Project on Seismic Reflection

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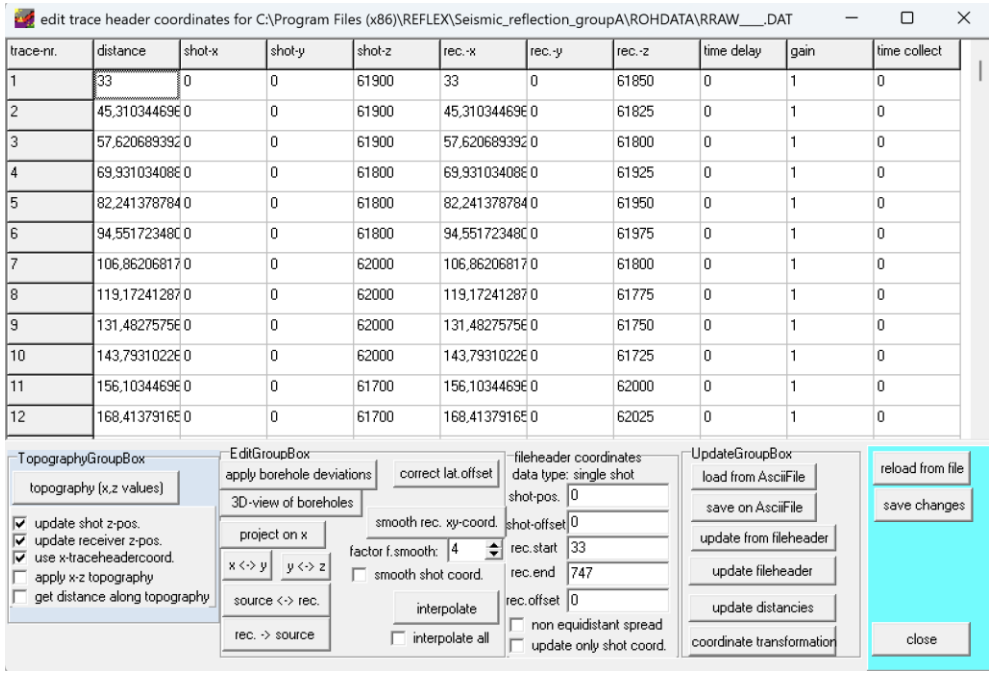
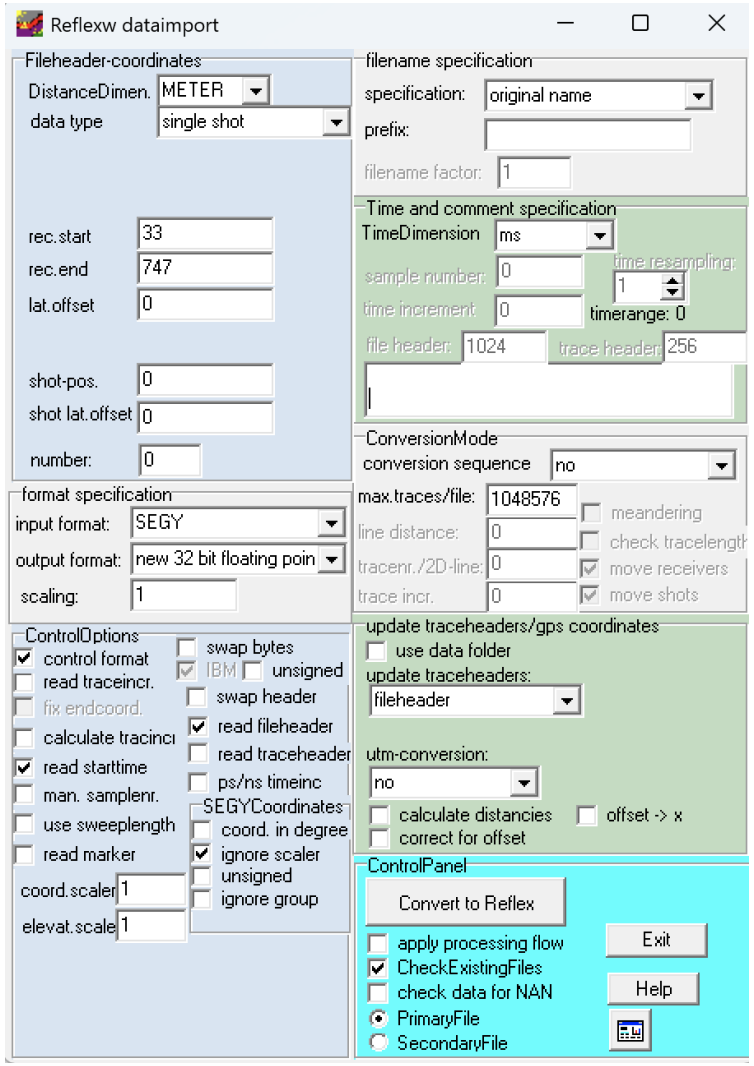
Data Import

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.

