Homework 4

Submitted By :
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Roll No: 175320009

Questions:

1: Generate 4 sets of minimum phase synthetic data for signal to noise ratio values of a) 10 b) 25 c) 50 and d) 100. Now, for each of the datasets, you need to figure out:
optimum spiking (gap) lag (0.004 to 0.02 s)
optimum operator length (0.1 to 2s)
optimum pre whitening parameter (0.0001 to 0.01)

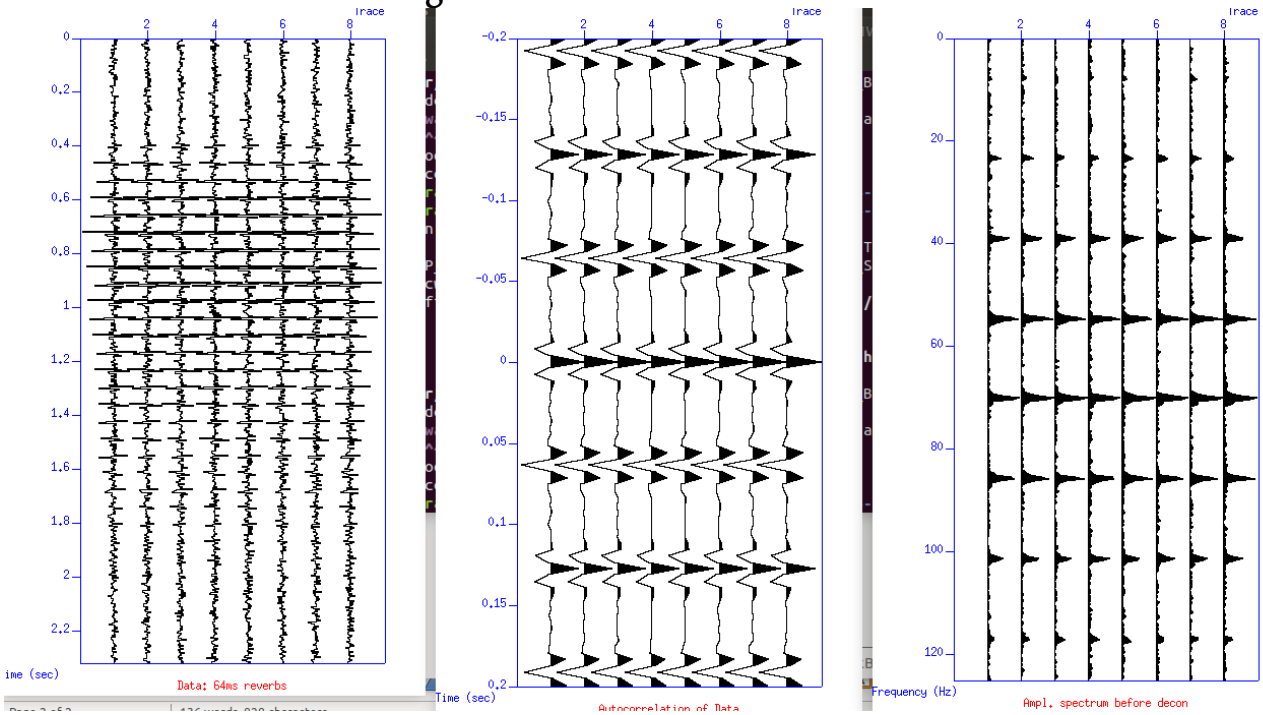
2: Deconvolution on viking graben data: ntg: On the t∧2 corrected ntg gather, minimum phased using sushape: Try to eliminate the sea bottom multiples using predictive error filtering (supef). Bandpass filter the data after deconvolution. Pick the optimum parameters for deconvolution. Are the multiples attenuated?

3: Deconvolution on viking graben data: CMP gathers

Question 1:
Here in this exersize the best minimum prediction lag is 0.005 sec or around 5 ms. And the optimum operator length is around 0.5 sec.

SNR : 10

Characteristics of seismogram:

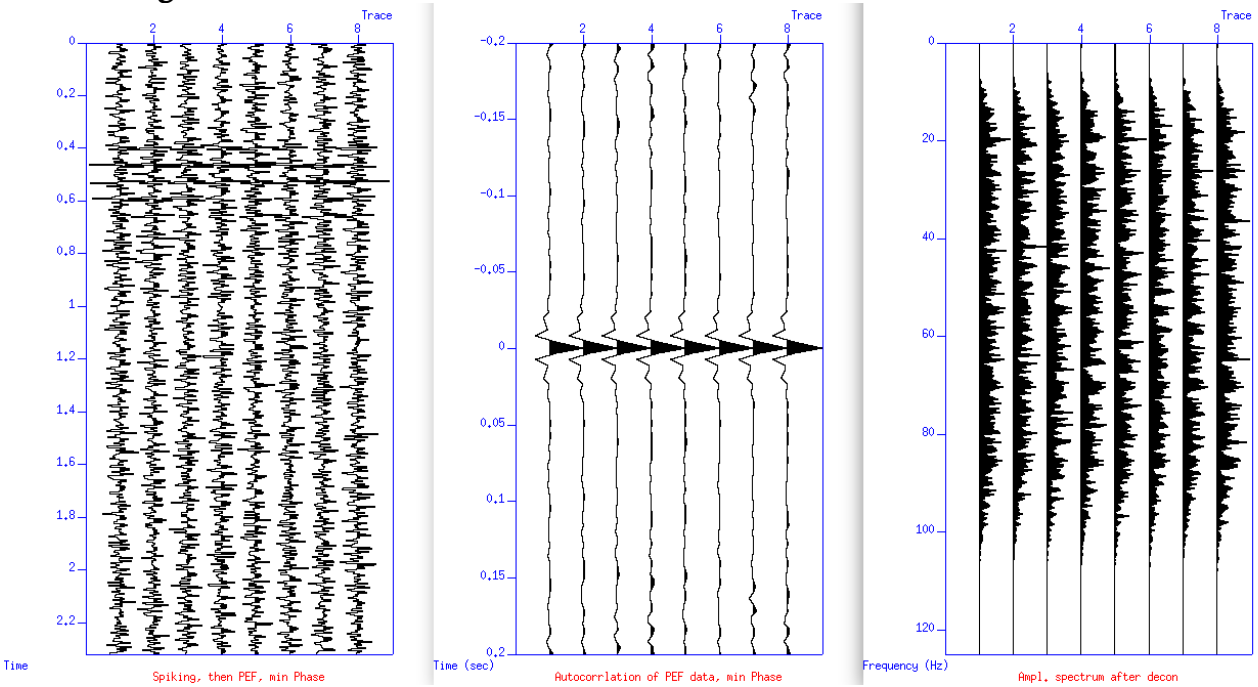


SNR : 10

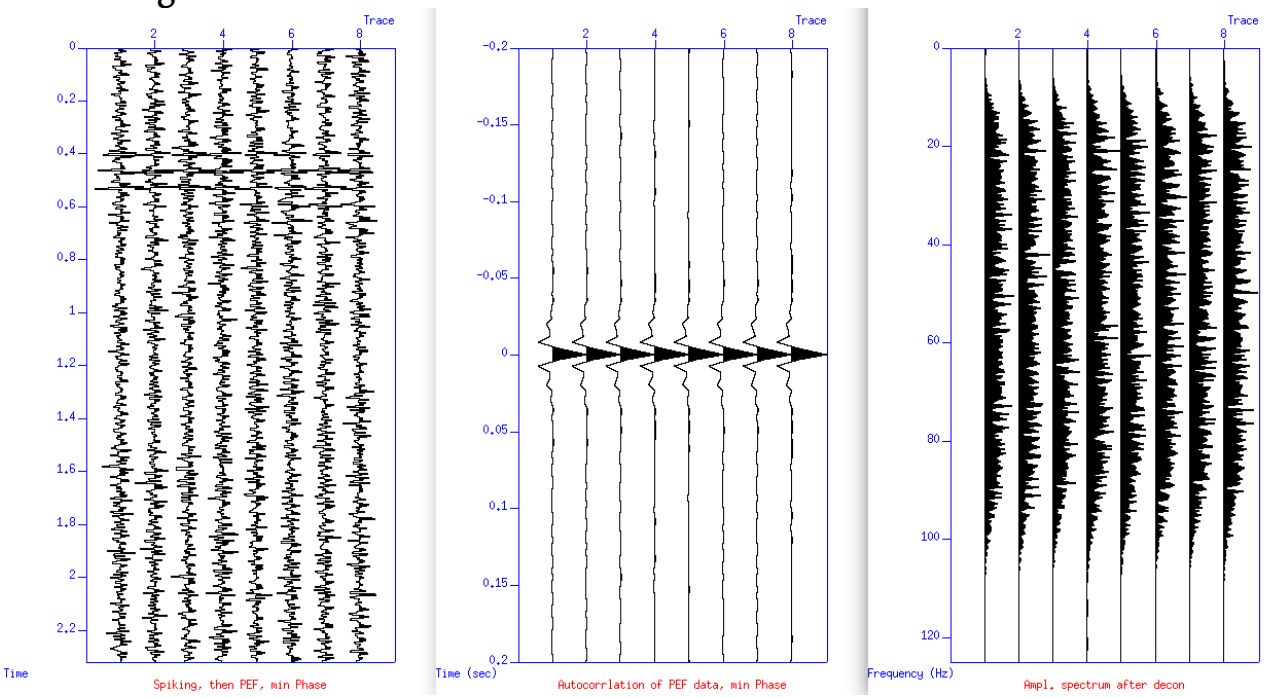
MINLAG_pef: 0.005 sec

MAXLAG_pef: 0.2 sec

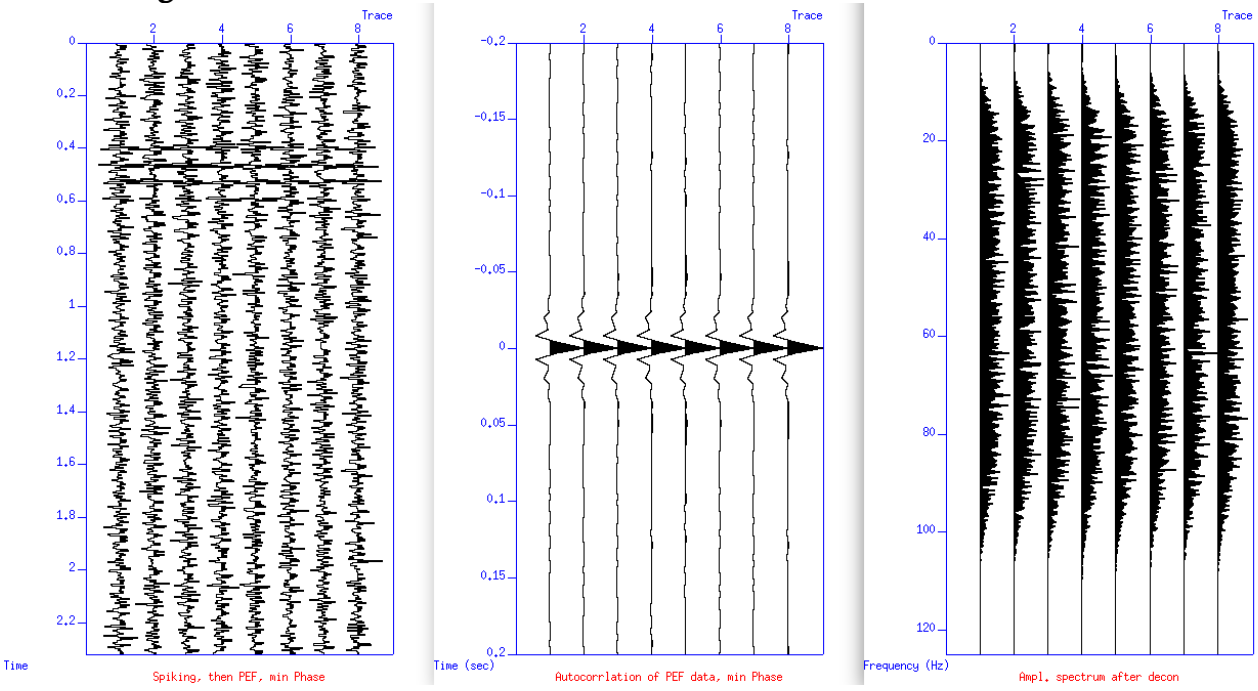
Whitening Noice: 0.2%



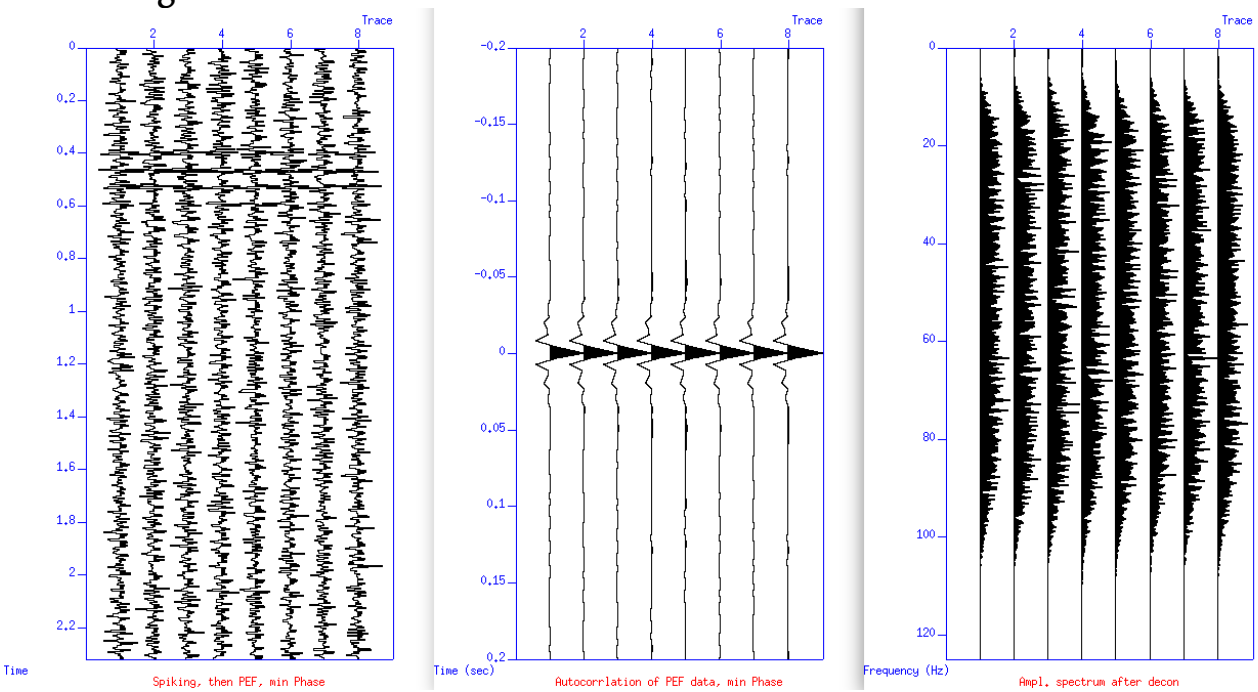
SNR : 10
MINLAG_pef: 0.005 sec
