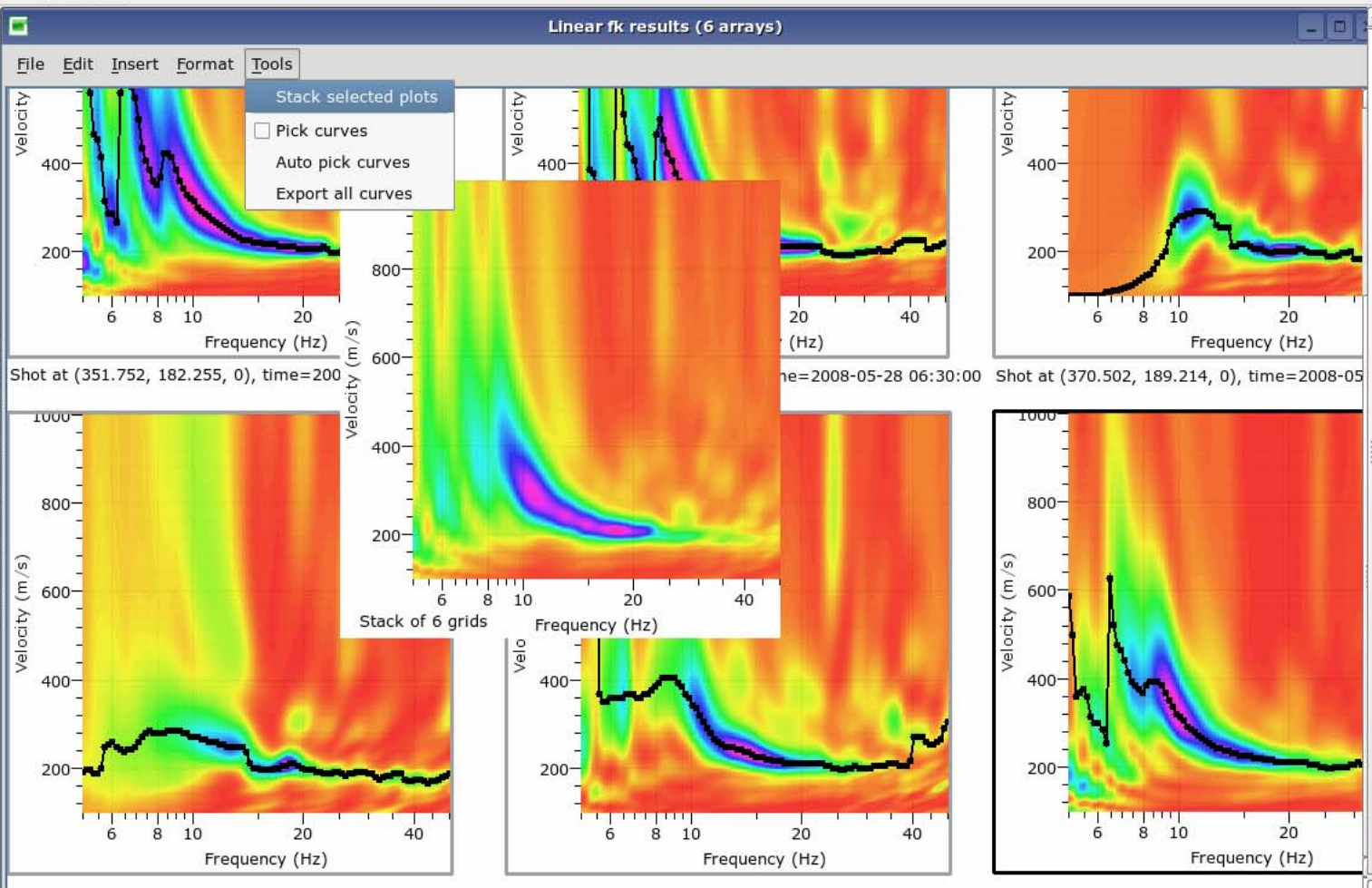
Groups

- East offset (hammer)
- East offset (black pow...)
- East shot
- West shot
- West offset (hammer)
- West offset (black pow...)

