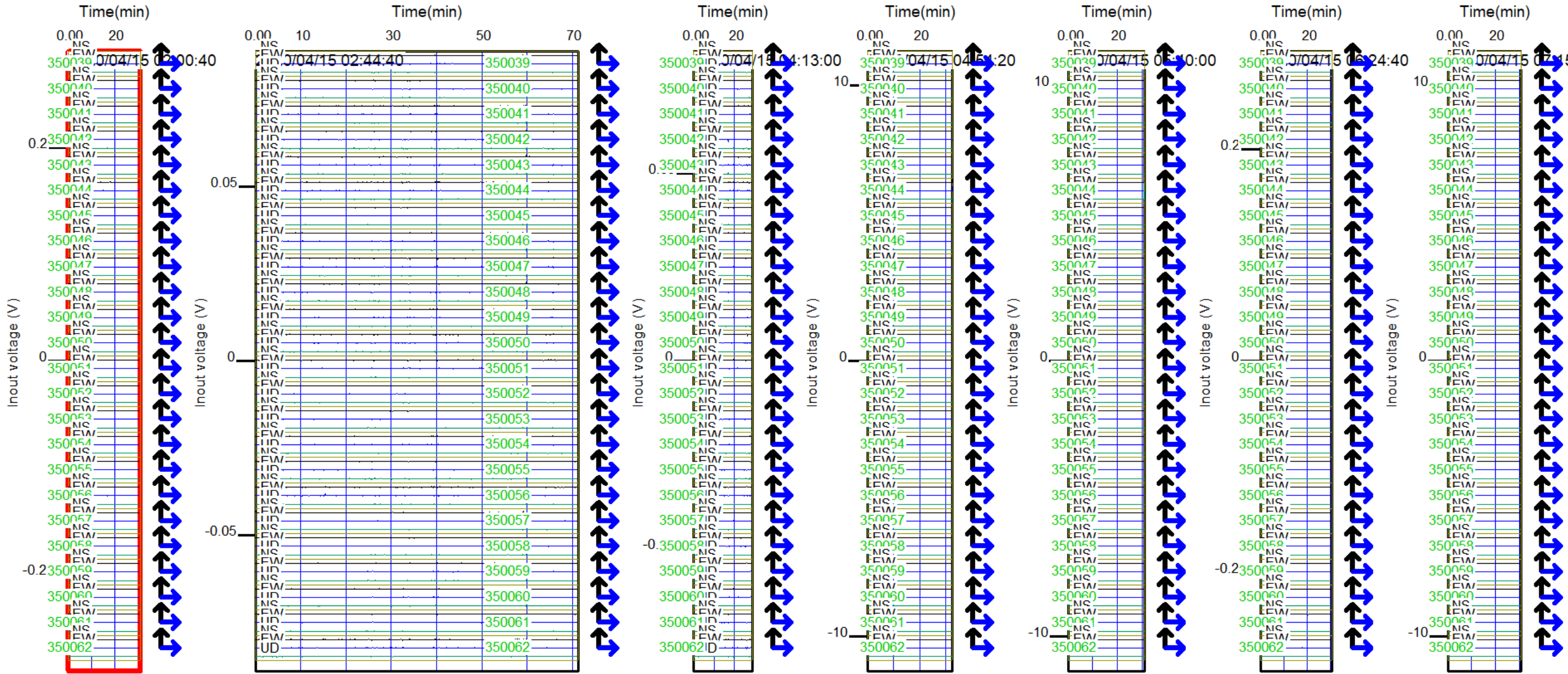


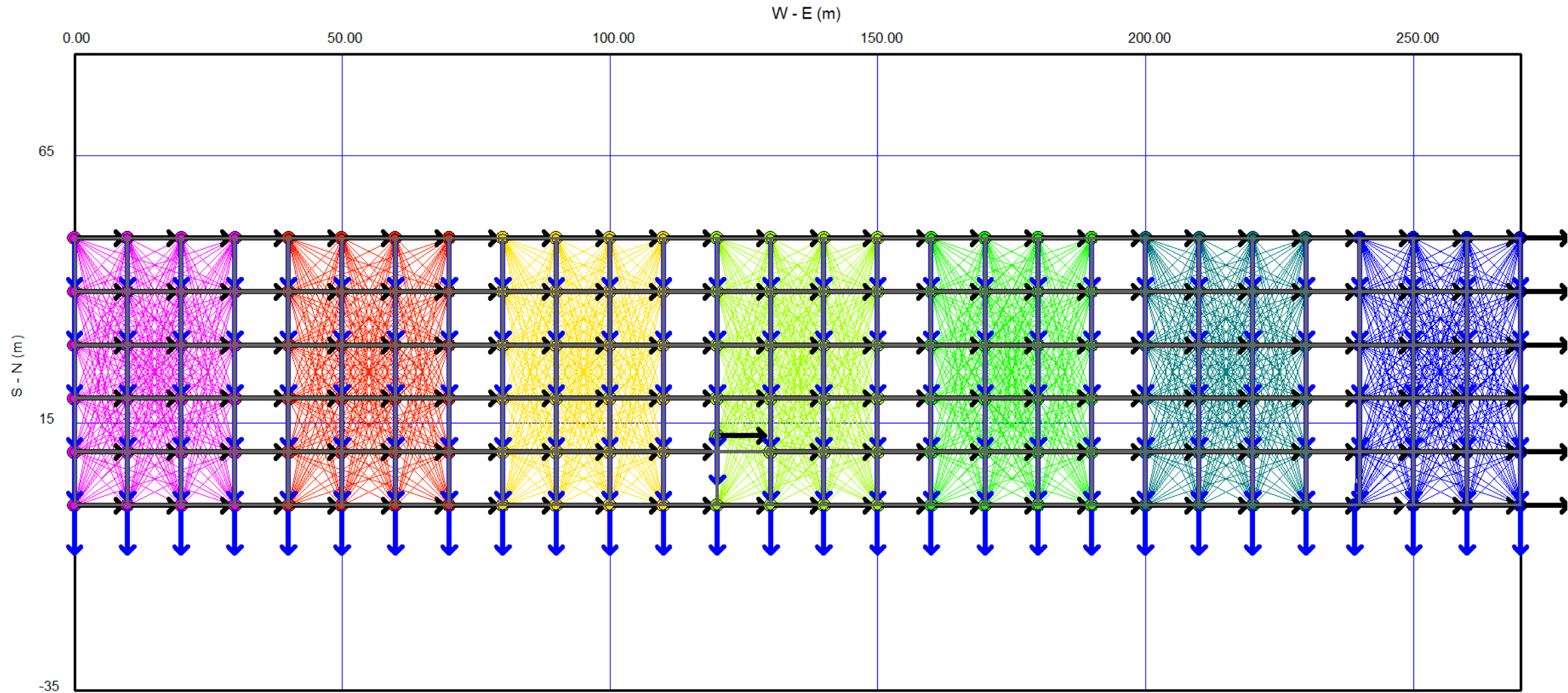
3D3C ambient noise tomography processing

- Calculating H/V spectra from 3D3C data
- Calculating Love wave dispersion curves from 3D3C data based on CMP-SPAC
- Numerical example of 3D3C processing

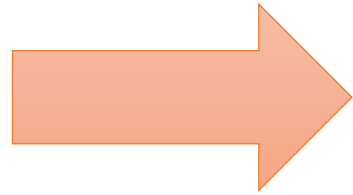
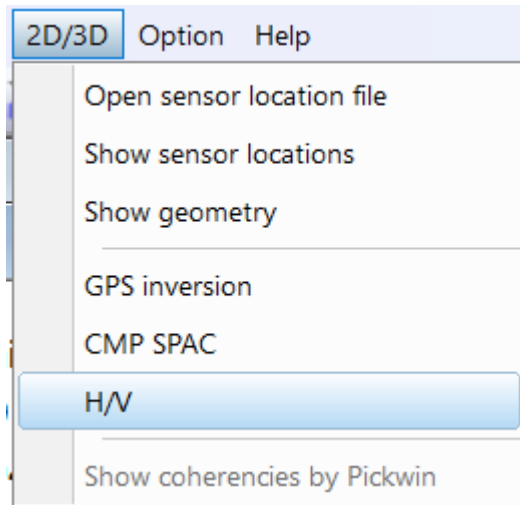
Raw waveform data obtained from 24 3C sensor



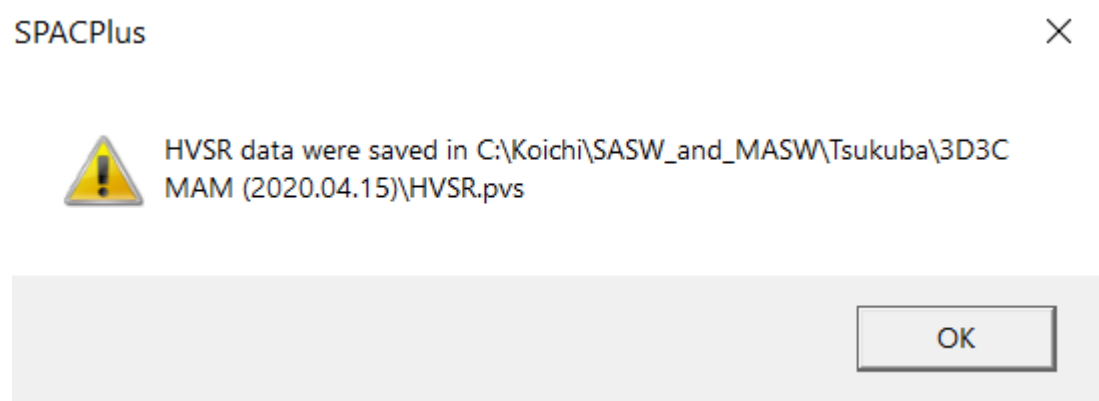
Geometry includes 3C sensor
(double circles indicate 3C sensors and blue and black arrows
indicate sensor orientation)