MAXLAG_pef: 0.4 sec
Whitening Noice: 0.2%



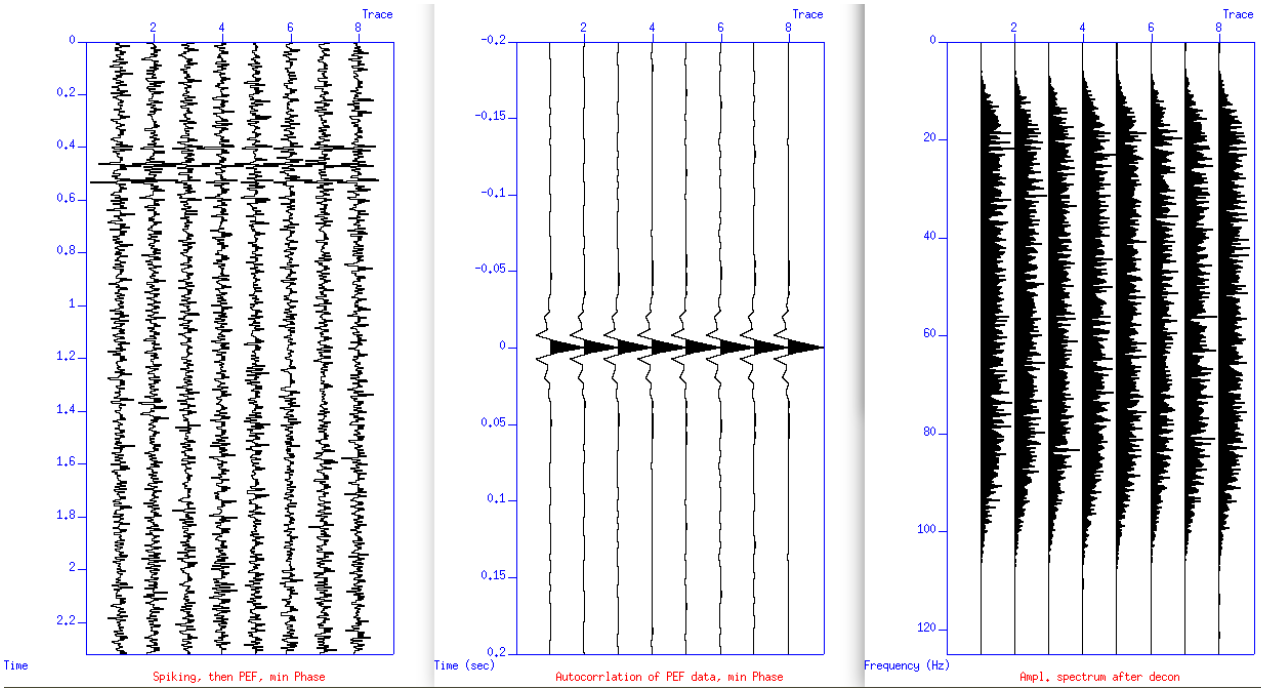
SNR : 10
MINLAG_pef: 0.005 sec
MAXLAG_pef: 0.4 sec
Whitening Noice: 0.2%



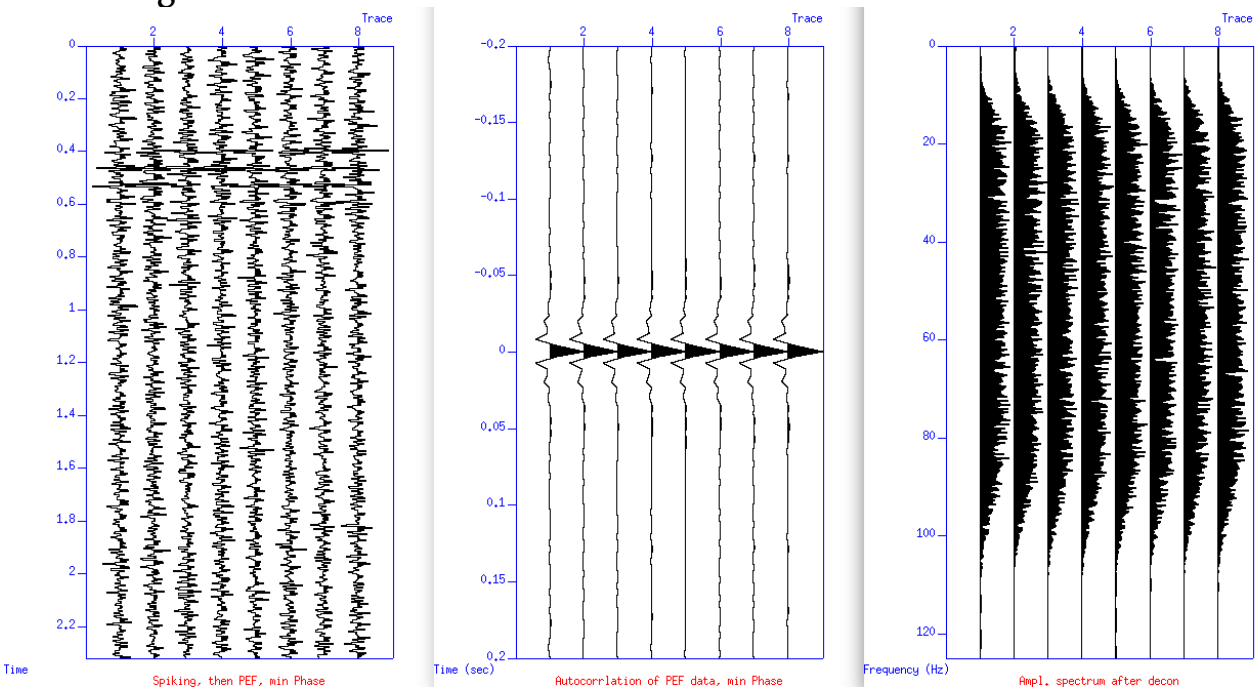
SNR : 10
MIN LAG: 0.005 sec
MAX LAG : 0.5 sec
Whitening Noice: 0.2%



