

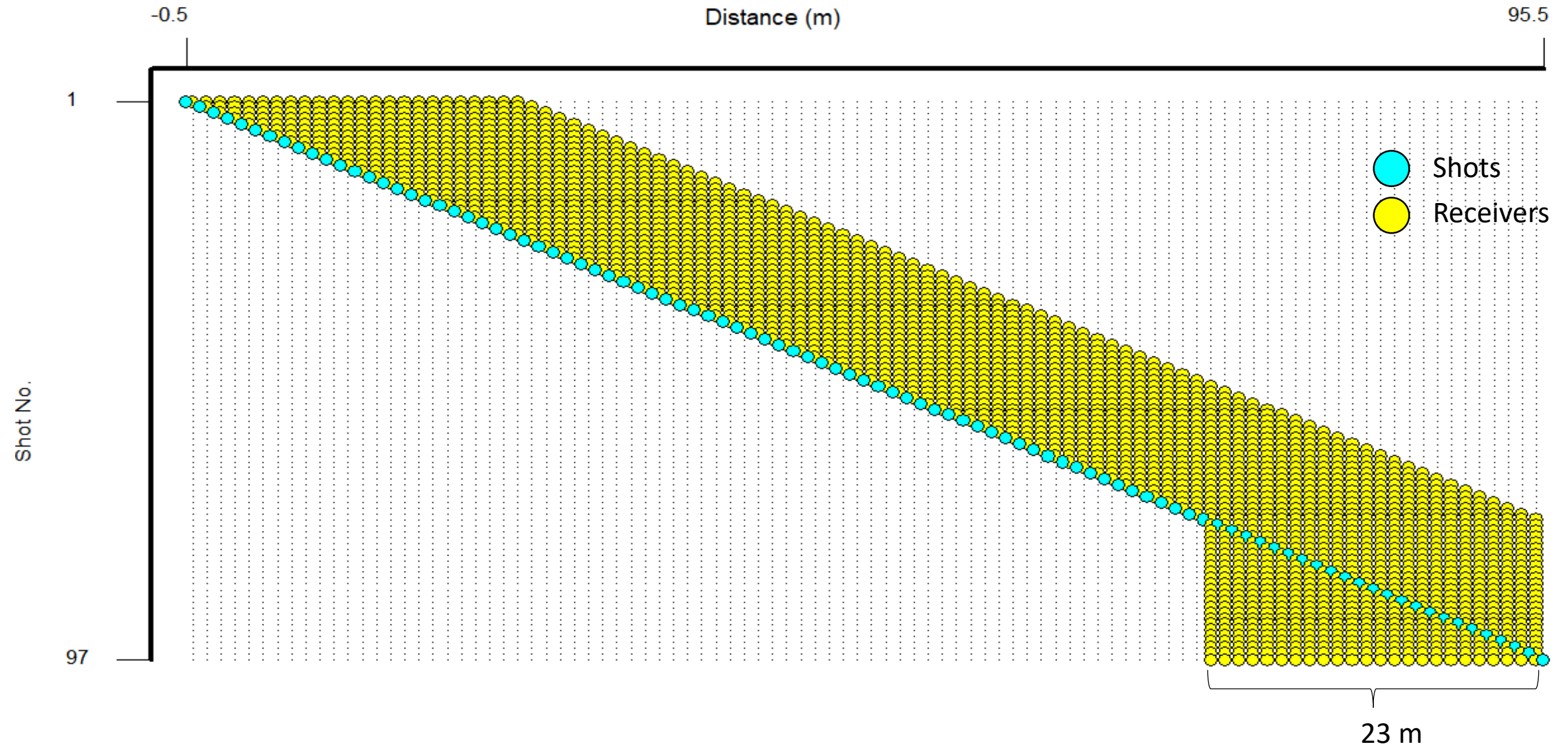
# Tutorial for 2D MASW processing using SeisImager/SW-2D

- Processing 2D MASW data obtained by Geode.
- SeisImager/SW-2D license is required.
- Download the latest installer from :  
<https://seisimager.com/download/SeisImager.zip>
- Download the example data from :  
[https://seisimager.com/download/MASW\(2D\).zip](https://seisimager.com/download/MASW(2D).zip)
- Can be processed either using wizard or manually
- The tutorial summarize manual processing
- See “*SeisImager/SW™ Manual*”, “*SeisImager/SW-Pro™ Manual*” and “*GeoPlot™ Manual*” for more details

# Acquisition geometry

- Source interval : 1 m
- 1<sup>st</sup> source position : -0.5 m
- Receiver interval : 1 m
- 1<sup>st</sup> receiver position : 0 m
- Survey line length : 95 m (0~95 m)

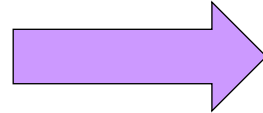
# Acquisition geometry



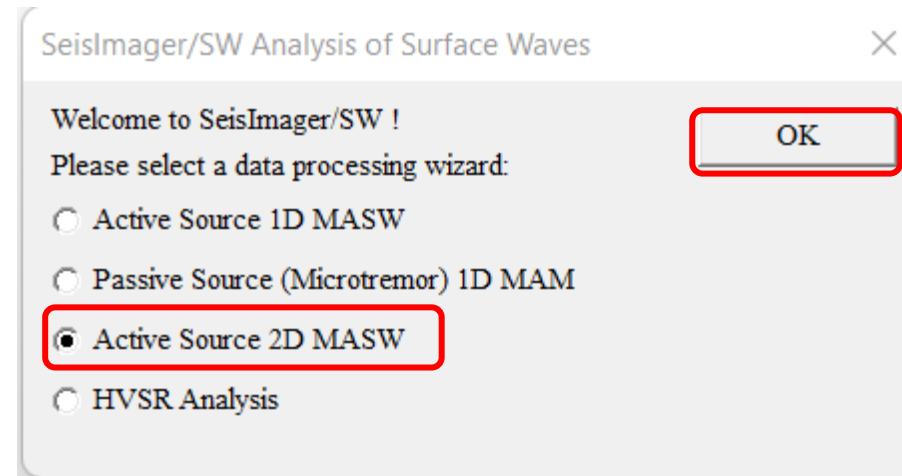
# Processing with surface wave analysis wizard

Data can be processed almost automatically using the “Surface Wave Analysis Wizard”

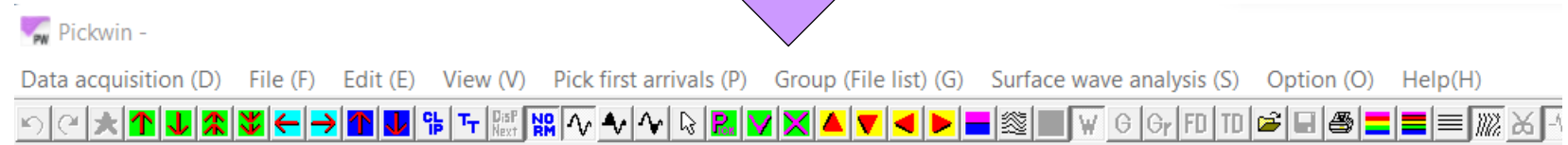
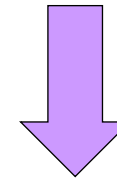
Click “Surface Wave Analysis Wizard” icon



Choose “Active Source 2D MASW” and click “OK”



Press "Enter" key to start processing



Press Enter key to start Surface Wave Analysis Wizard.

2D MASW (0)

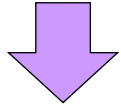
Wizard automatically selects processing menu describes below by pressing “Enter” key

# Import Geode data files (SEG2 files : .dat or .sg2)

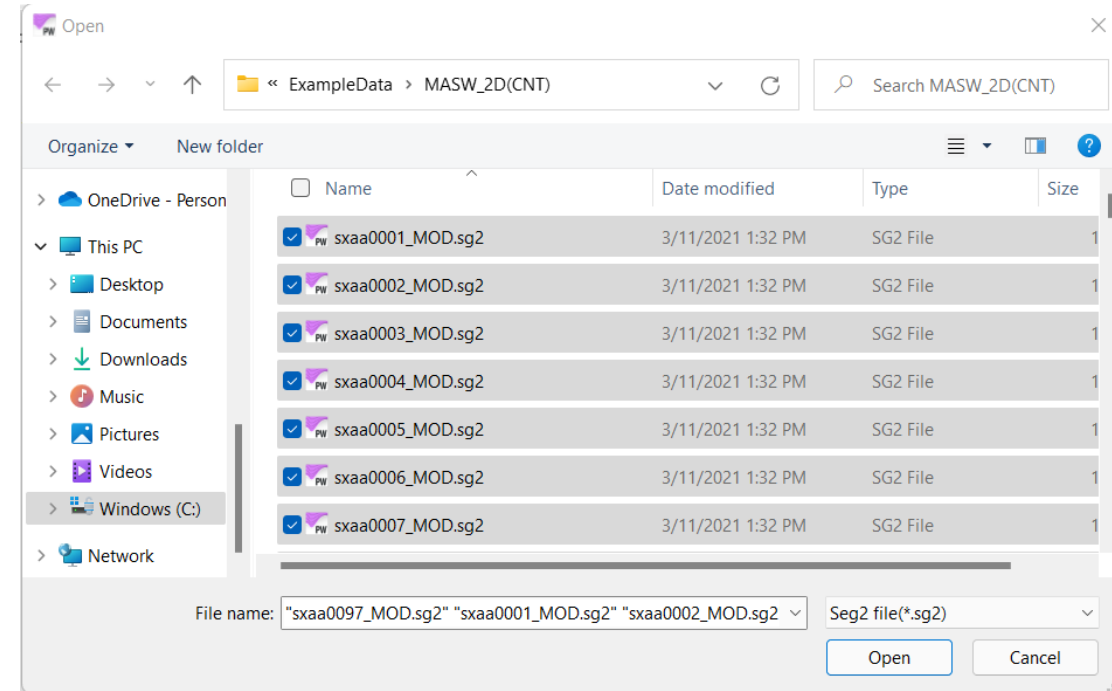
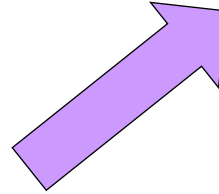
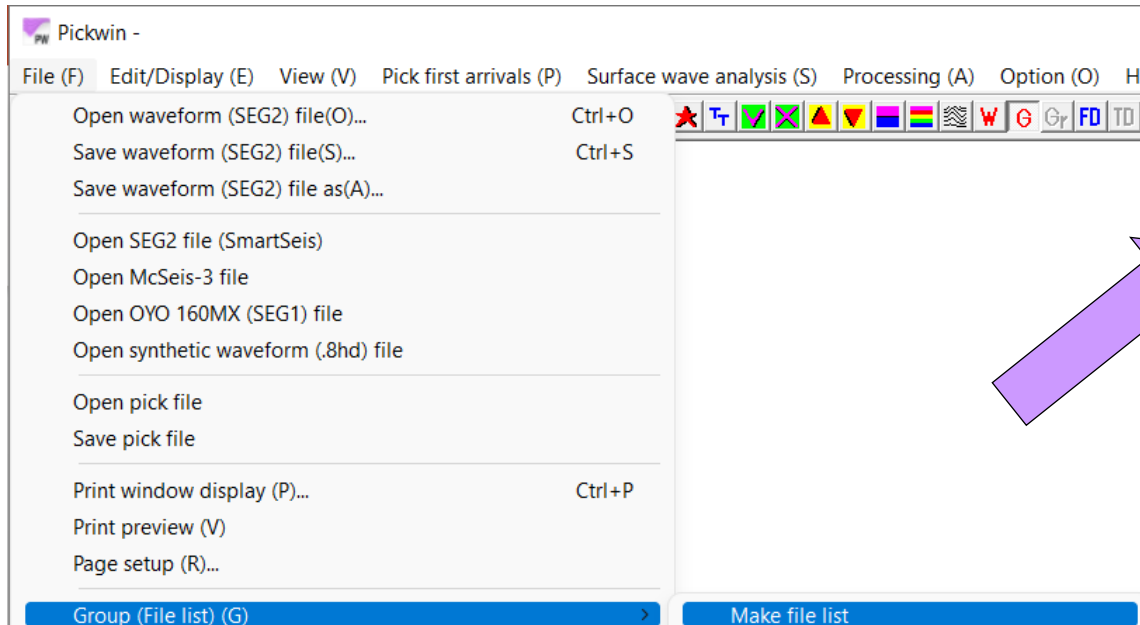
Hereafter, the tutorial describes manual processing without the wizard.

The wizard basically follow almost the same procedure by pressing “Enter” key.

Double click icon to launch Pickwin



Select “File”, “Group (file list)”, “Make file list”.



Select all SEG2 files.

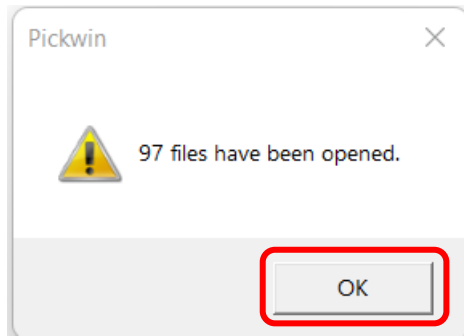
Use “File”, “Group (file list)”, “Make file list (select a folder)” if the number of files is more than 100.



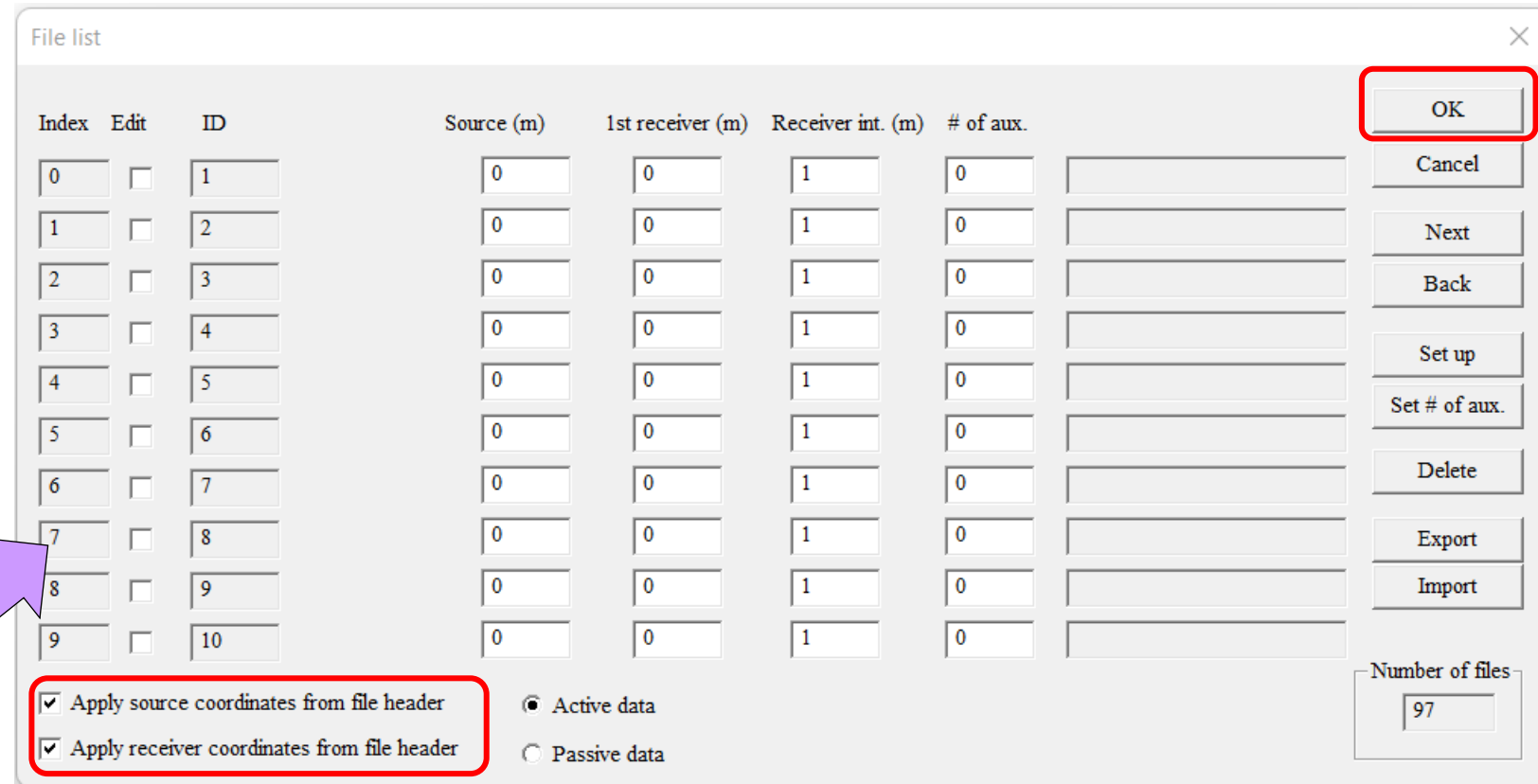
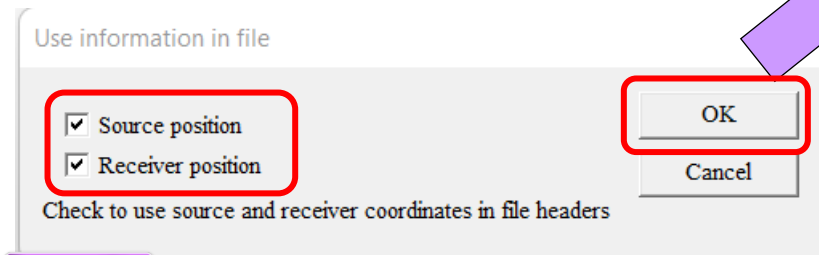
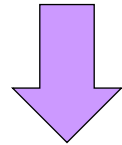
# Import Geode data files (SEG2 files : .dat or .sg2)

If waveform data files contain correct source-receiver geometry.