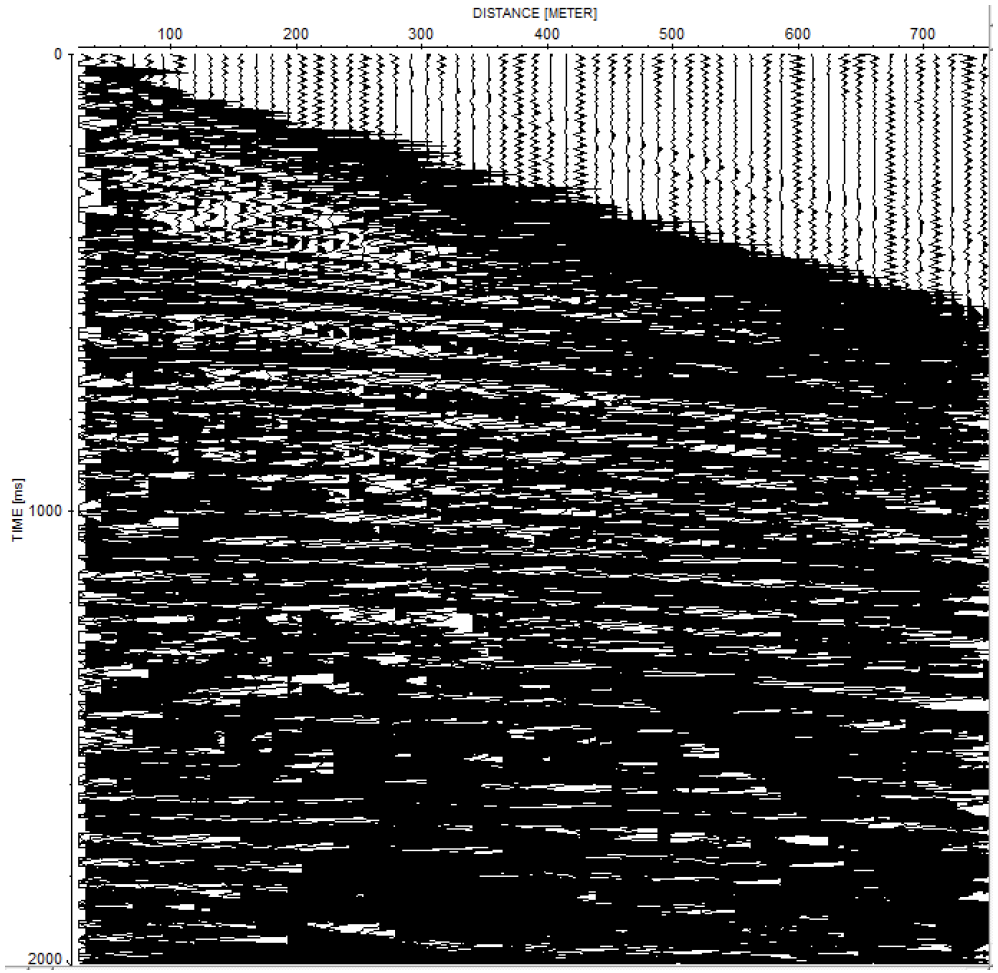




Raw Data

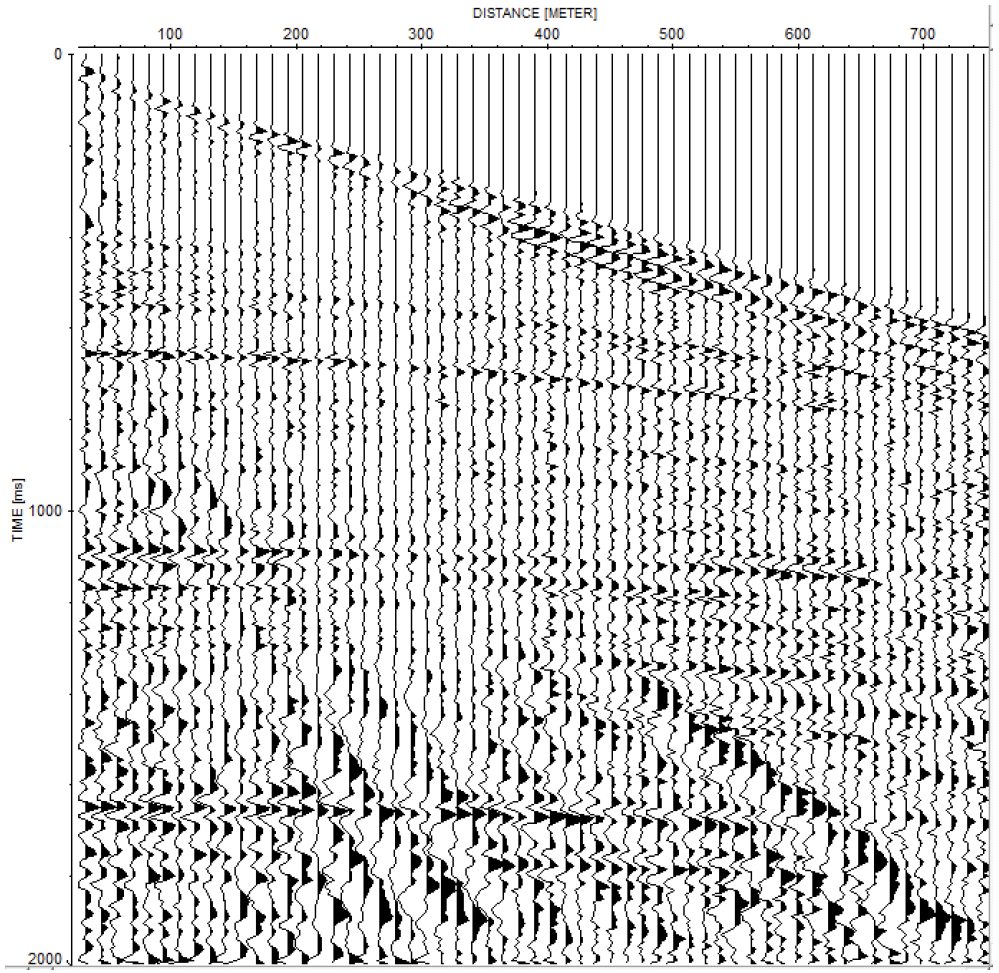
Wigglemode

without trace normalization



Wigglemode

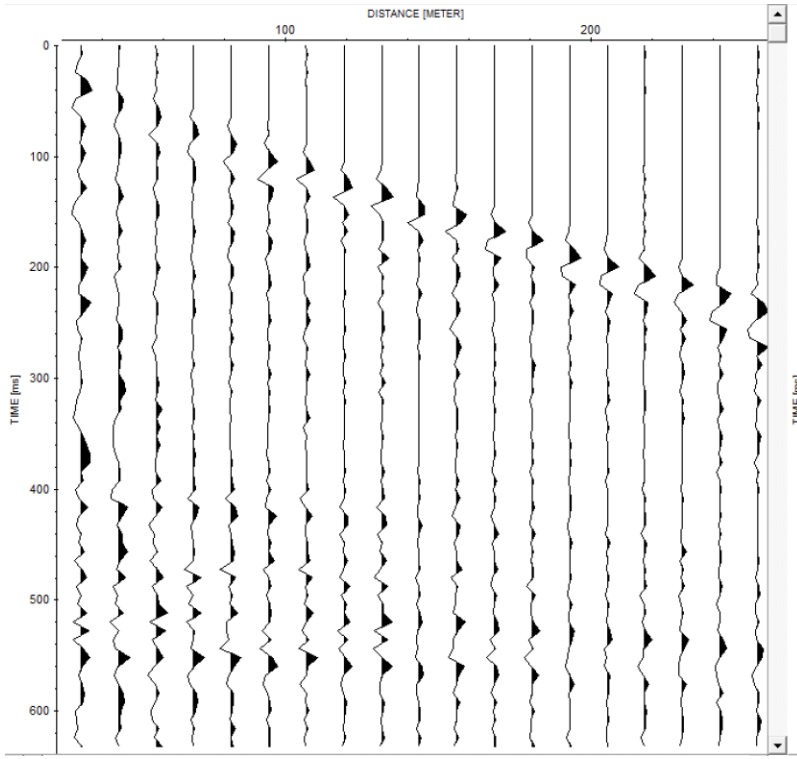
with trace normalization



Resampling at 1 ms

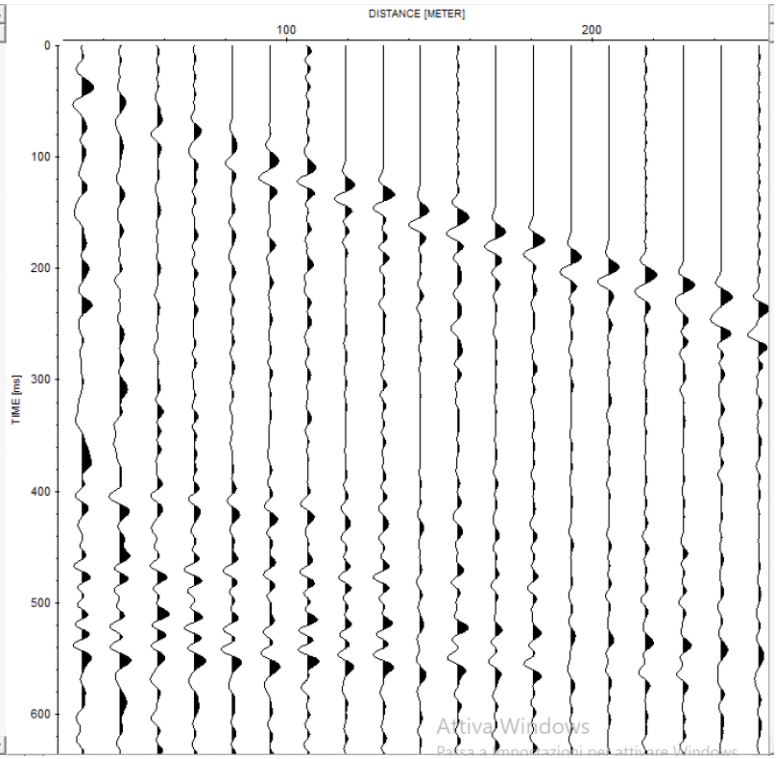
Sampling interval at 8ms:

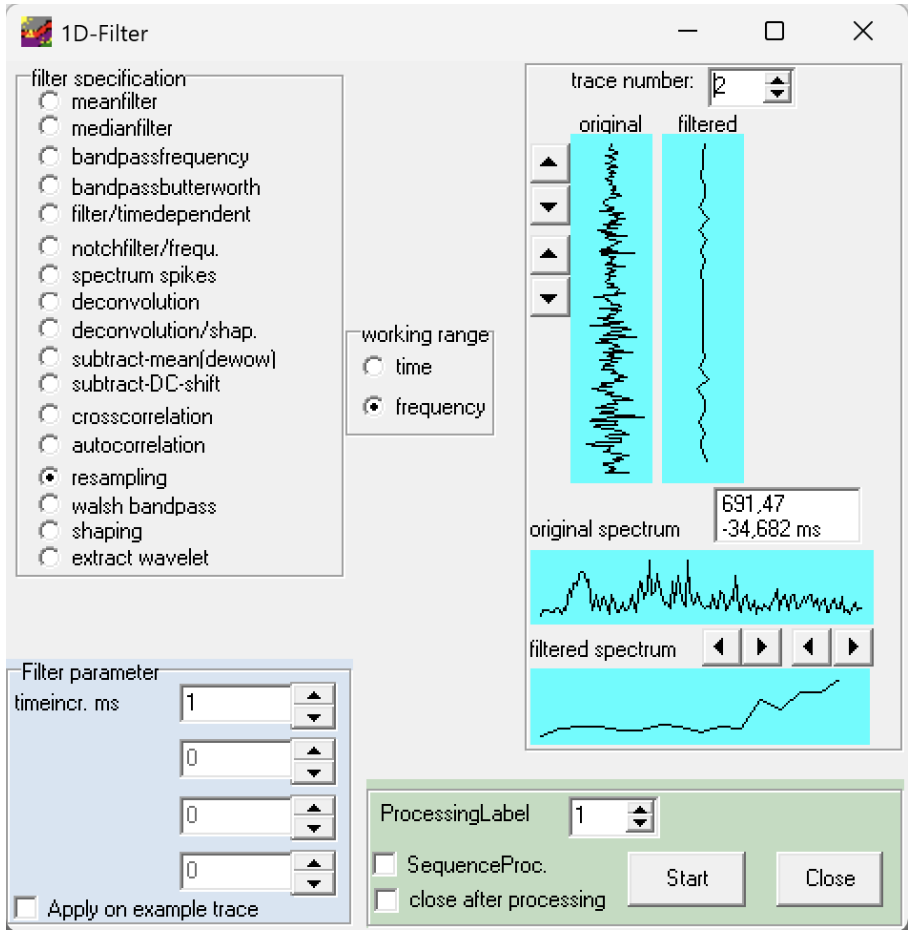
Zoomed section



Sampling interval at 1ms:

Zoomed section

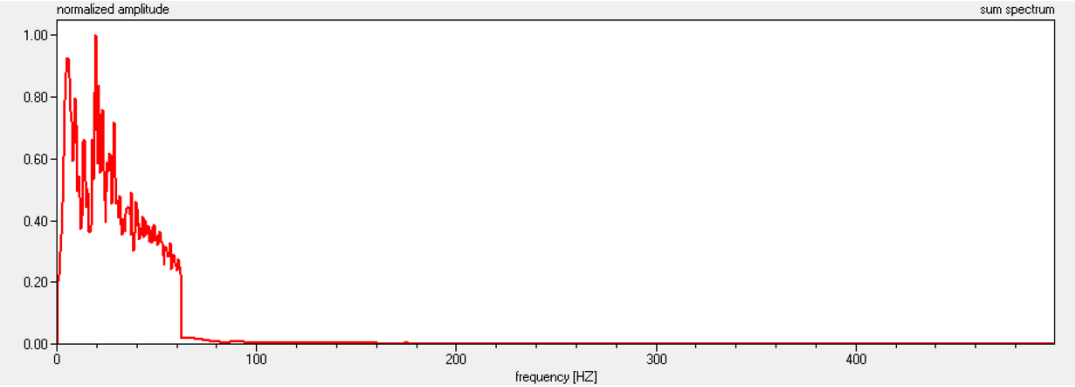




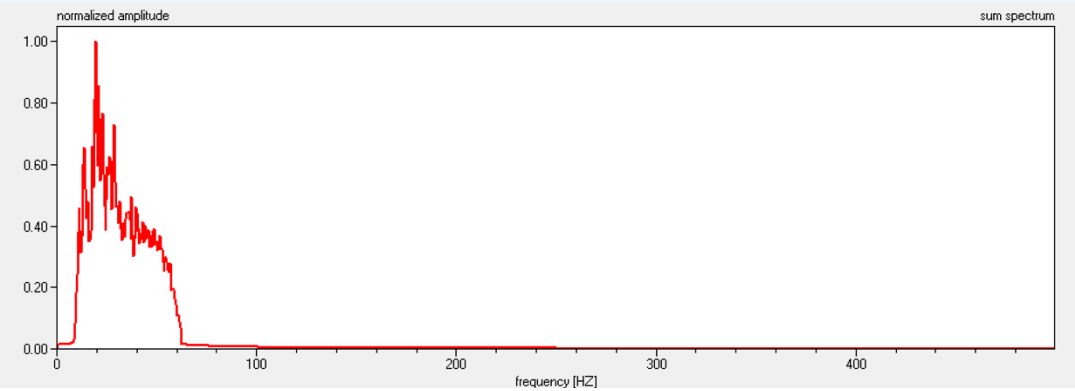
Passband Filter

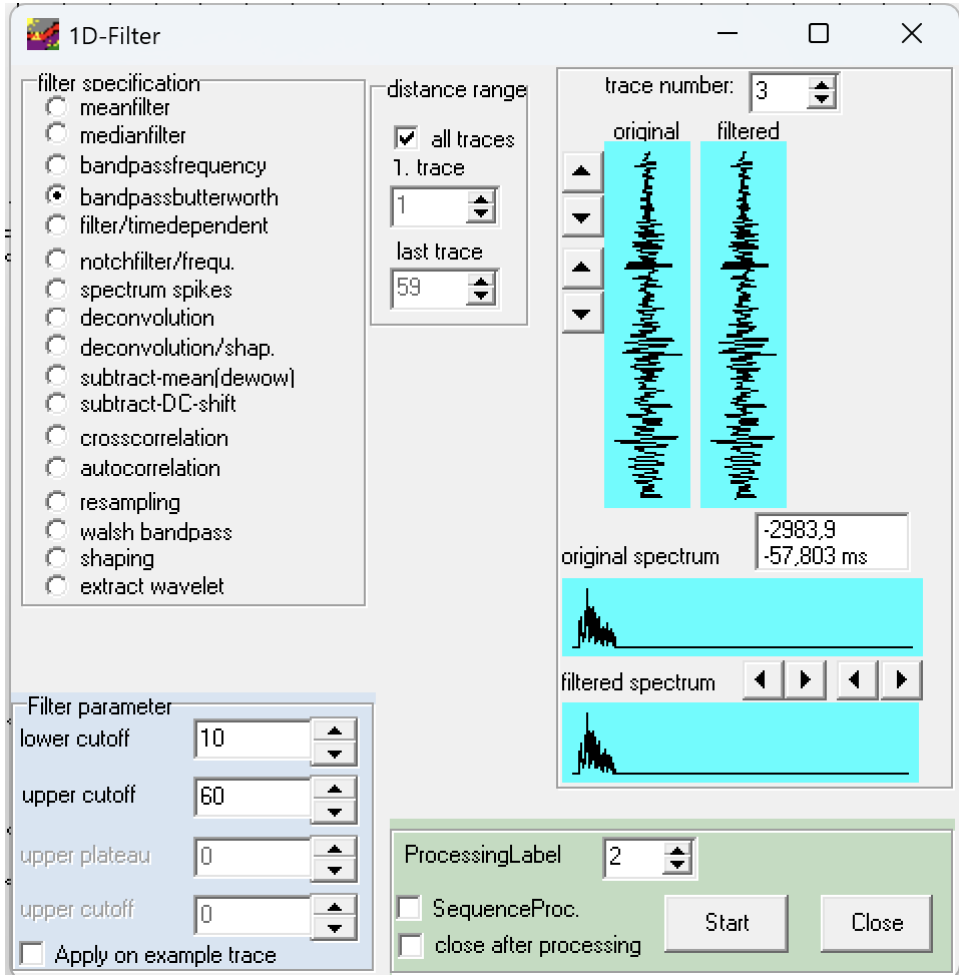
We filter the data to remove the low frequency components (lower than 10Hz) because are mostly due to the ground roll.