Linear fk results (6 arrays)

File Edit Insert Format Tools

- Stack selected plots
- Pick curves
- Auto pick curves
- Export all curves



Shot at (351.752, 182.255, 0), time=200

Shot at (370.502, 189.214, 0), time=2008-05-28 06:30:00

Stack of 6 grids

Velocity (m/s)

Frequency (Hz)

Log Groups

Grids of selected plot are stacked and a new plot is added

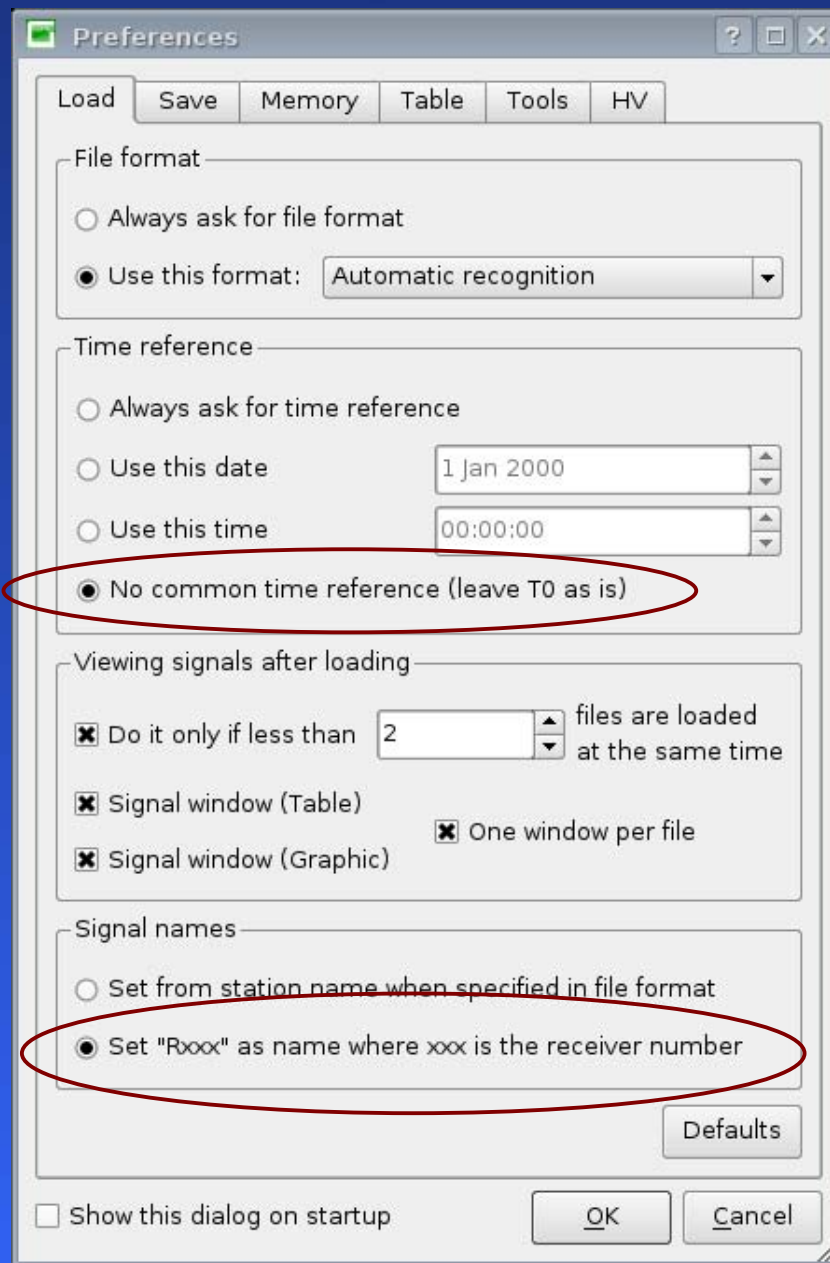
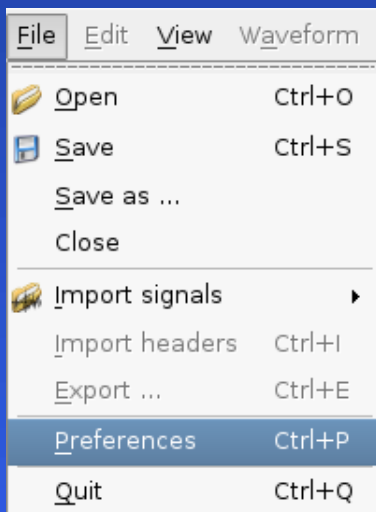
Taskbar: mwathele@sirac: ~/arra Geopsy - /home/mwathele GIMP 216 signals, 8 files, free cache 242.816 Mb 0%