Click “OK” to continue.



Check “Source position” and “Receiver position” if waveform data files contain correct source-receiver geometry.



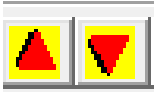
Check “Apply source coordinate from file header” and “Apply receiver coordinate from file header” if waveform data files contain correct source-receiver geometry.



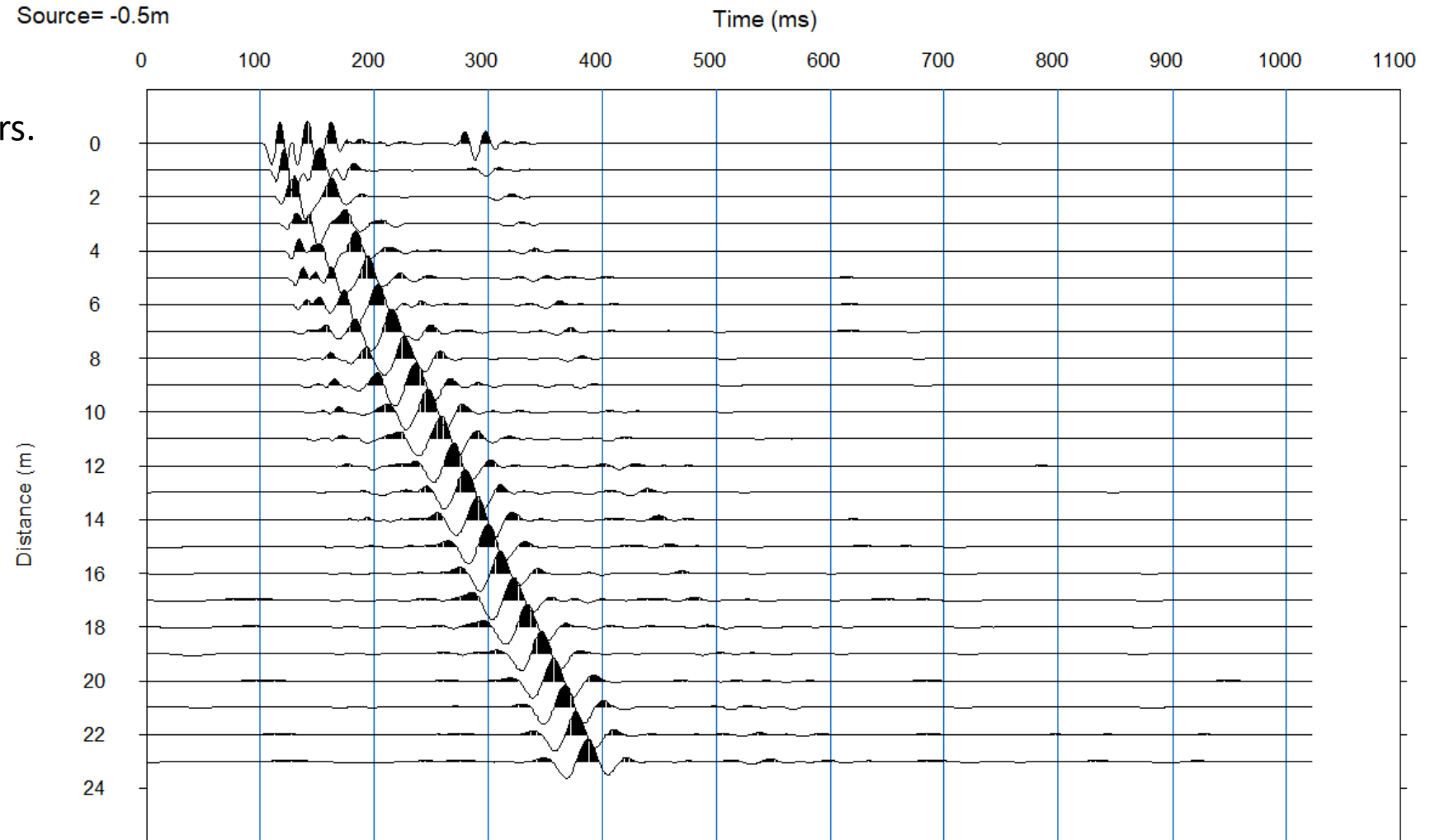
# Import Geode data files (SEG2 files : .dat or .sg2)

The 1<sup>st</sup> shot gather appears.

Use



to scroll shot gathers.



C:\Koichi\SeisImagerManagement\TestProcedure\ExampleData\MASW\_2D(CNT)\sxaa0001\_MOD.sg2

# Manually set up acquisition geometry (optional)

If waveform data files do not contain correct source-receiver geometry, the acquisition geometry can be set up manually.

File list

Index	Edit	ID	Source (m)	1st receiver (m)	Receiver int. (m)	# of aux.	
0	<input type="checkbox"/>	1	0	0	1	0	
1	<input type="checkbox"/>	2	0	0	1	0	
2	<input type="checkbox"/>	3	0	0	1	0	
3	<input type="checkbox"/>	4	0	0	1	0	
4	<input type="checkbox"/>	5	0	0	1	0	
5	<input type="checkbox"/>	6	0	0	1	0	
6	<input type="checkbox"/>	7	0	0	1	0	
7	<input type="checkbox"/>	8	0	0	1	0	
8	<input type="checkbox"/>	9	0	0	1	0	
9	<input type="checkbox"/>	10	0	0	1	0	

☐ Apply source coordinates from file header

☐ Apply receiver coordinates from file header

☒ Active data

☐ Passive data

OK

Cancel

Next

Back

Set up

Set # of aux.

Delete

Export

Import

Number of files

97

Click “Set up” to set up geometry.

Uncheck “Apply source coordinate from file header” and “Apply receiver coordinate from file header” if waveform data files do not contain correct source-receiver geometry.



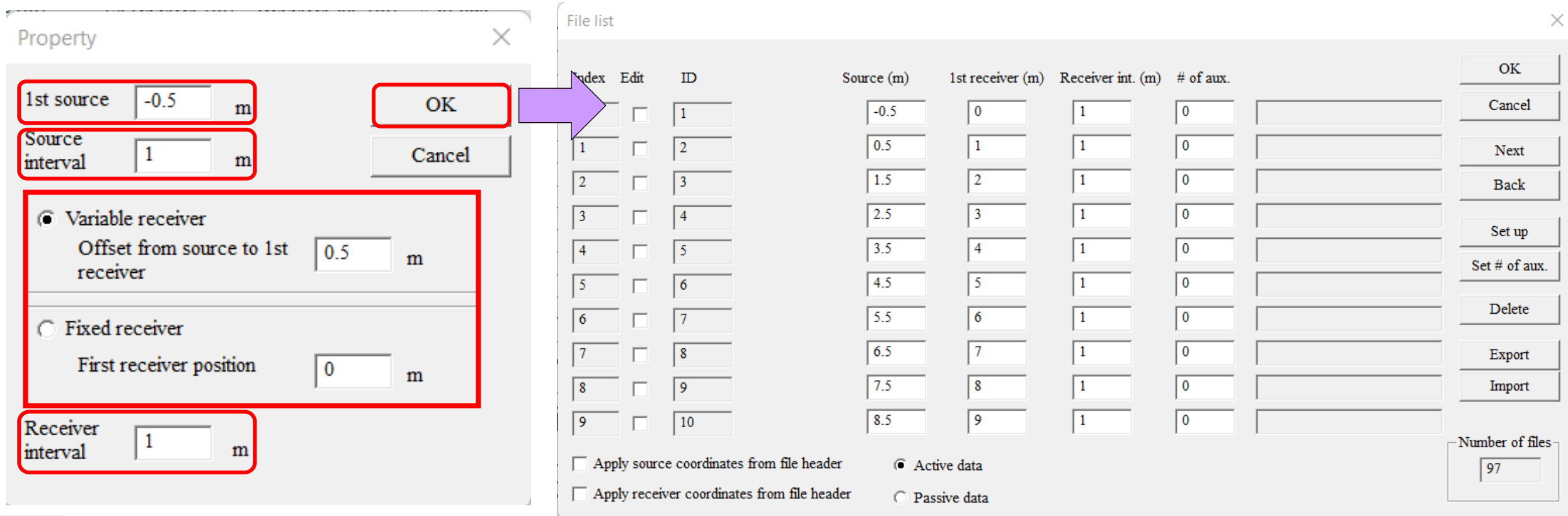


# Manually set up acquisition geometry

If waveform data files do not contain correct source-receiver geometry, the acquisition geometry can be set up manually.

Enter the 1<sup>st</sup> source position, source interval, and receiver interval.

Choose “Variable receiver” or “Fixed receiver” and enter offset from source to 1<sup>st</sup> receiver or first receiver position respectively.



The 'Property' dialog box contains the following fields and options:

- 1st source: -0.5 m
- Source interval: 1 m
- ☒ Variable receiver
  - Offset from source to 1st receiver: 0.5 m
- ☐ Fixed receiver
  - First receiver position: 0 m
- Receiver interval: 1 m
- Buttons: OK, Cancel

The 'File list' dialog box contains the following table and options:

Index	Edit	ID	Source (m)	1st receiver (m)	Receiver int. (m)	# of aux.
	<input type="checkbox"/>	1	-0.5	0	1	0
1	<input type="checkbox"/>	2	0.5	1	1	0
2	<input type="checkbox"/>	3	1.5	2	1	0
3	<input type="checkbox"/>	4	2.5	3	1	0
4	<input type="checkbox"/>	5	3.5	4	1	0
5	<input type="checkbox"/>	6	4.5	5	1	0
6	<input type="checkbox"/>	7	5.5	6	1	0
7	<input type="checkbox"/>	8	6.5	7	1	0
8	<input type="checkbox"/>	9	7.5	8	1	0
9	<input type="checkbox"/>	10	8.5	9	1	0

Buttons: OK, Cancel, Next, Back, Set up, Set # of aux., Delete, Export, Import

Number of files: 97

Options:

- ☐ Apply source coordinates from file header
- ☐ Apply receiver coordinates from file header
- ☒ Active data
- ☐ Passive data



# Manually set up acquisition geometry

Geometry example 1 :  
Variable receiver with sources behind receiver spread.

Property

1st source  m

Source interval  m

☒ Variable receiver

Offset from source to 1st receiver  m

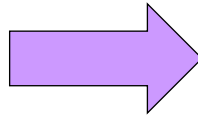
☐ Fixed receiver

First receiver position  m

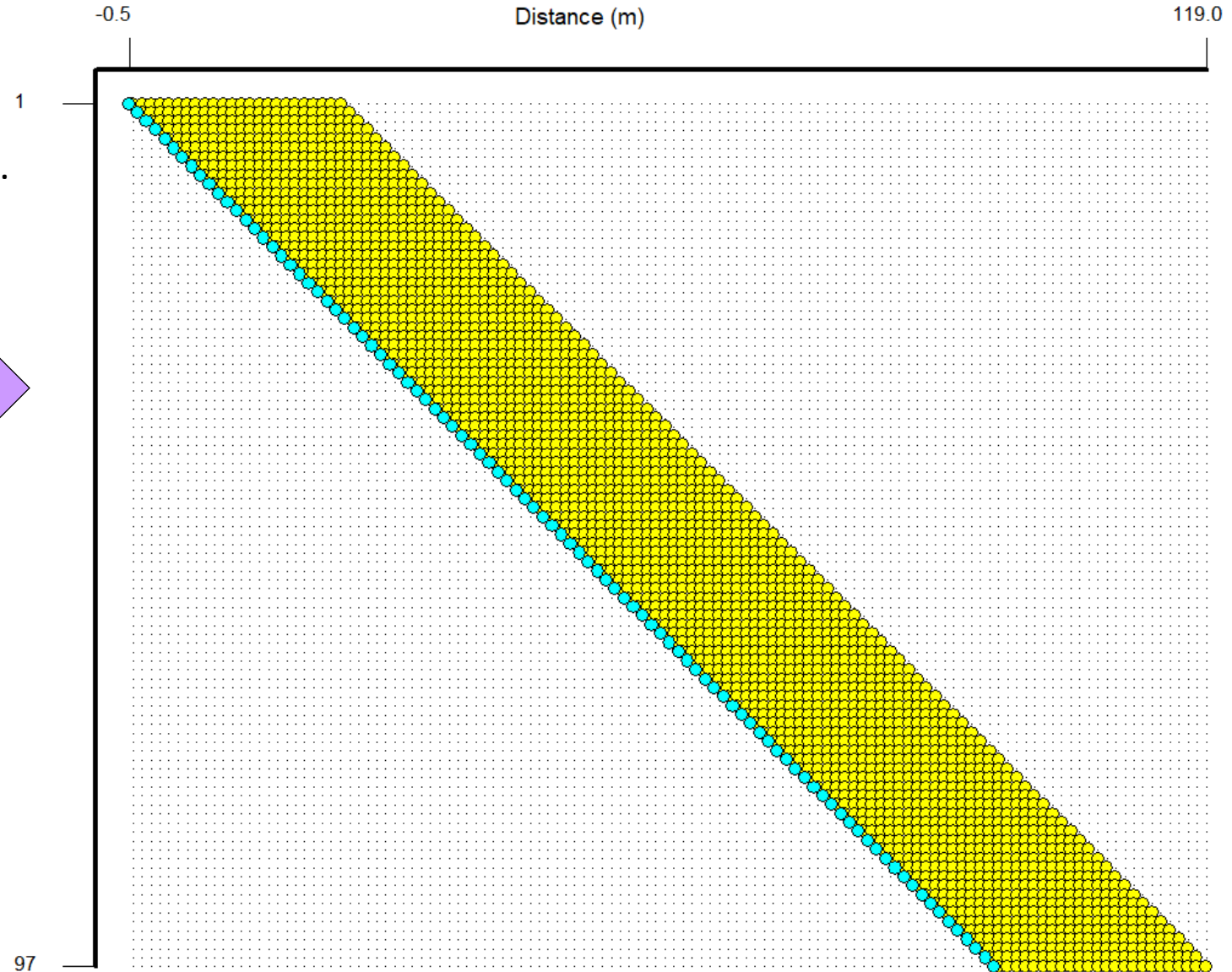
Receiver interval  m

OK

Cancel



Shot No.