Calculate H/V for CMP bins




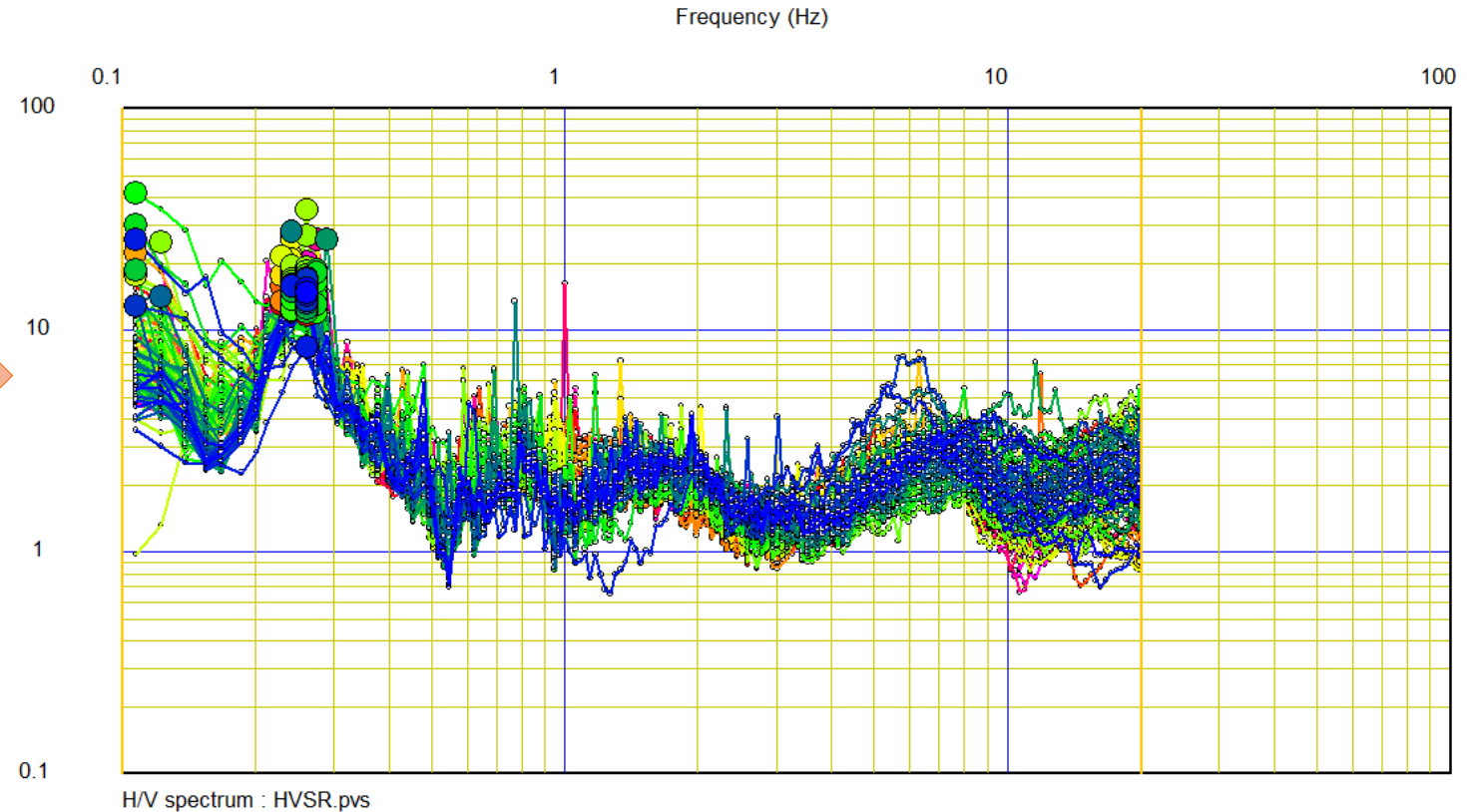
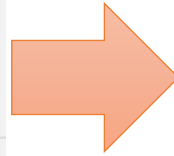
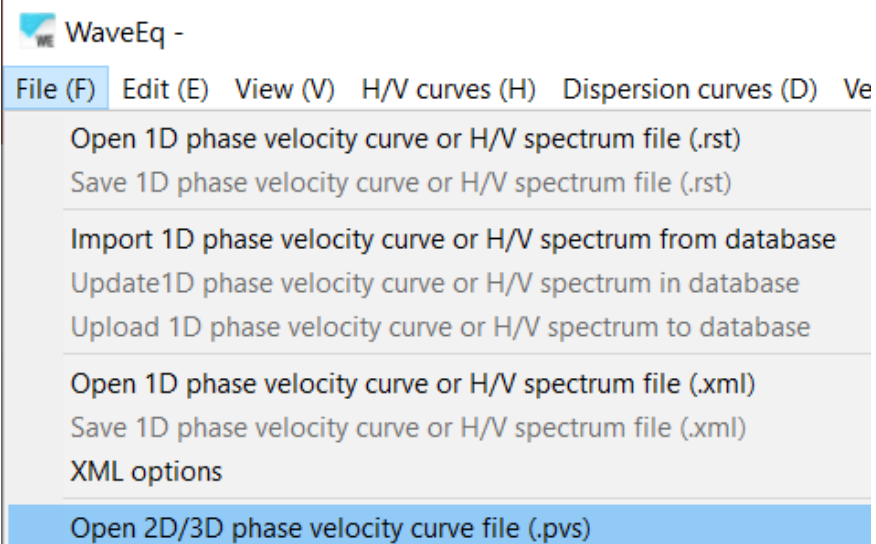
End of calculation



H/V curves were saved in "HVSR.pvs"

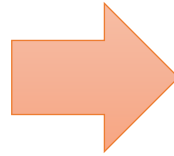
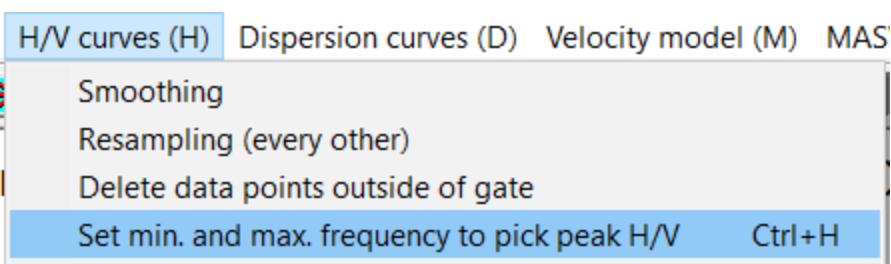
Import H/V curves to WaveEq

Click  to show all H/V curves.