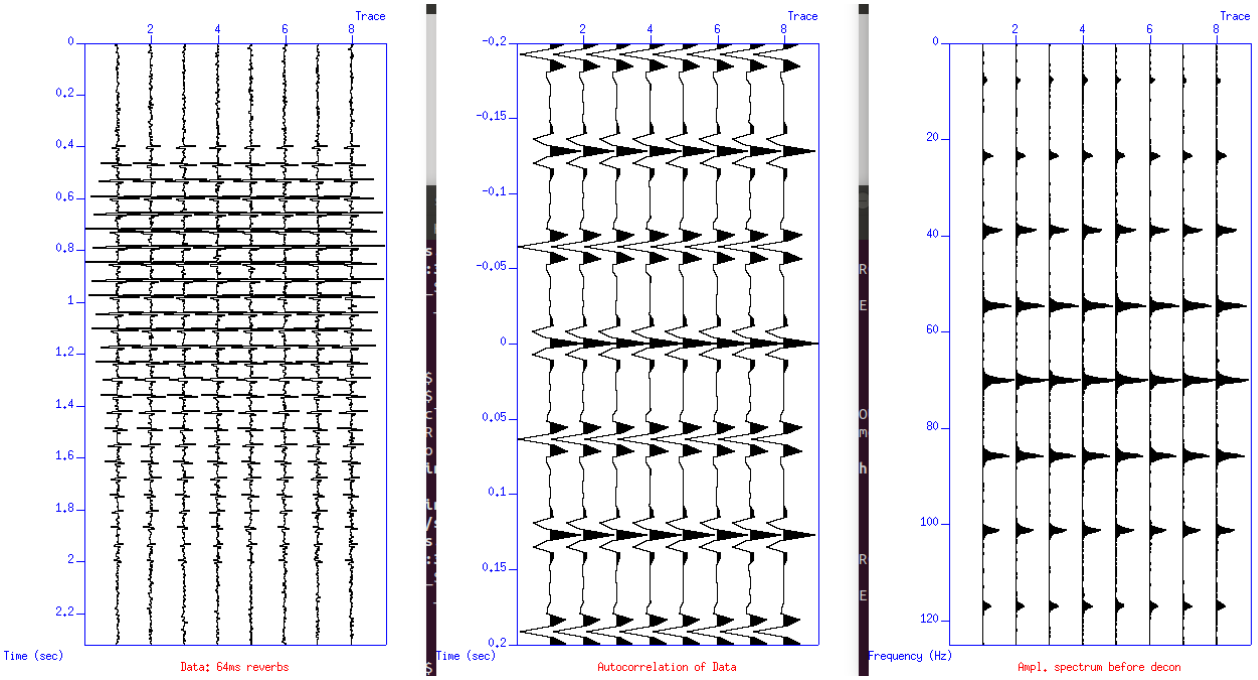
SNR : 10
MIN LAG: 0.005 sec
MAX LAG : 0.6 sec
Whitening Noice: 0.2%



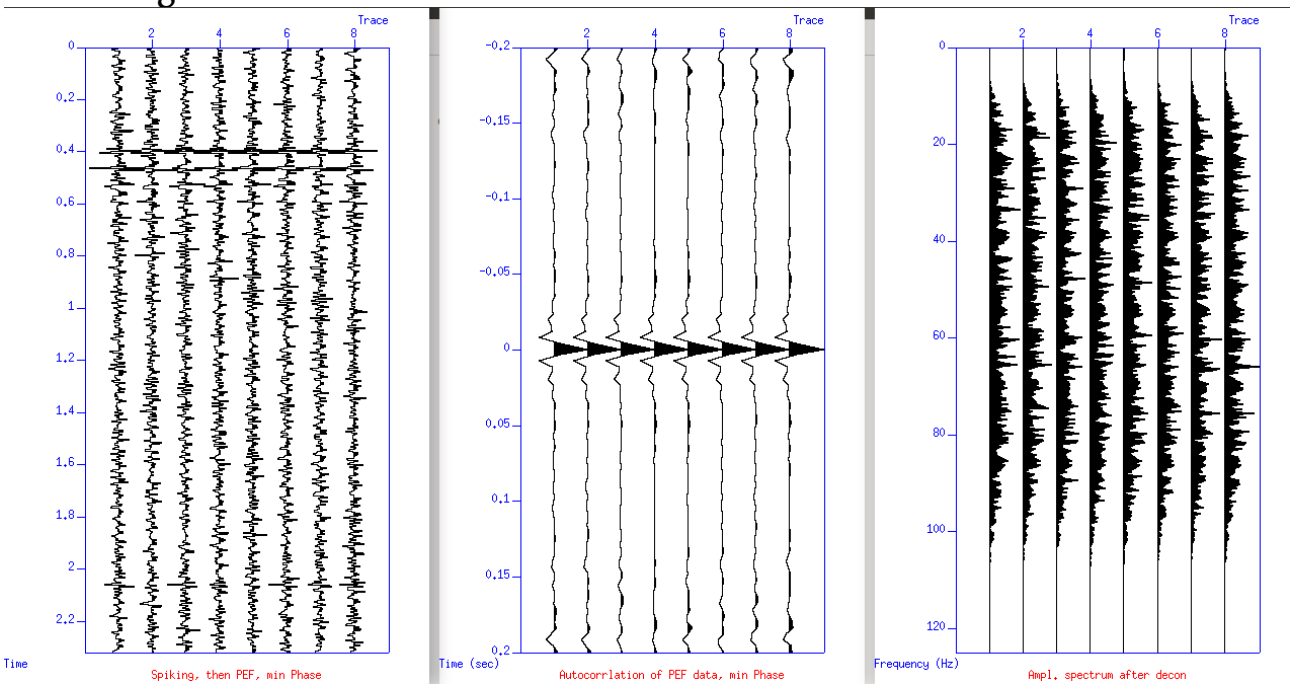
SNR : 10
MIN LAG: 0.005 sec
MAX LAG : 1.2 sec
Whitening Noice: 0.2%



