



Project on Seismic Reflection

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Data Import

Coordinates:

- Common Shot gather recorded with a 59 channels off-end spread.
- The group interval is about 12.3m
- The first group is 33m far from the source
- The last group is at 747m from the source.

edit trace header coordinates for C:\Program Files (x86)\REFLEX\Seismic_reflection_groupA\ROHDATA\RRAW____.DAT

trace-nr.	distance	shot-x	shot-y	shot-z	rec-x	rec-y	rec-z	time delay	gain	time collect
1	33	0	0	61900	33	0	61850	0	1	0
2	45,3103446960	0	0	61900	45,3103446960	0	61825	0	1	0
3	57,6206893920	0	0	61900	57,6206893920	0	61800	0	1	0
4	69,9310340860	0	0	61800	69,9310340860	0	61925	0	1	0
5	82,2413787840	0	0	61800	82,2413787840	0	61950	0	1	0
6	94,5517234800	0	0	61800	94,5517234800	0	61975	0	1	0
7	106,8620681700	0	0	62000	106,862068170	0	61800	0	1	0
8	119,1724128700	0	0	62000	119,172412870	0	61775	0	1	0
9	131,4827575600	0	0	62000	131,482757560	0	61750	0	1	0
10	143,7931022600	0	0	62000	143,793102260	0	61725	0	1	0
11	156,1034469600	0	0	61700	156,103446960	0	62000	0	1	0
12	168,4137916500	0	0	61700	168,413791650	0	62025	0	1	0

TopographyGroupBox
topography (x,z values)
 update shot z-pos.
 update receiver z-pos.
 use x-traceheadercoord.
 apply xz-topography
 get distance along topography

EditGroupBox
apply borehole deviations
correct lat.offset
3D-view of boreholes
project on x
x <-> y y <-> z
source <-> rec.
rec. -> source

fileheader coordinates
data type: single shot
shot-pos: 0
smooth rec. xy-coord.
smooth shot coord.
factor f.smooth: 4
smooth shot coord.
interpolate
interpolate all
non equidistant spread
update only shot coord.

UpdateGroupBox
load from AsciiFile
save on AsciiFile
update from fileheader
update fileheader
update distances
coordinate transformation

reload from file
save changes
close

Reflexw dataimport

Fileheader-coordinates
DistanceDimen: METER
data type: single shot
rec.start: 33
rec.end: 747
lat.offset: 0
shot-pos: 0
shot lat.offset: 0
number: 0

filename specification
specification: original name
prefix:
filename factor: 1

Time and comment specification
TimeDimension: ms
sample number: 0
time increment: 0
file header: 1024
trace header: 256
time resampling: 1
timerange: 0

ConversionMode
conversion sequence: no
max.traces/file: 1048576
meandering: 0
line distance: 0
check tracelength: 0
tracenr./2D-line: 0
move receivers: 0
trace incr.: 0
move shots: 0

format specification
input format: SEGY
output format: new 32 bit floating point
scaling: 1

ControlOptions
 control format
 read traceincr.
 fix endcoord.
 calculate tracelen
 read starttime
 man. samplenr.
 use sweeplength
 read marker
 swap bytes
 IBM
 unsigned
 swap header
 read fileheader
 read traceheader
 ps/ns timeinc
 SEGYCoordinates
coord. in degree
 ignore scalar
 unsigned
 ignore group

update traceheaders/gps coordinates
 use data folder
update traceheaders:
fileheader

utm-conversion:
no
 calculate distances
 offset -> x
 correct for offset

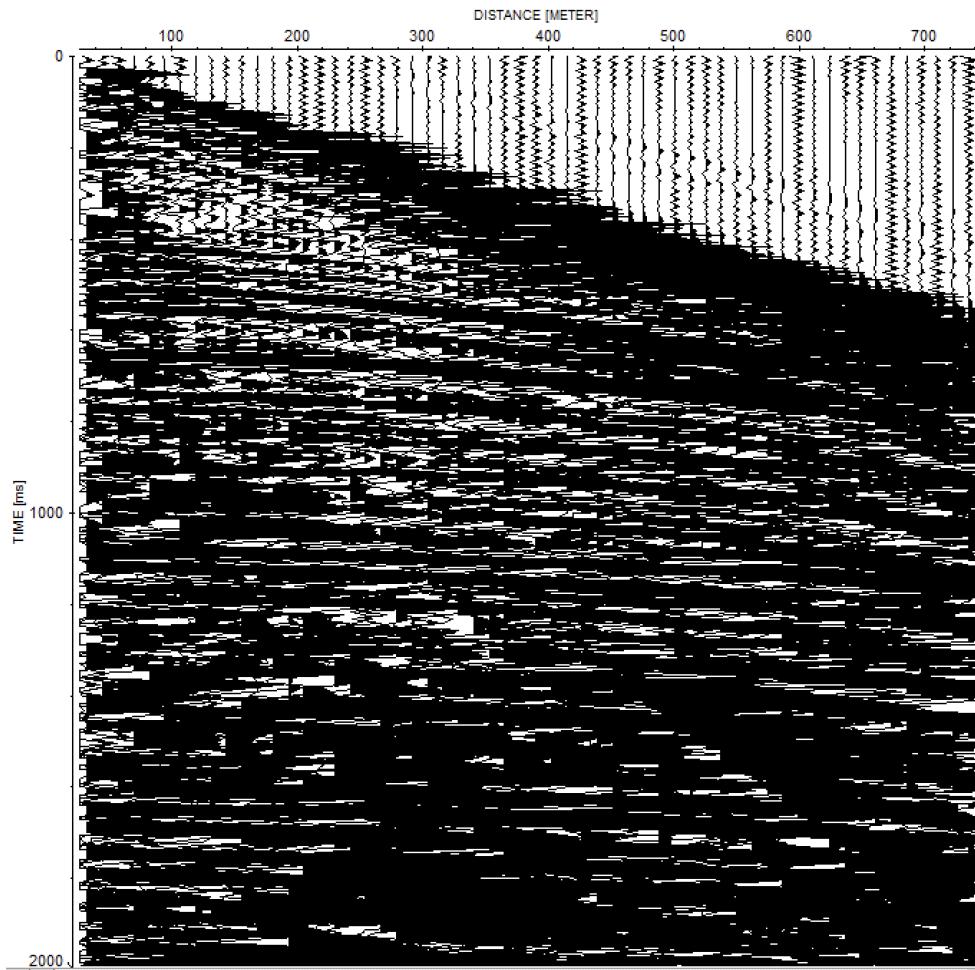
ControlPanel
Convert to Reflex
apply processing flow
 CheckExistingFiles
 check data for NAN
 PrimaryFile
 SecondaryFile
Exit
Help