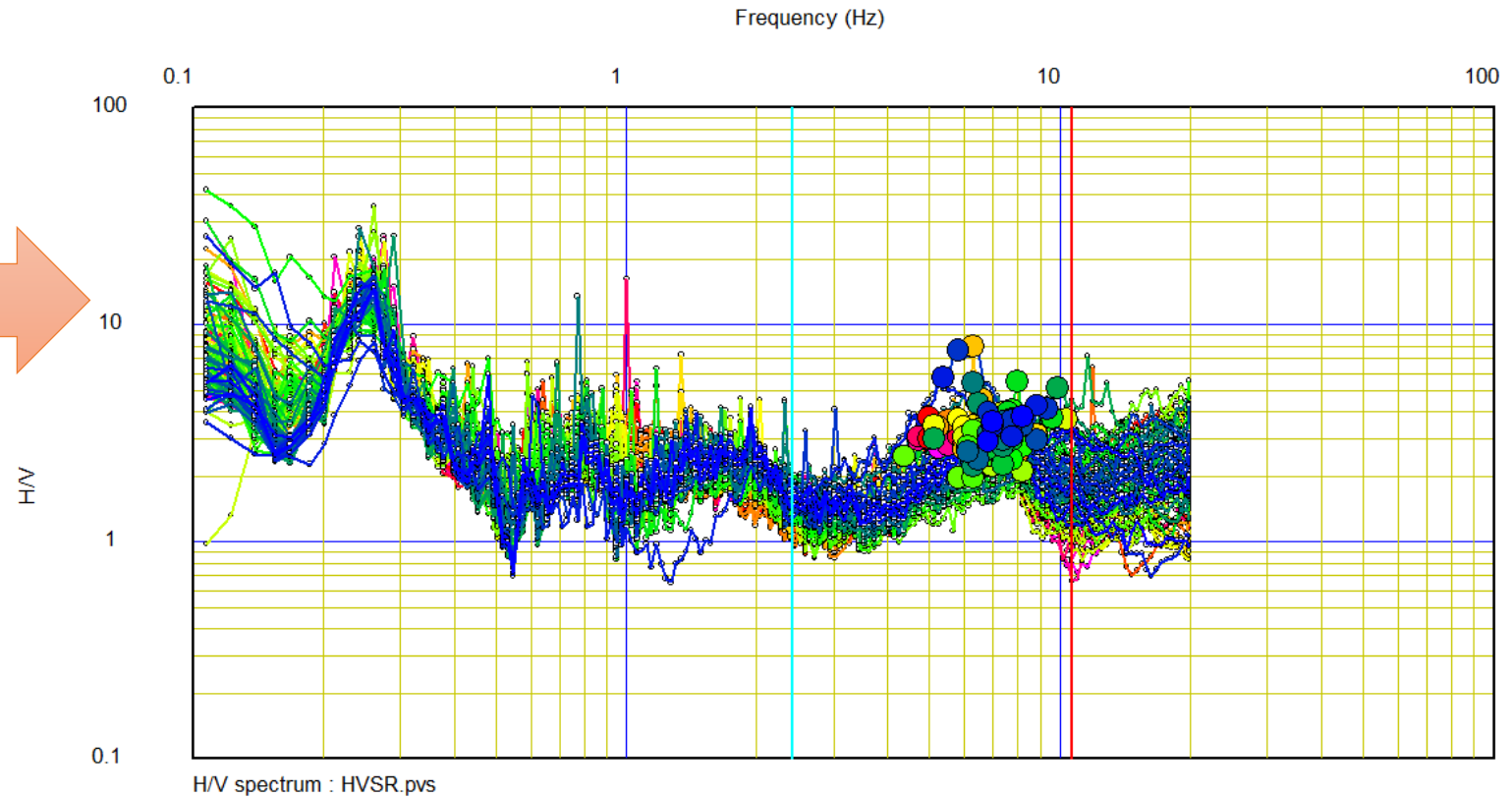


Set up min. and max frequencies to pick H/V peaks

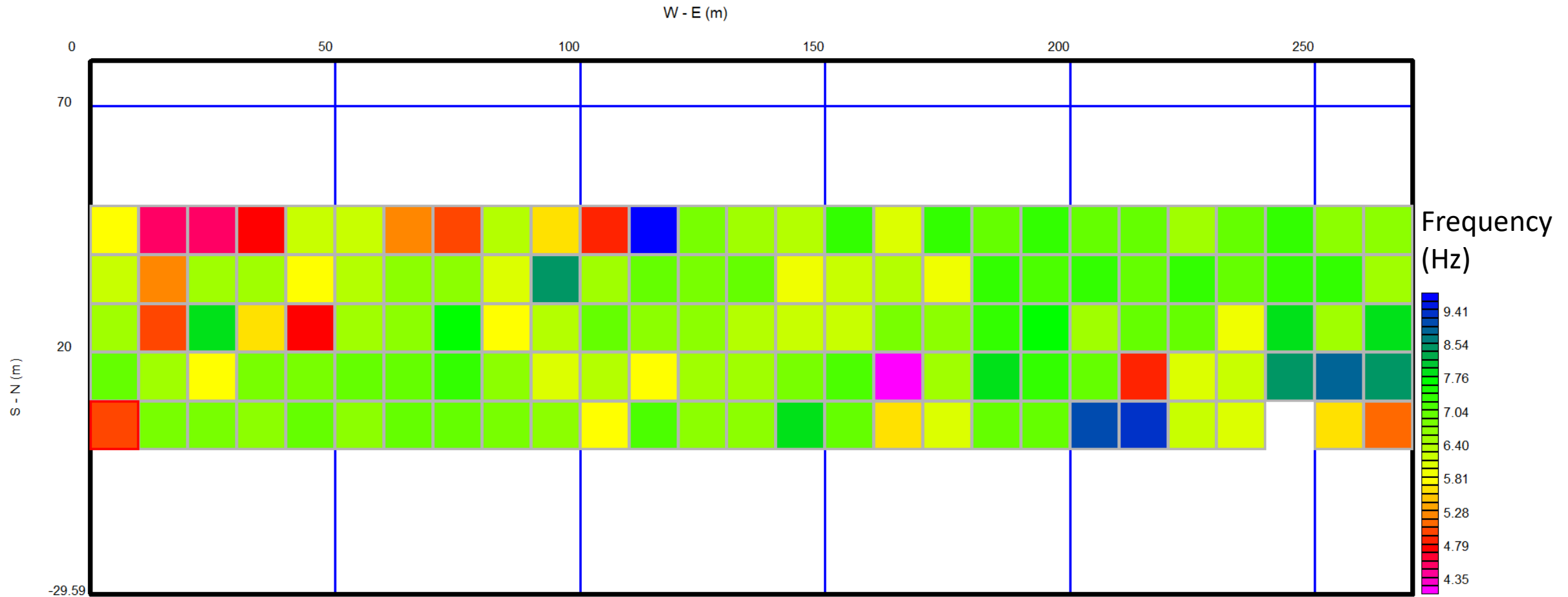
Select “H/V curves”, “Set min. and max. frequency to pick H/V” or press “Ctrl+H”.



Example shown below picked H/V peaks in a frequency range between approx. 2 ~ 10 Hz.

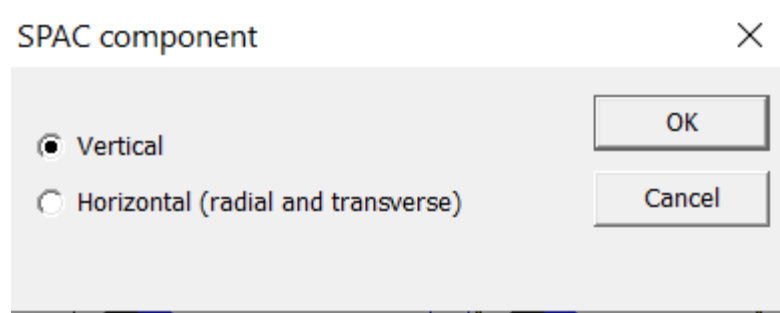


H/V peak frequency map

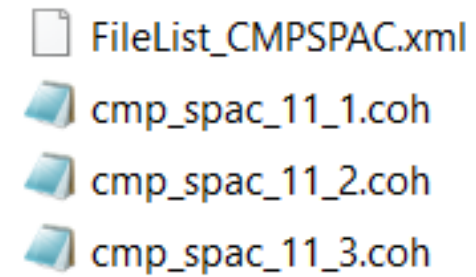


Calculating Love wave dispersion curves

Vertical component

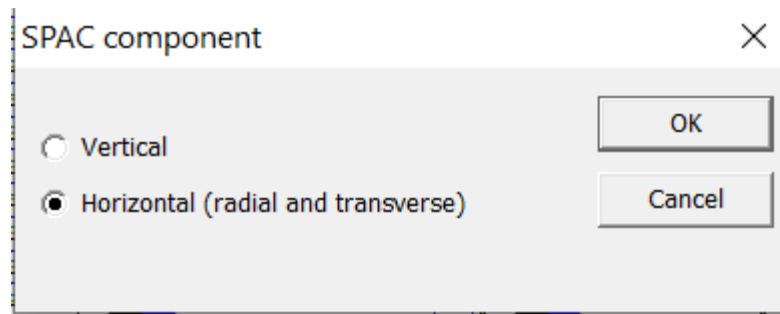


SPAC files for vertical component

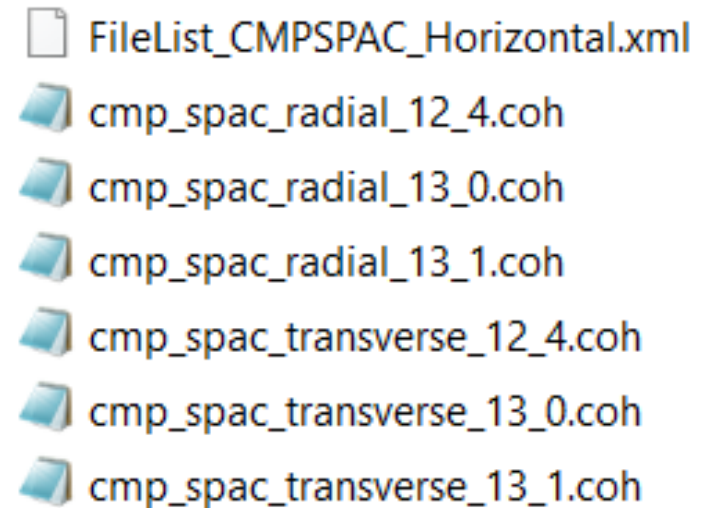


3D3C ambient
noise

Radial and transverse components



SPAC files for radial and transverse components



Import 3C SPAC files to Pickwin

Open a file list of vertical component SPACs at first.

Vertical component SPACs appear.