# Manually set up acquisition geometry

Geometry example 2 :  
Variable receiver with sources ahead of receiver spread.

Property

1st source  m

Source interval  m

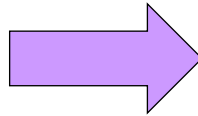
☒ Variable receiver  
Offset from source to 1st receiver  m

☐ Fixed receiver  
First receiver position  m

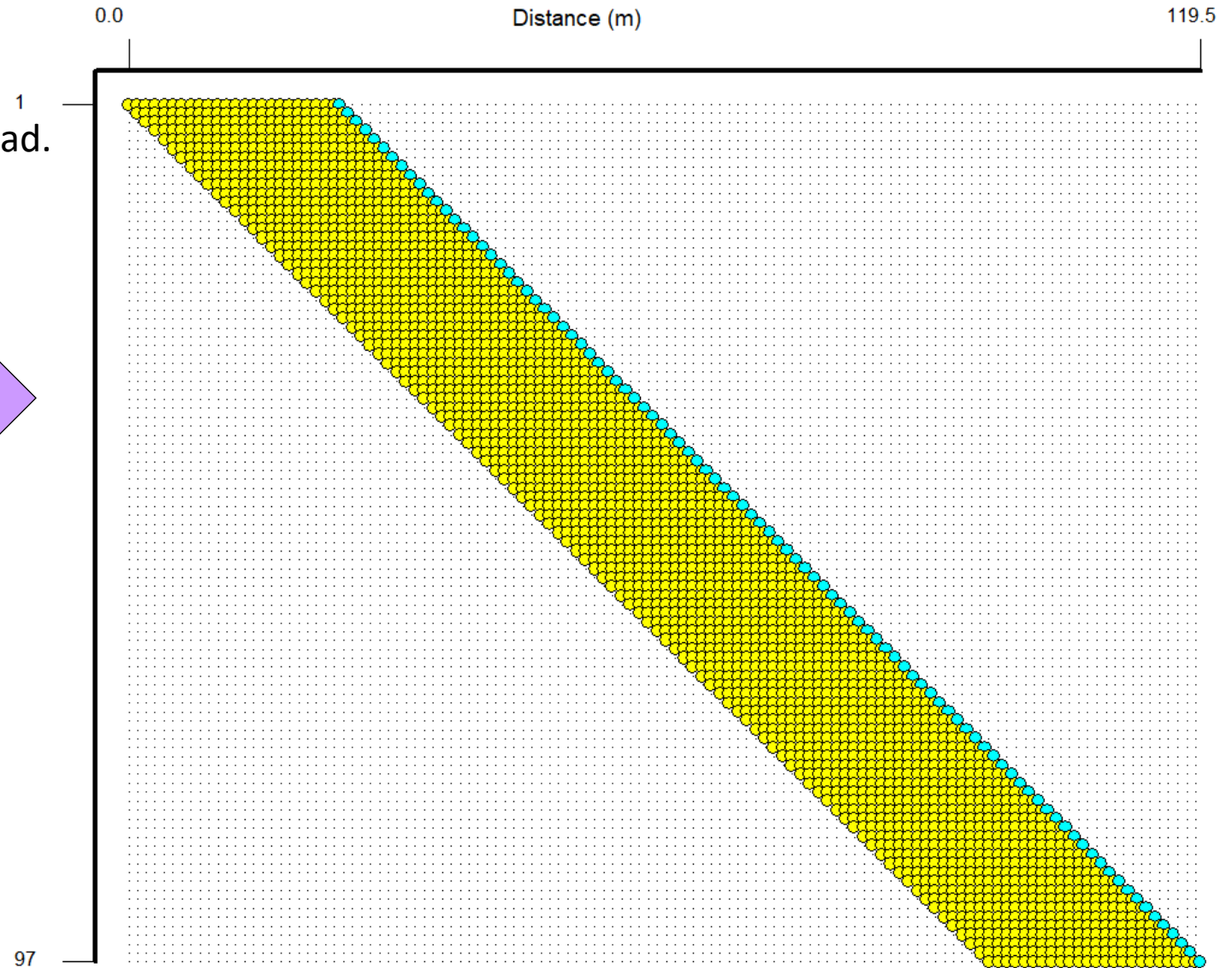
Receiver interval  m

OK

Cancel



Shot No.



# Manually set up acquisition geometry

Geometry example 3 :  
Fixed receiver spread.

Property

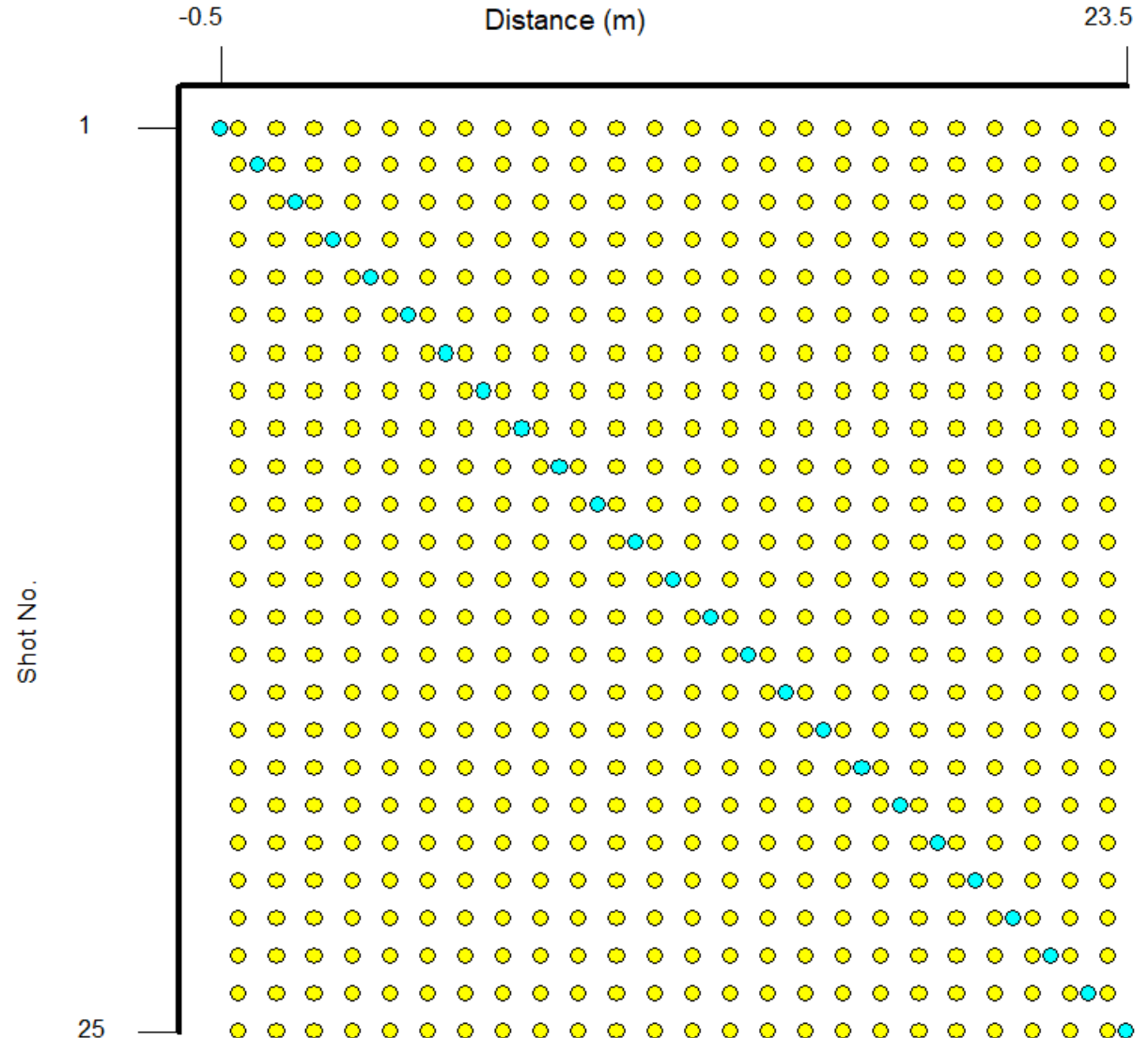
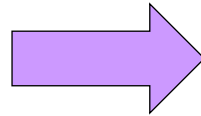
1st source  m

Source interval  m

☐ Variable receiver  
Offset from source to 1st receiver  m

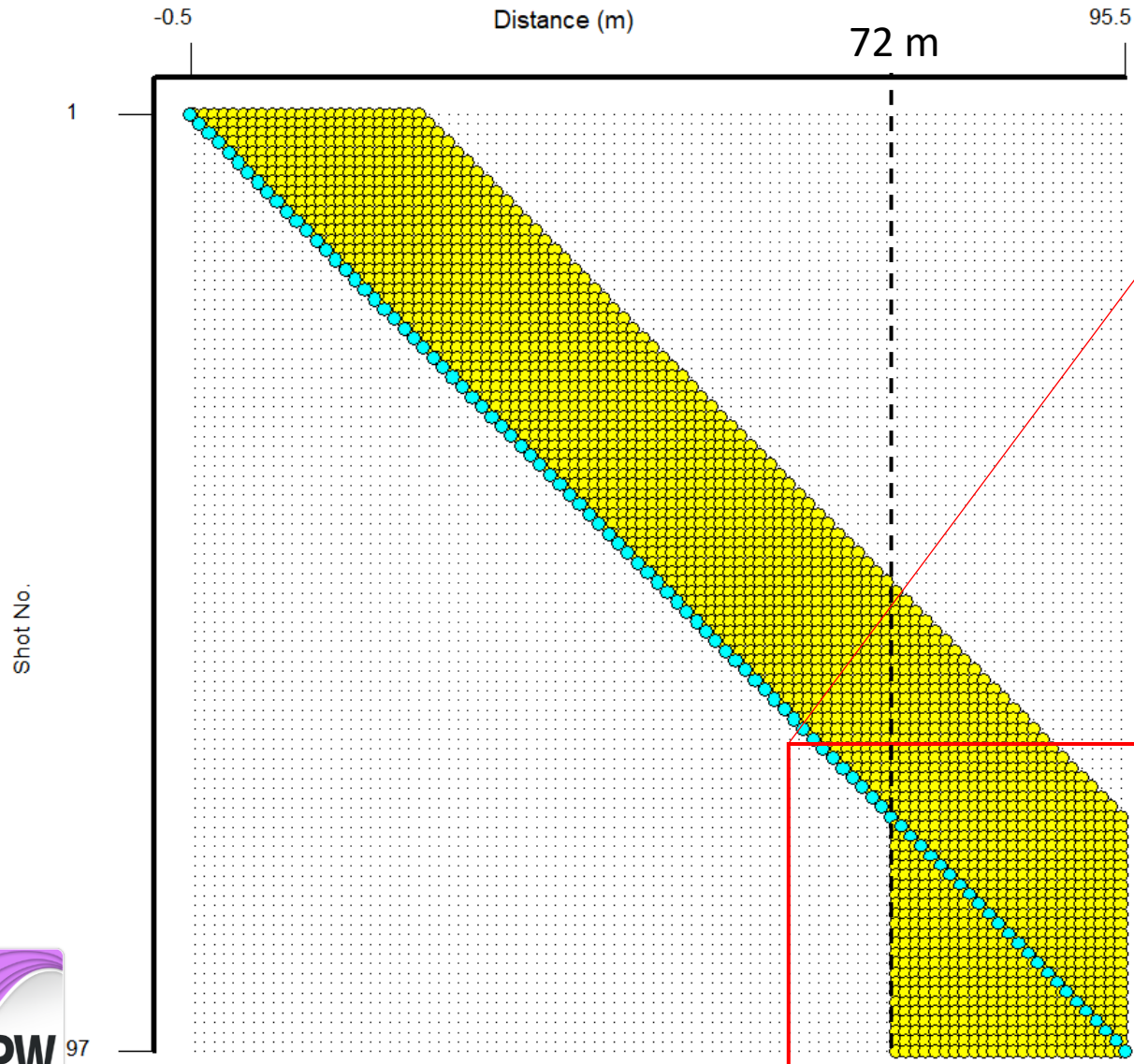
☒ Fixed receiver  
First receiver position  m

Receiver interval  m

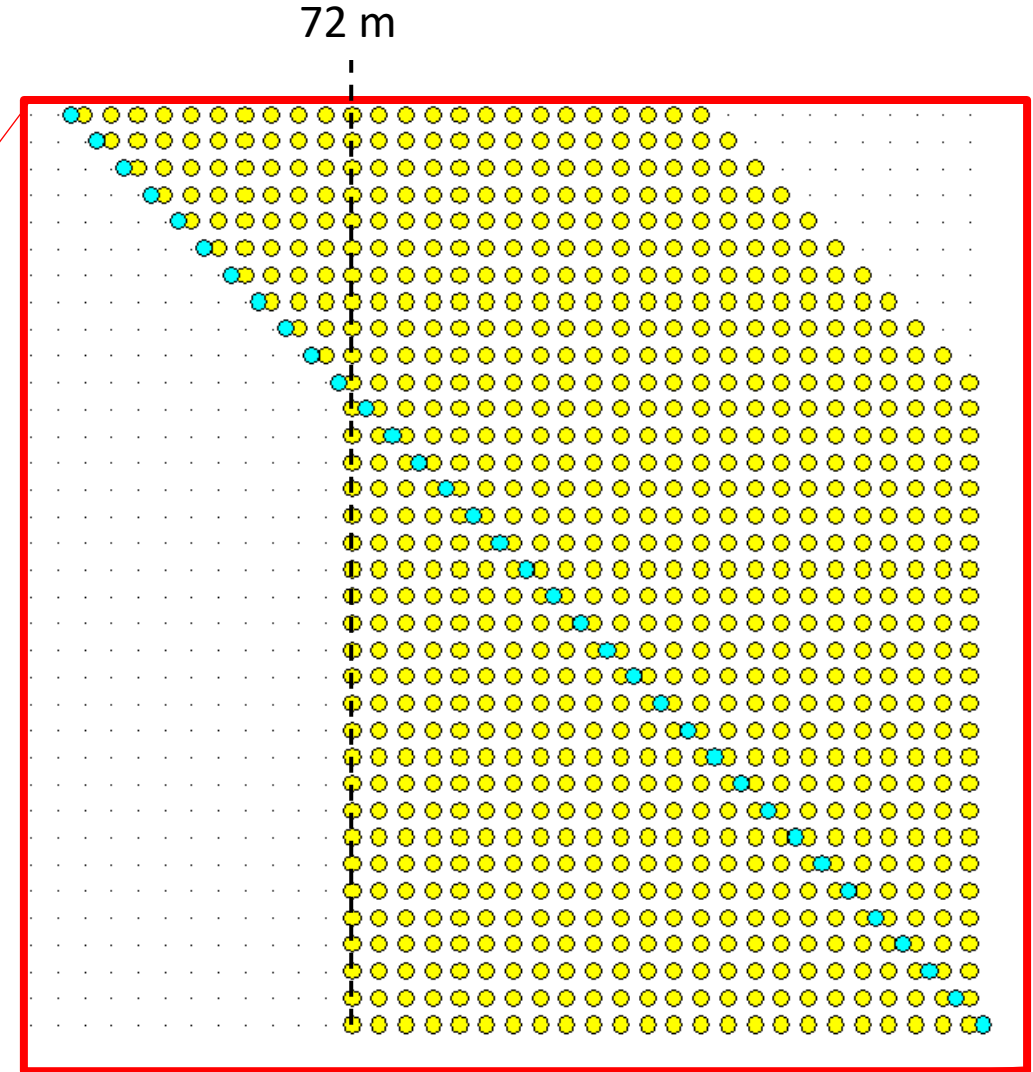


# Manually set up acquisition geometry

Source and/or receiver location can be edited manually.