Raw Data

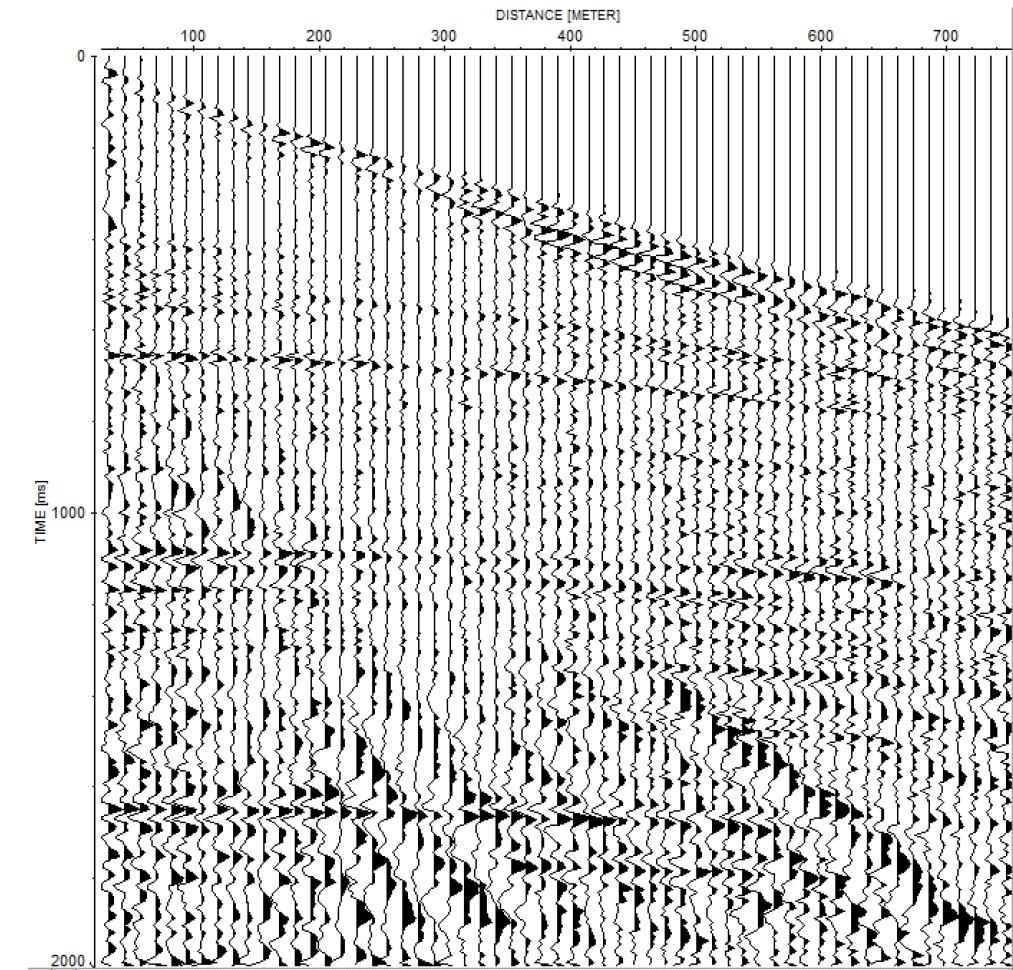
Wigglemode

without trace normalization



Wigglemode

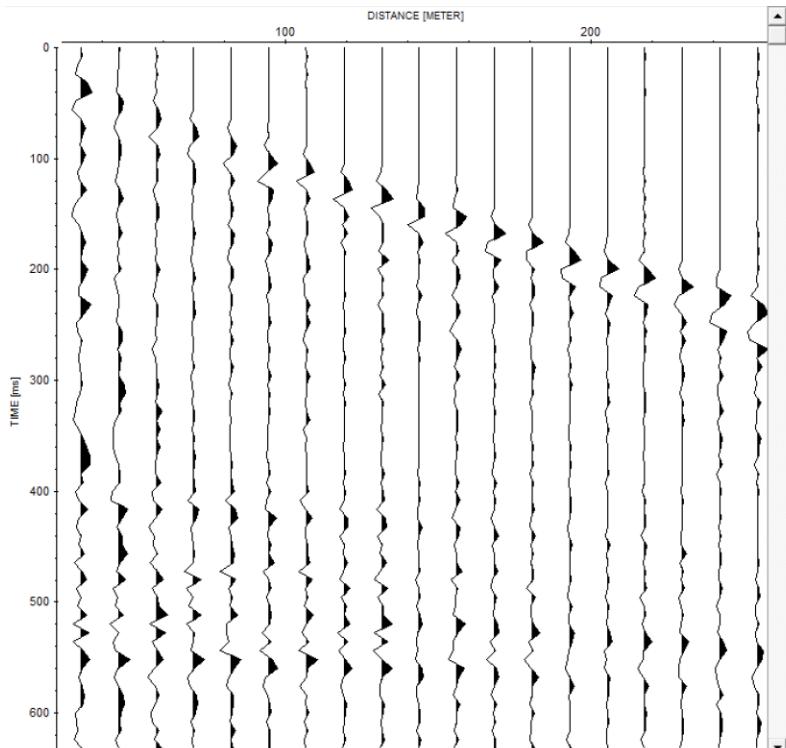
with trace normalization



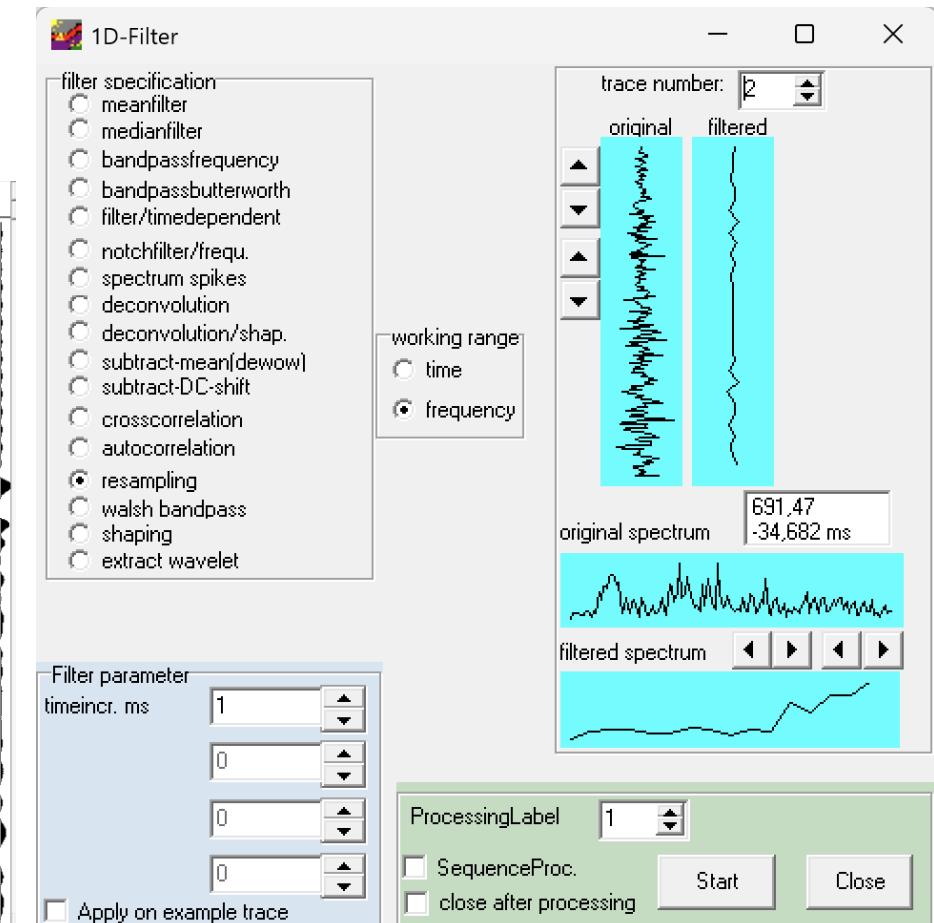
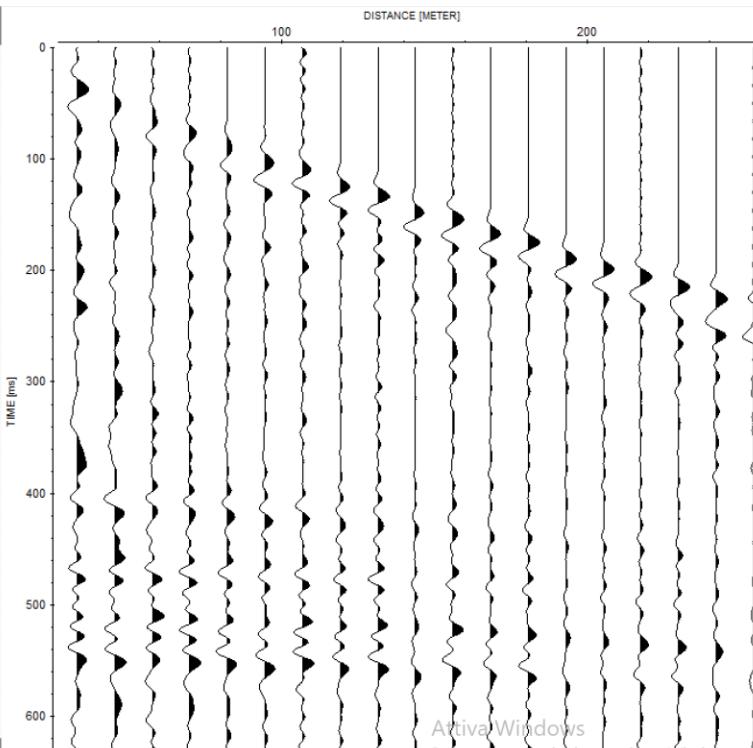


Resampling at 1 ms

Sampling interval at 8ms:
Zoomed section



Sampling interval at 1ms:
Zoomed section

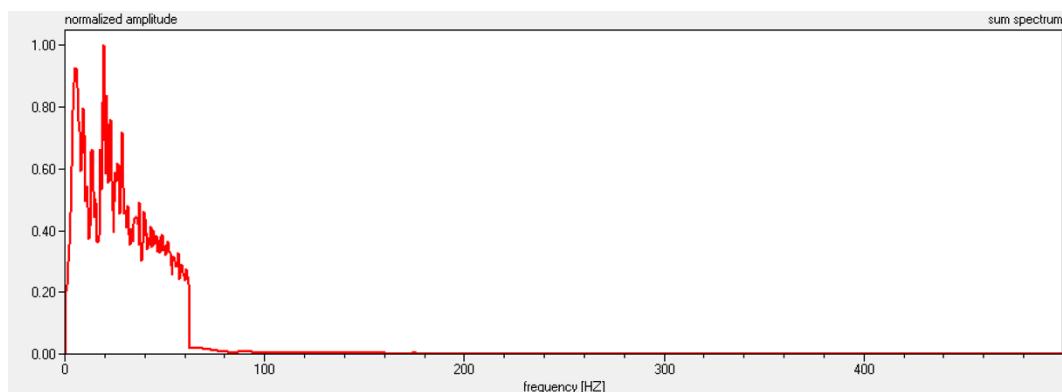




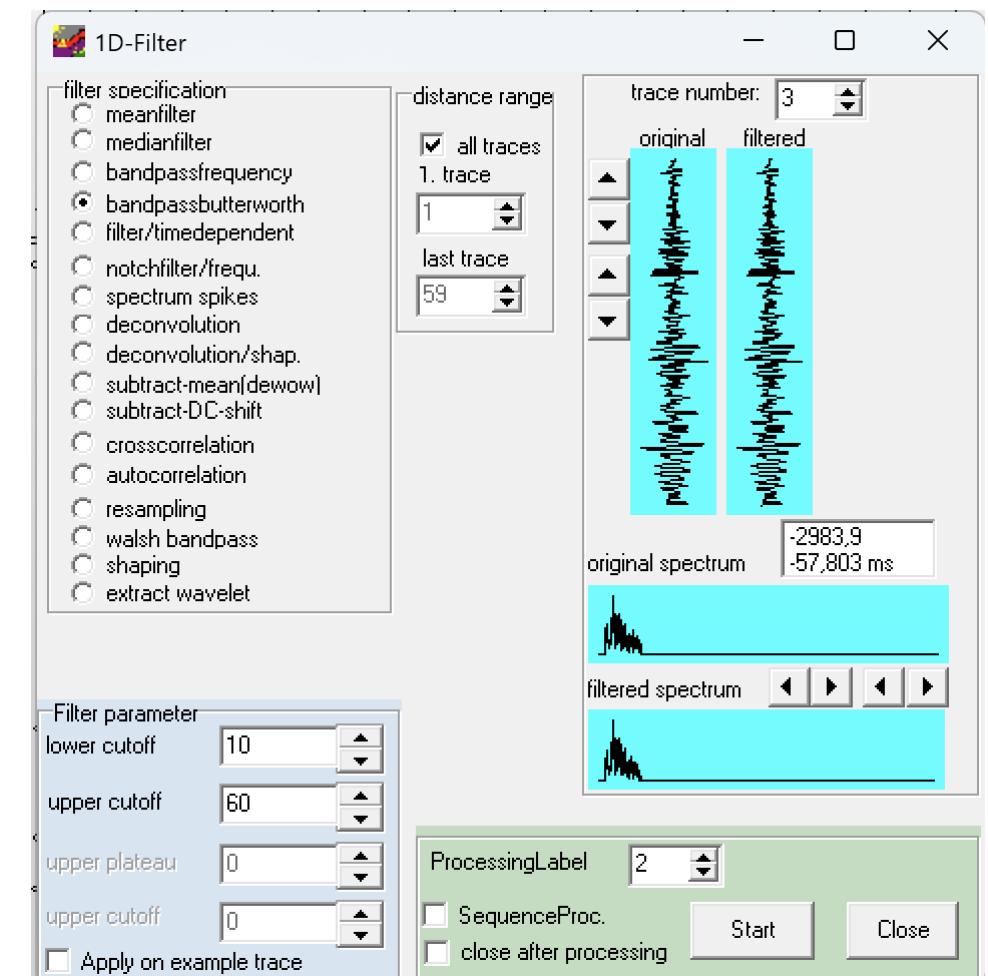
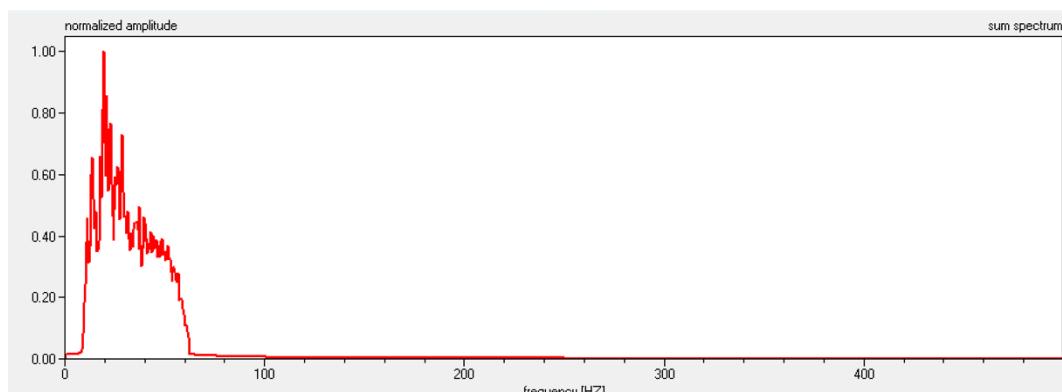
Passband Filter

We filter the data to remove the low frequency components (lower than 10Hz) because are mostly due to the ground roll.