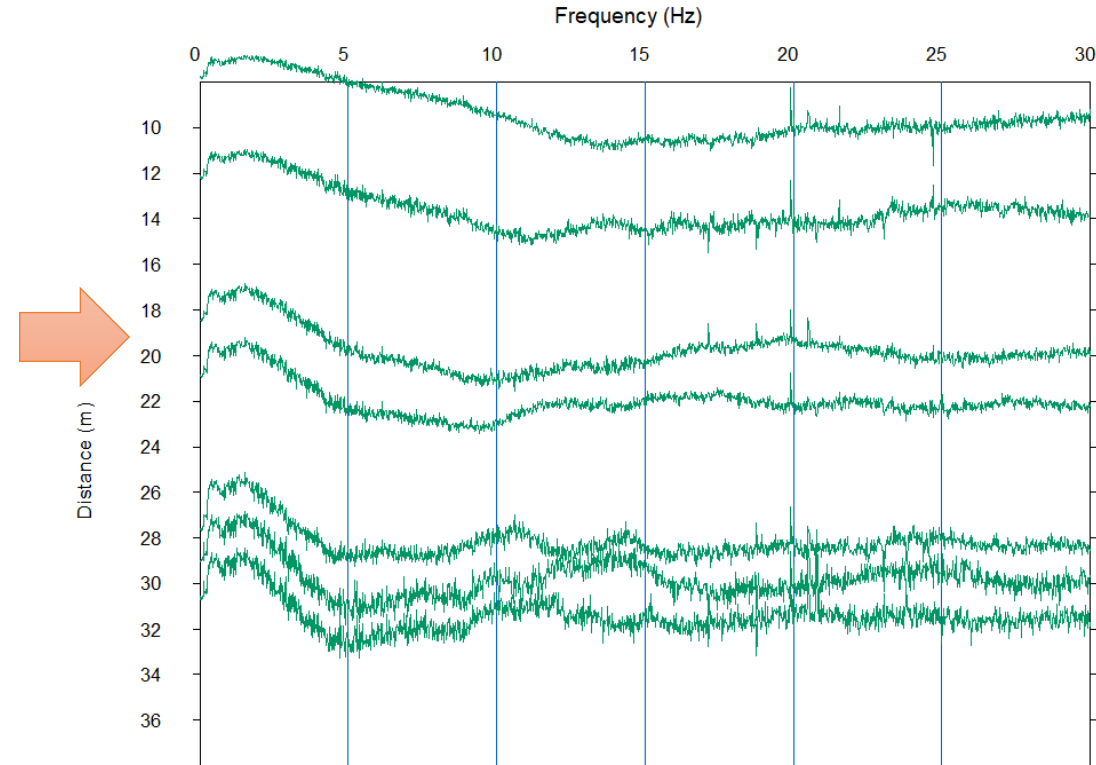
File list

Index	Edit	ID	CMP X (m)	CMP Y (m)	# of aux.	
0	<input type="checkbox"/>	0	10	5	0	2020/4/21 13:20:31.000
1	<input type="checkbox"/>	0	10	15	0	2020/4/21 13:20:31.000
2	<input type="checkbox"/>	0	10	25	0	2020/4/21 13:20:32.000
3	<input type="checkbox"/>	0	10	35	0	2020/4/21 13:20:32.000
4	<input type="checkbox"/>	0	10	45	0	2020/4/21 13:20:32.000
5	<input type="checkbox"/>	1	30	5	0	2020/4/21 13:20:32.000
6	<input type="checkbox"/>	1	30	15	0	2020/4/21 13:20:32.000
7	<input type="checkbox"/>	1	30	25	0	2020/4/21 13:20:32.000
8	<input type="checkbox"/>	1	30	35	0	2020/4/21 13:20:32.000
9	<input type="checkbox"/>	1	30	45	0	2020/4/21 13:20:32.000

☒ 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

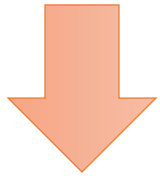
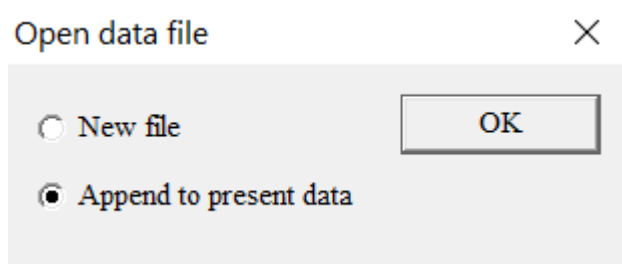
Number of files
70



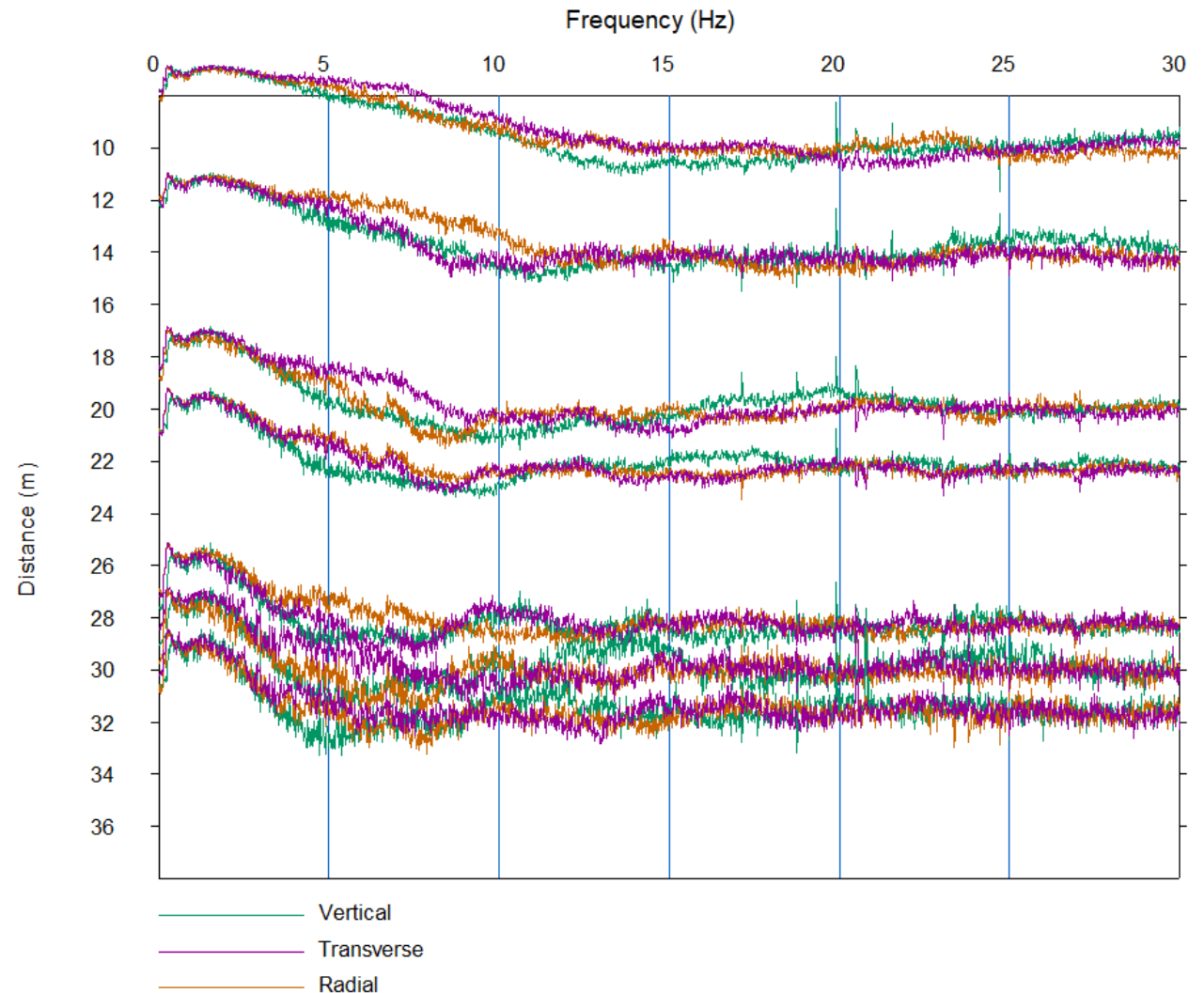
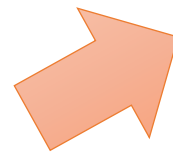
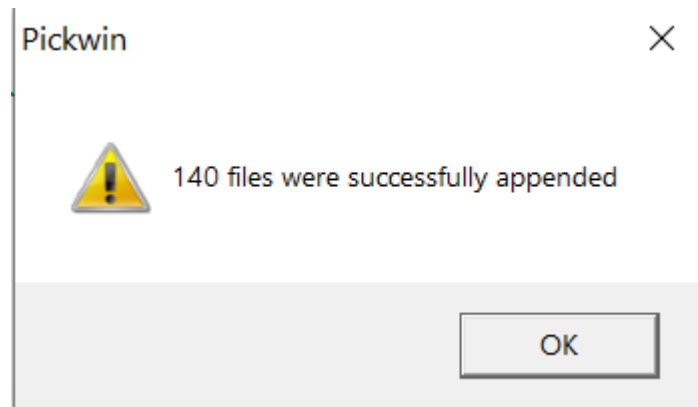
Import 3C SPAC files to Pickwin

Open a file list of horizontal component SPACs secondly.

Three component (vertical, radial and transverse) SPACs appear.