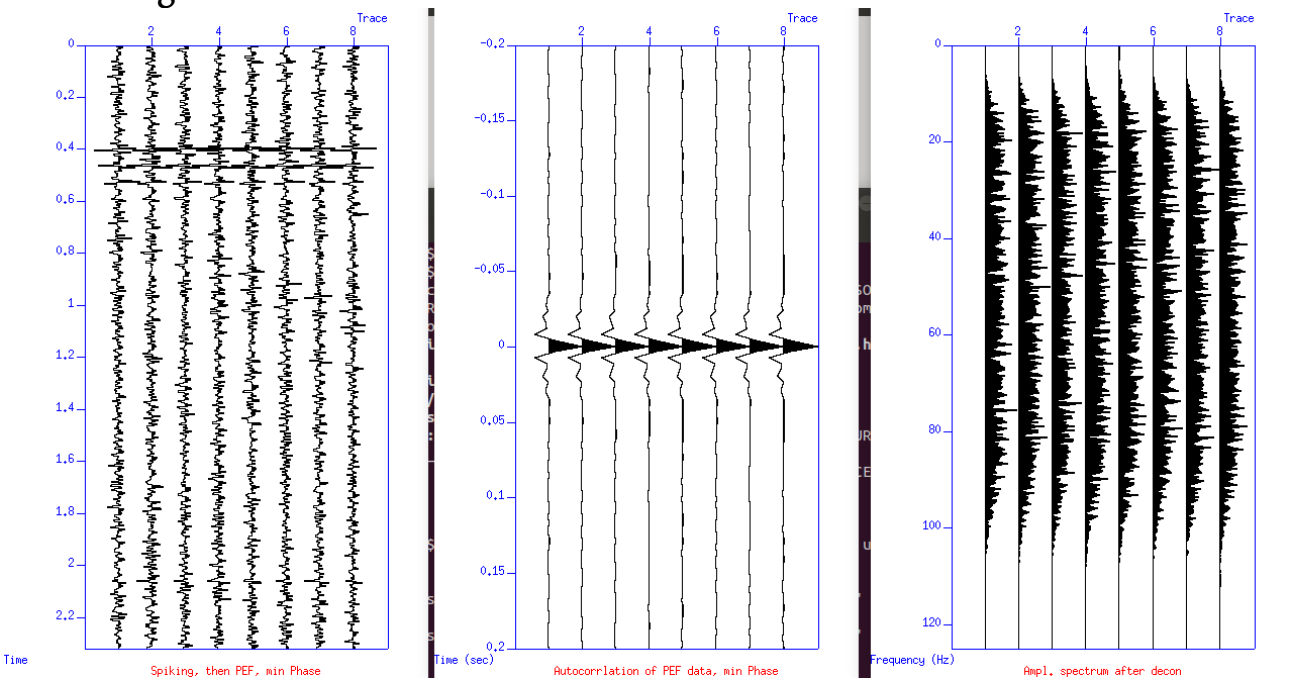
SNR : 25
Characteristic of the seismogram:



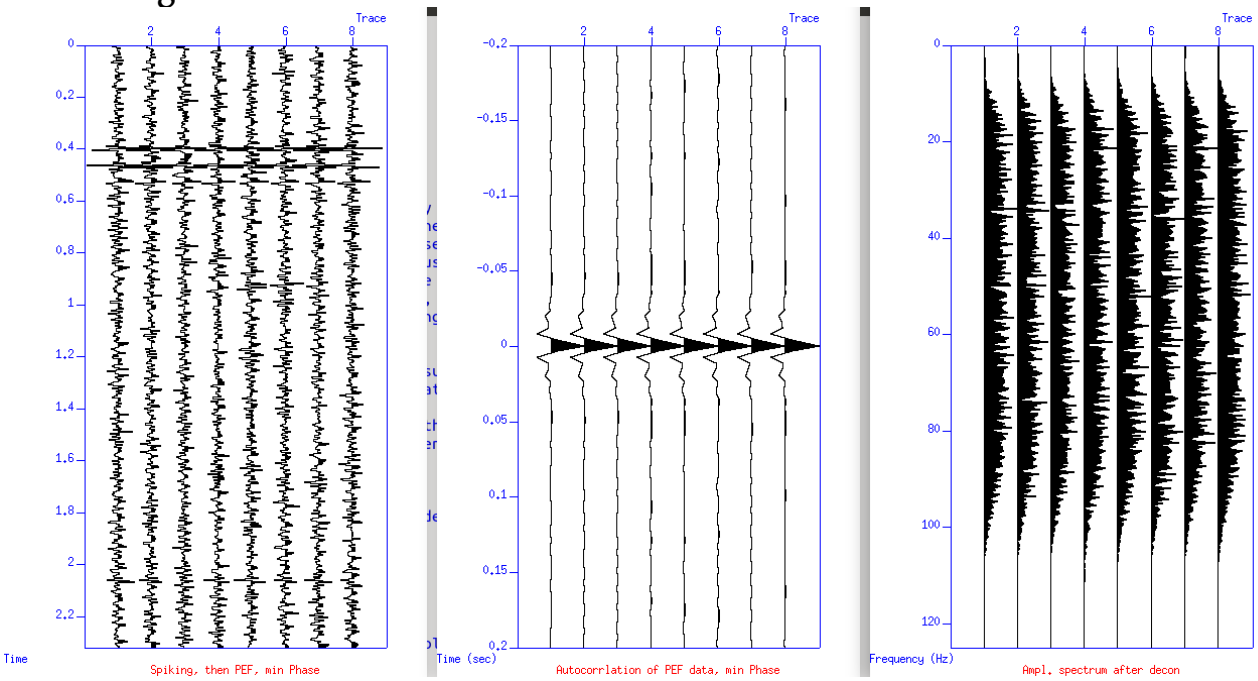
SNR : 25
MIN LAG: 0.005 sec
MAX LAG : 0.2 sec
Whitening Noice: 0.2%