Spectrum before filtering

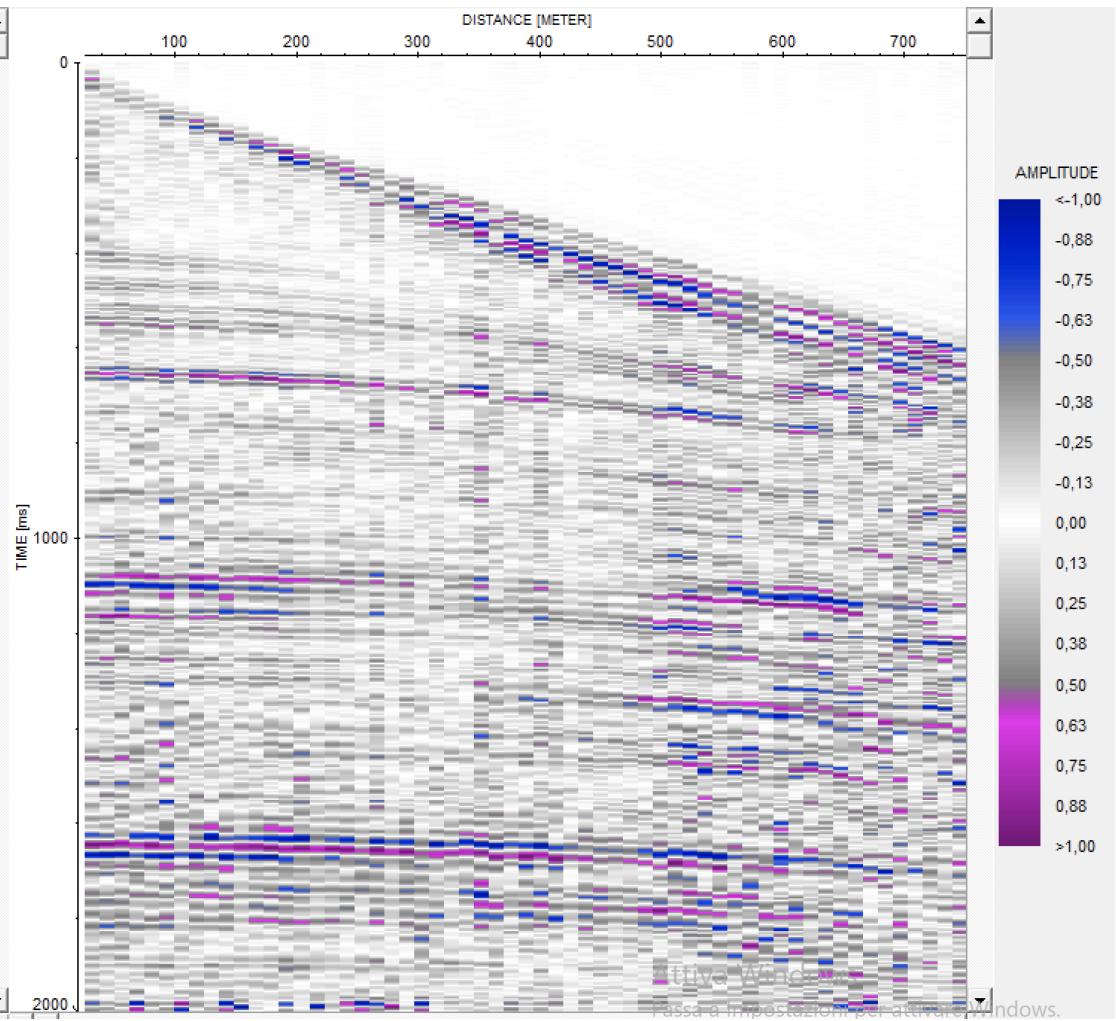
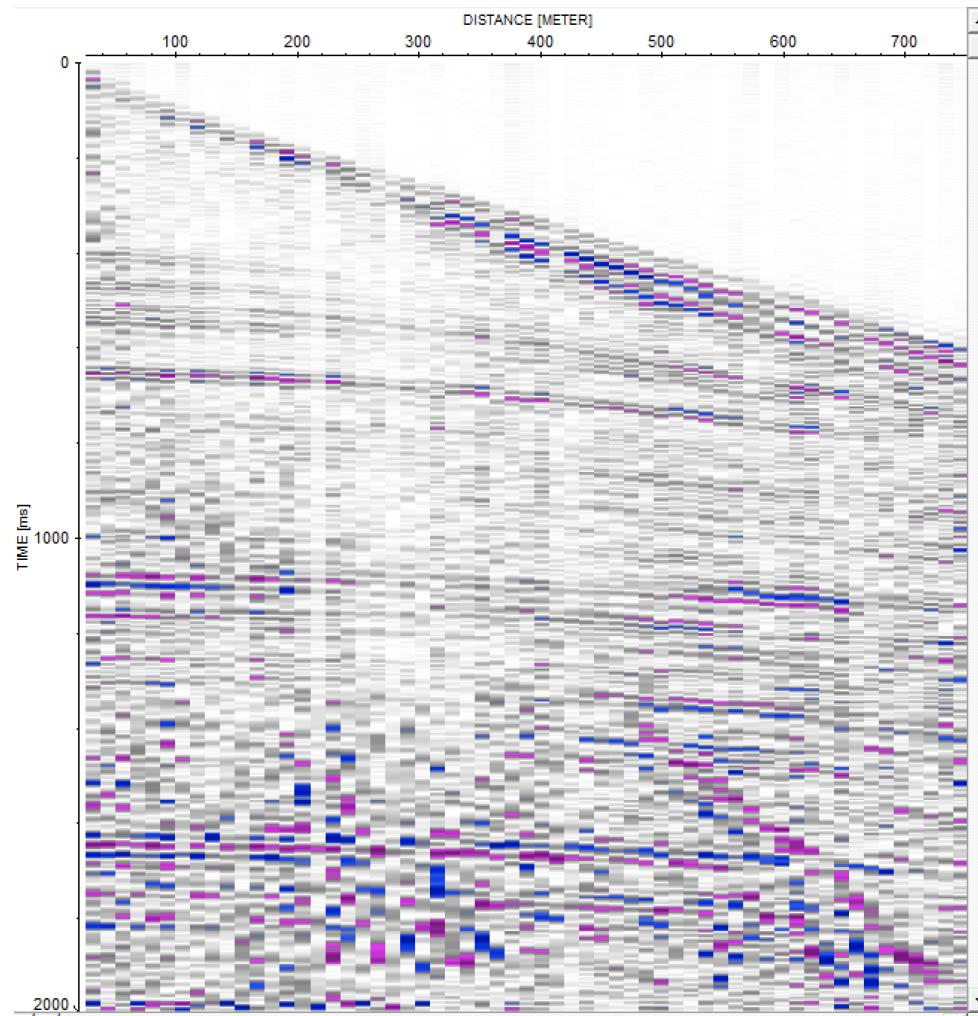