Number of SPAC files appear.

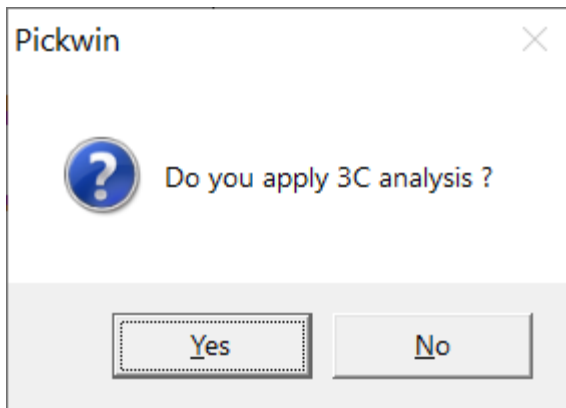


Calculate Rayleigh and Love dispersion curves for each CMP bins.

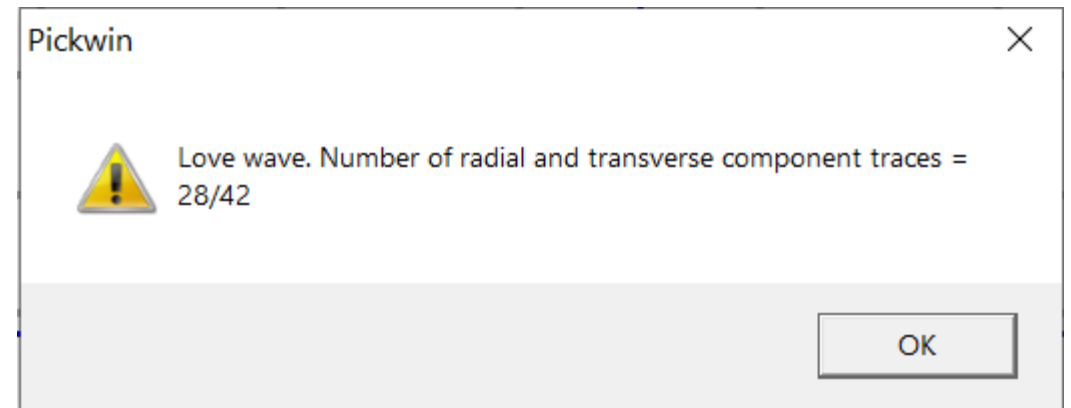
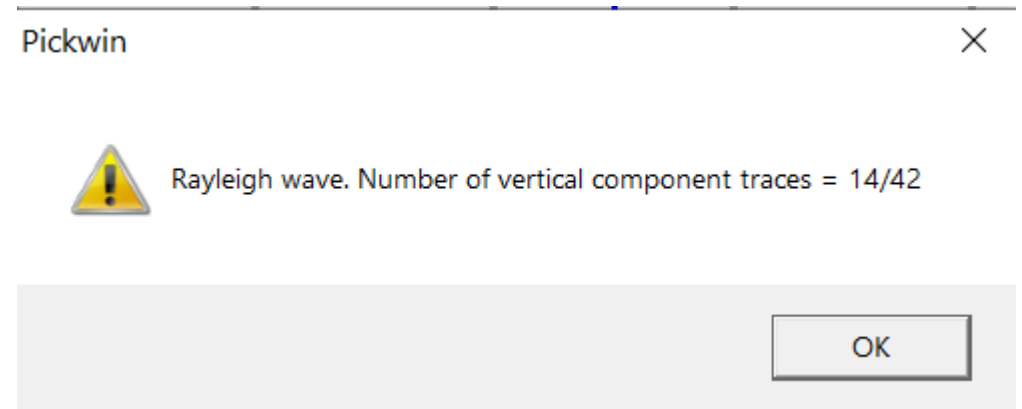
Select “Surface wave analysis”, “Phase velocity-frequency transformation” or press “Ctrl+D”.

Surface wave analysis (S) Option (O) Help(H)
Phase velocity-frequency transformation(D) Ctrl+D

Click “Yes”.



Number of traces (SPACs) used for calculating Rayleigh and Love wave dispersion curve appear respectively.

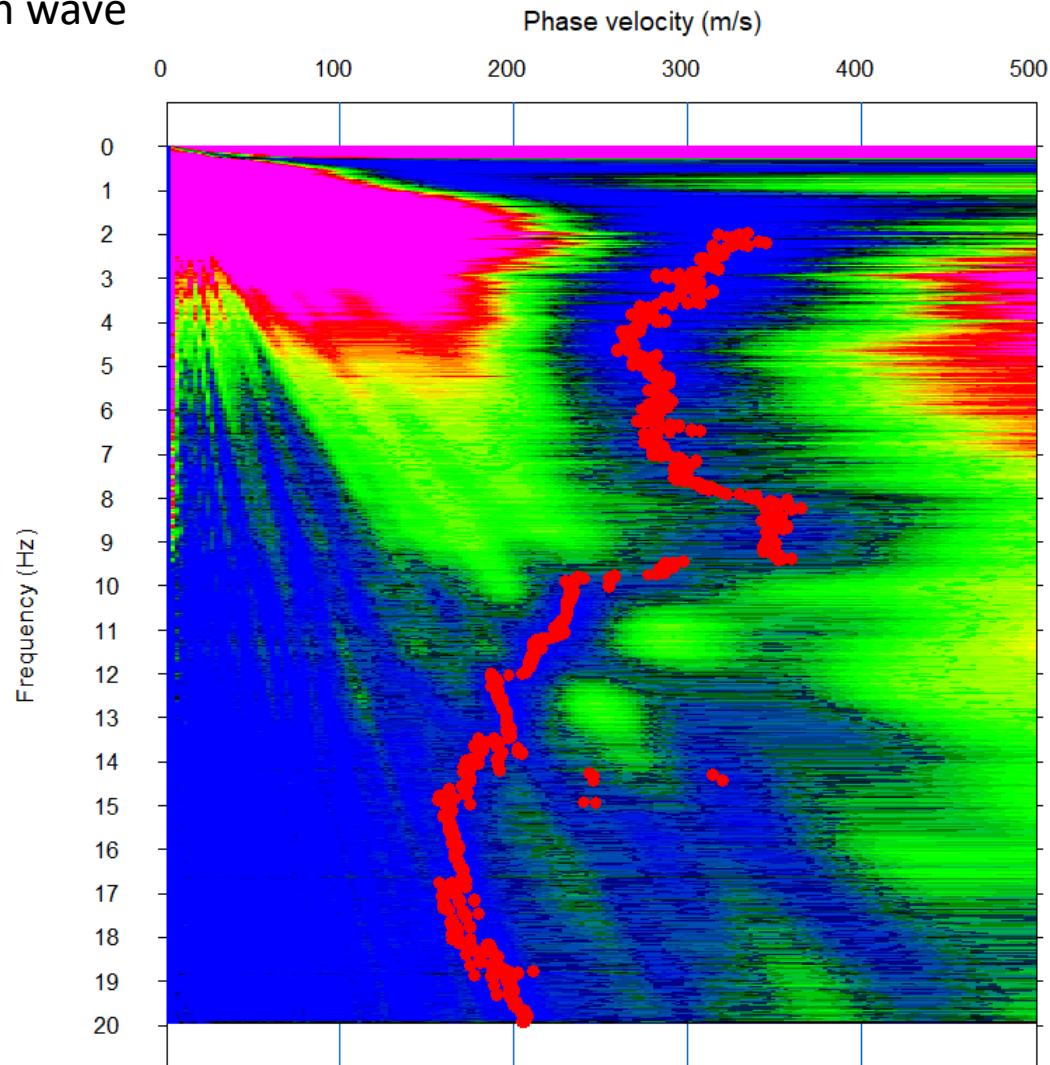


Note that dispersion curves cannot be calculated for all CMP bins at once currently