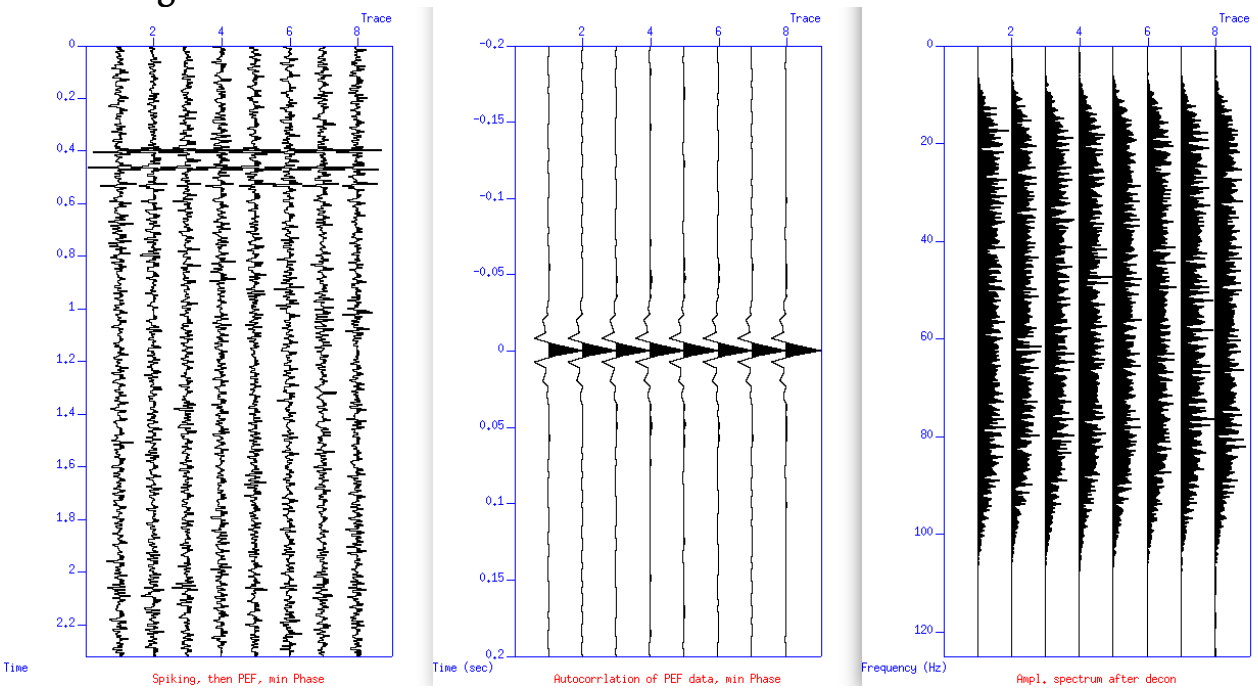
SNR : 25
MIN LAG: 0.005 sec
MAX LAG : 0.4 sec
Whitening Noice: 0.2%



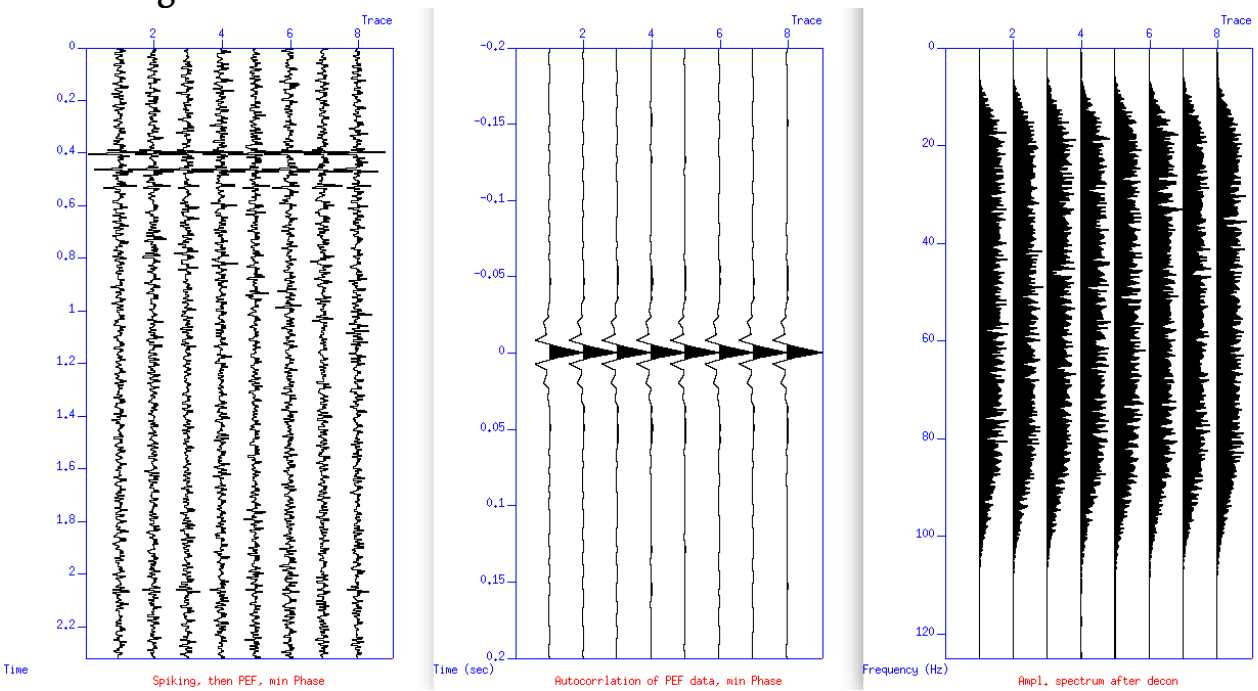
SNR : 25
MIN LAG: 0.005 sec
MAX LAG : 0.5 sec
Whitening Noice: 0.2%



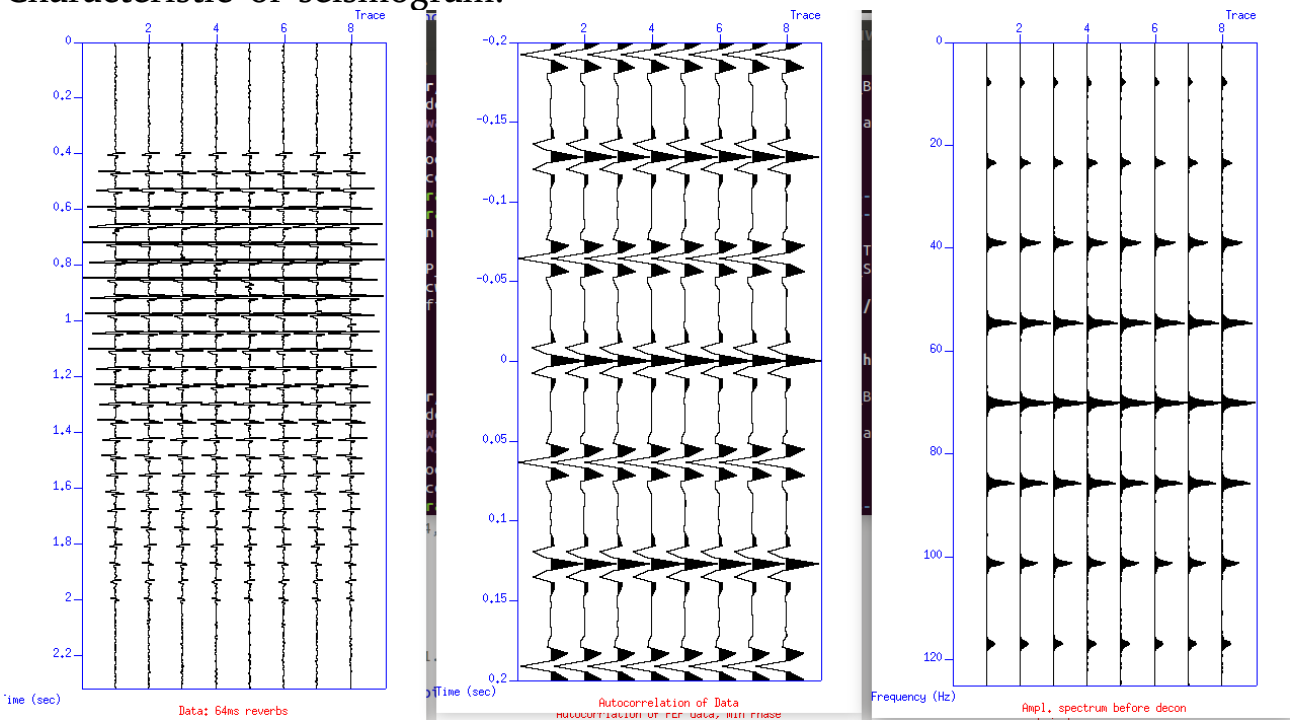
SNR : 25
MIN LAG: 0.005 sec
MAX LAG : 0.6 sec
Whitening Noice: 0.2%