Spectrum before filtering

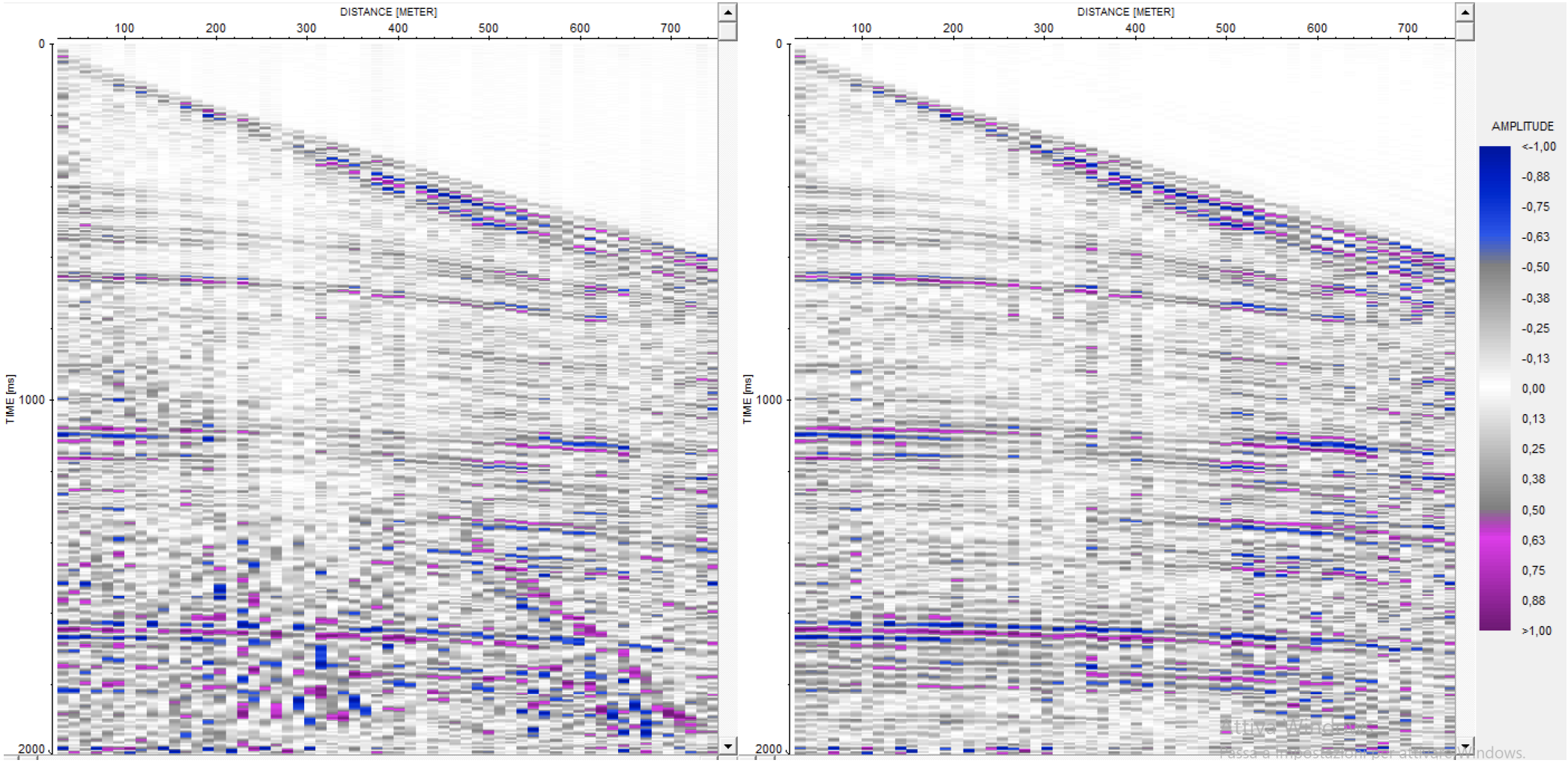


Spectrum after filtering

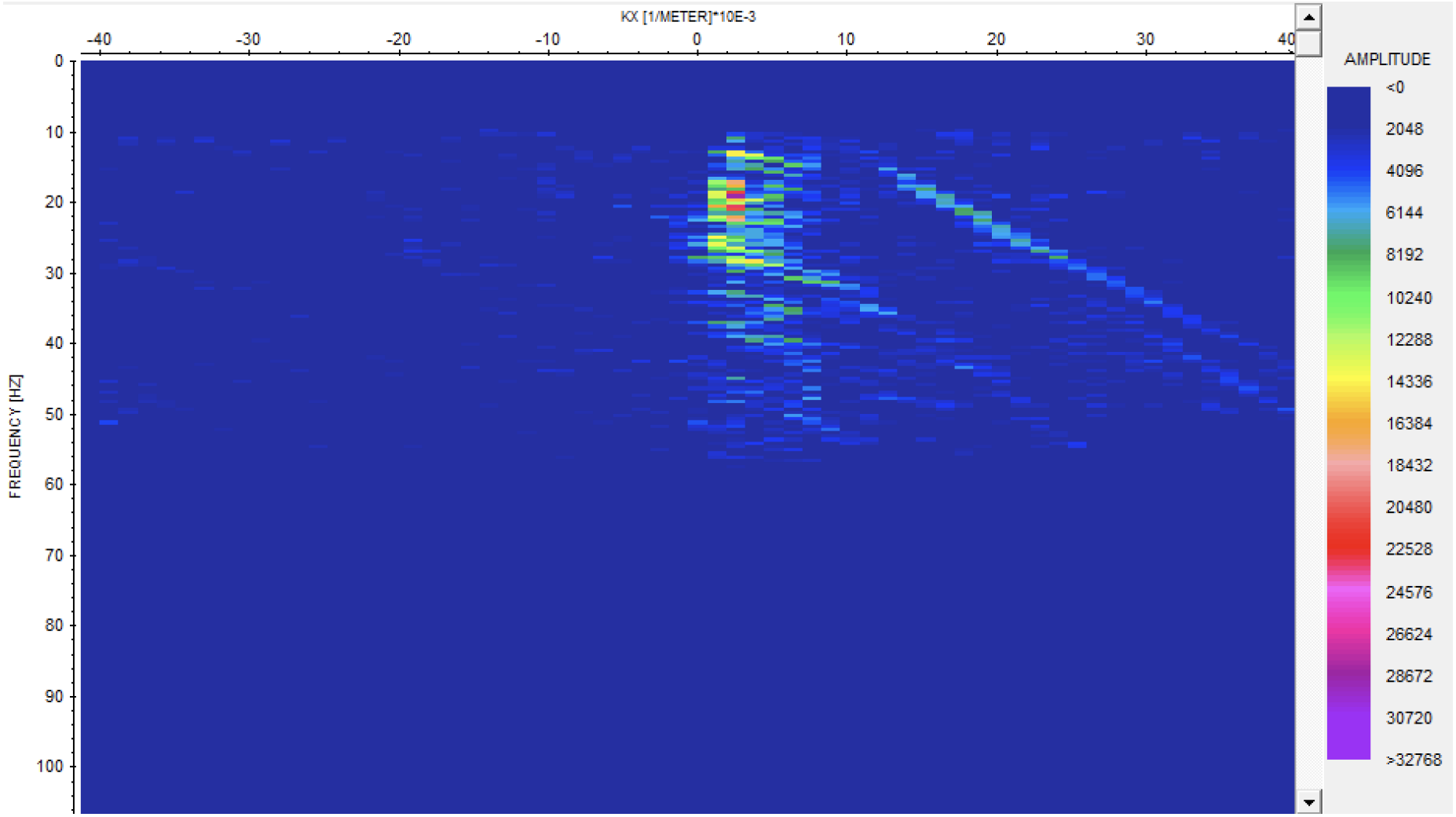




Comparison Original vs Bandpassbutterworth

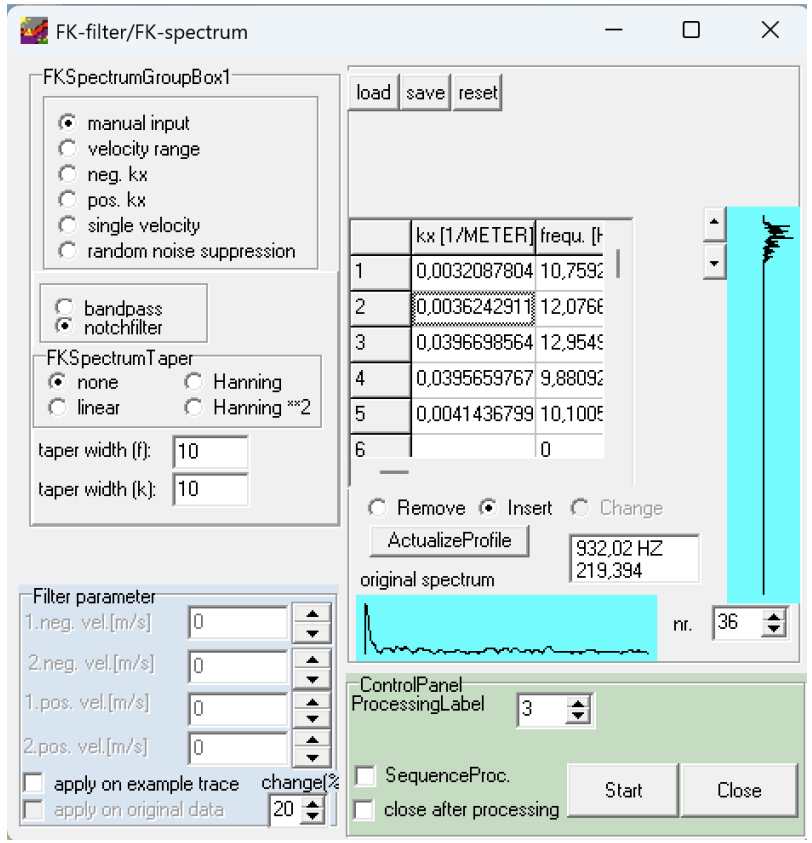


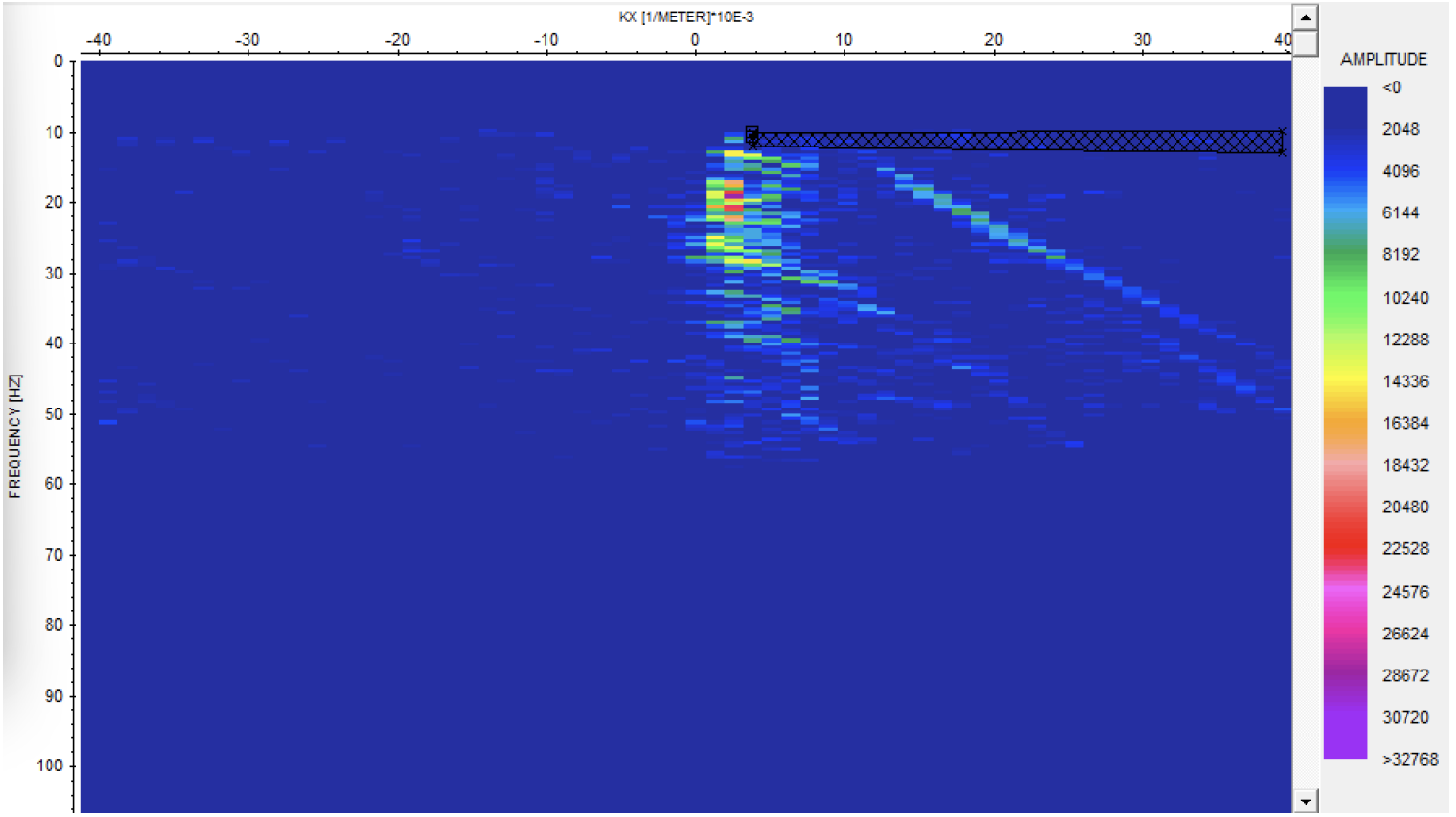
FK Spectrum of the Original Dataset



Ground Roll Removal

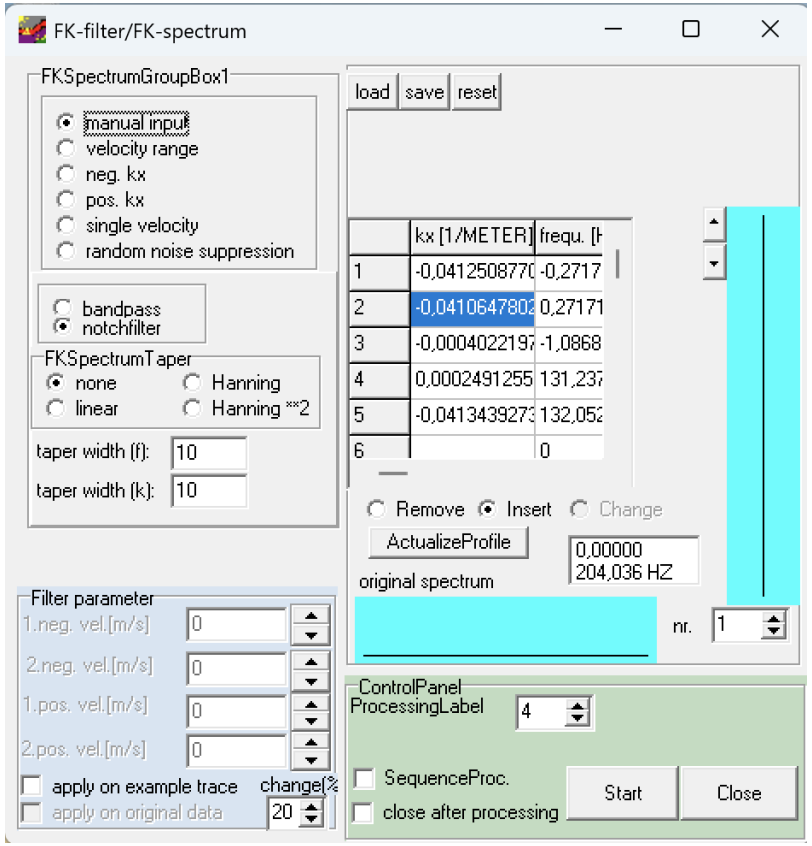
First FK filter design:

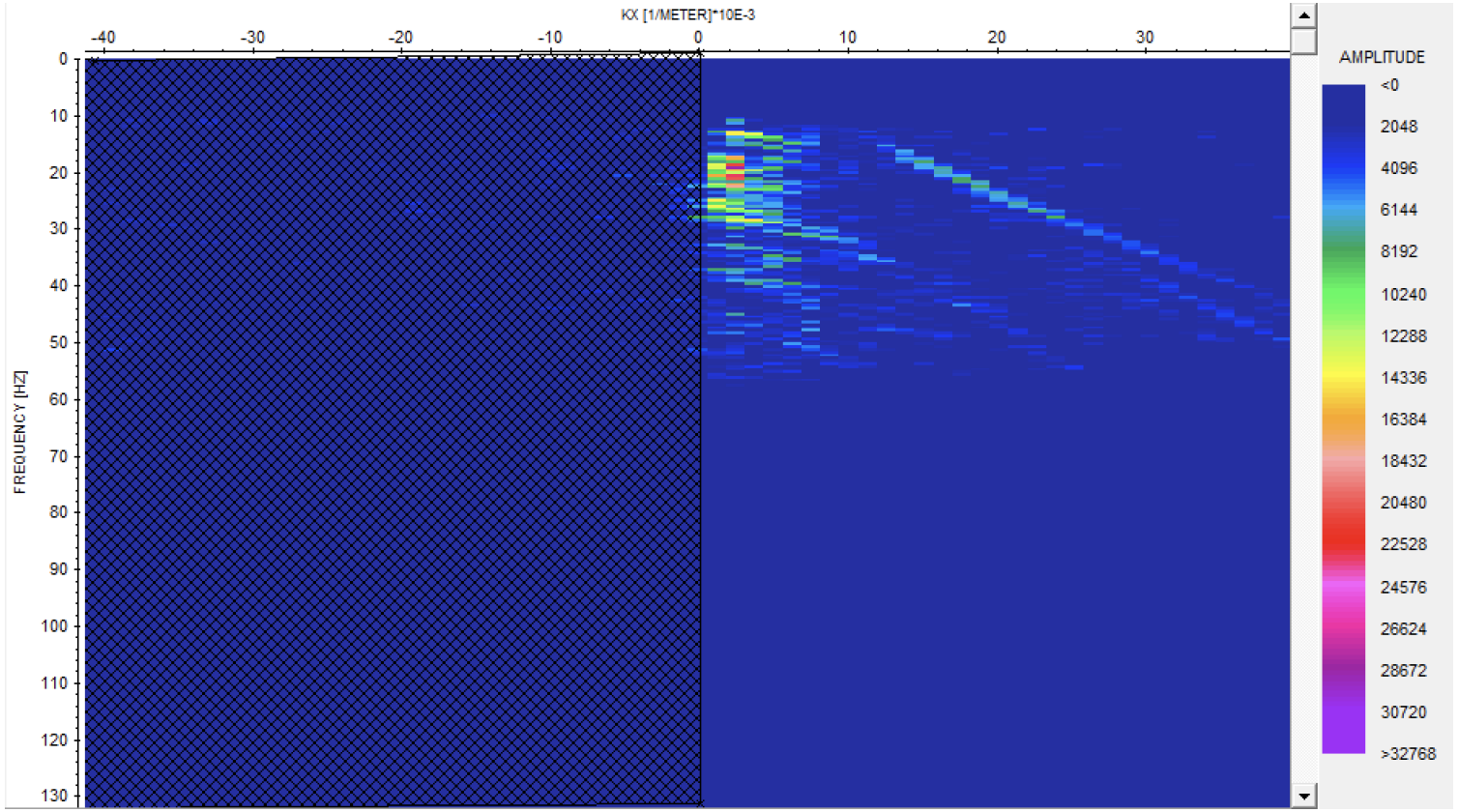




Aliasing Removal

Second FK filter design:





Comparison Before and After FK Filters

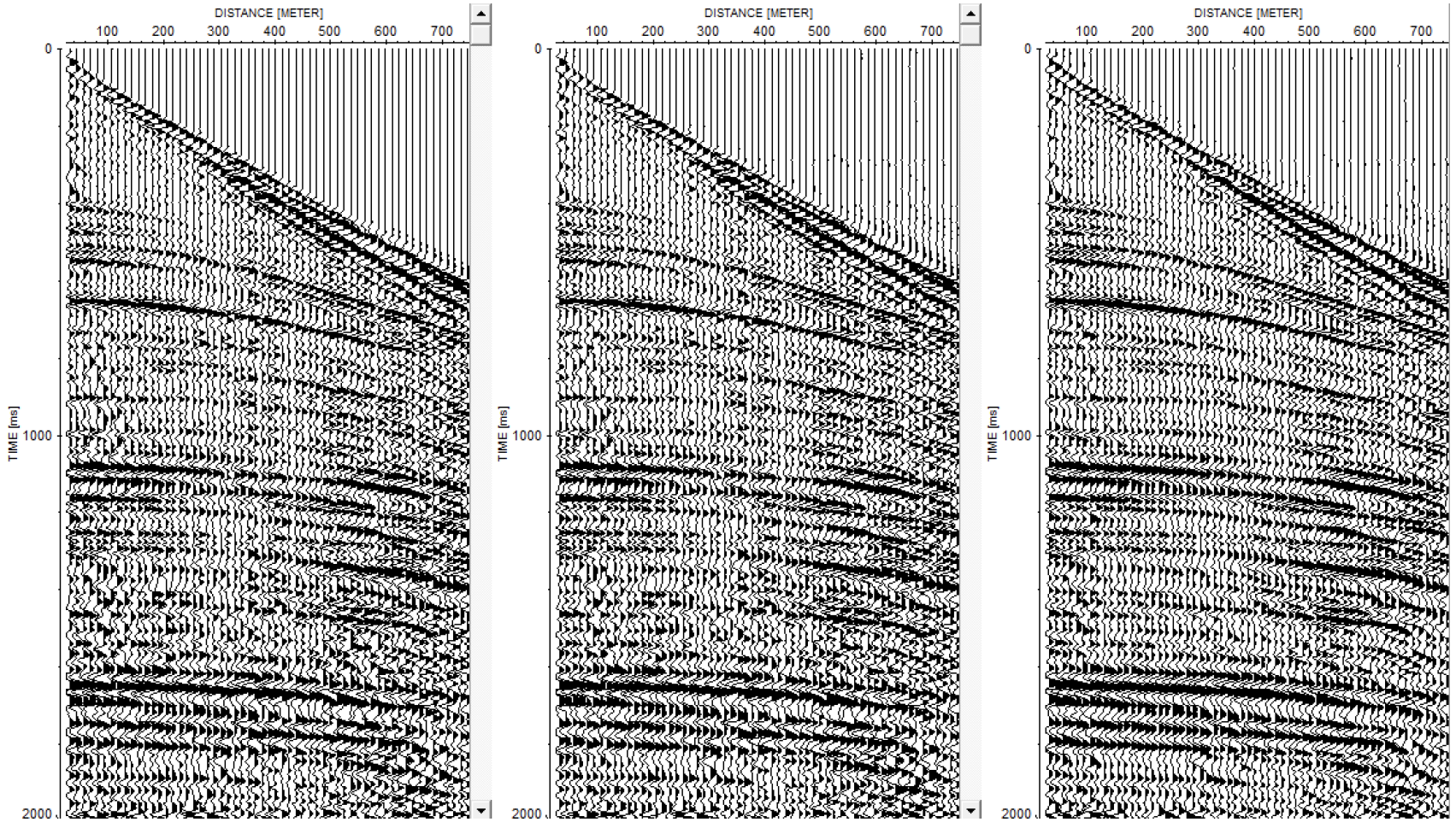
Before FK filters

After Ground Roll removal

First FK filter

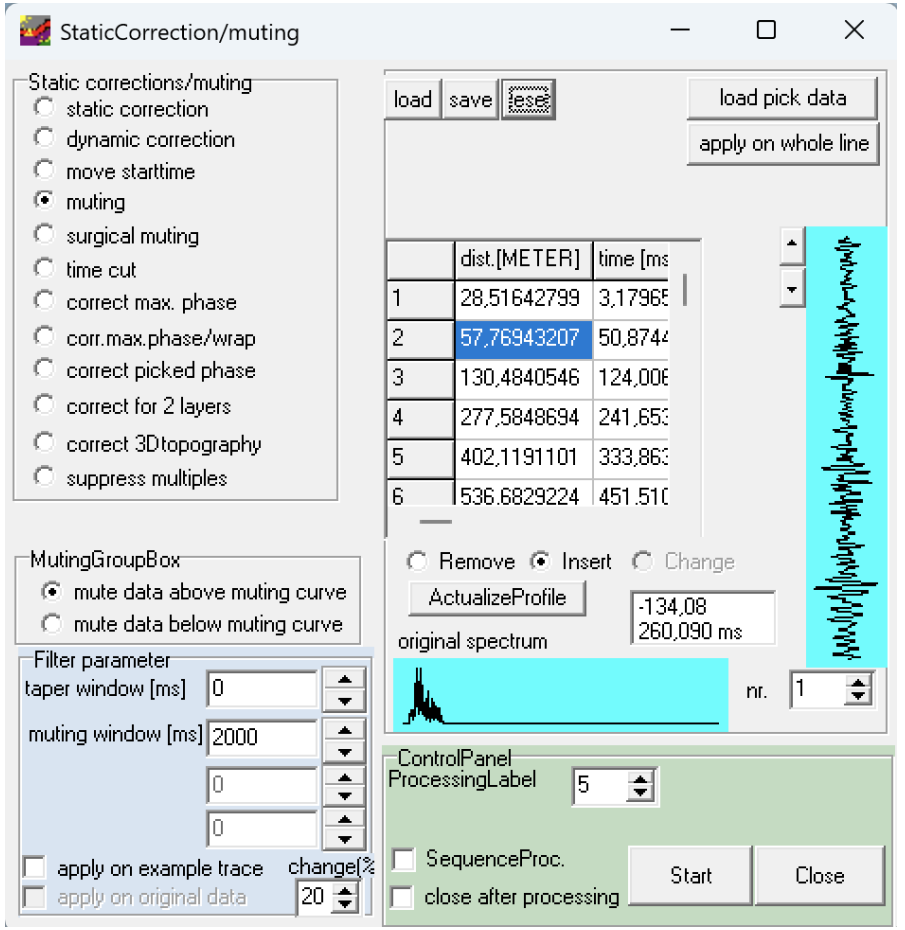
After Aliasing removal

Second FK filter



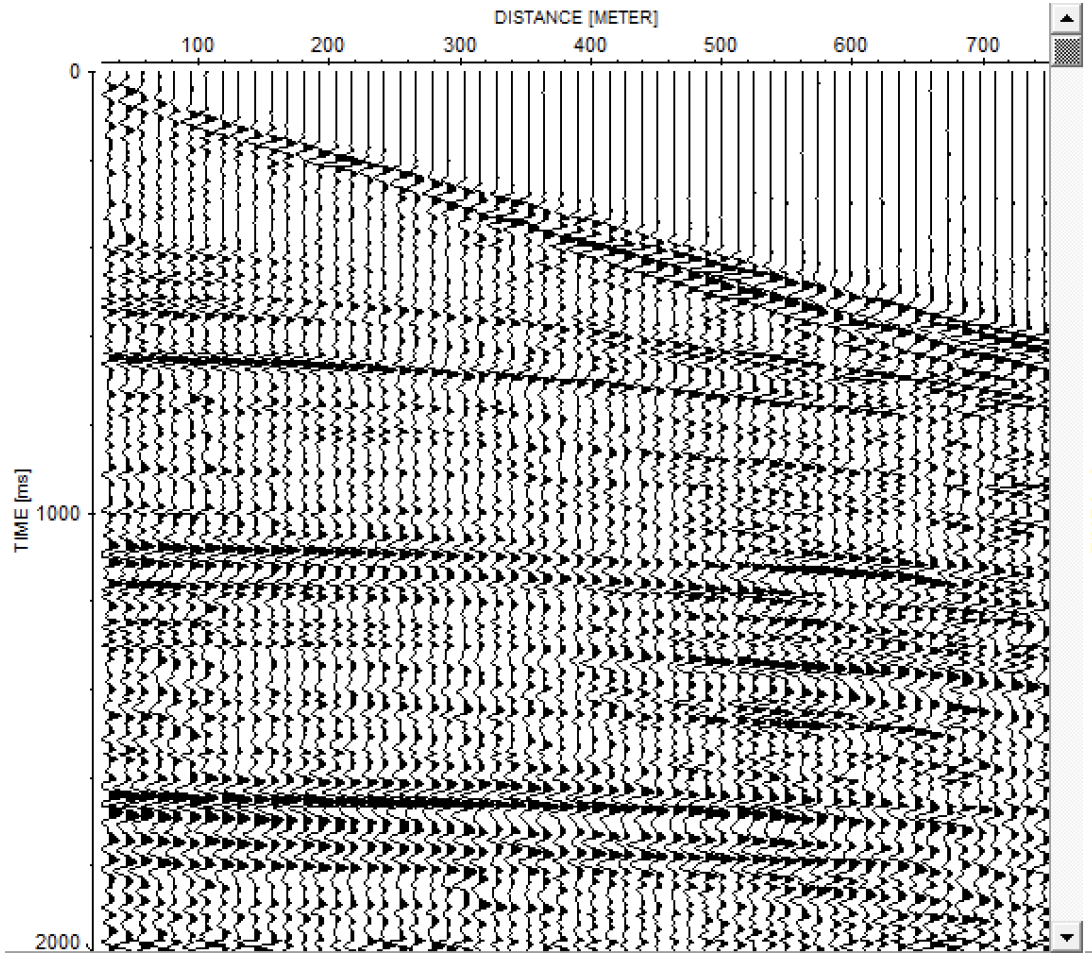
Muting

Muting curve design:

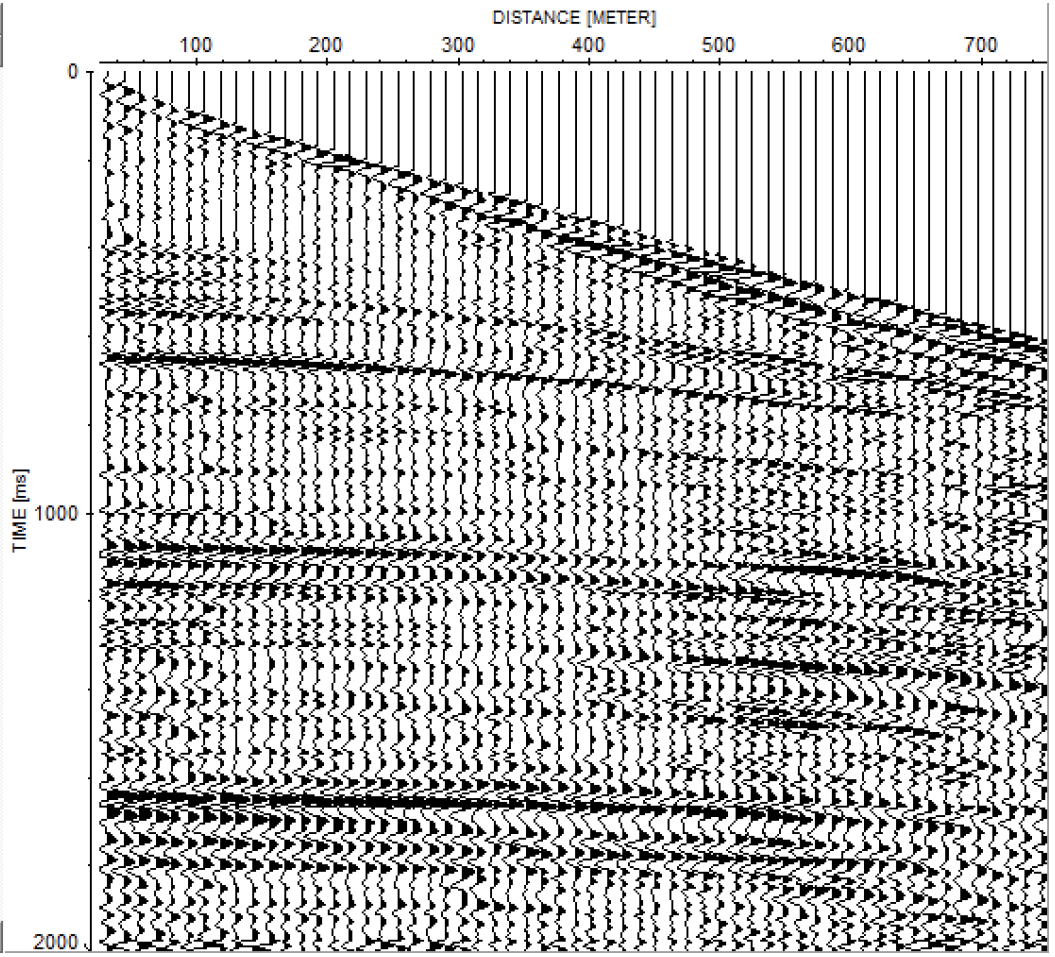


Comparison Before and After Muting

Before Muting

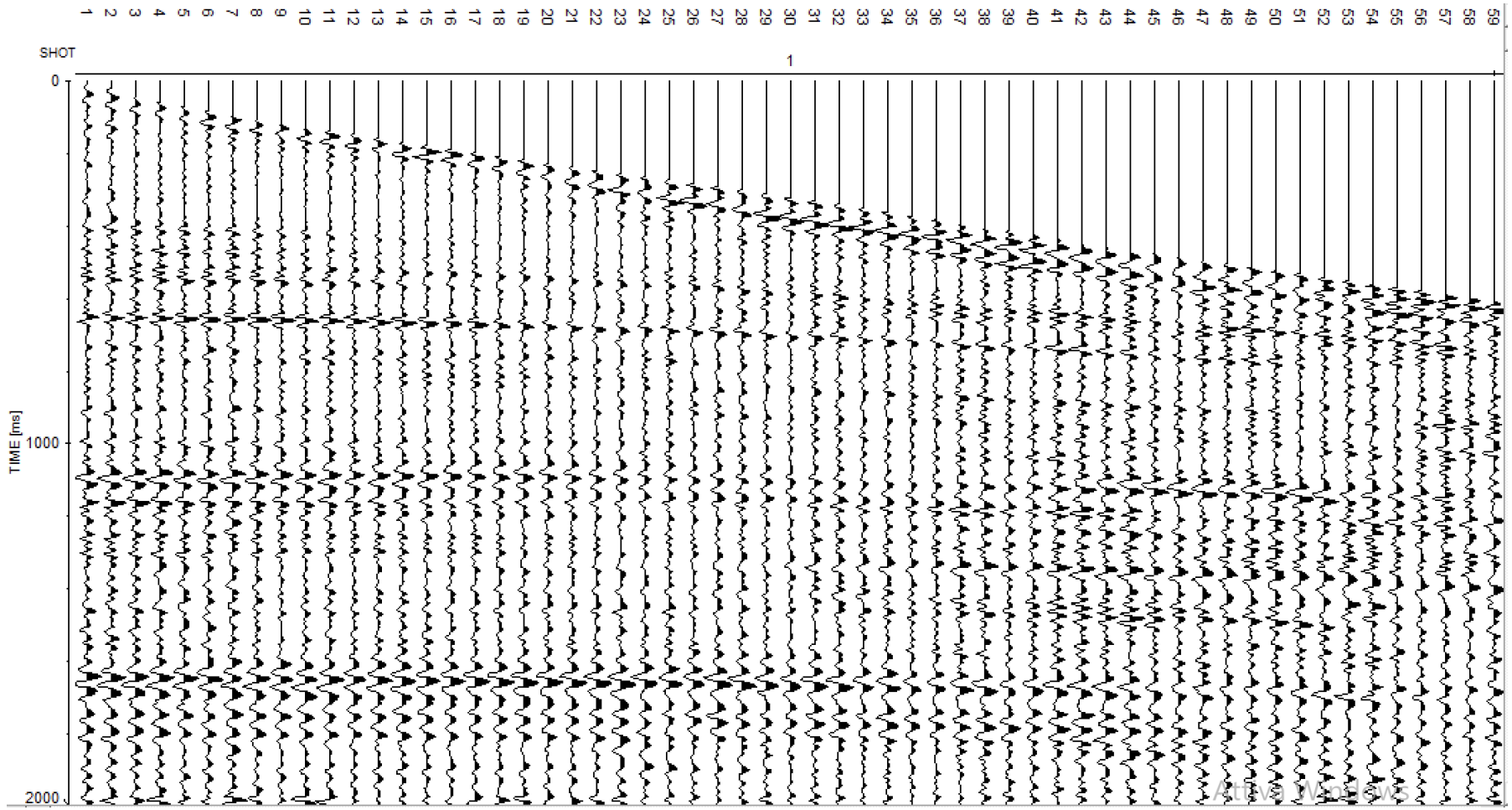


After Muting



CMP Visualization

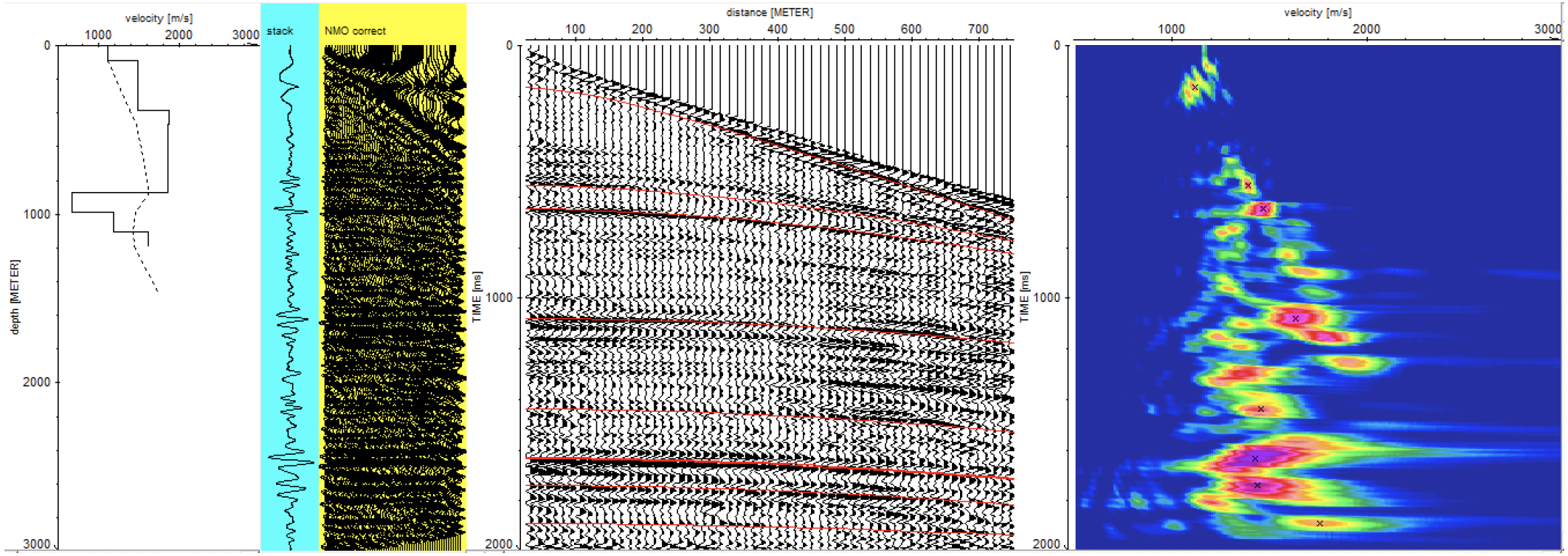
- Sorting: shot
- Second axis: offset
- Number of shots: 1
- Group interval: 12,3m
- Channels: 59