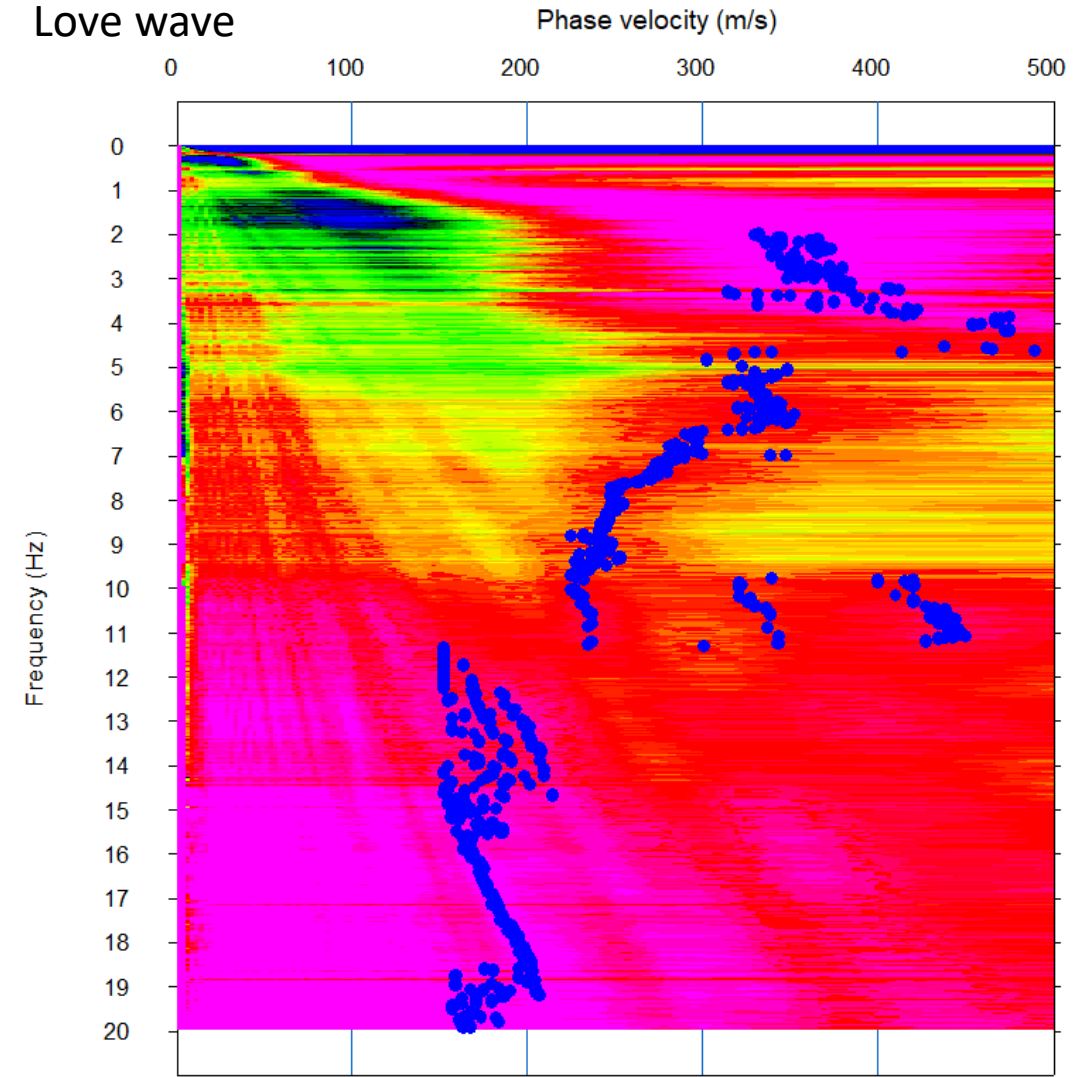
Rayleigh and Love wave phase velocity images

Use  to switch Rayleigh and Love wave images.

Rayleigh wave

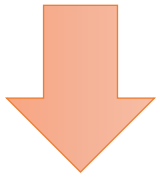
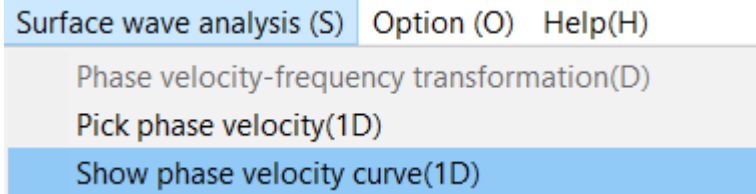


Love wave

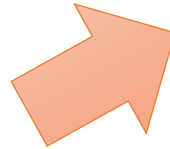
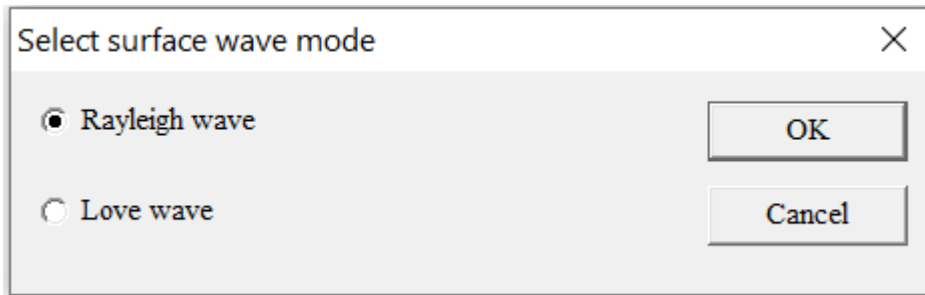


Rayleigh and Love wave dispersion curves

Select “Surface wave analysis”, “Show phase velocity curve” to show Rayleigh and Love dispersion curves by WaveEq.

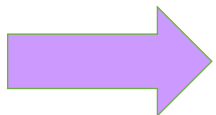
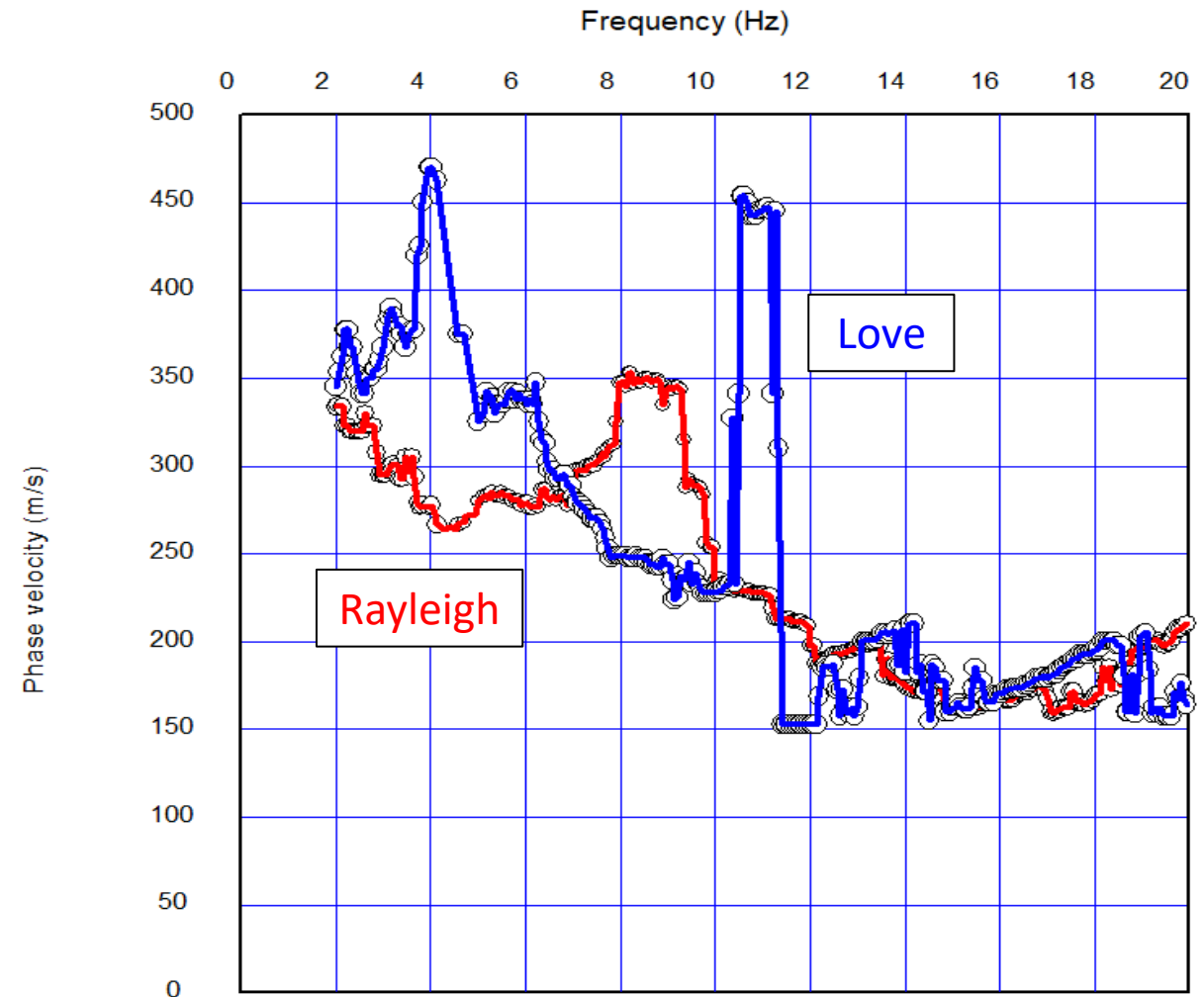


Select a dispersion curve shown at first.