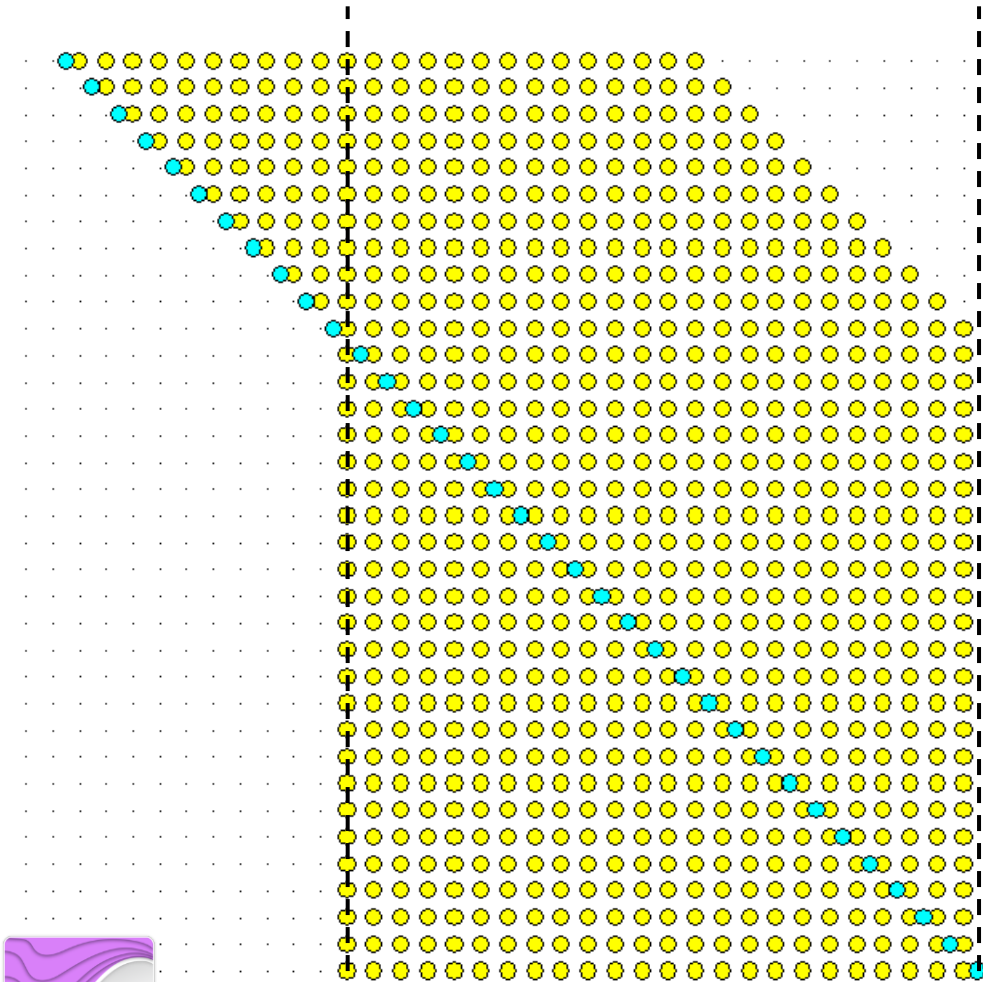
Receiver spreads were fixed after the shot of 71.5 m.



# Manually set up acquisition geometry

72 m

95.5 m



File list

Index	Edit	ID	Source (m)	1st receiver (m)	Receiver int. (m)	# of aux.
70	<input type="checkbox"/>	71	69.5	70	1	1
71	<input type="checkbox"/>	72				
72	<input type="checkbox"/>	73				
73	<input type="checkbox"/>	74	72.5	72	1	1
74	<input type="checkbox"/>	75	73.5	72	1	1
75	<input type="checkbox"/>	76	74.5	72	1	1
76	<input type="checkbox"/>	77	75.5	72	1	1
77	<input type="checkbox"/>	78	76.5	72	1	1
78	<input type="checkbox"/>	79	77.5	72	1	1
79	<input type="checkbox"/>	80	78.5	72	1	1

☐ Apply source coordinates from file header ☒ Active data  
☐ Apply receiver coordinates from file header ☐ Passive data

OK  
Cancel  
Next  
Back  
Set up  
Set # of aux.  
Delete  
Export  
Import

Number of files  
97

Change 1<sup>st</sup> receiver distance

File list

Index	Edit	ID	Source (m)	1st receiver (m)	Receiver int. (m)	# of aux.
87	<input type="checkbox"/>	88	86.5	72	1	1
88	<input type="checkbox"/>	89	87.5	72	1	1
89	<input type="checkbox"/>	90	88.5	72	1	1
90	<input type="checkbox"/>	91	89.5	72	1	1
91	<input type="checkbox"/>	92	90.5	72	1	1
92	<input type="checkbox"/>	93	91.5	72	1	1
93	<input type="checkbox"/>	94	92.5	72	1	1
94	<input type="checkbox"/>	95	93.5	72	1	1
95	<input type="checkbox"/>	96	94.5	72	1	1
96	<input type="checkbox"/>	97	95.5	72	1	1

☐ Apply source coordinates from file header ☒ Active data  
☐ Apply receiver coordinates from file header ☐ Passive data

Cancel  
Next  
Back  
Set up  
Set # of aux.  
Delete  
Export  
Import

Number of files  
97

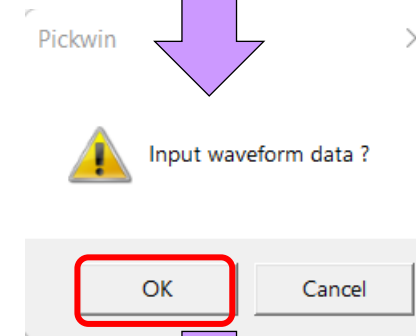
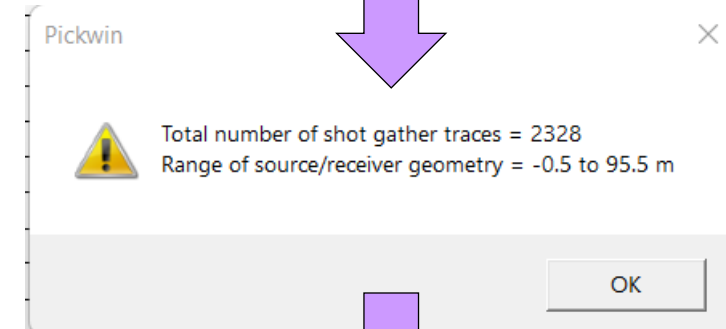
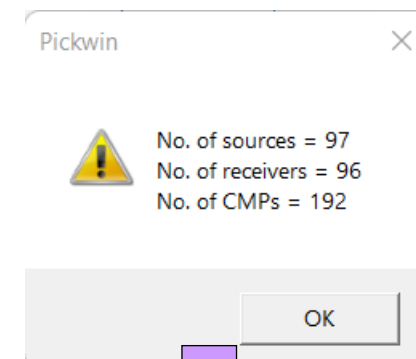
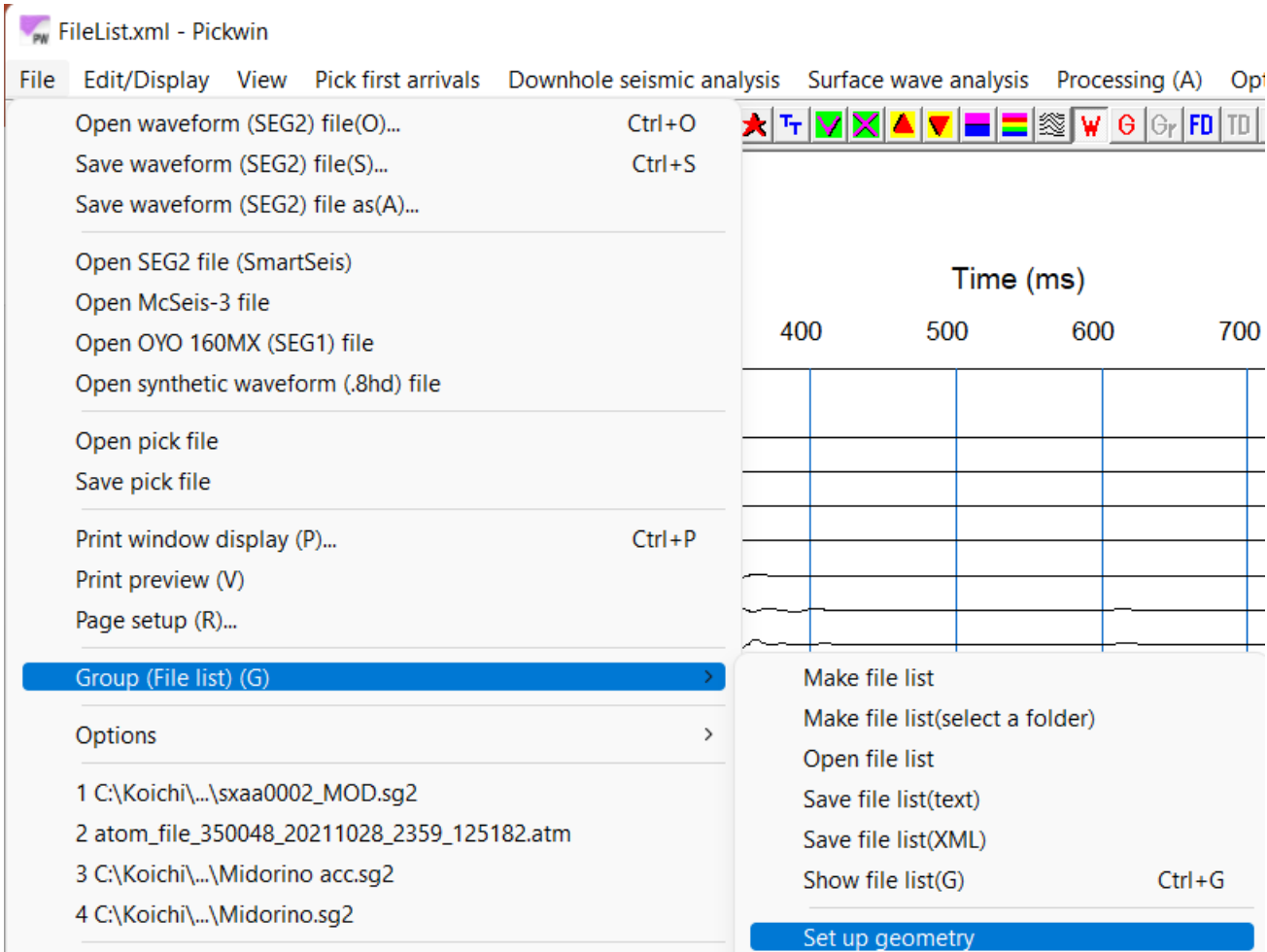
Use "Next" and "Back" to scroll shots



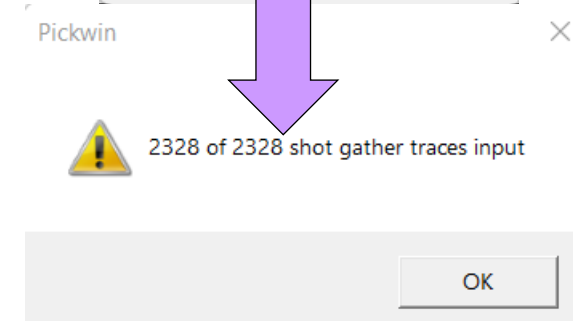


# Set up Geometry

Select “File”, “Group (File list)”, “Set up geometry”

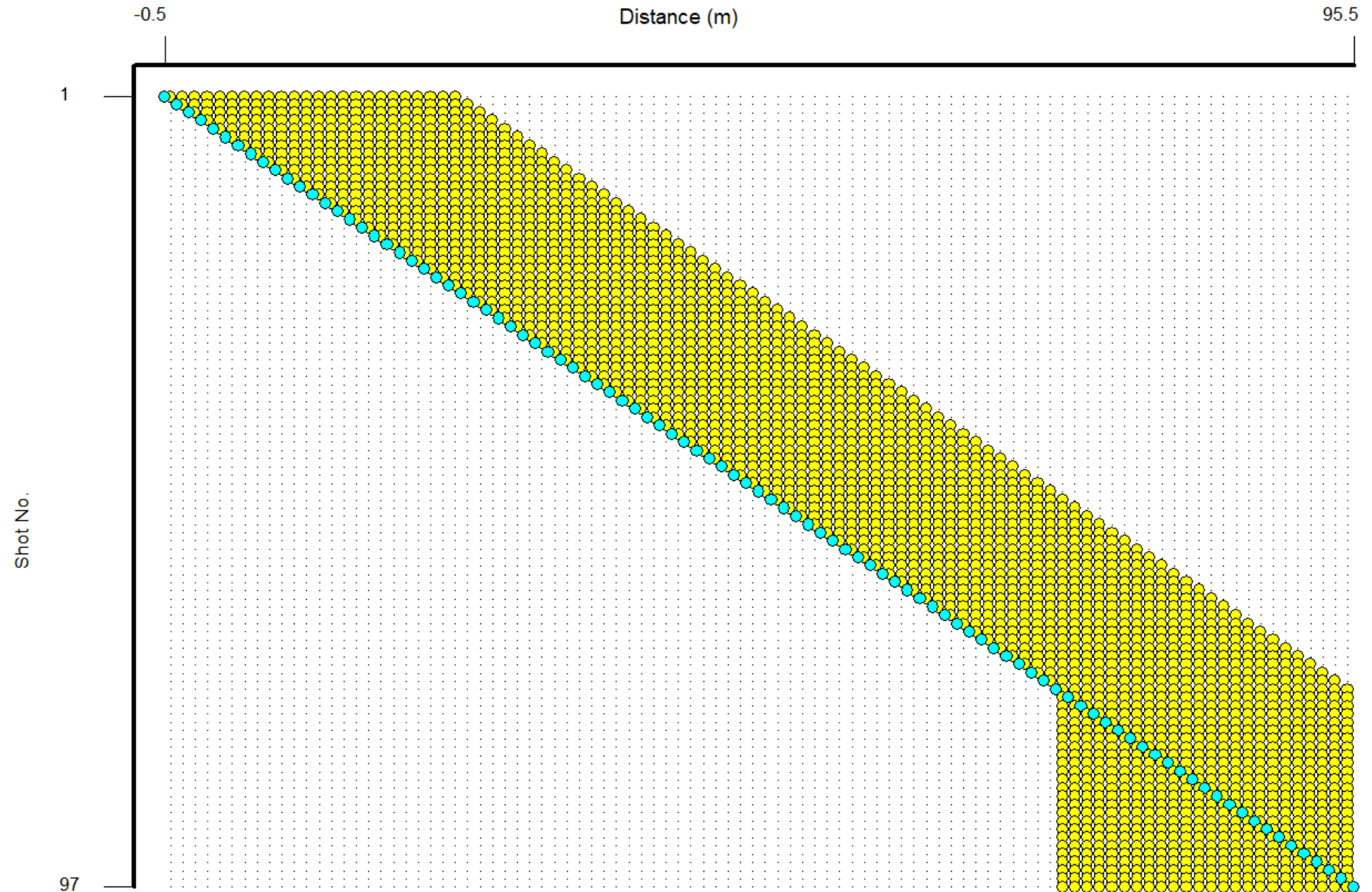


Select “OK”