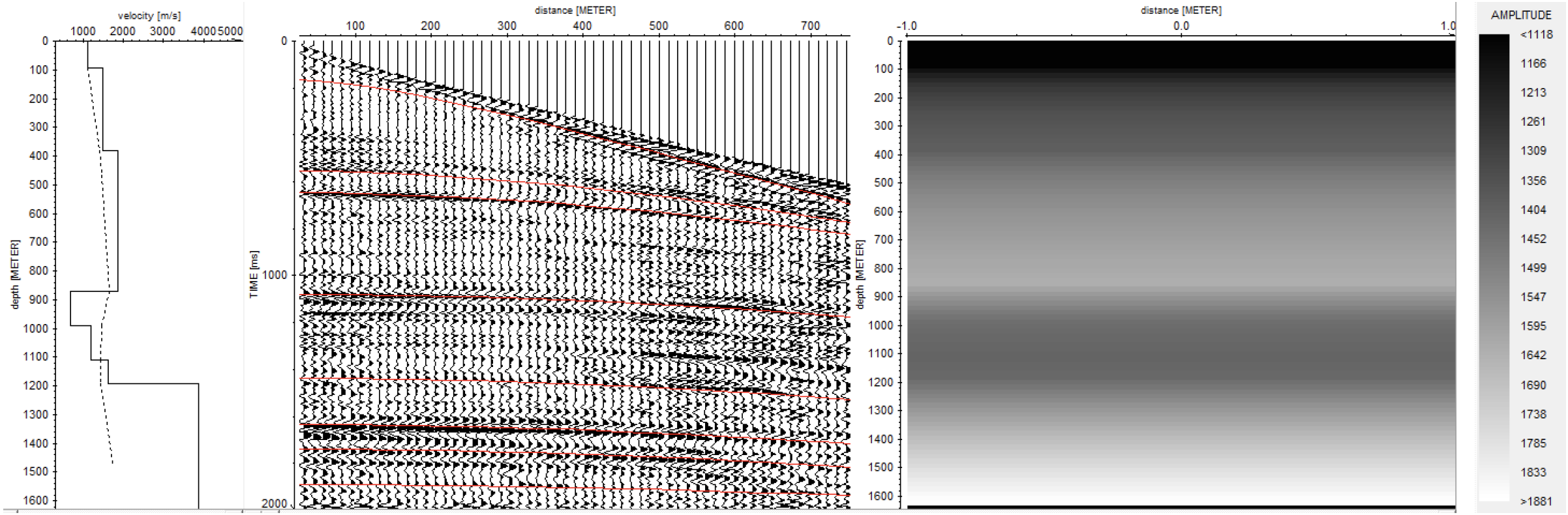
Velocity Analysis

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

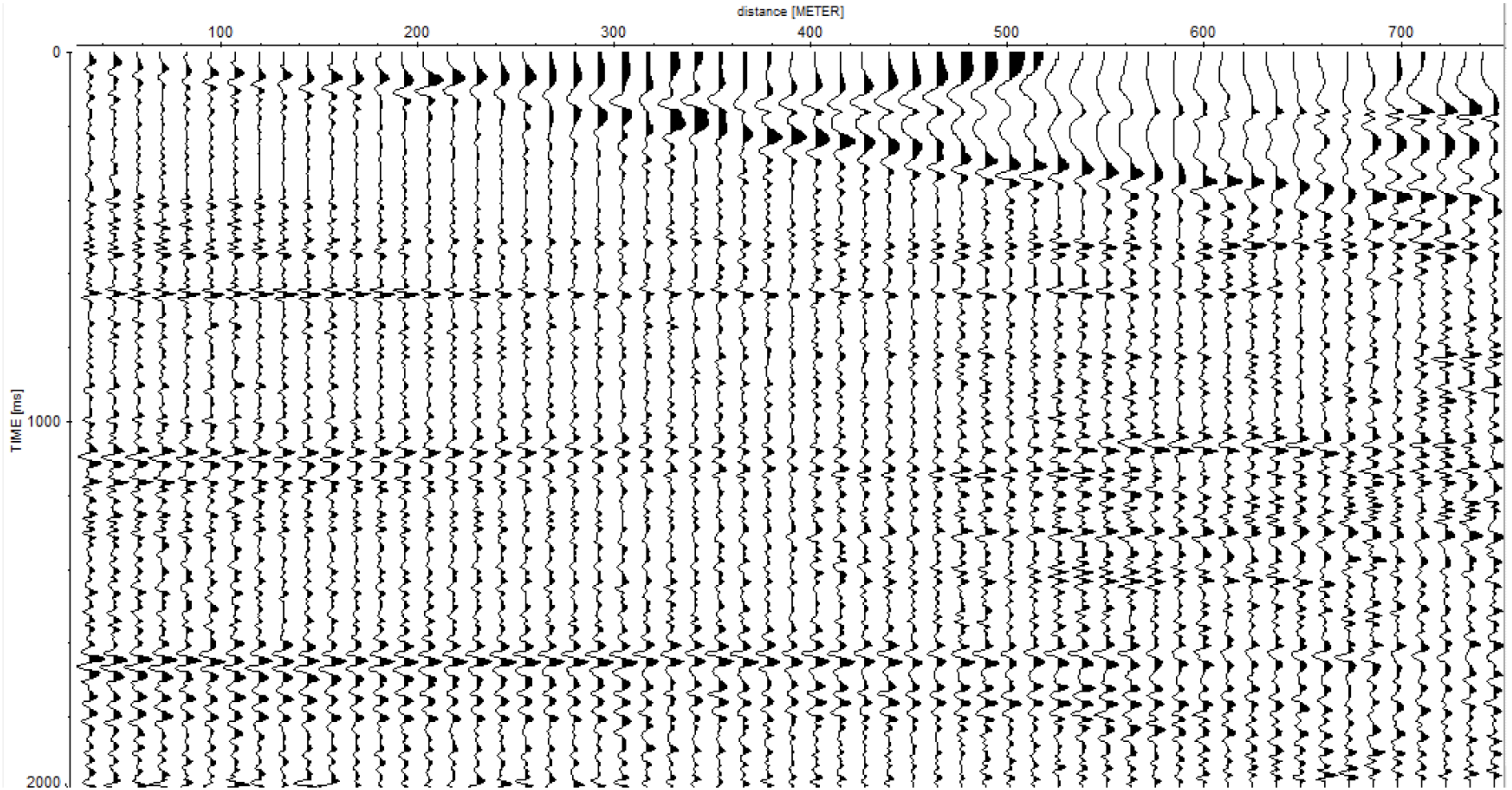


Velocity Analysis - 2D Model

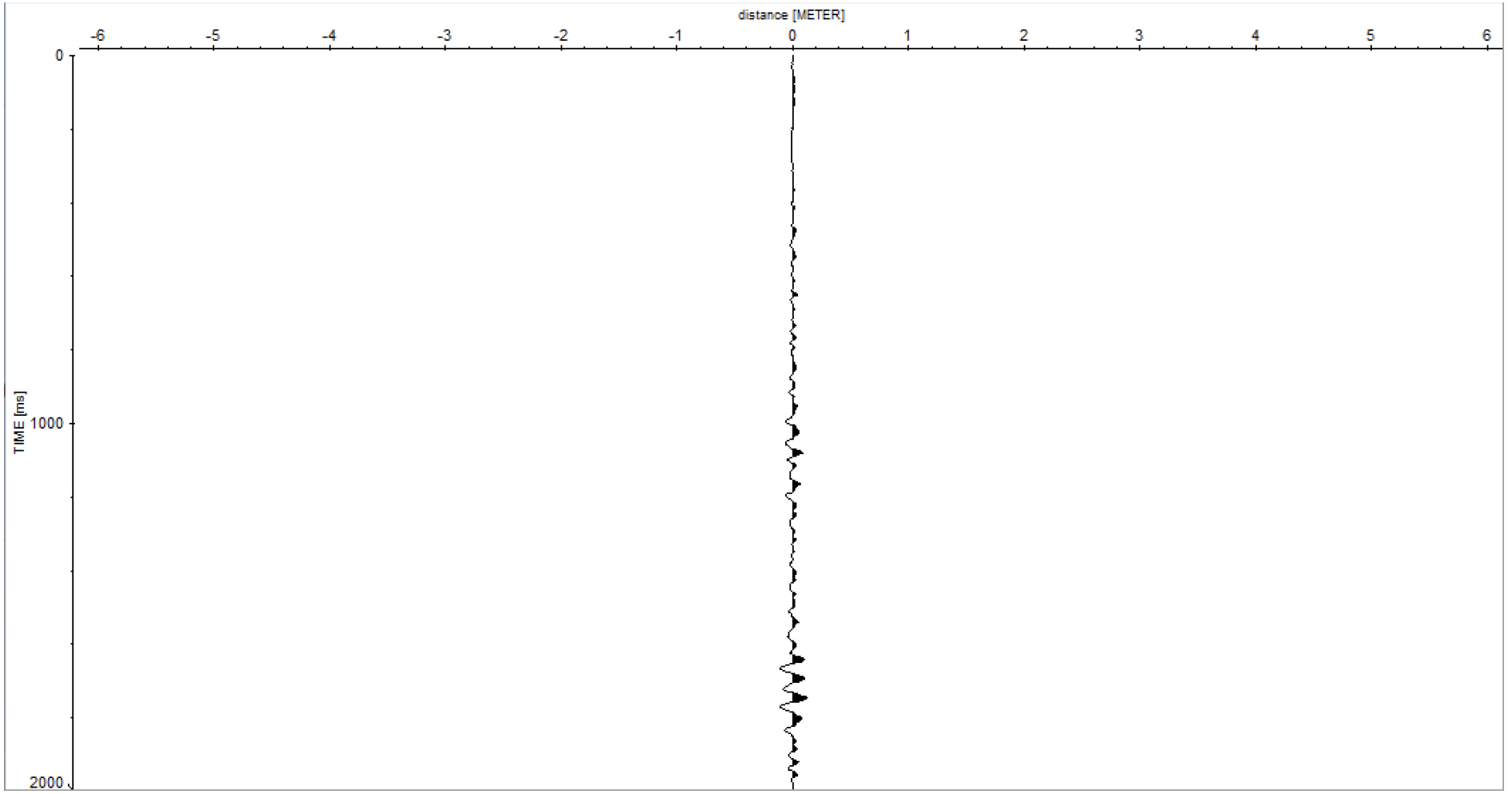


NMO Correction

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



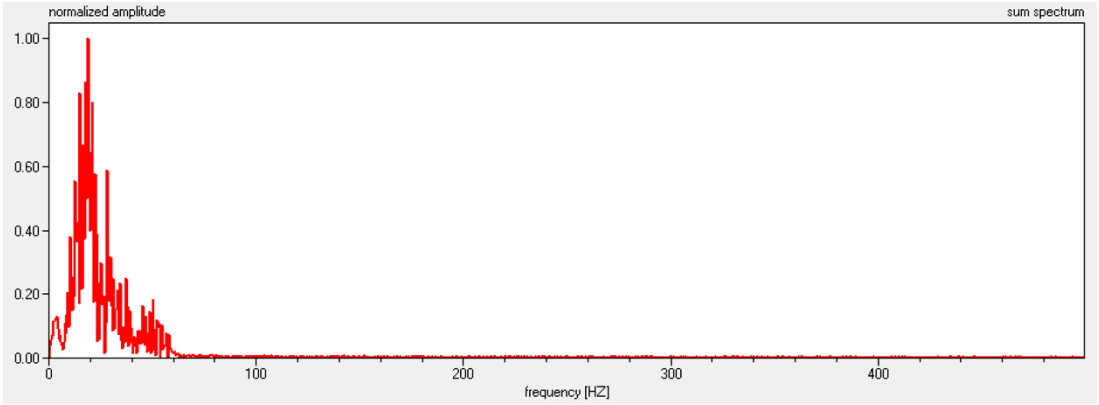
Single Trace Stack



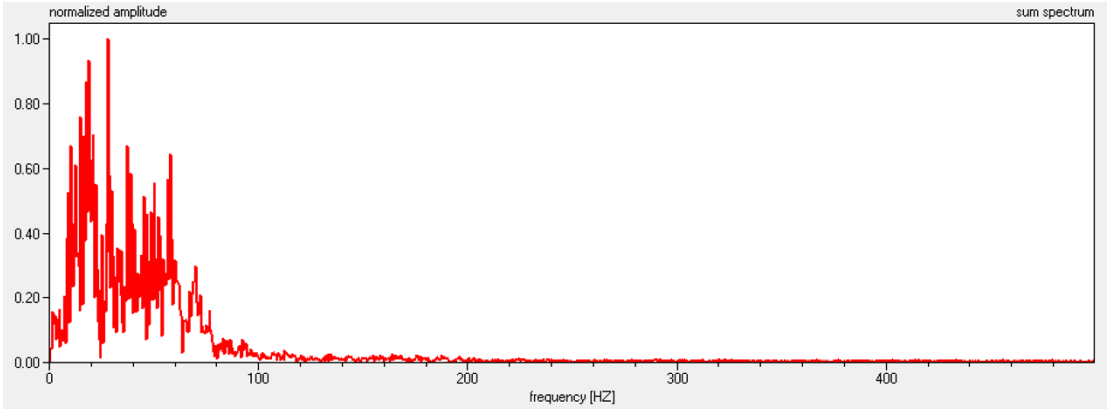