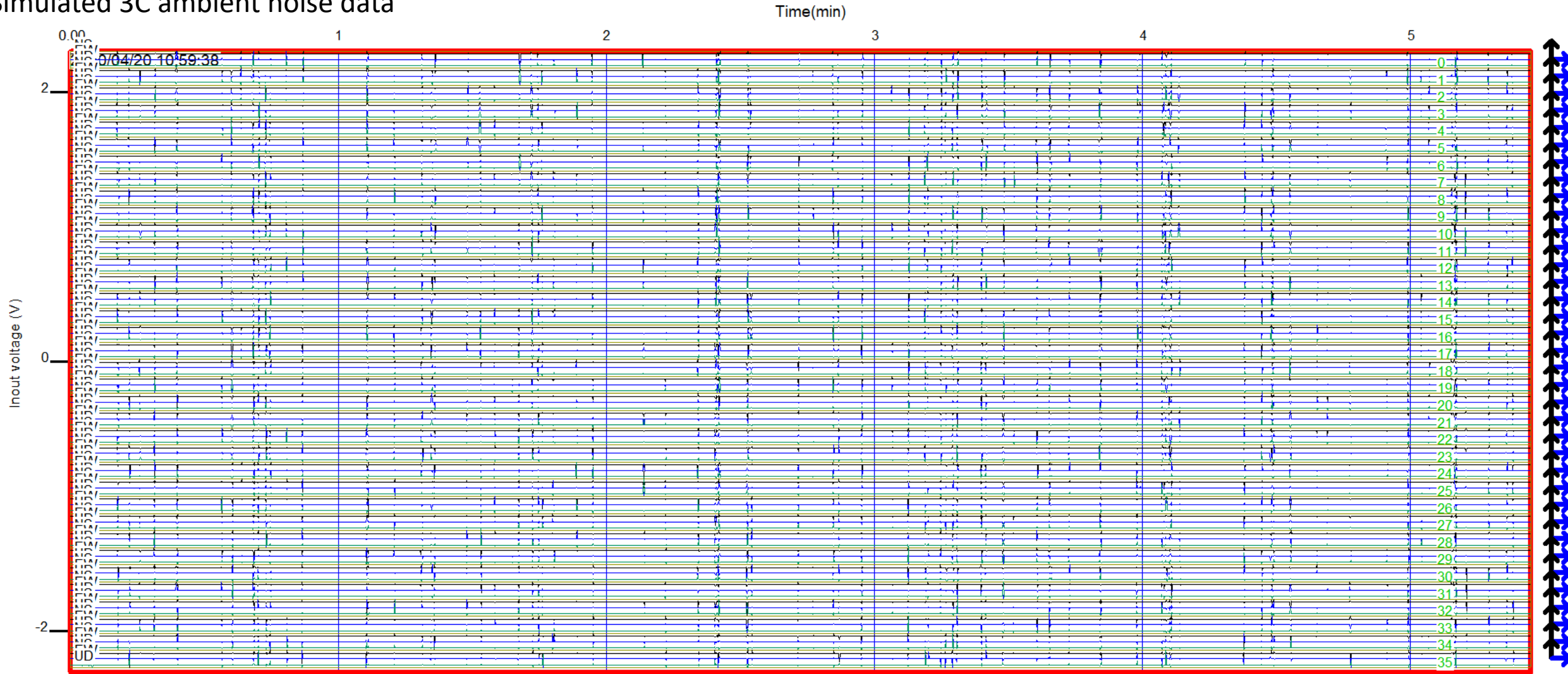
Rayleigh and Love dispersion curves appear.

Use  to select dispersion curves to be shown.