# Set up Geometry

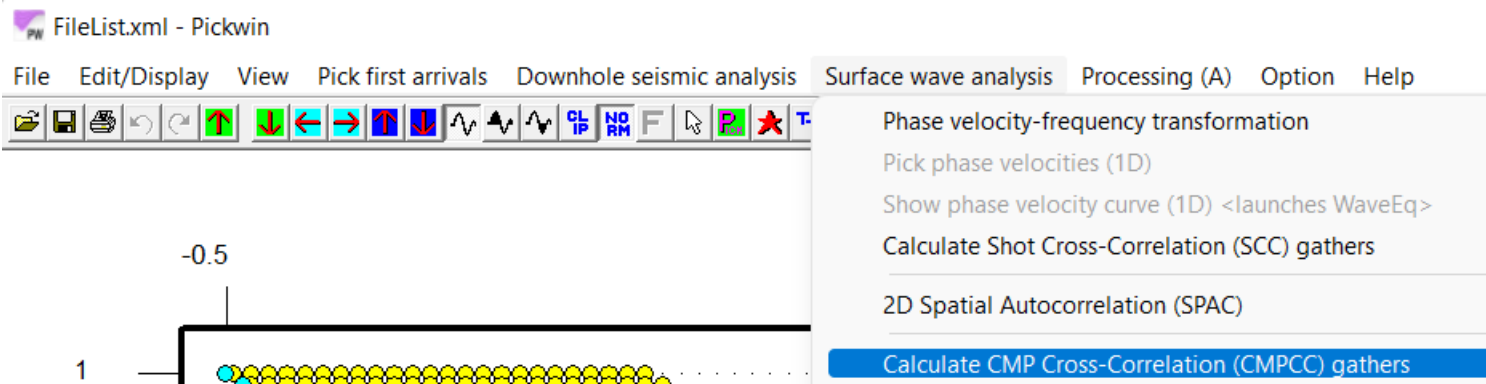
Confirm acquisition geometry



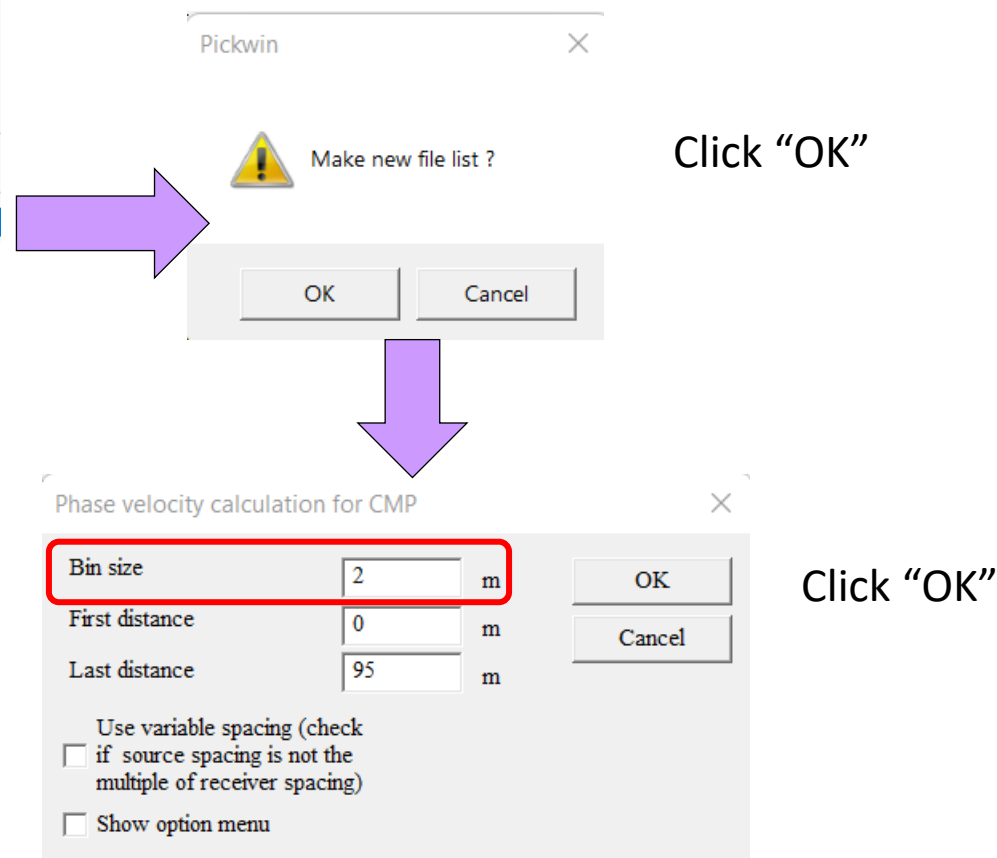


# Calculate CMP Cross-Correlation (CMPCC) gathers

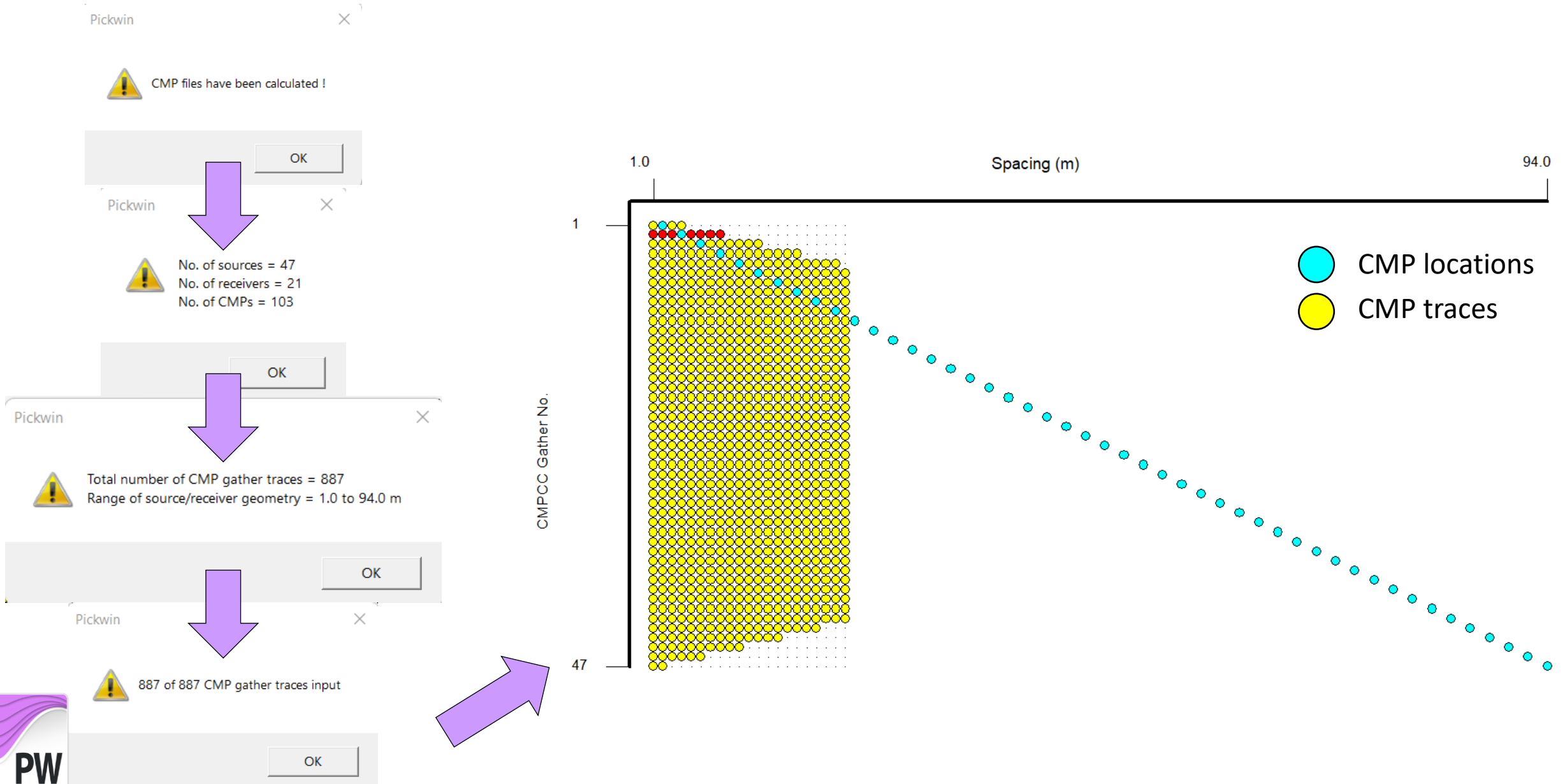
Select "Surface wave analysis", "Calculate CMP Cross-Correlation (CMPCC) gathers"



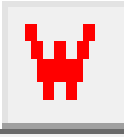
The bin size is interval of CMPCC gathers.  
Default value is set to the double of receiver spacing.

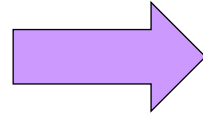



# Calculate CMP Cross-Correlation (CMPCC) gathers



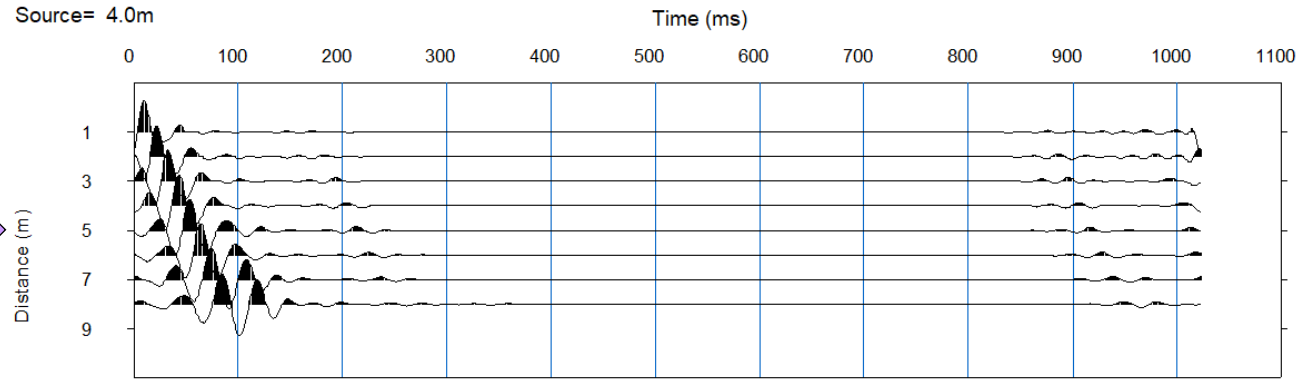
# Examine CMP Cross-Correlation (CMPCC) gathers (not required)

Click  to show CMPCC traces

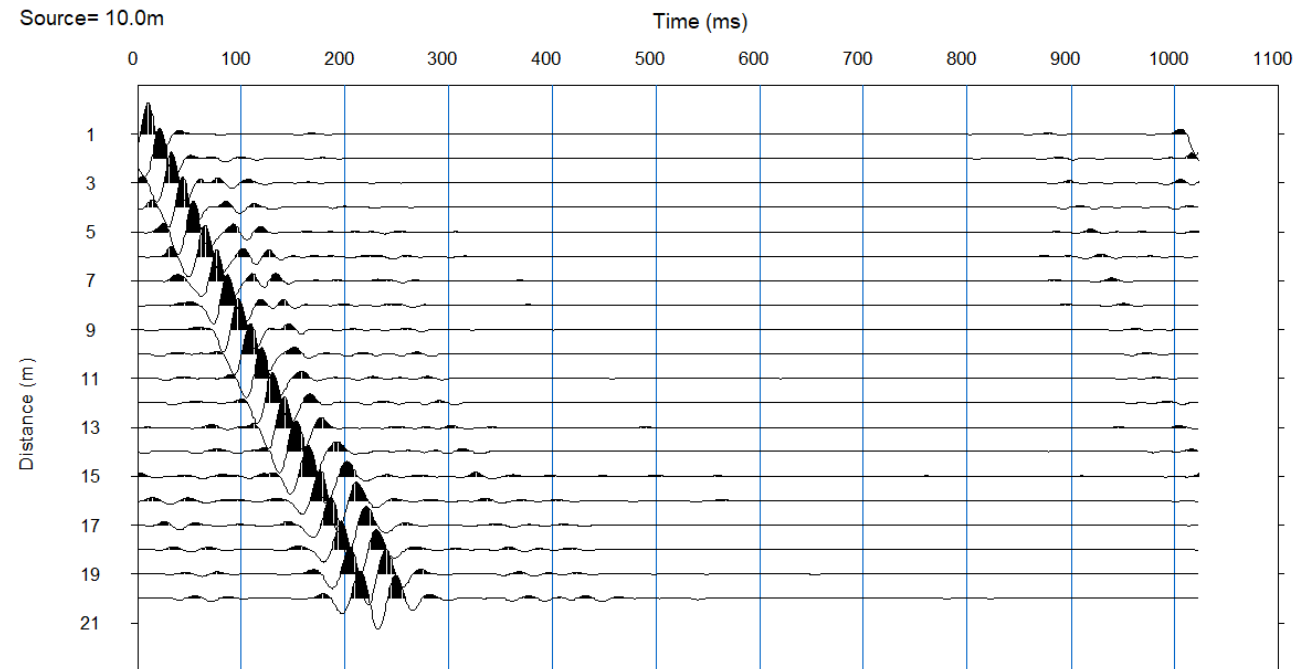


Click  to show CMPCC geometry

Use  to scroll CMPCC gathers



C:\Koichi\SeisImager\Pickwin95\_ee\testdata\SurfaceWaveExample(ChibaNT)\cmp\_009400.sg2  
cmp\_000200.sg2-cmp\_009400.sg2

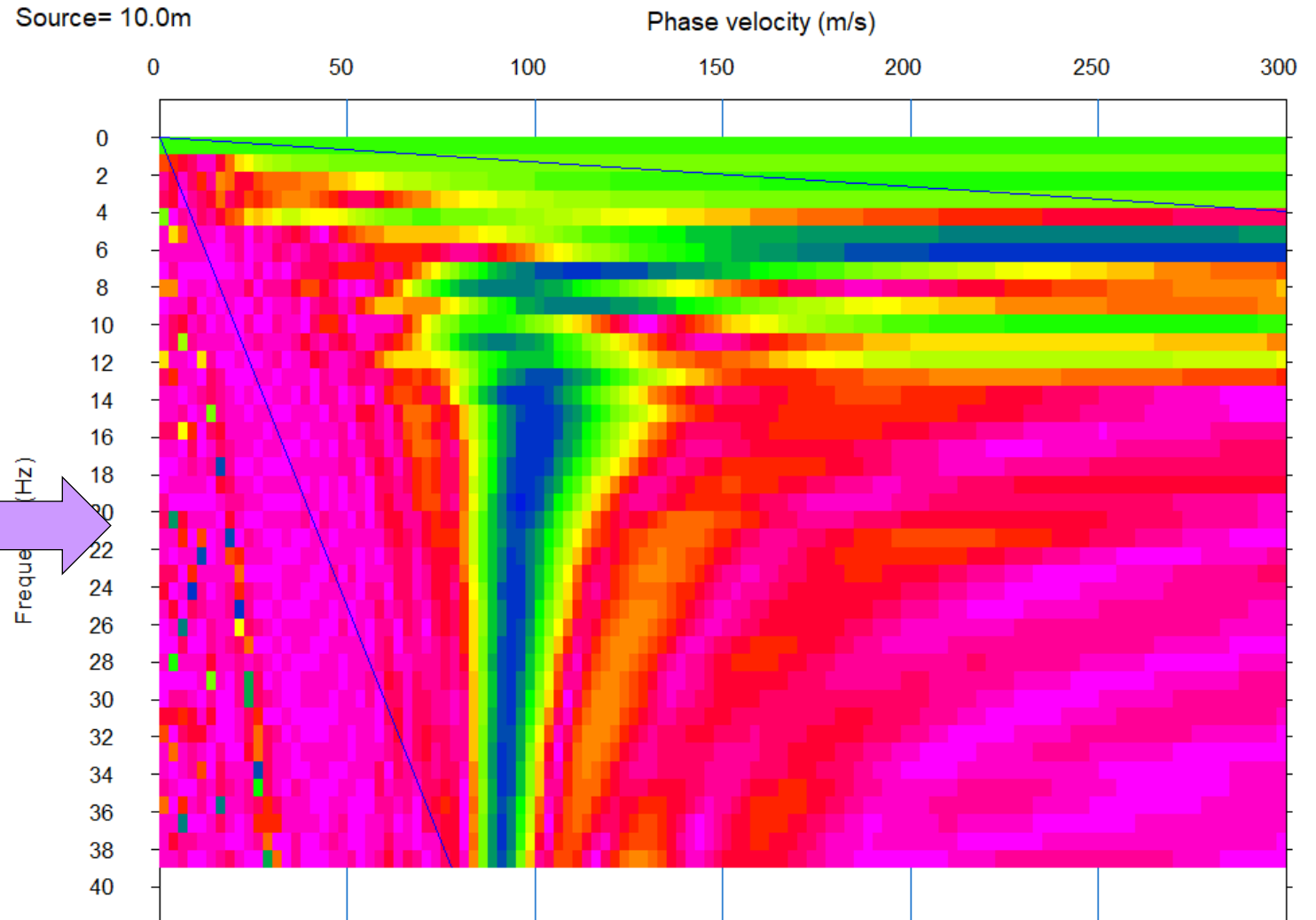
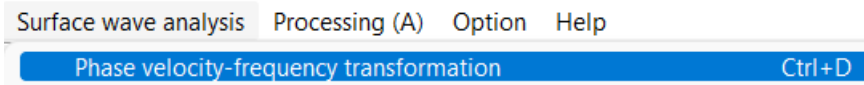


C:\Koichi\SeisImager\Pickwin95\_ee\testdata\SurfaceWaveExample(ChibaNT)\cmp\_009400.sg2  
cmp\_000200.sg2-cmp\_009400.sg2

# Examine CMP Cross-Correlation (CMPCC) gathers

It is strongly recommended to take a look several phase velocity images to decide phase velocity and frequency ranges, and minimum frequency to pick phase velocity before picking dispersion curves

Select “Surface wave analysis”, “Phase velocity-frequency transformation” or press “Ctrl+D” to show a phase velocity image for each CMPCC gather.