Spectrum after filtering



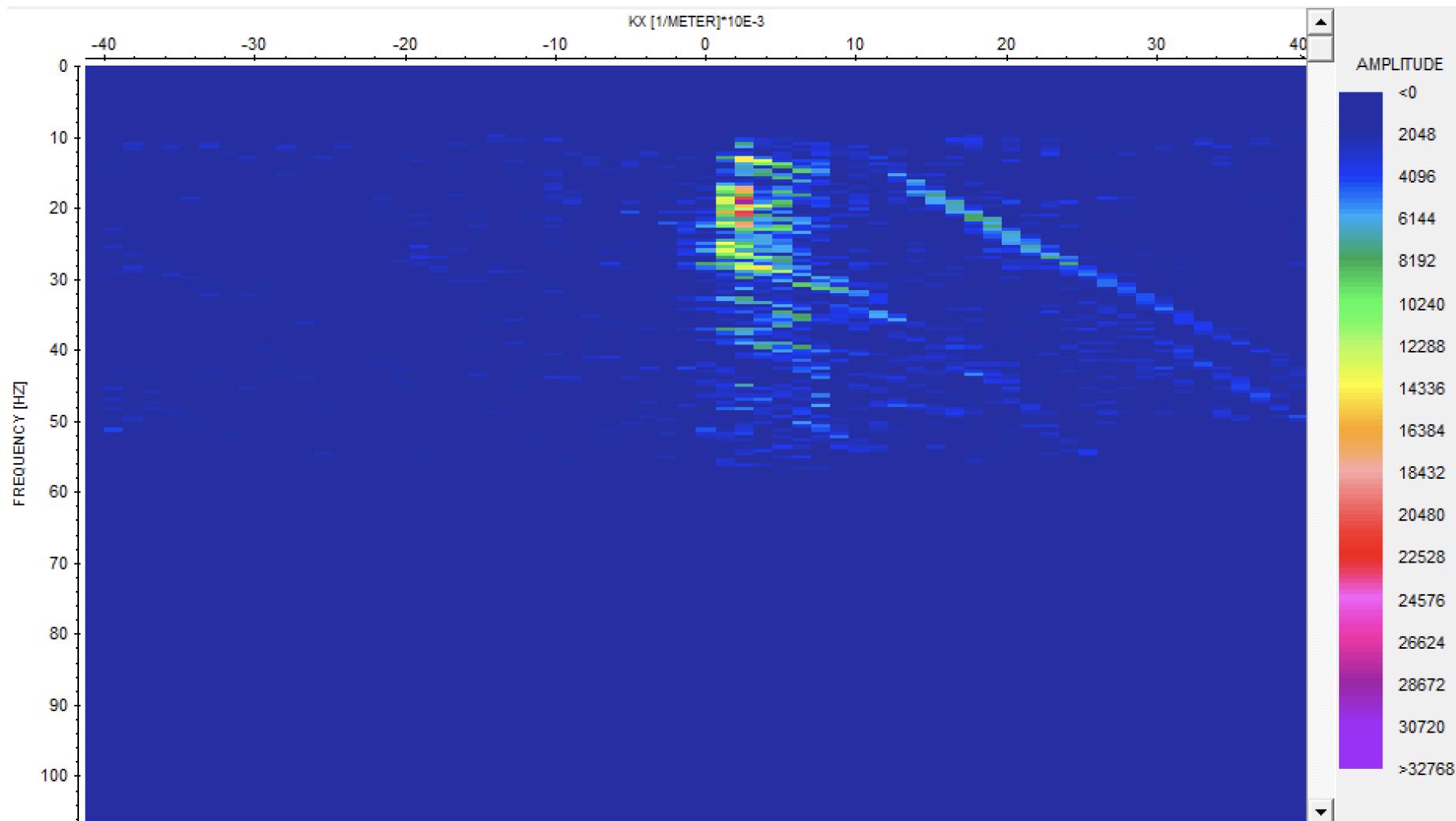


Comparison Original vs Bandpassbutterworth





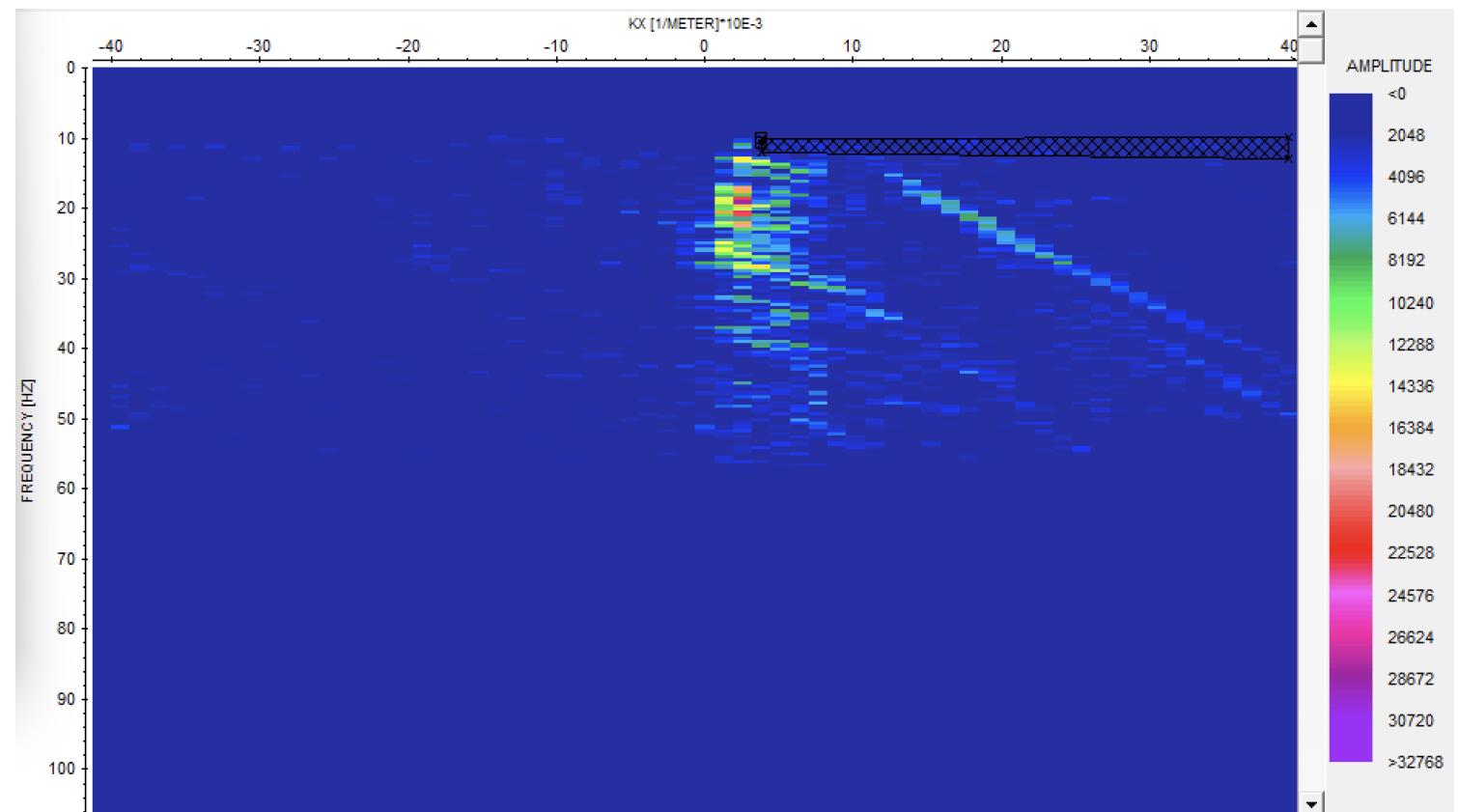
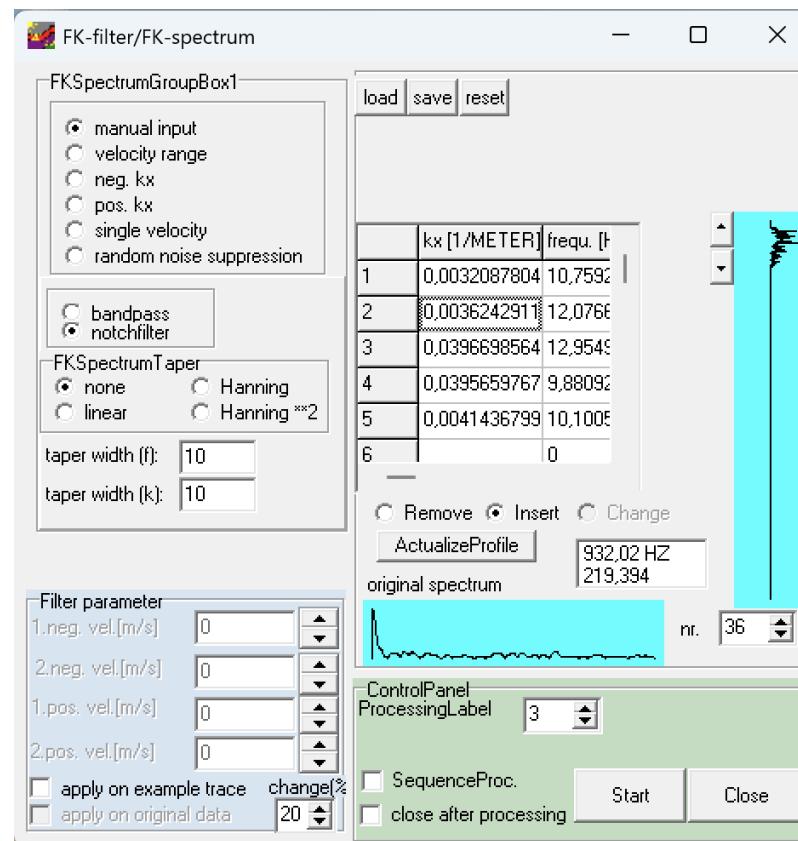
FK Spectrum of the Original Dataset





Ground Roll Removal

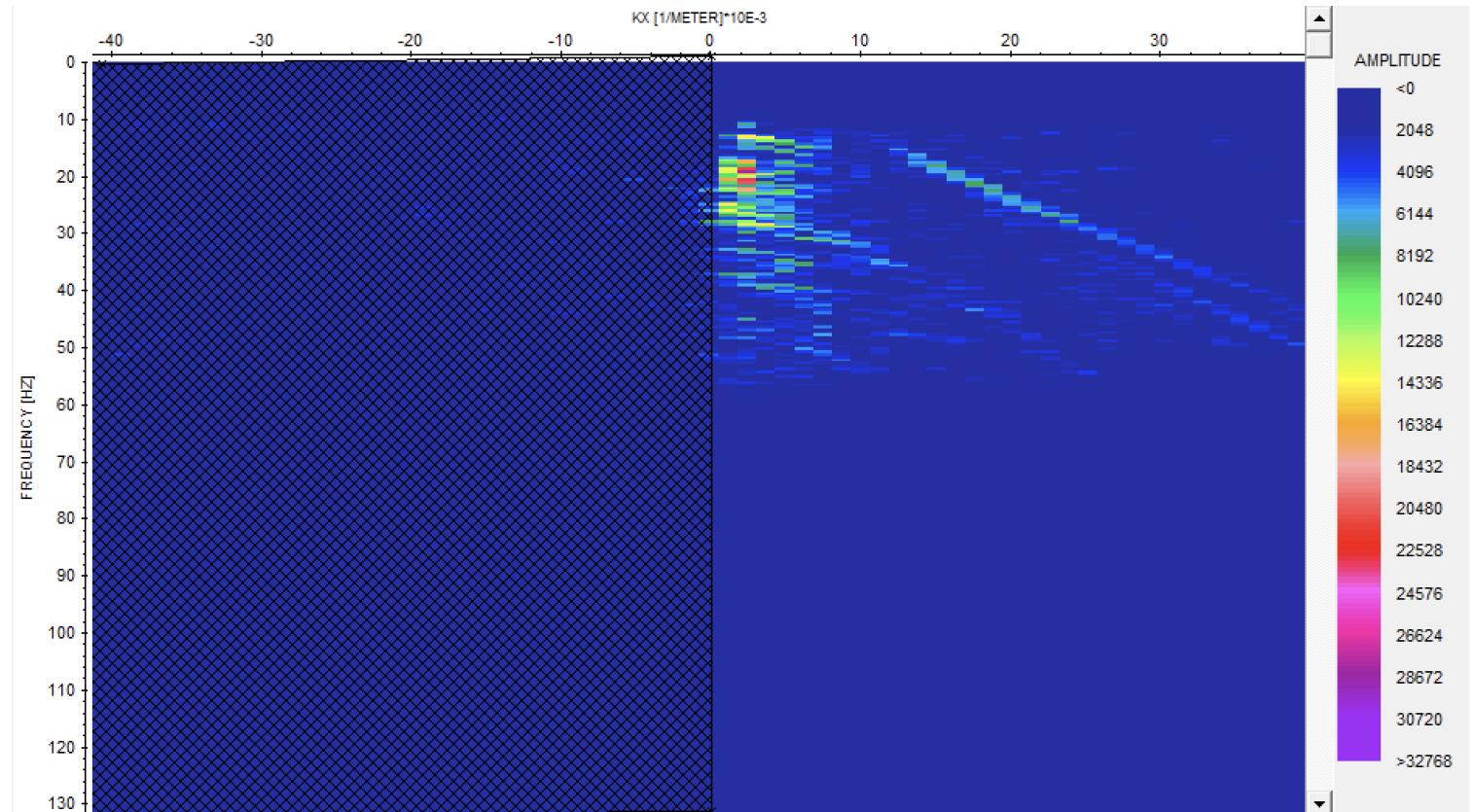
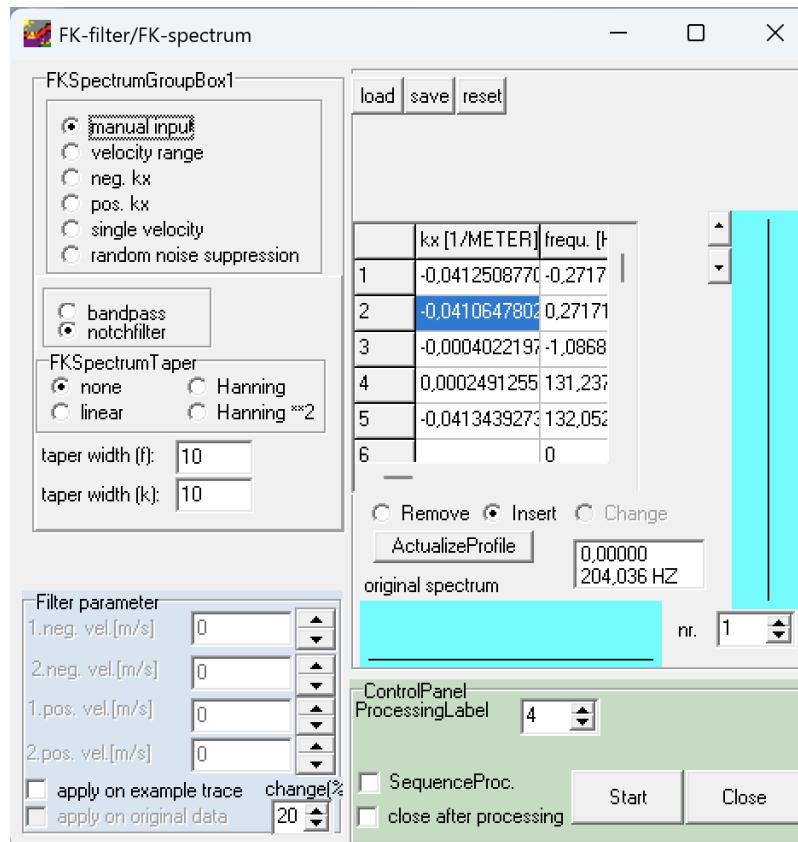
First FK filter design:





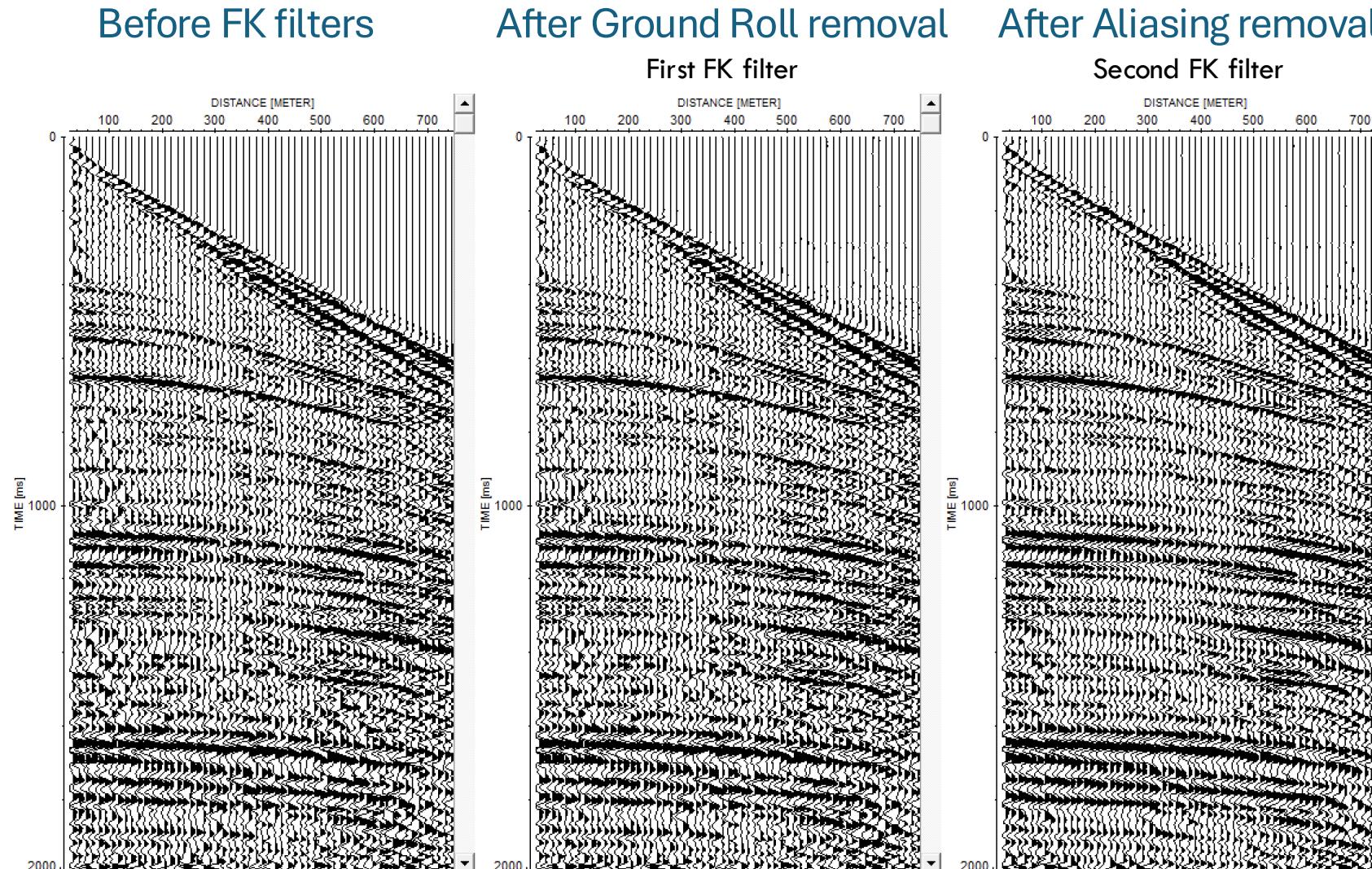
Aliasing Removal

Second FK filter design:





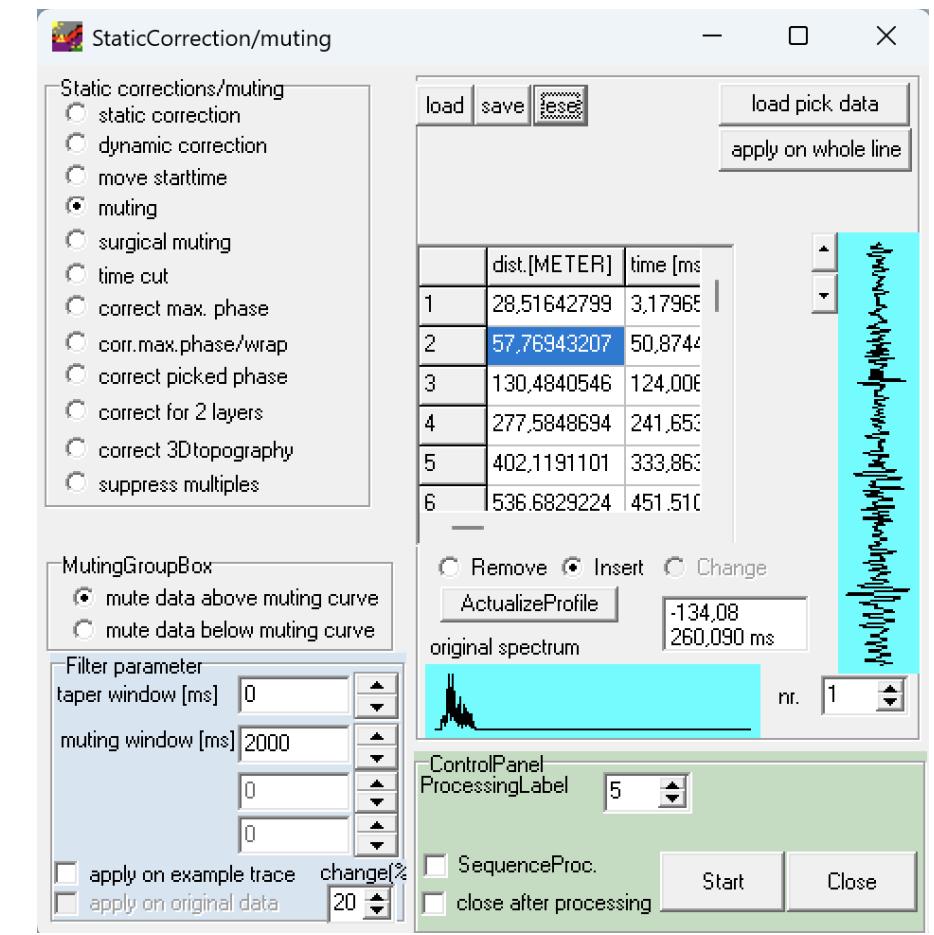
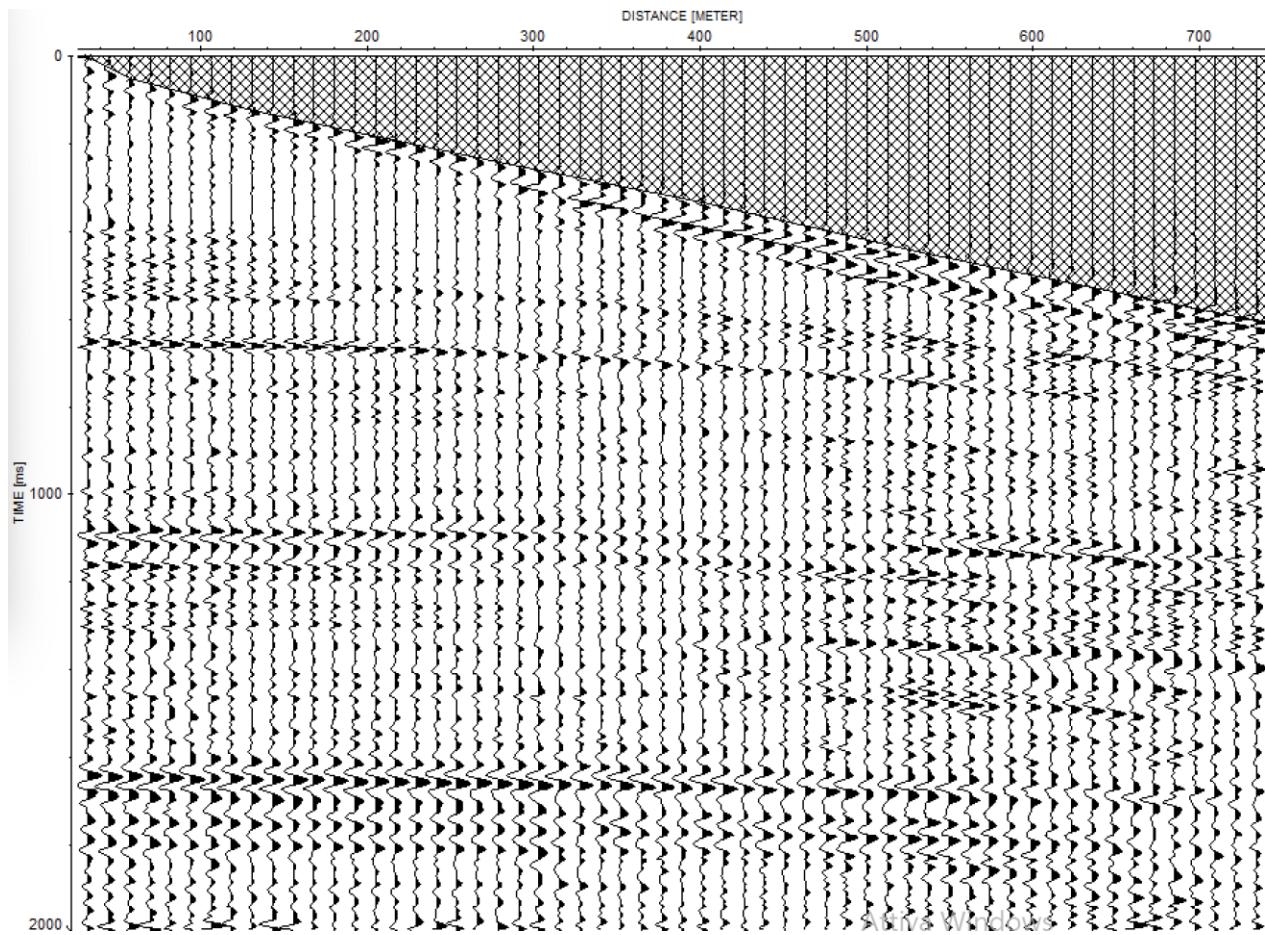
Comparison Before and After FK Filters