Numerical example of 3D3C processing

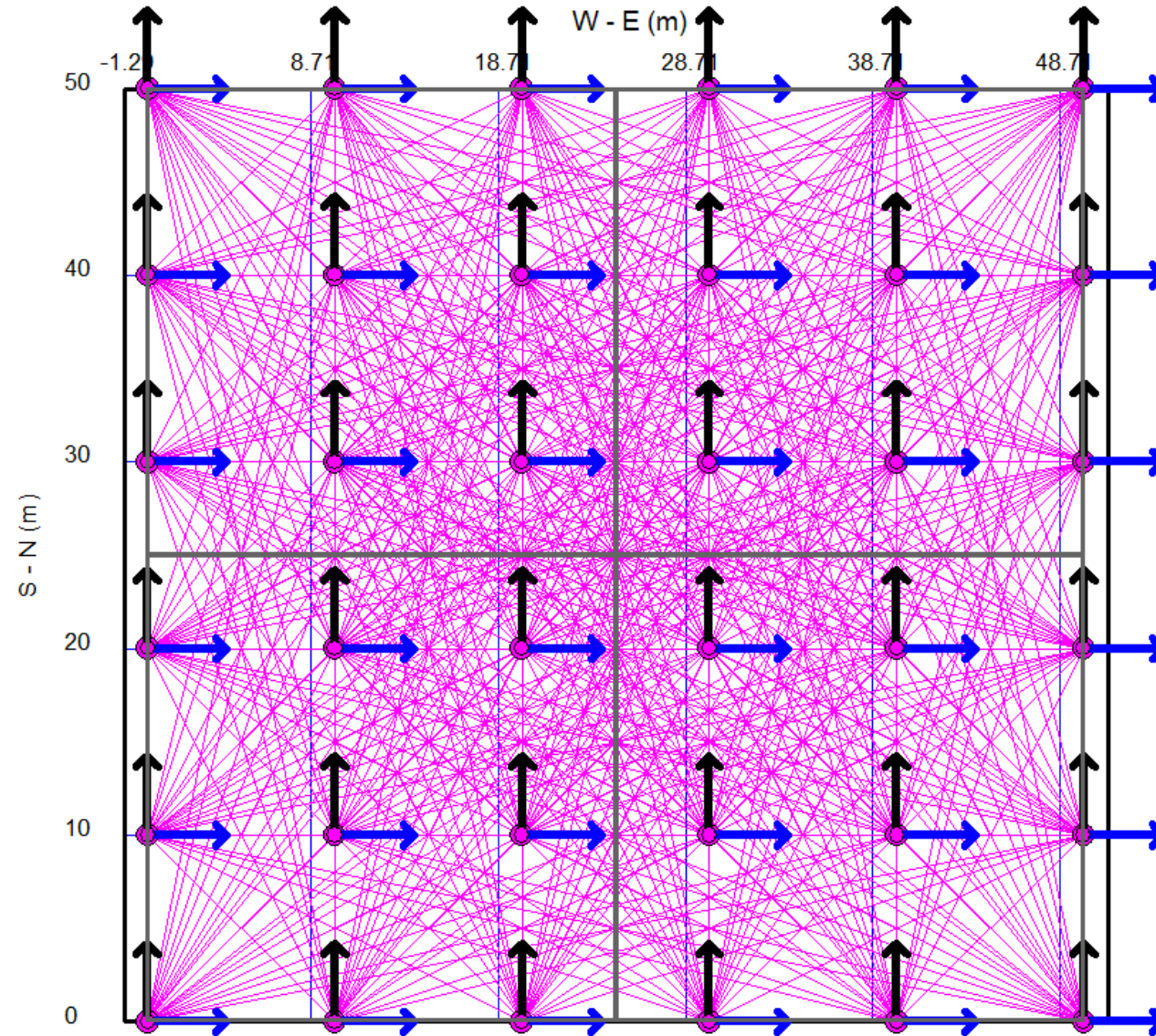
Simulated 3C ambient noise data



Rayleigh and Love wave phase velocities are 200 and 180 m/s respectively

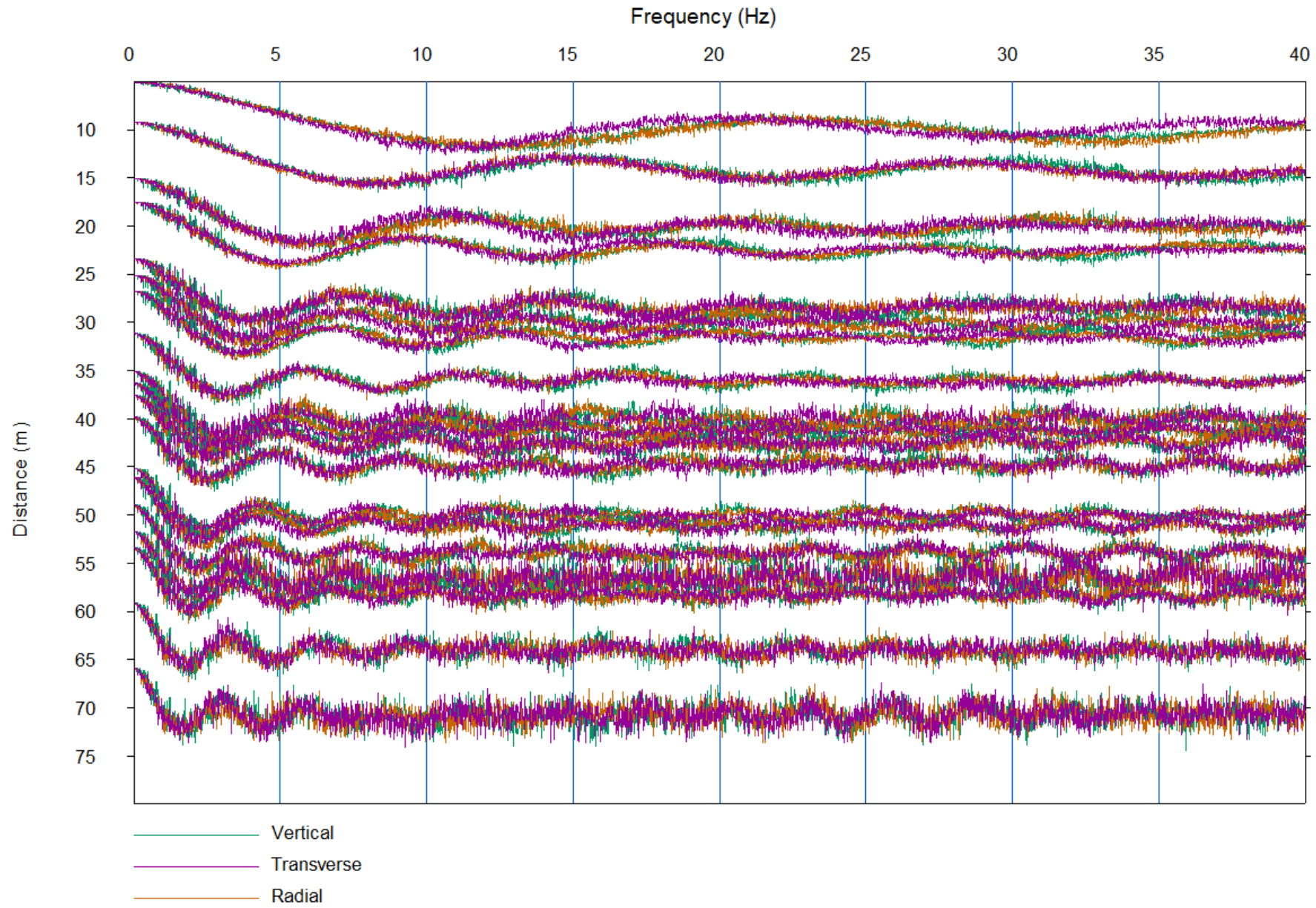
Numerical example of 3D3C processing

Sensor geometry



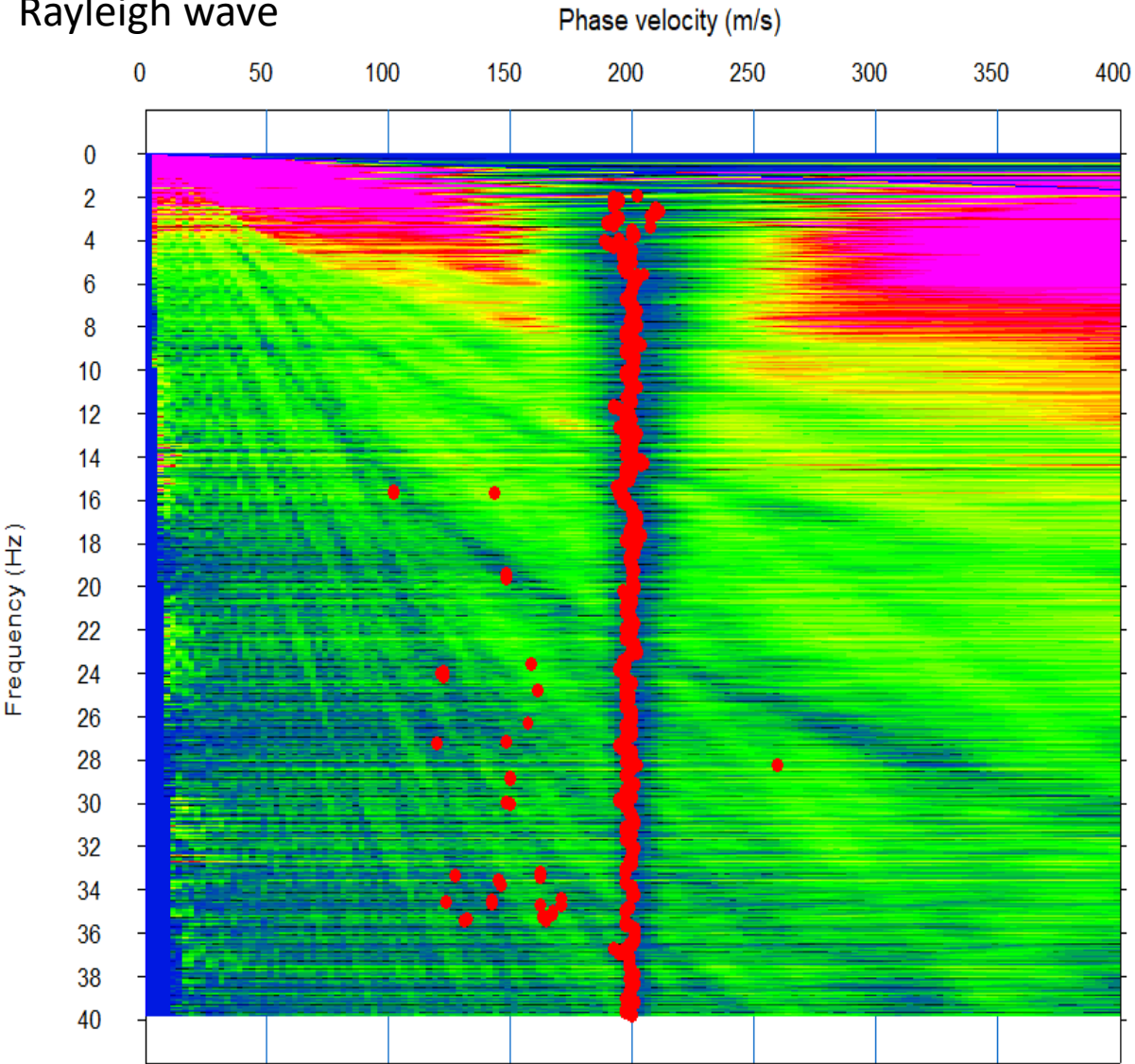
Numerical example of 3D3C processing

Example of 3C SPAC

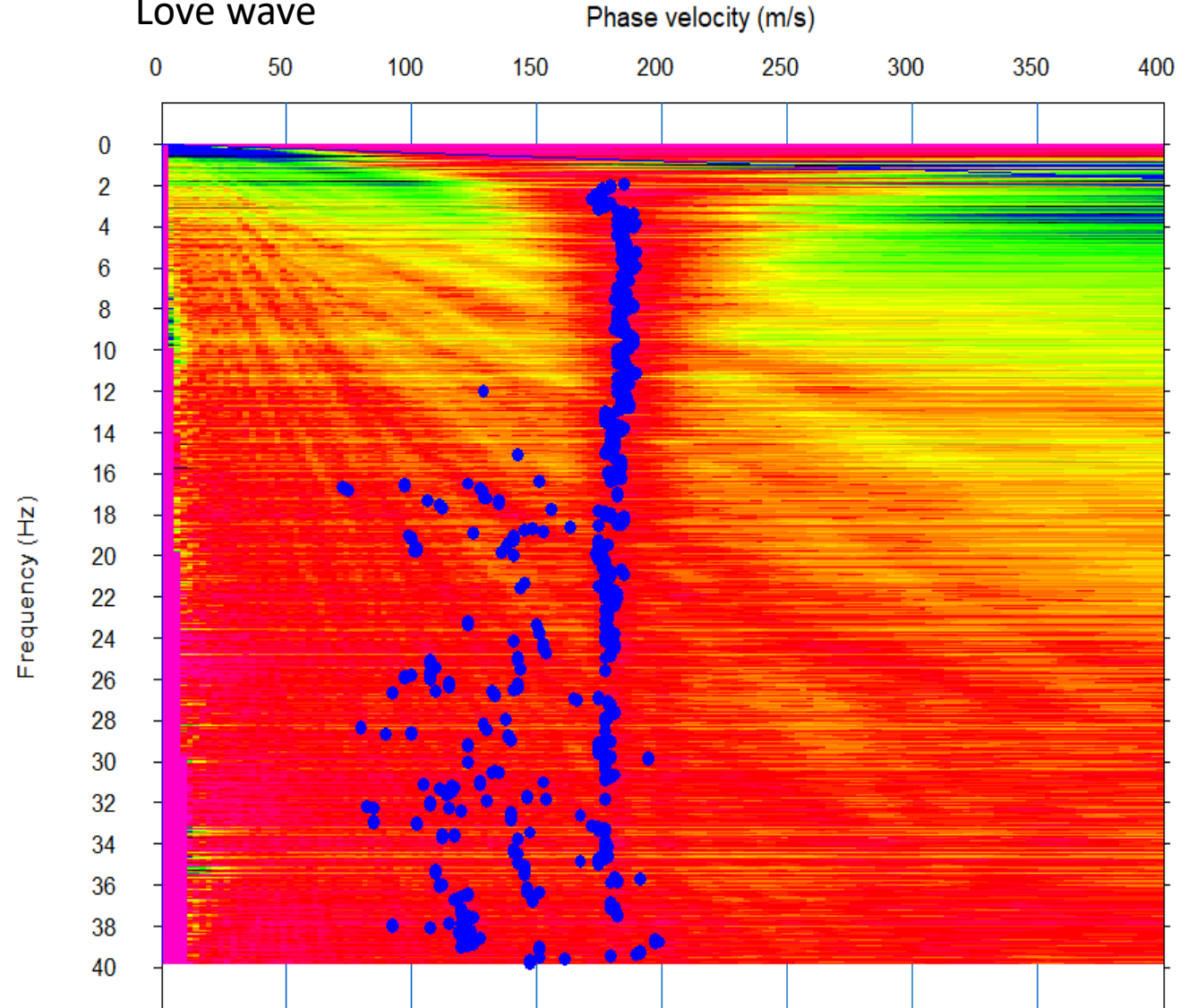


Numerical example of 3D3C processing

Rayleigh wave



Love wave



Numerical example of 3D3C processing

Correct phase velocities of 200 and 180 m/s were obtained for Rayleigh and Love waves respectively.