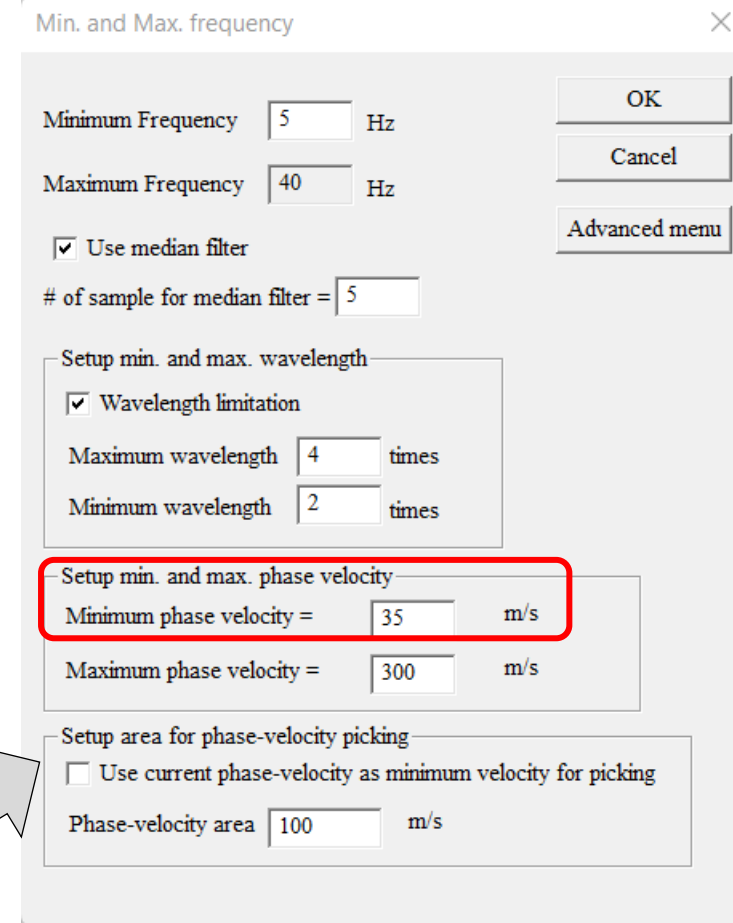
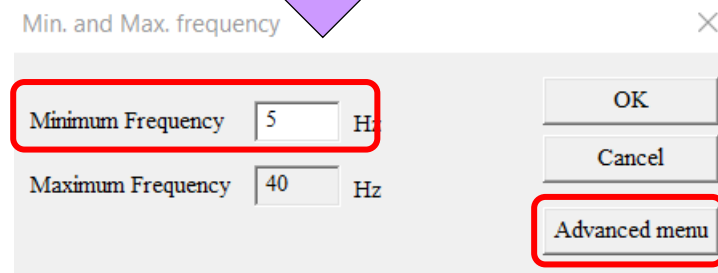
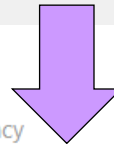
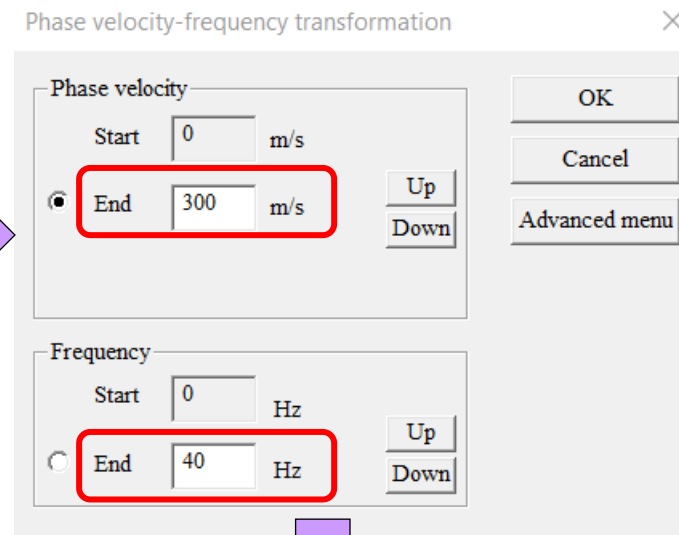
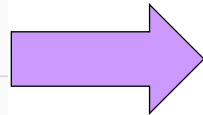
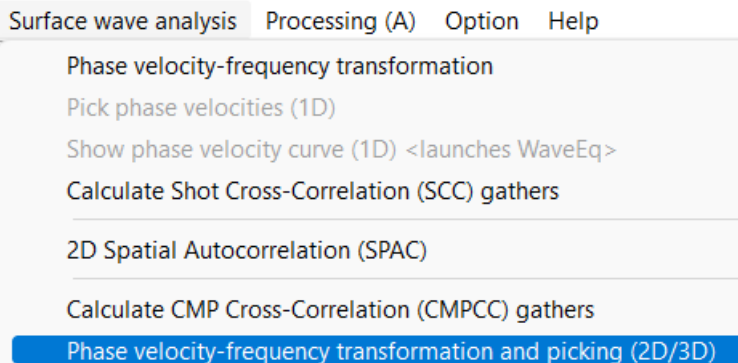


# Calculate phase velocity images and pick dispersion curves for all CMPCC gathers

Select “Surface wave analysis”, “Phase velocity-frequency transformation and picking (2D/3D)”

Set up phase velocity and frequency range based on phase velocity image shown in previous page.

It is sometimes better to change “Minimum phase velocity”. Click “Advanced menu” to change it.

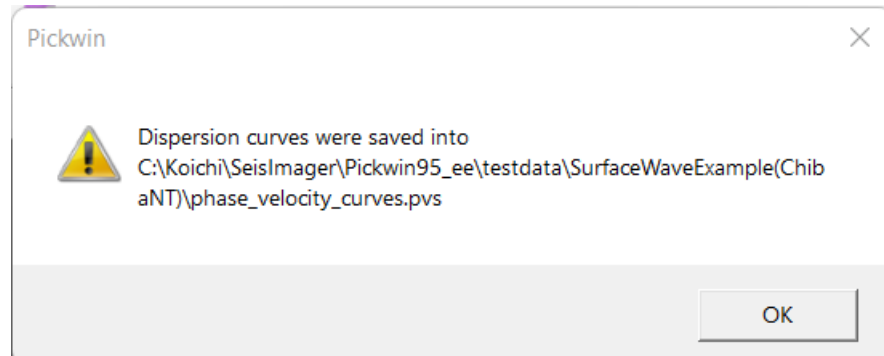


Change minimum frequency to pick dispersion curves based on the phase velocity image.

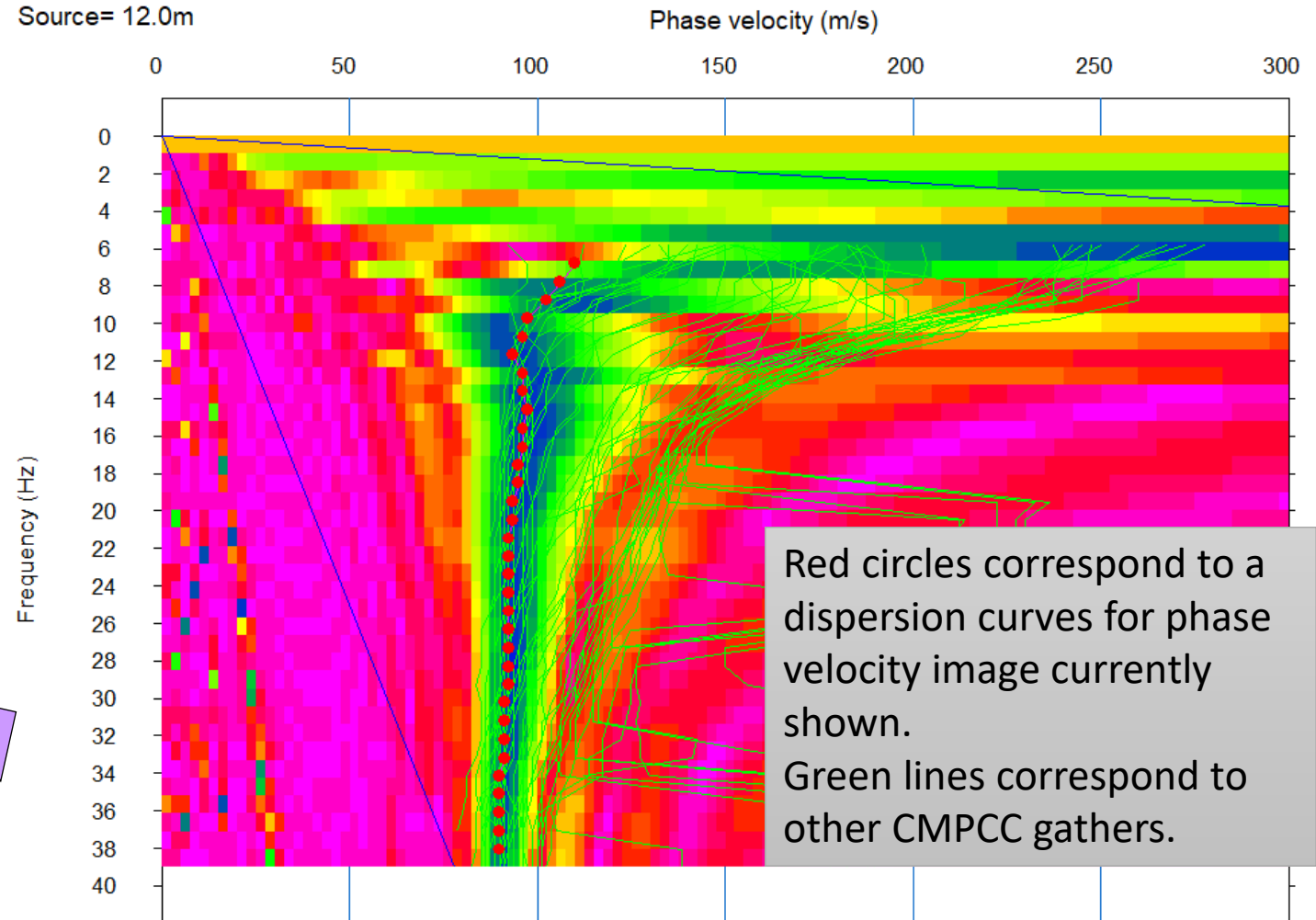
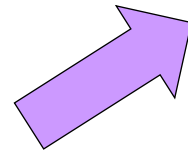
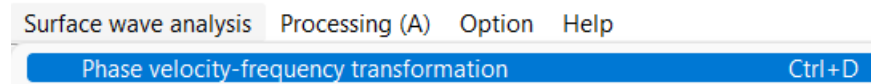


# Calculate phase velocity images and pick dispersion curves for all CMPCC gathers

Picked dispersion curves were automatically saved in a .pvs file.

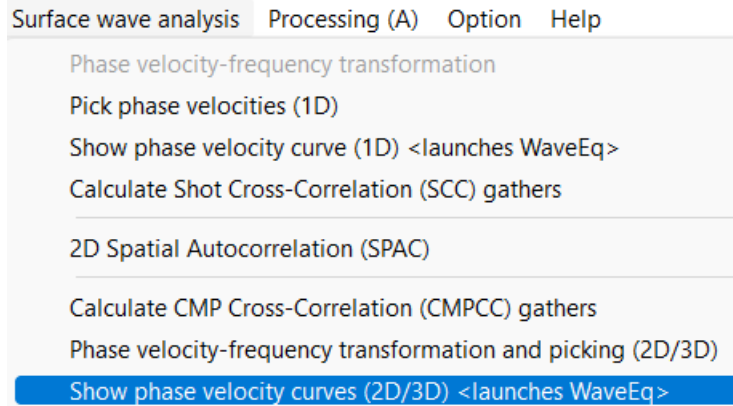


It is strongly recommended to take a look several phase velocity images.  
Select “Surface wave analysis”, “Phase velocity-frequency transformation” or press “Ctrl+D” to show picked dispersion curves on a phase velocity image for each CMPCC gather.

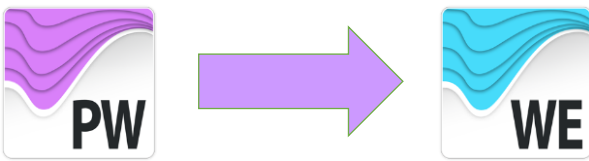
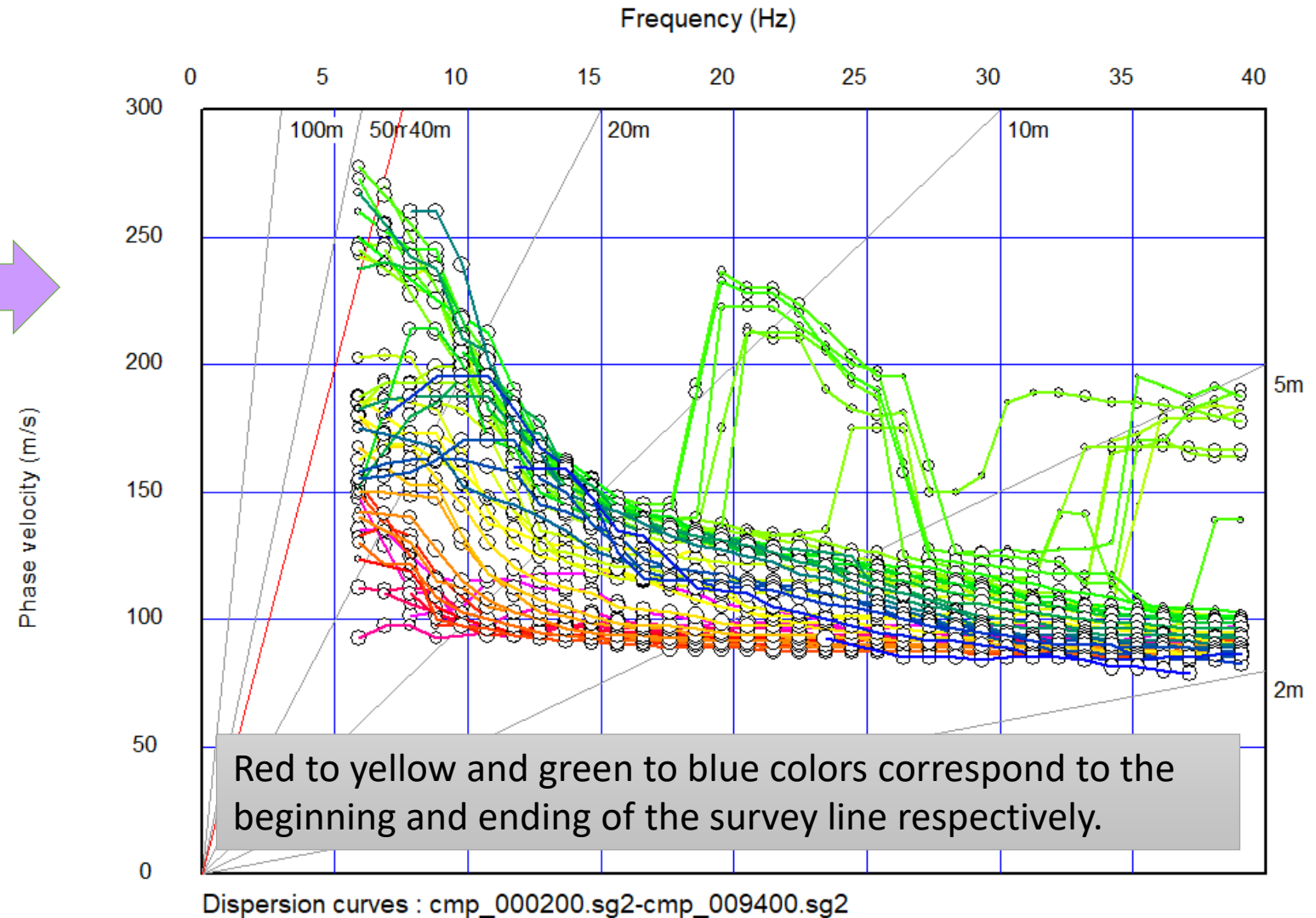


# Show dispersion curves by WaveEq

Select “Surface wave analysis”, “Show Phase velocity curves (2D/3D)”.