System tray: 13:04:49 Istanbul

Creating a database for a MASW experiment

Setting source and receiver coordinates

Usual preferences for loading active source recordings



Importing recorded signals

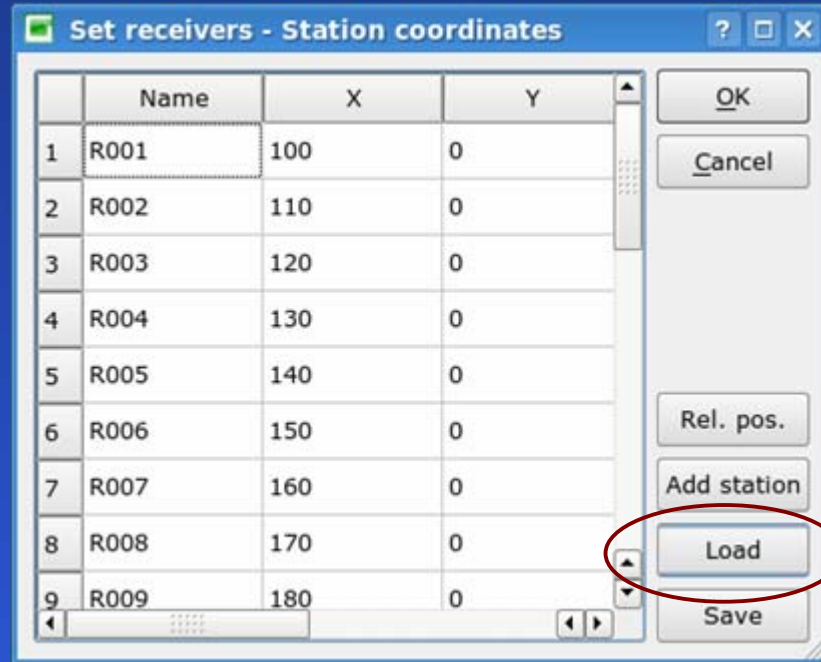
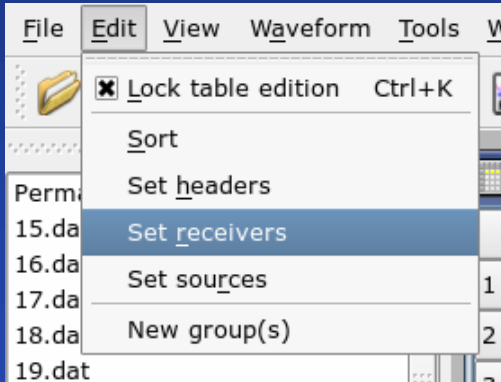
The screenshot displays a software application with a 'File' menu open, showing options like 'All signals', 'Temporary', and 'Permanent files'. Below the menu, a table lists signal data. In the foreground, a 'Load Signals' dialog box is open, showing a file list and the file names entered in the 'File name' field.

ID	Name	Component	Time reference	Start
194	R002	Vertical	28/05/2008 06:31:46	-0.20000
195	R003	Vertical	28/05/2008 06:31:46	-0.200000 s
196	R004	Vertical	28/05/2008 06:31:46	-0.200000 s
197	R005	Vertical	28/05/2008 06:31:46	-0.200000 s
198	R006	Vertical	28/05/2008 06:31:46	-0.200000 s
199	R007	Vertical	28/05/2008 06:31:46	-0.200000 s
200	R008	Vertical	28/05/2008 06:31:46	-0.200000 s

File name: "15.dat" "16.dat" "17.dat" "18.dat" "19.dat" "20.dat" "21.dat" "22.dat" "23.dat"