Deconvolution

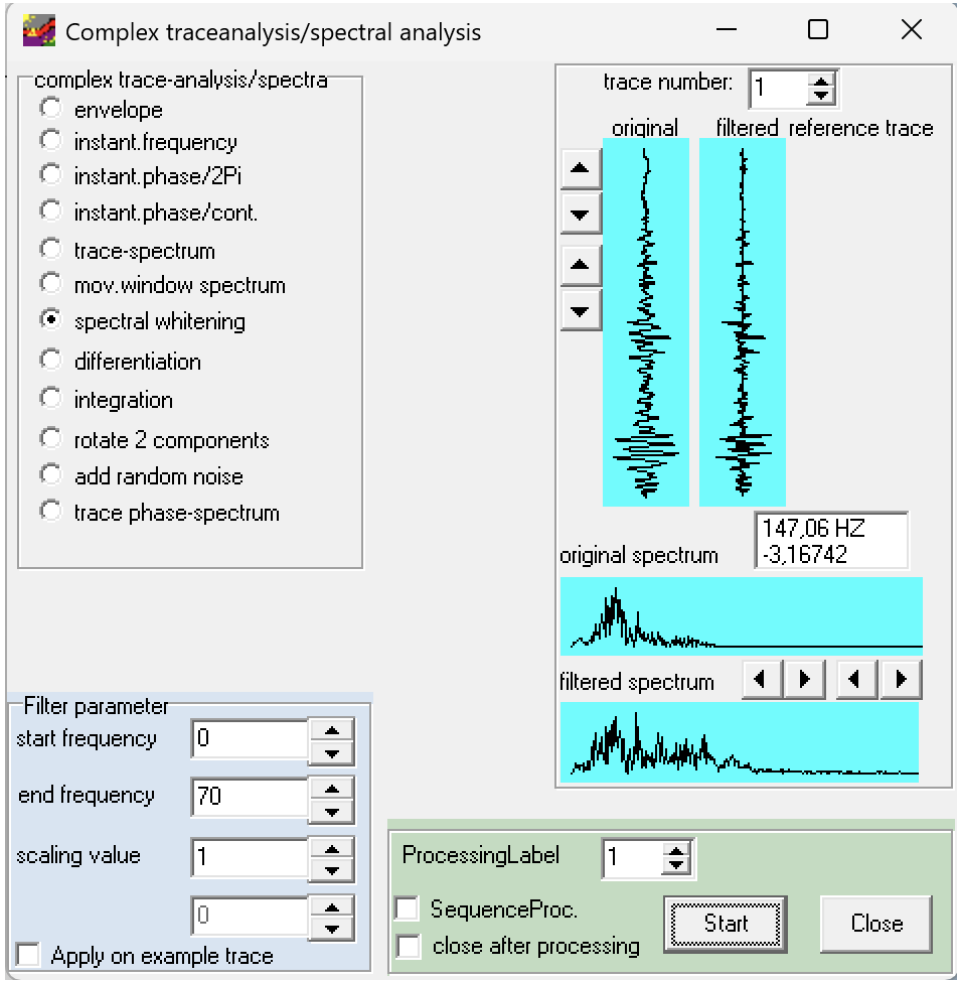
We performed deconvolution using Spectral-Whitening function, which is a zero-phase deconvolution.
We noticed that the after the deconvolution spectrum is flatter as expected.

Spectrum before deconvolution



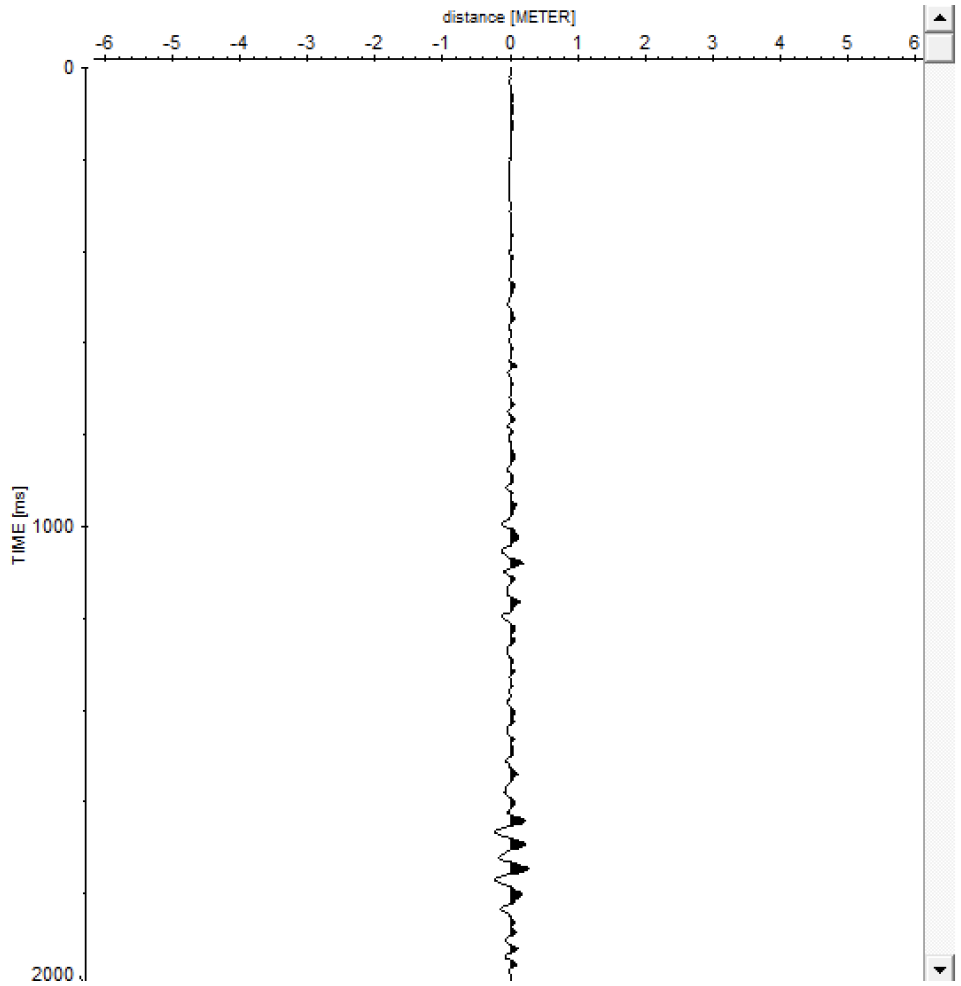
Spectrum after deconvolution





Comparison Before and After Deconvolution

Before



After