WaveEq is automatically launched and phase velocity curves appears.







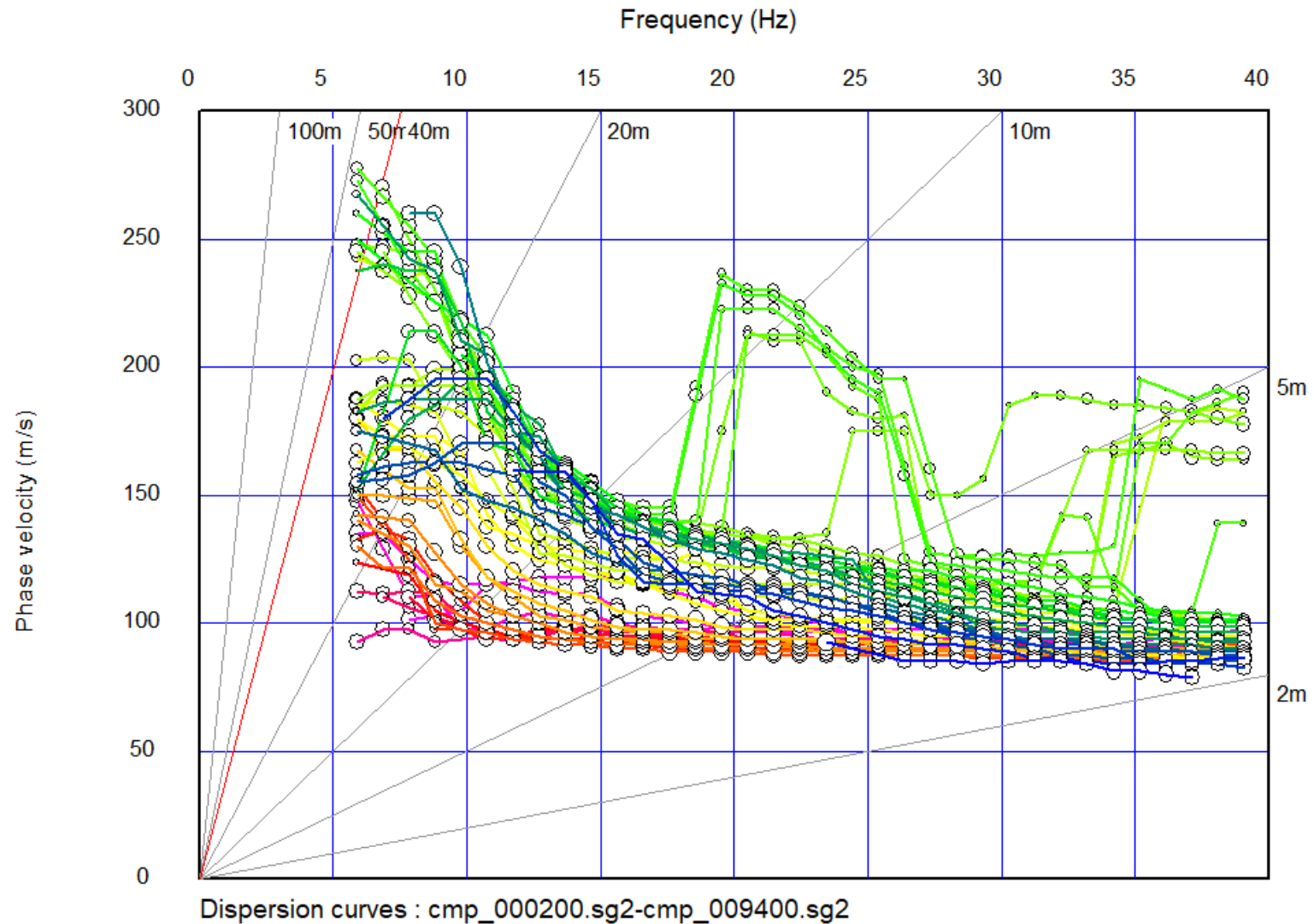
# Show dispersion curves by WaveEq

Delete noises or unnecessary phase velocities like 1D processing.

Use  to scroll dispersion curves.

Use  to change how many dispersion curves are shown.

Use  to single and multi phase velocities.





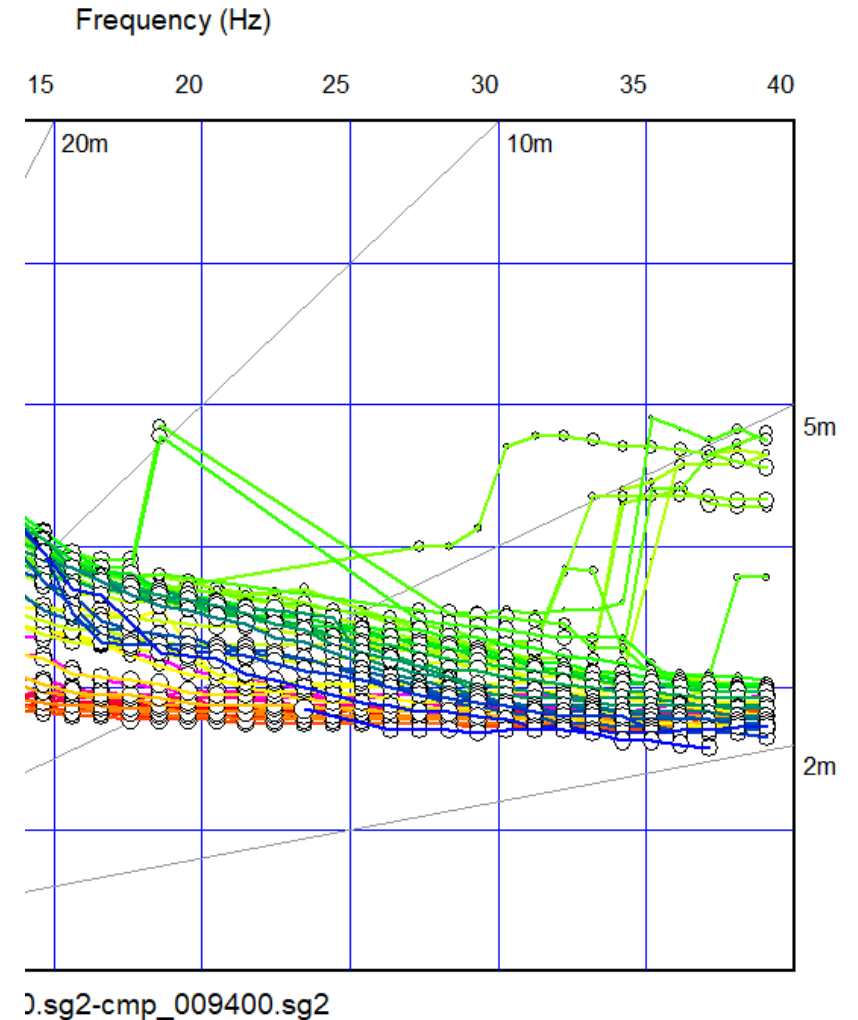
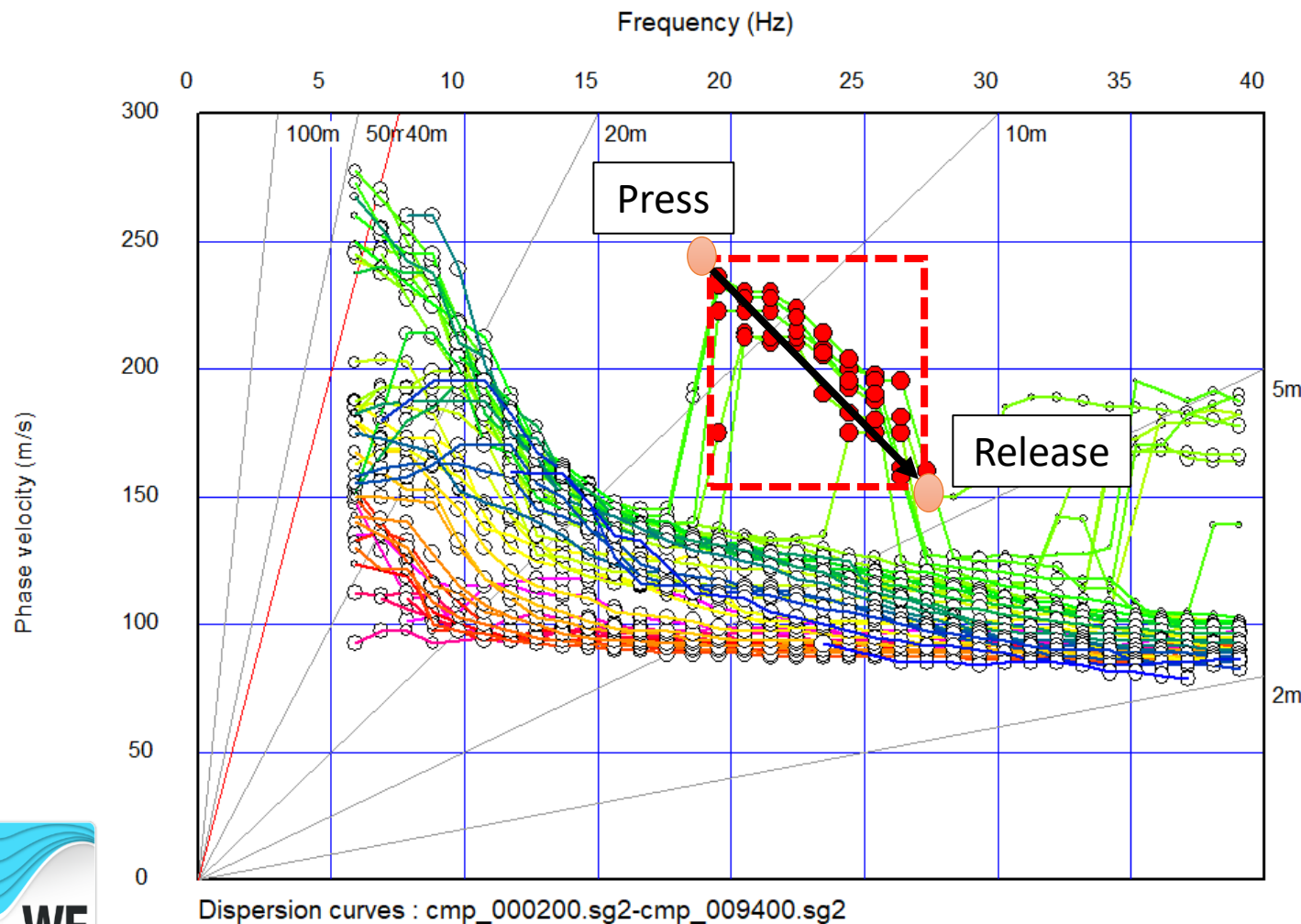
# Edit dispersion curves

Click

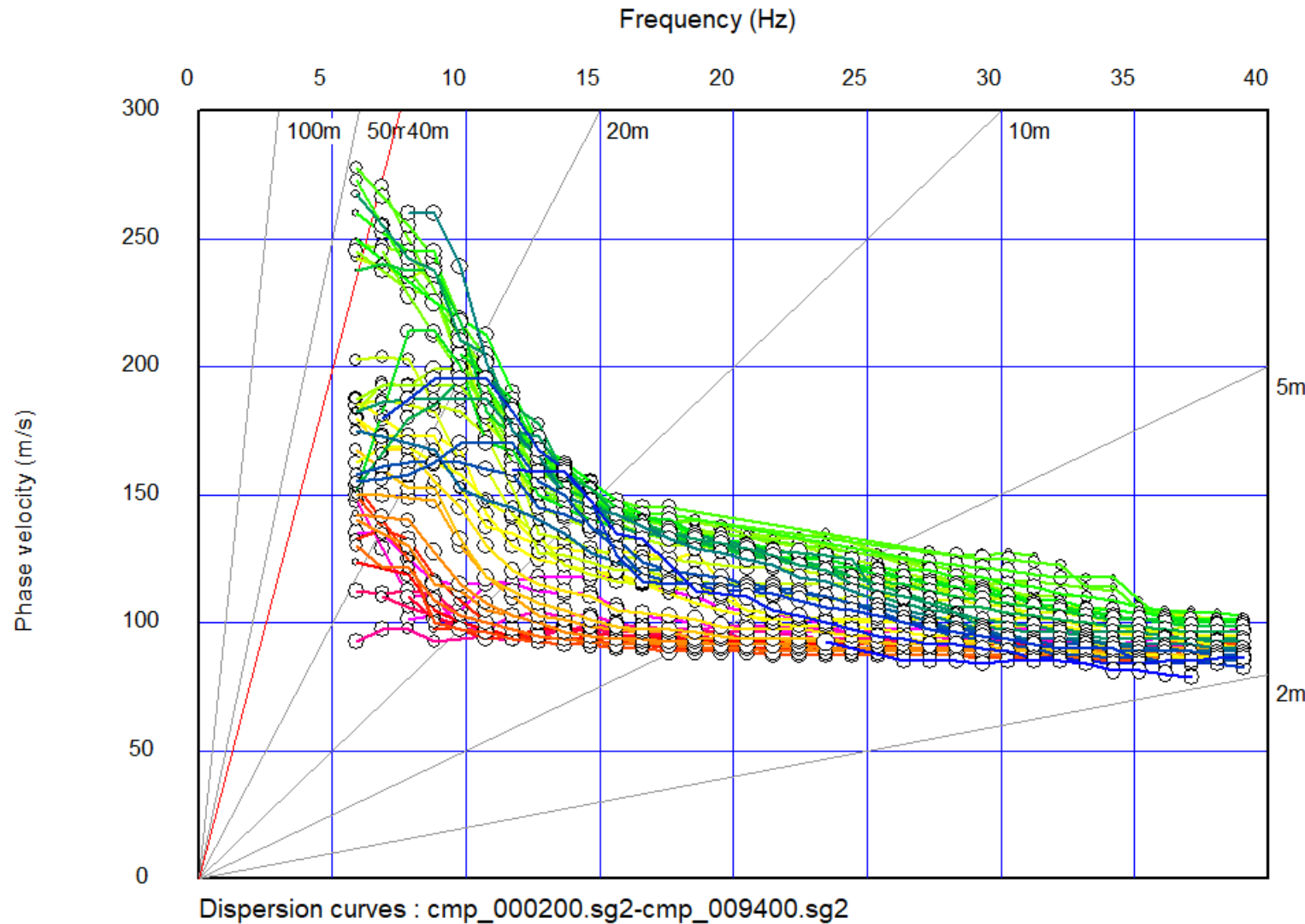


to select multi-phase velocities.