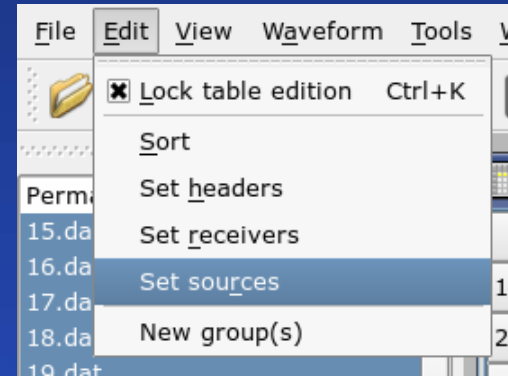
Files of type: Signal file (*)

Set proper coordinates of geophones



Load coordinate file : "geophones.coord"

Set proper coordinates of shot points



Source coordinates

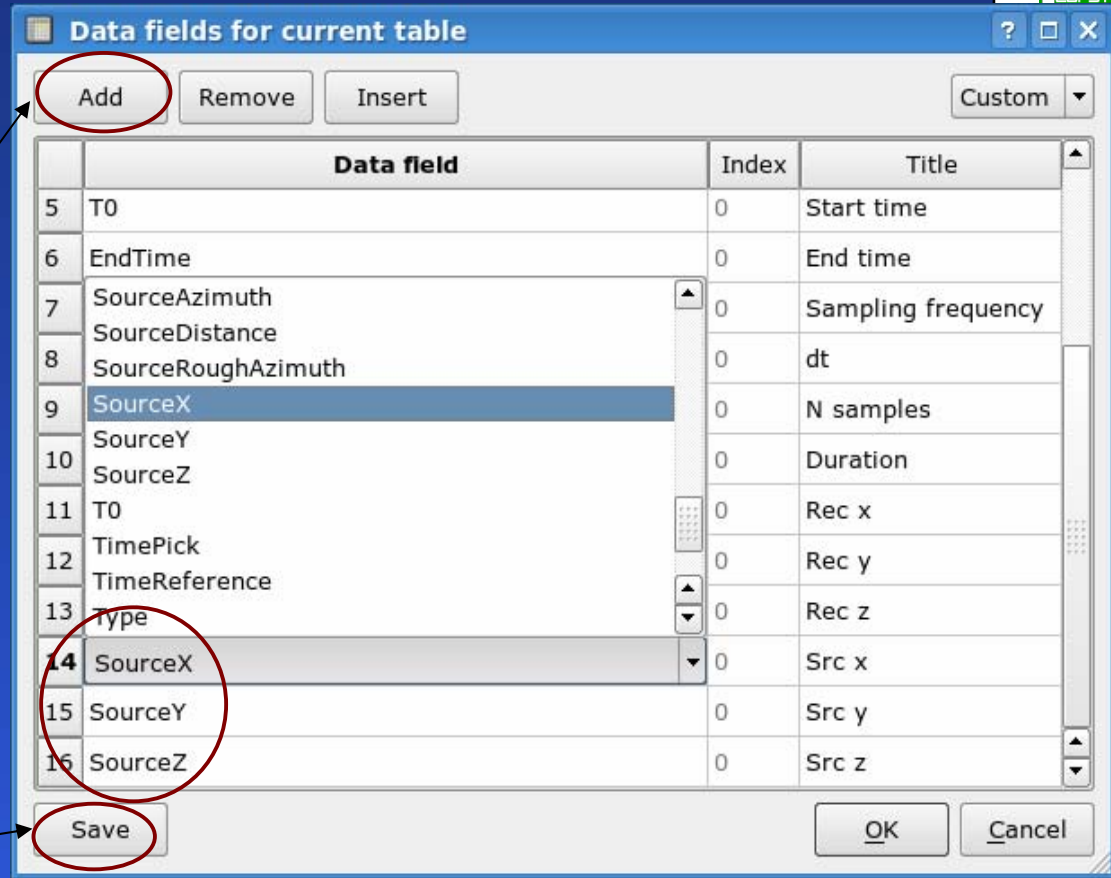
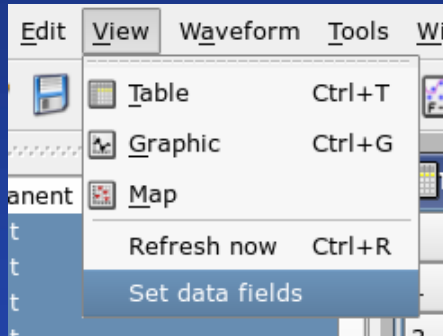
	Name	X	Y	Z
1	Shot_15	370.502	189.214	0
2	Shot_16	351.752	182.255	0
3	Shot_17	340.033	177.906	0
4	Shot_18	325.97	172.687	0
5	Shot_19	370.502	189.214	0
6	Shot_20	311.972	167.295	0
7	Shot_21	297.98	161.891	0
8	Shot_22	279.322	154.686	0
9	Shot_23	279.322	154.686	0