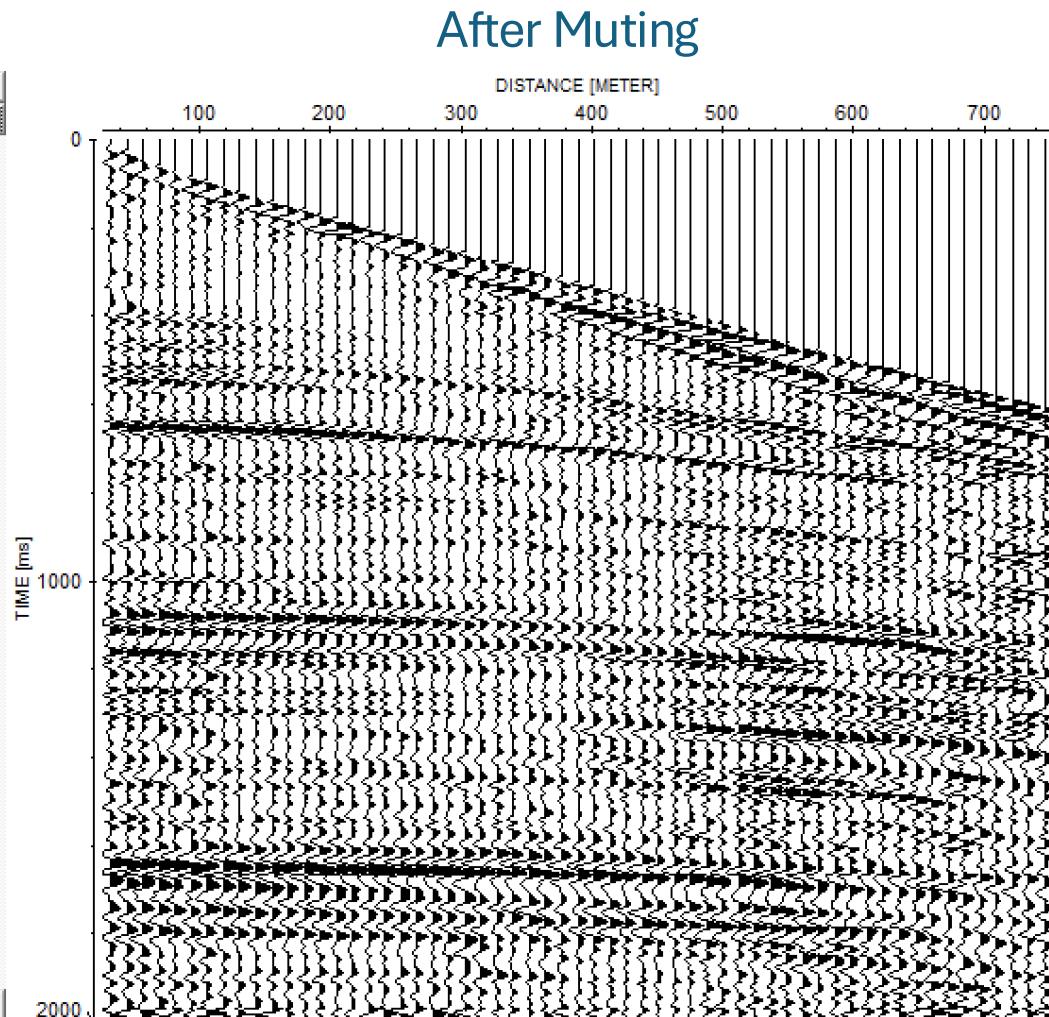
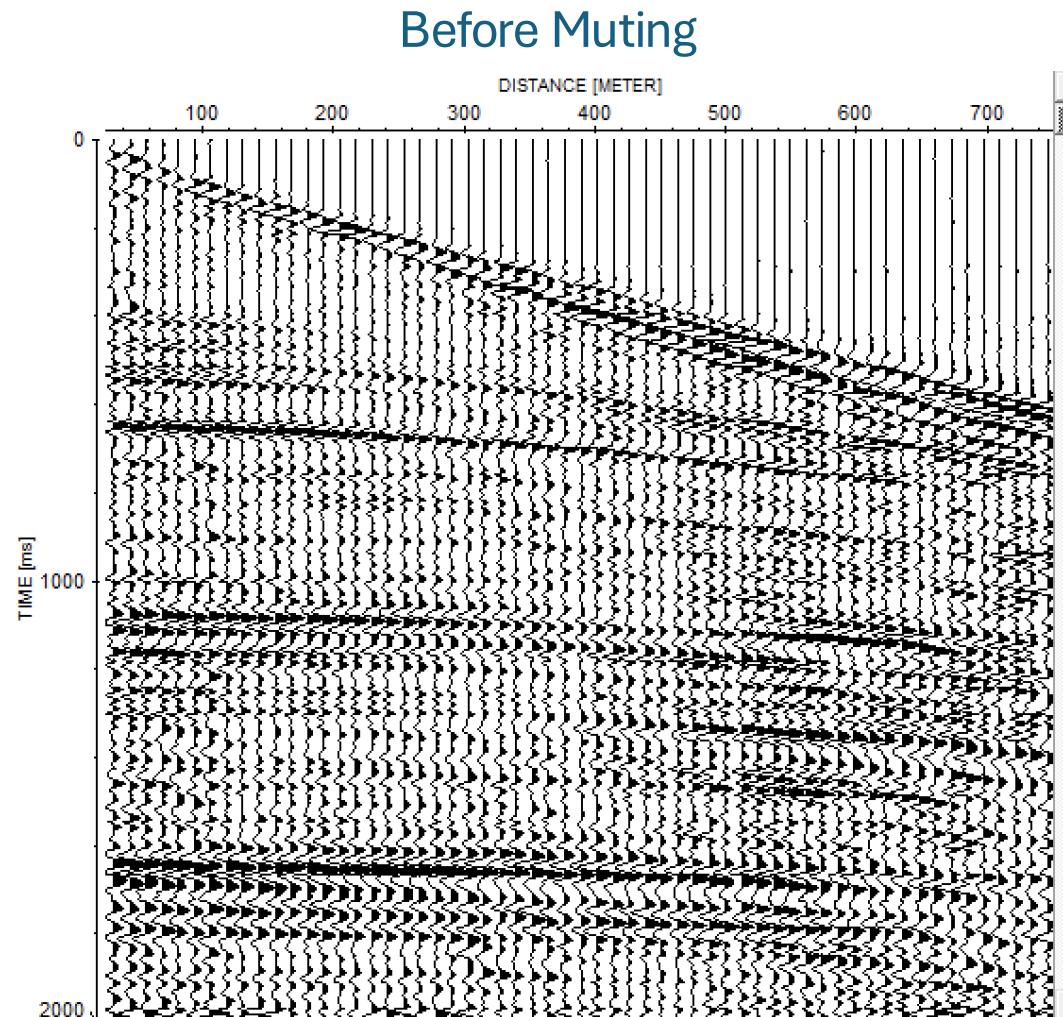
Muting

Muting curve design:





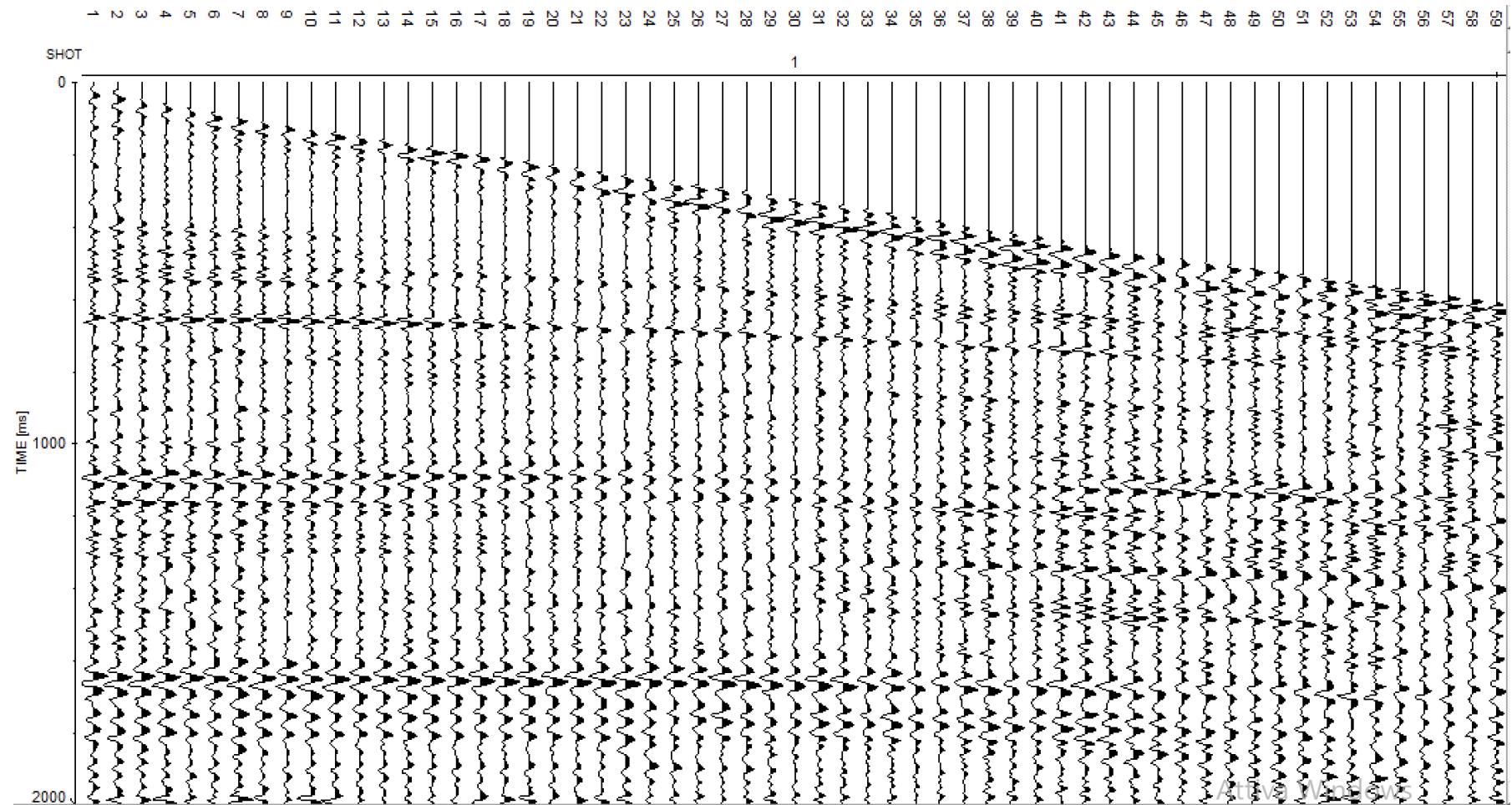
Comparison Before and After Muting





CMP Visualization

- Sorting: shot
- Second axis: offset
- Number of shots: 1
- Group interval: 12,3m
- Channels: 59

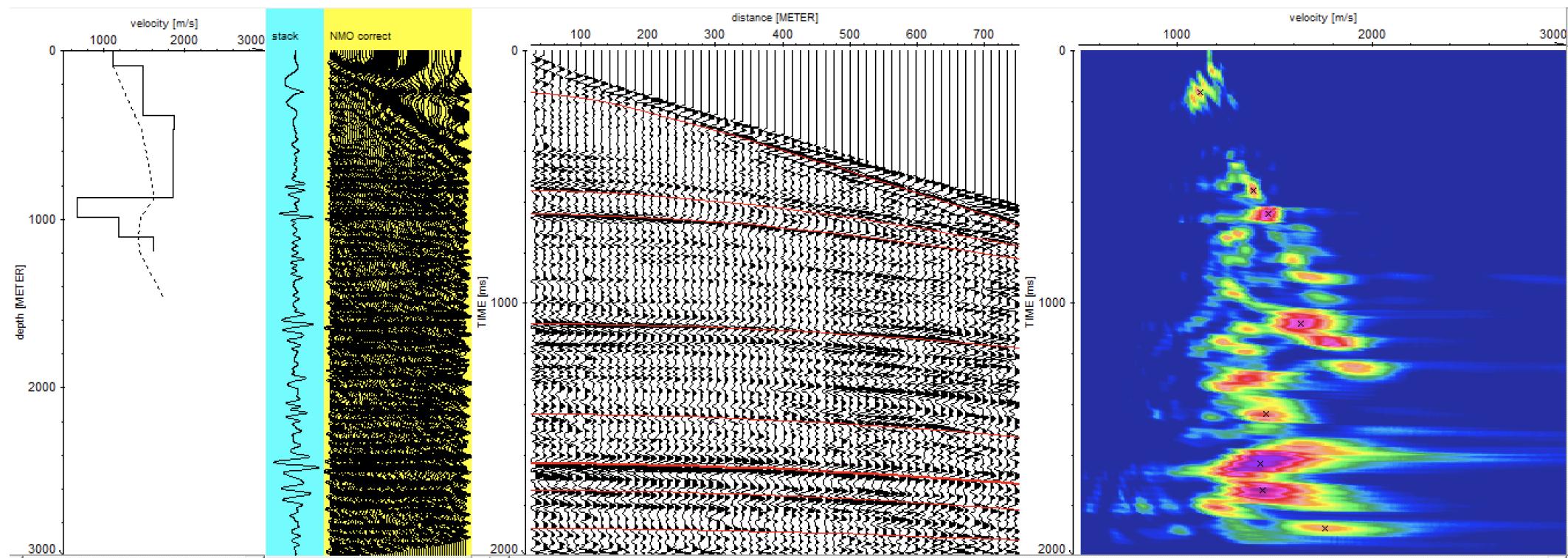




Velocity Analysis

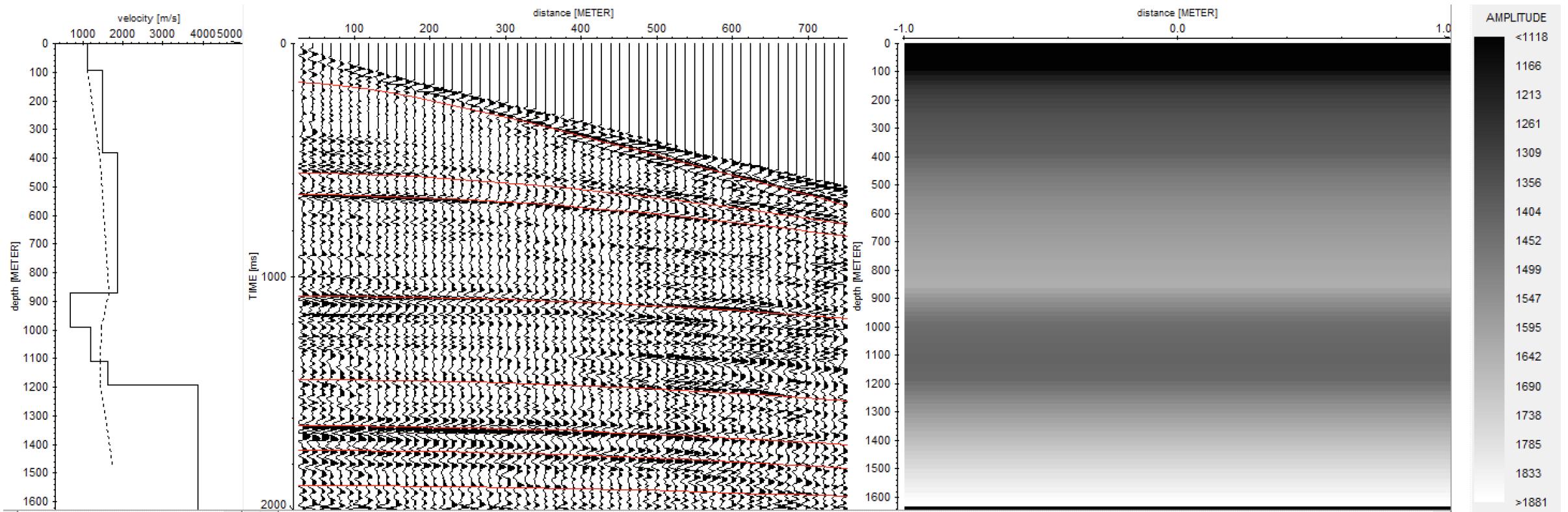
Parameters:

- Operator: Semblance (because it is sensitive to both amplitude and waveform difference)
- Time window: 40 (comparable with the wavelet duration)
- Minimum velocity: 500 m/s
- Maximum velocity: 3000 m/s
- Velocity interval: 10 m/s