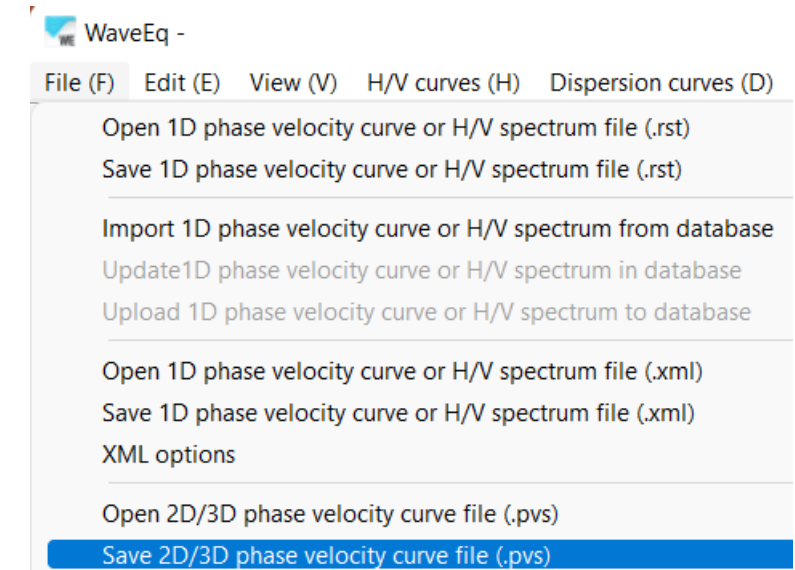
Hit “Delete” key to delete selected phase velocities.



# Edit dispersion curves

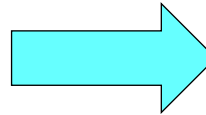
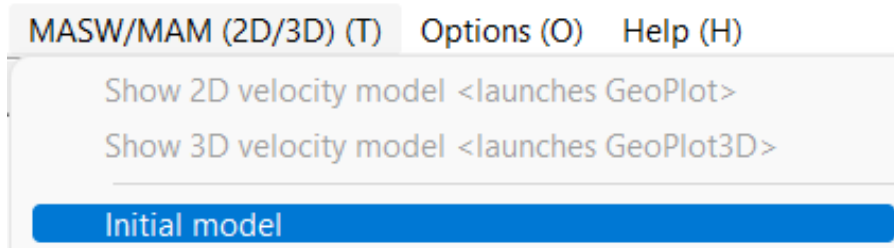


Select “File”, “Save 2D/3D phase velocity curve” to export all dispersion curves to an ASCII file (.pvs).

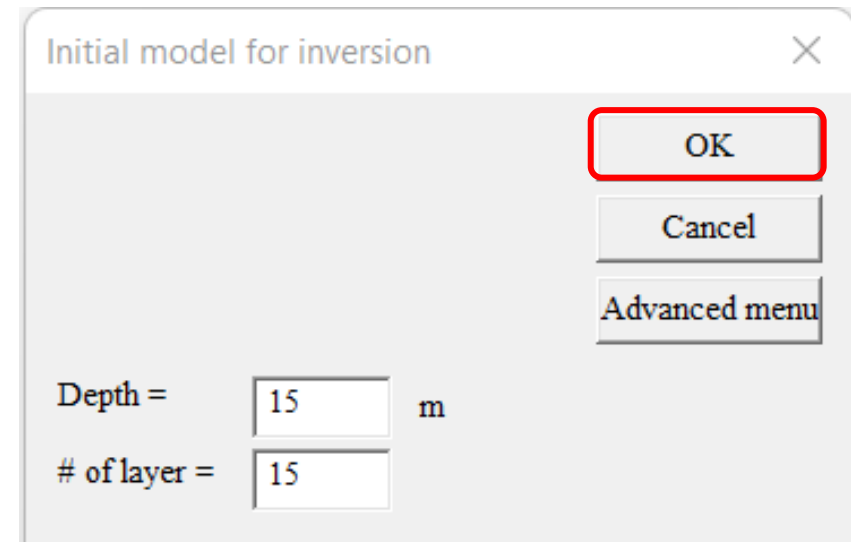


# Create an initial velocity model

Select “MASW/MAM (2D/3D)”, “Initial model” to create an initial velocity model.



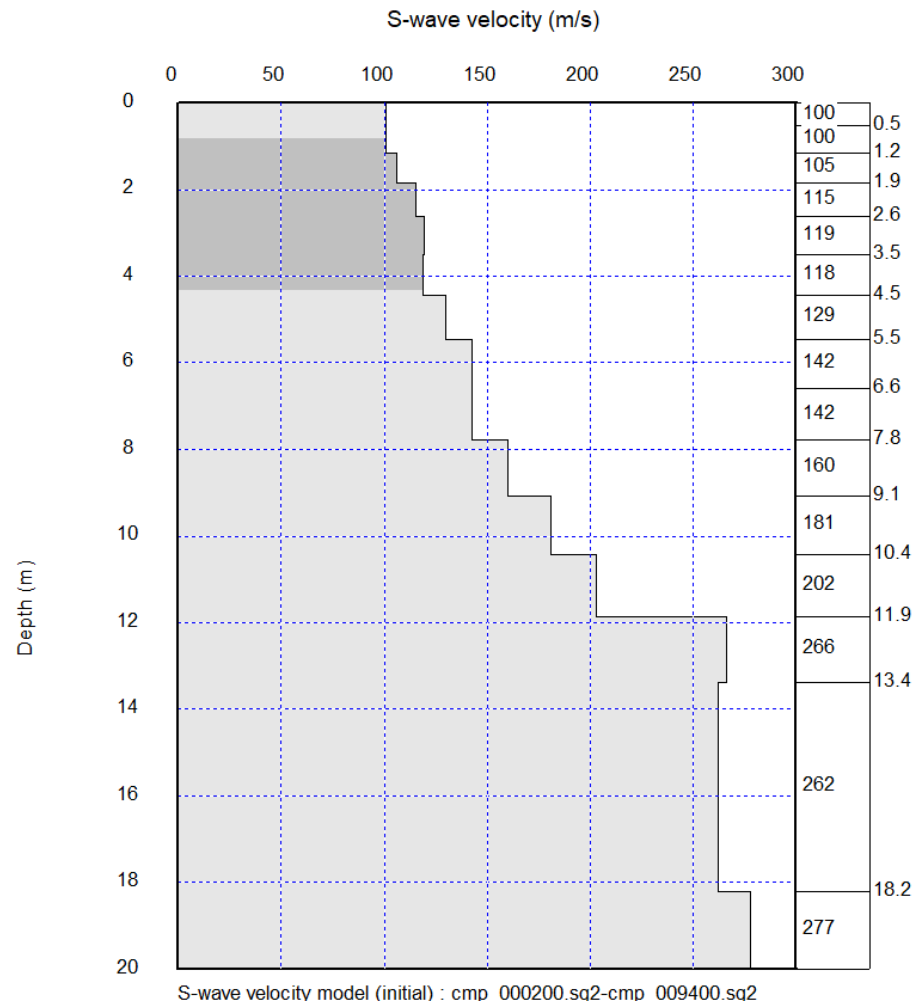
Set depth and the number of layers of model and click “OK”.




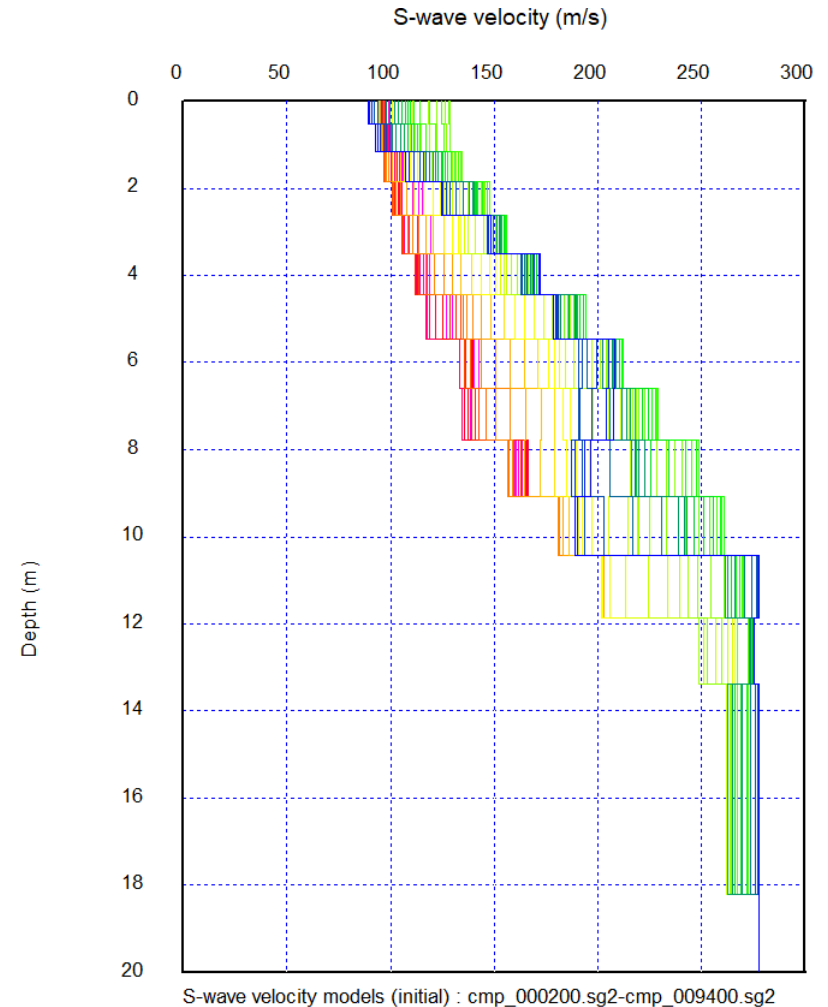
# Create an initial velocity model

Initial velocity model appears.

Index=0 Distance=2.00m



Use  to change how many velocity profiles are shown like dispersion curves.

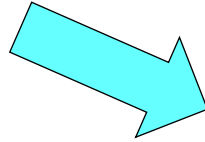


# Show 2D velocity model by GeoPlot3D

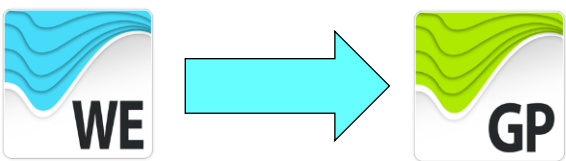
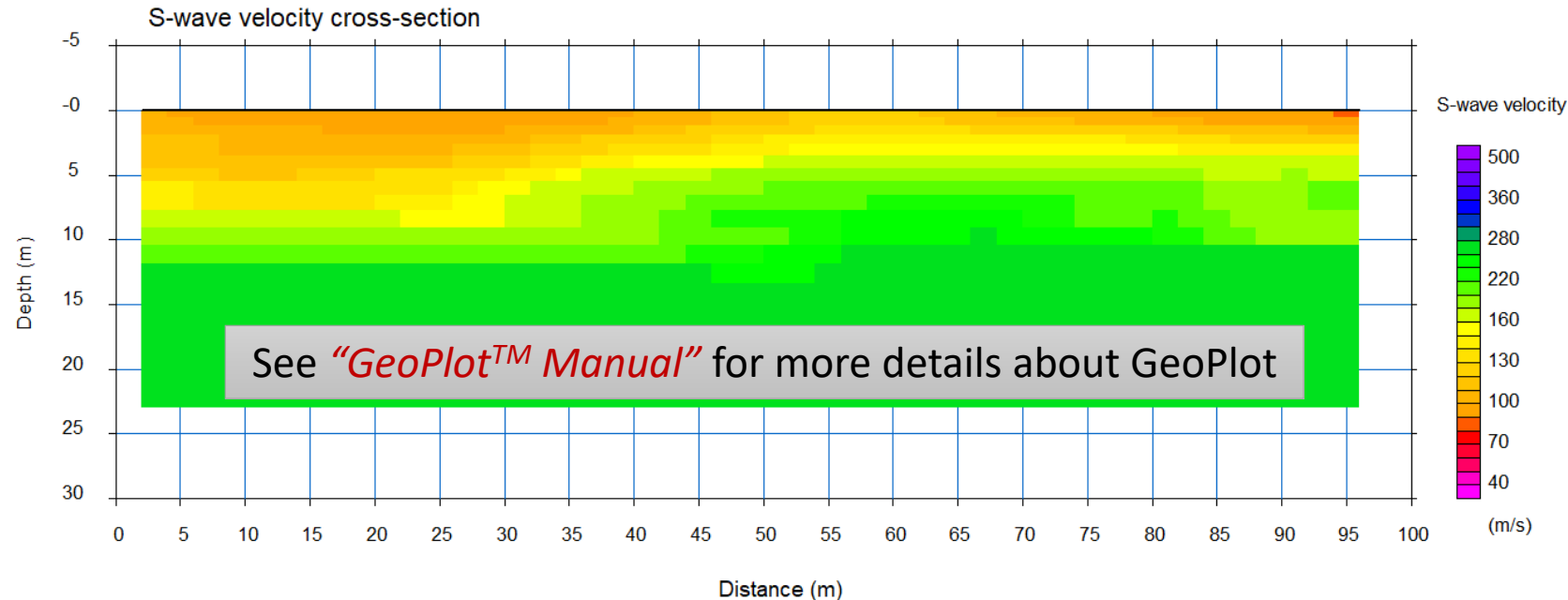
Select “MASW (2D/3D)”, “Show 2D velocity model <launches GeoPlot>”. Note that you can apply inversion before showing 2D velocity model.

MASW/MAM (2D/3D) (T) Options (O) Help (H)

Show 2D velocity model <launches GeoPlot>

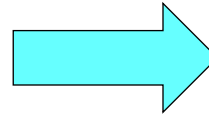
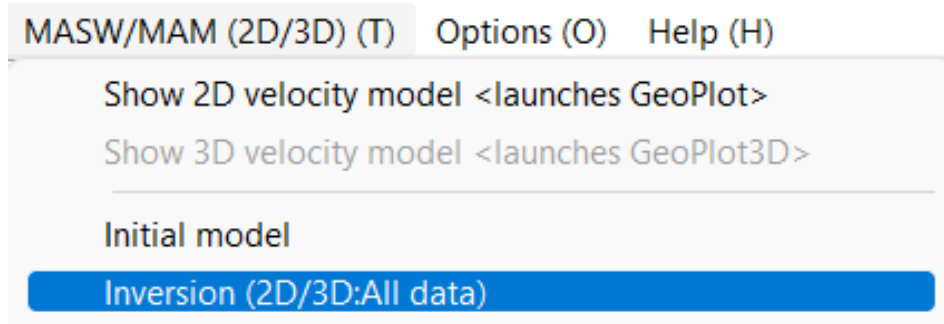


GeoPlot launches and velocity model appears.

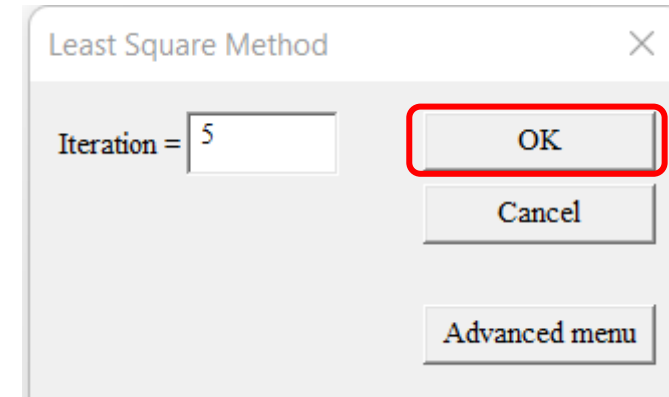


# Apply inversion

Select “MASW (2D/3D)”, “Inversion (2D/3D:All data)” to apply inversion to all dispersion curves at once.



Set the number of iteration for inversion and click “OK” to start the inversion.



See “*SeisImager/SW-ProTM Manual*” for more details about various inversion.