Source name pattern: Shot_{Return=left(ShortFileName,length(ShortFileName)-4);}

Buttons: OK, Cancel, Rel. pos., Add station, Load, Save, Apply

Check coordinates

View coordinates in a table

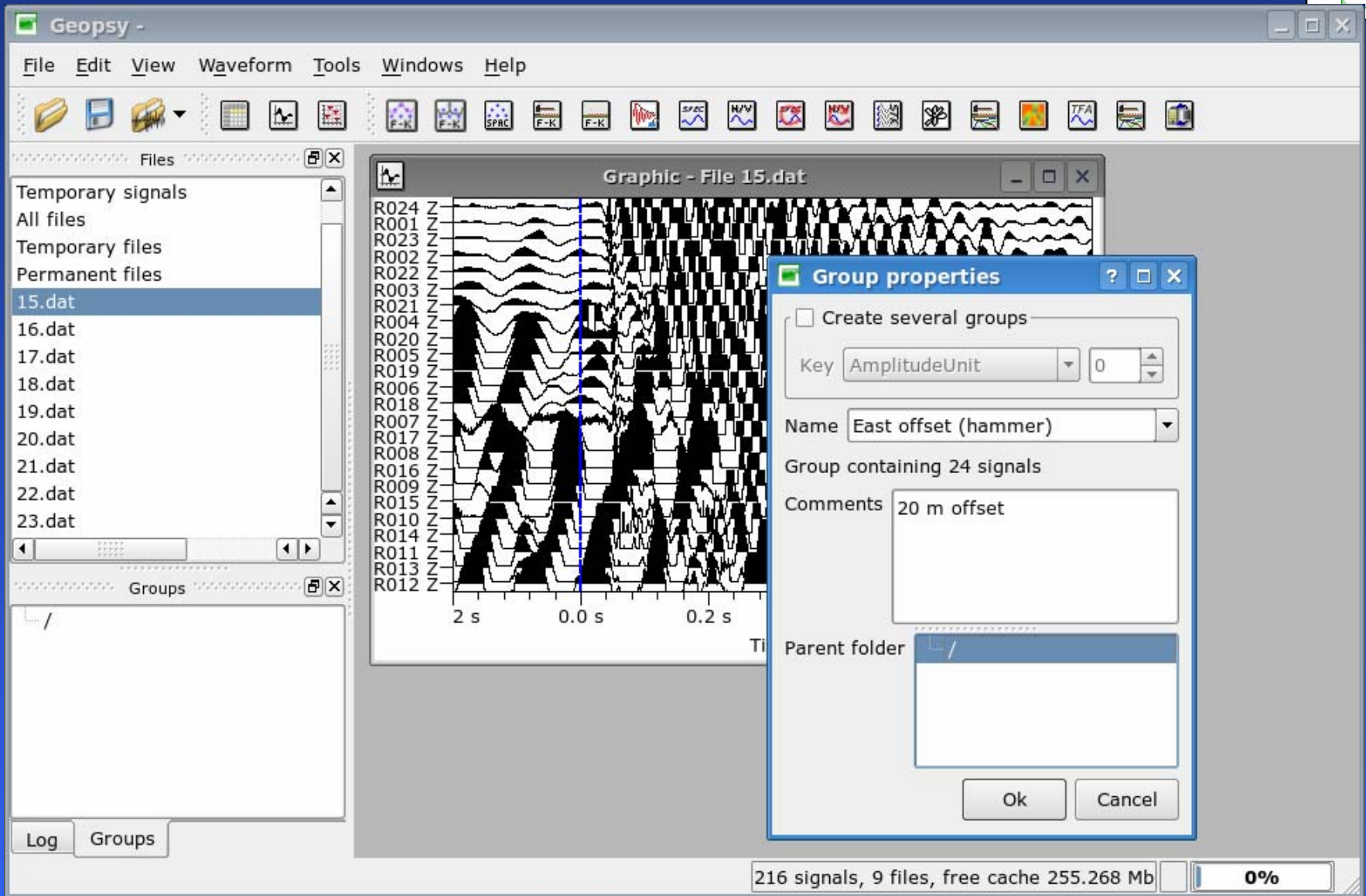


Add columns to the standard display

Apply it to all tables, not only for current one

N samples	Duration	Rec x	Rec y	Rec z	Src x	Src y	Src z
4000	1.000000 s	349.408	181.385	0	370.502	189.214	0
4000	1.000000 s	344.72	179.646	0	370.502	189.214	0
4000	1.000000 s	340.033	177.906	0	370.502	189.214	0
4000	1.000000 s	335.345	176.166	0	370.502	189.214	0
4000	1.000000 s	330.657	174.427	0	370.502	189.214	0
4000	1.000000 s	325.97	172.687	0	370.502	189.214	0

Organizing signals in a database: groups



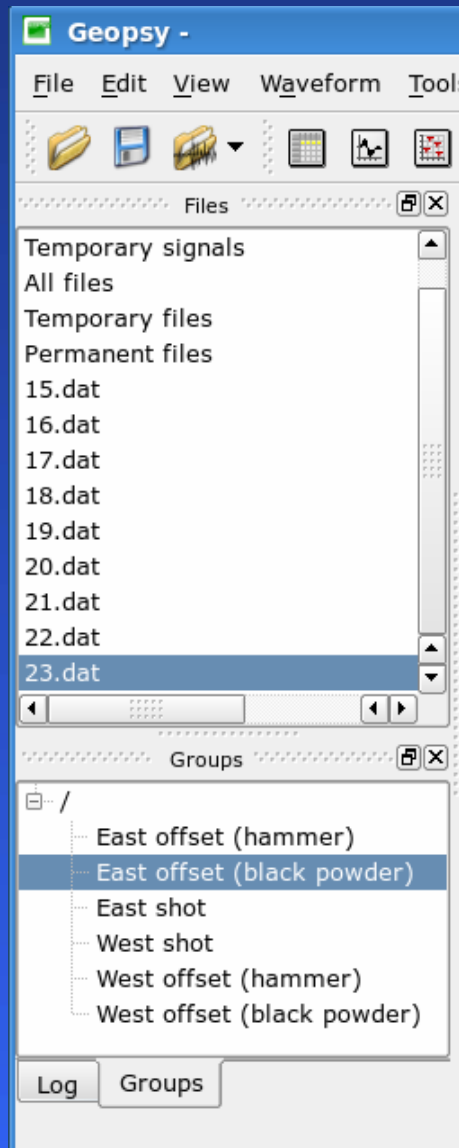
The screenshot shows the Geopsy software interface. The main window displays a seismic waveform plot titled "Graphic - File 15.dat". The plot shows multiple channels of seismic data, with a vertical blue line indicating a time offset at 0.0 s. The channels are labeled on the left with station identifiers: R024, R001, R023, R002, R022, R003, R021, R004, R020, R005, R019, R006, R018, R007, R017, R008, R016, R009, R015, R010, R014, R011, R013, and R012. The x-axis represents time in seconds, with markers at 2 s, 0.0 s, and 0.2 s.

A "Group properties" dialog box is open in the foreground. It contains the following information:

- Create several groups
- Key: AmplitudeUnit, 0
- Name: East offset (hammer)
- Group containing 24 signals
- Comments: 20 m offset
- Parent folder: /

At the bottom of the Geopsy window, a status bar indicates "216 signals, 9 files, free cache 255.268 Mb" and a progress indicator showing "0%".

Organizing signals in a database: groups



For each shot, sort signal by increasing distance to source and create a new group

Number	Group name	Comments
Shot 15	East offset (hammer)	20 m offset
Shot 19	East offset (black powder)	20 m offset
Shot 16	East shot	No offset
Shot 21	West shot	No offset
Shot 22	West offset (hammer)	20 m offset
Shot 23	West offset (black powder)	20 m offset

Finally, the database contains all information to process MASW, save it!