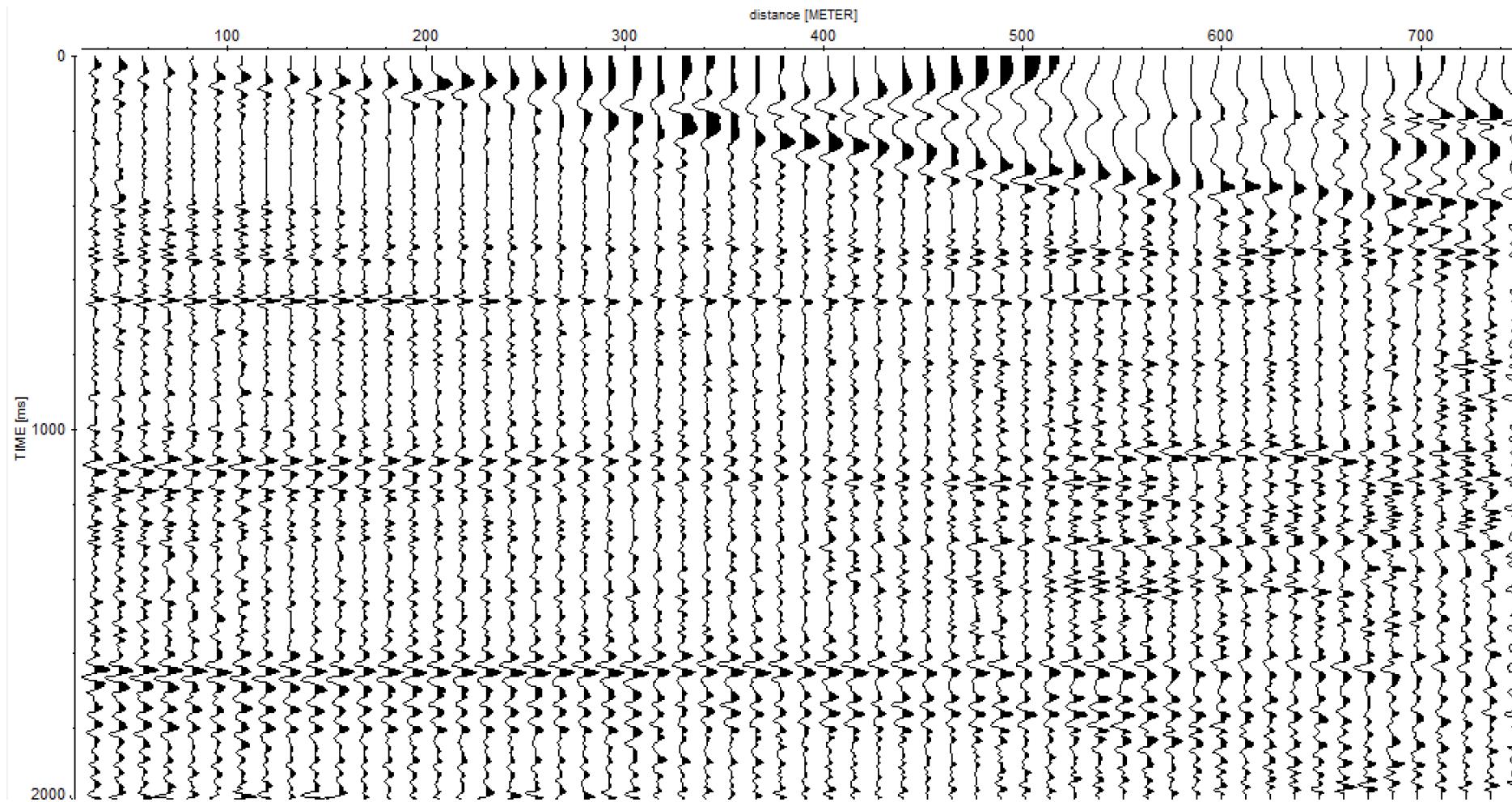
Velocity Analysis - 2D Model





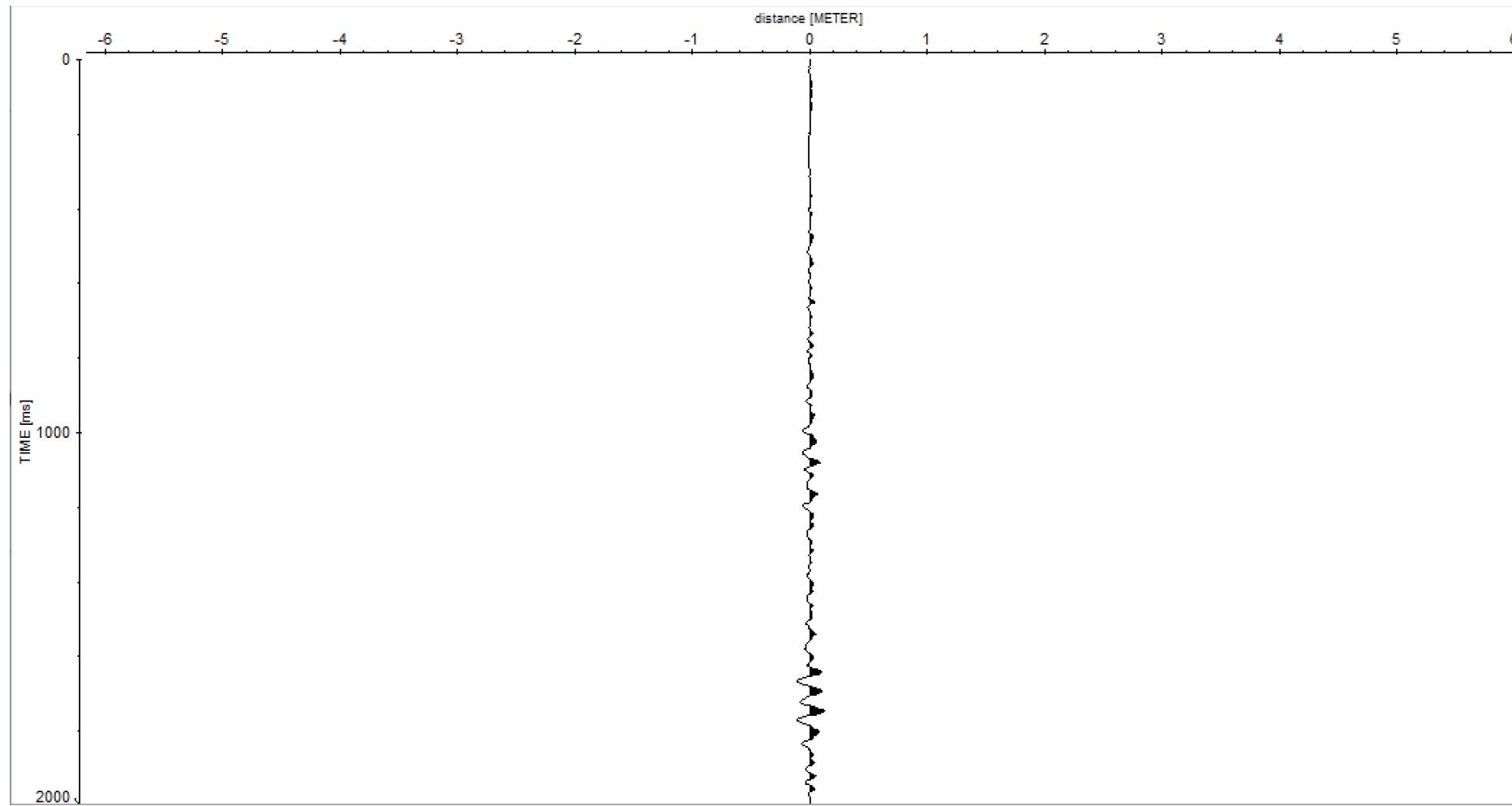
NMO Correction

We corrected the data by applying the NMO correction using the 2D velocity model obtained at the previous step.





Single Trace Stack

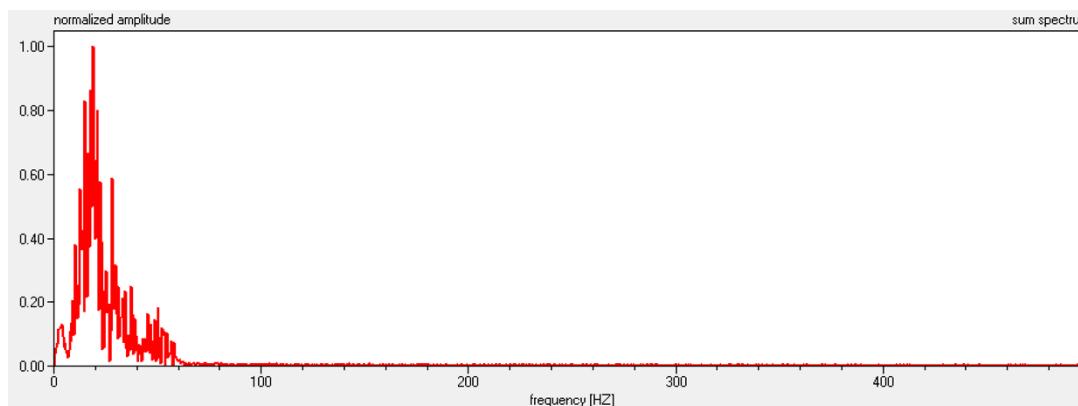




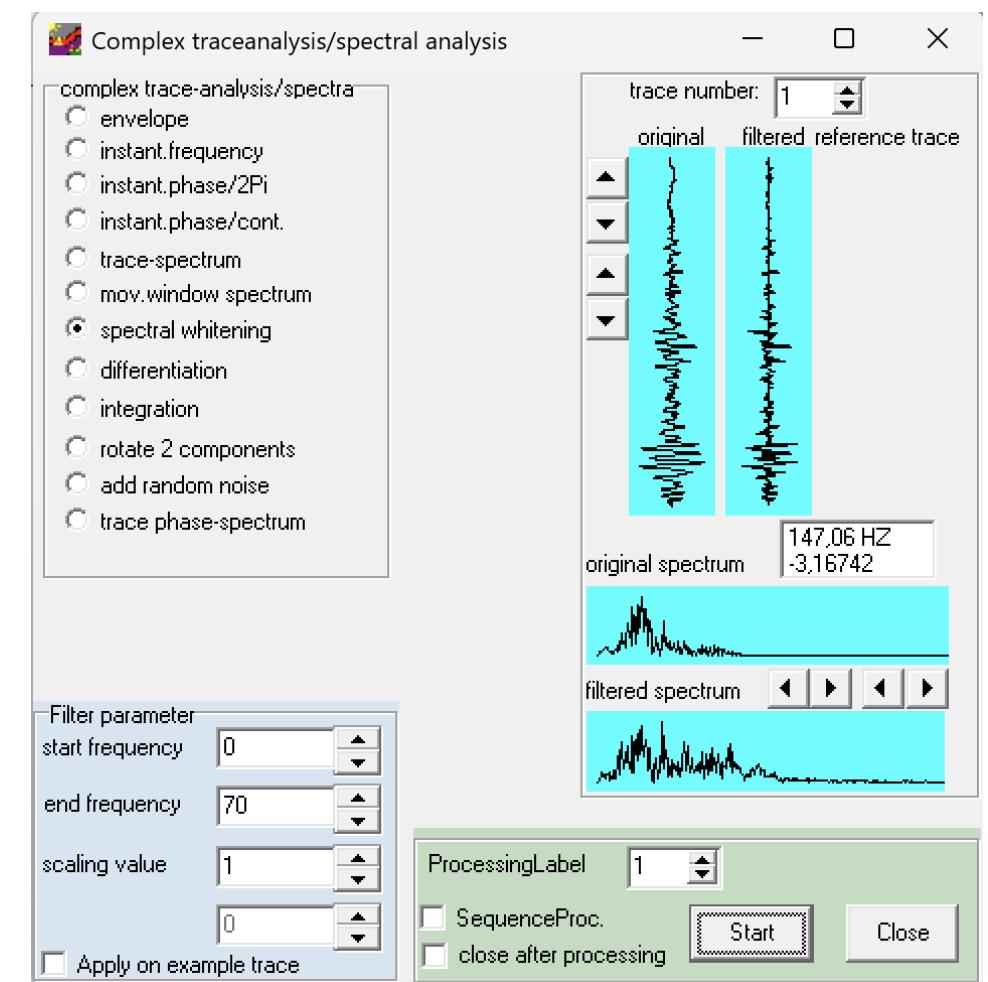
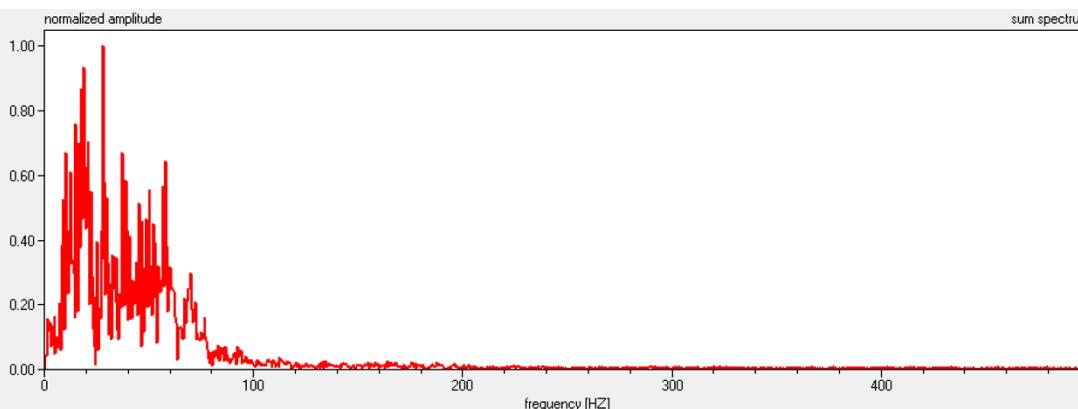
Deconvolution

We performed deconvolution using Spectral-Whitening function, which is a zero-phase deconvolution.
We noticed that the after the deconvolution spectrum is flatter as expected.

Spectrum before deconvolution



Spectrum after deconvolution





Comparison Before and After Deconvolution