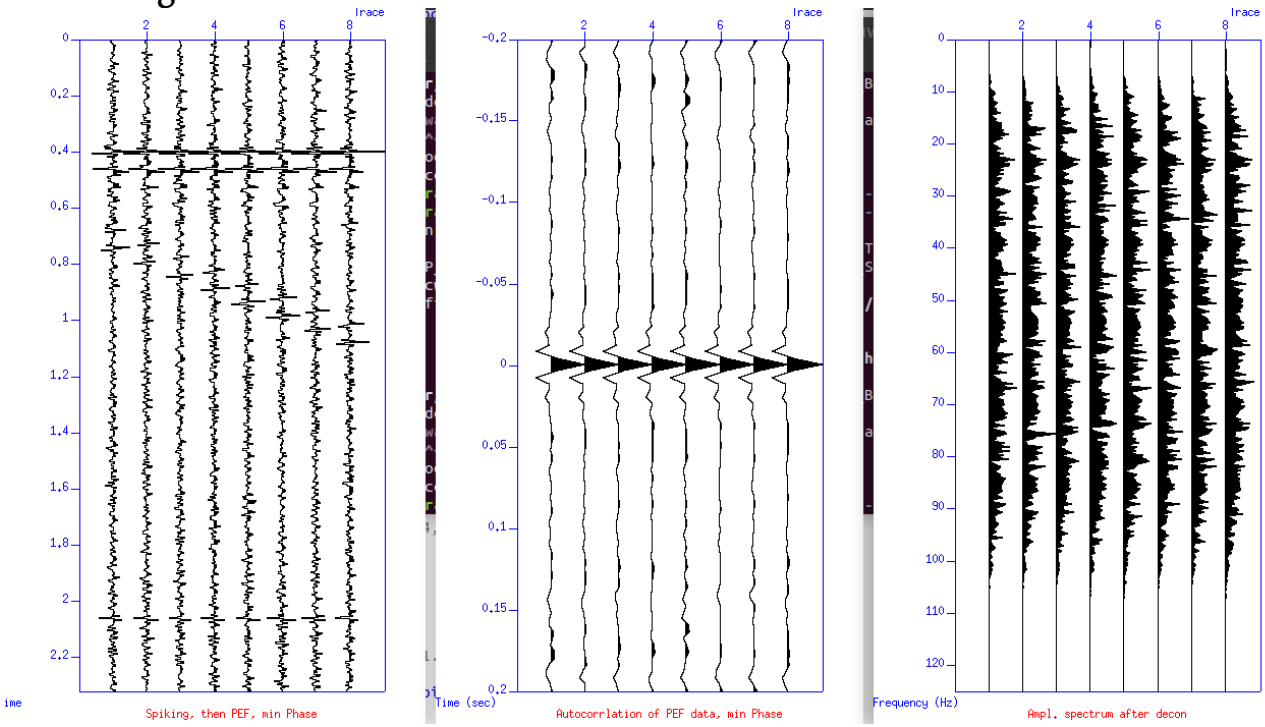
SNR : 25
MIN LAG: 0.005 sec
MAX LAG : 1.2 sec
Whitening Noice: 0.2%



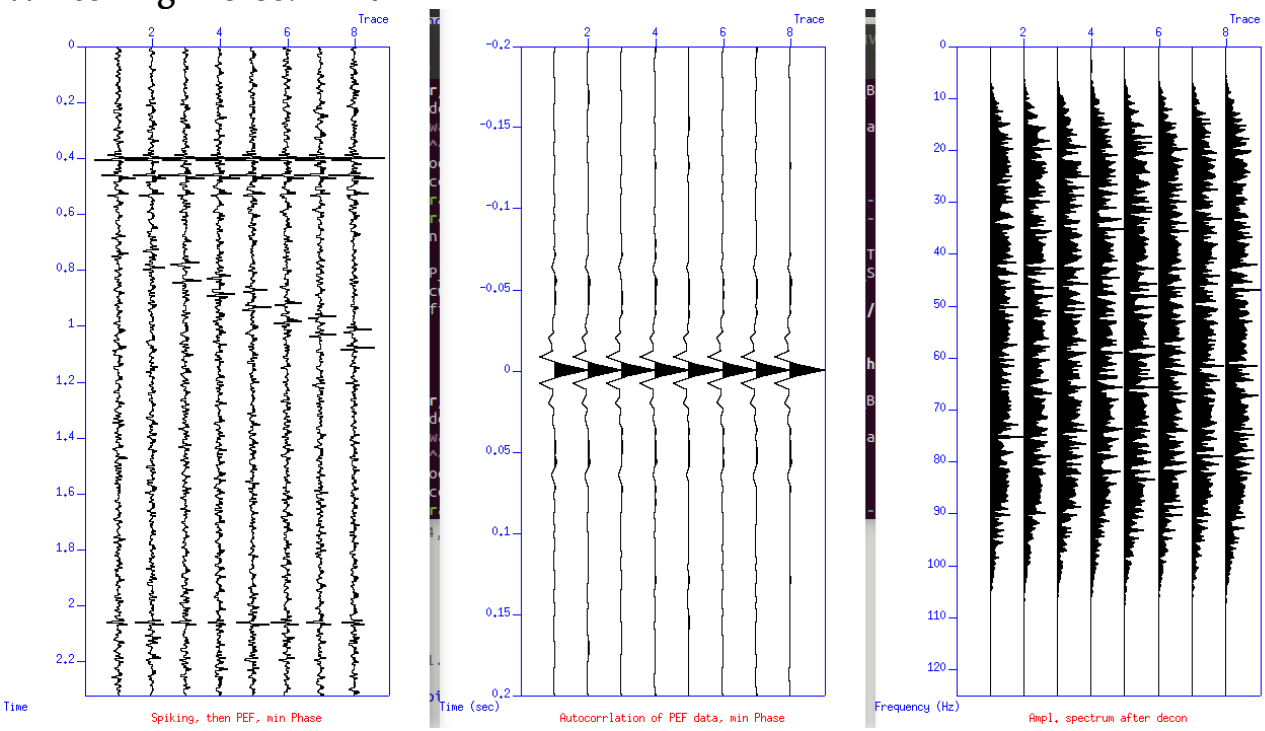
SNR: 50
Characteristic of seismogram:



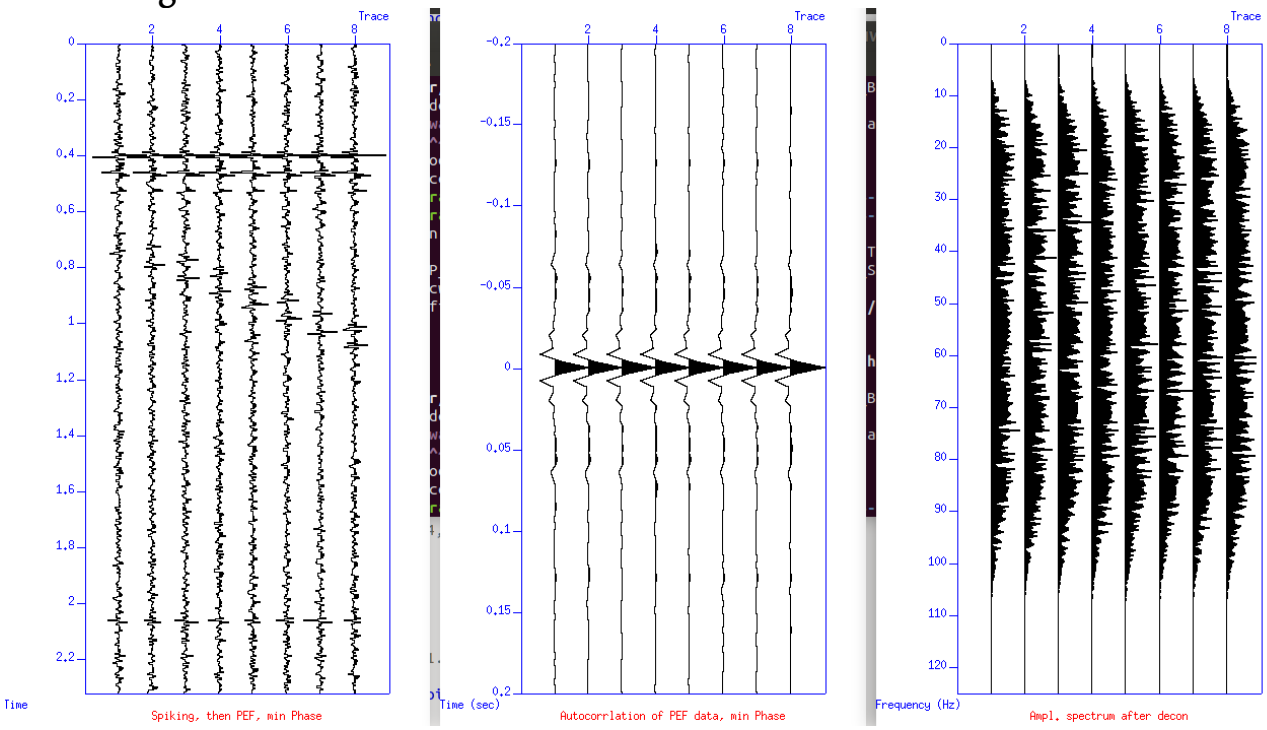
SNR : 50
MIN LAG: 0.005 sec
MAX LAG : 0.2 sec
Whitening Noice: 0.2%



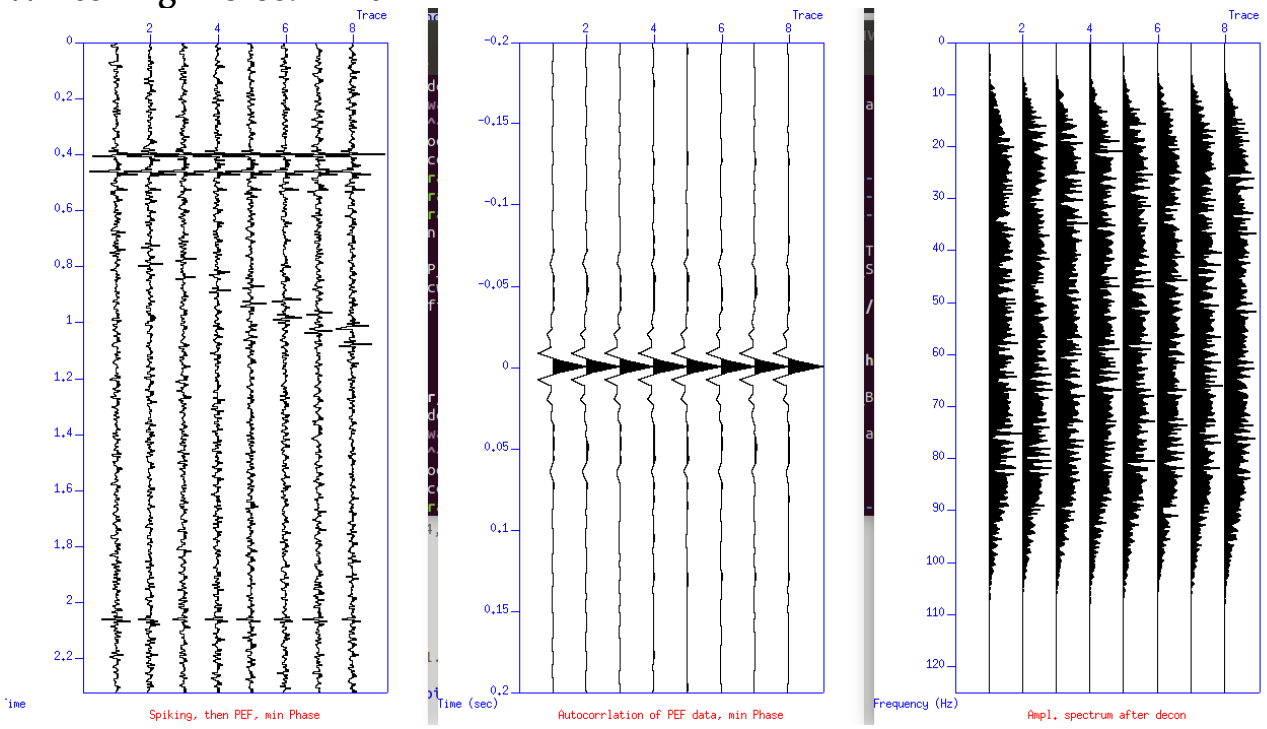
SNR : 50
MIN LAG: 0.005 sec
MAX LAG : 0.4 sec
Whitening Noice: 0.2%



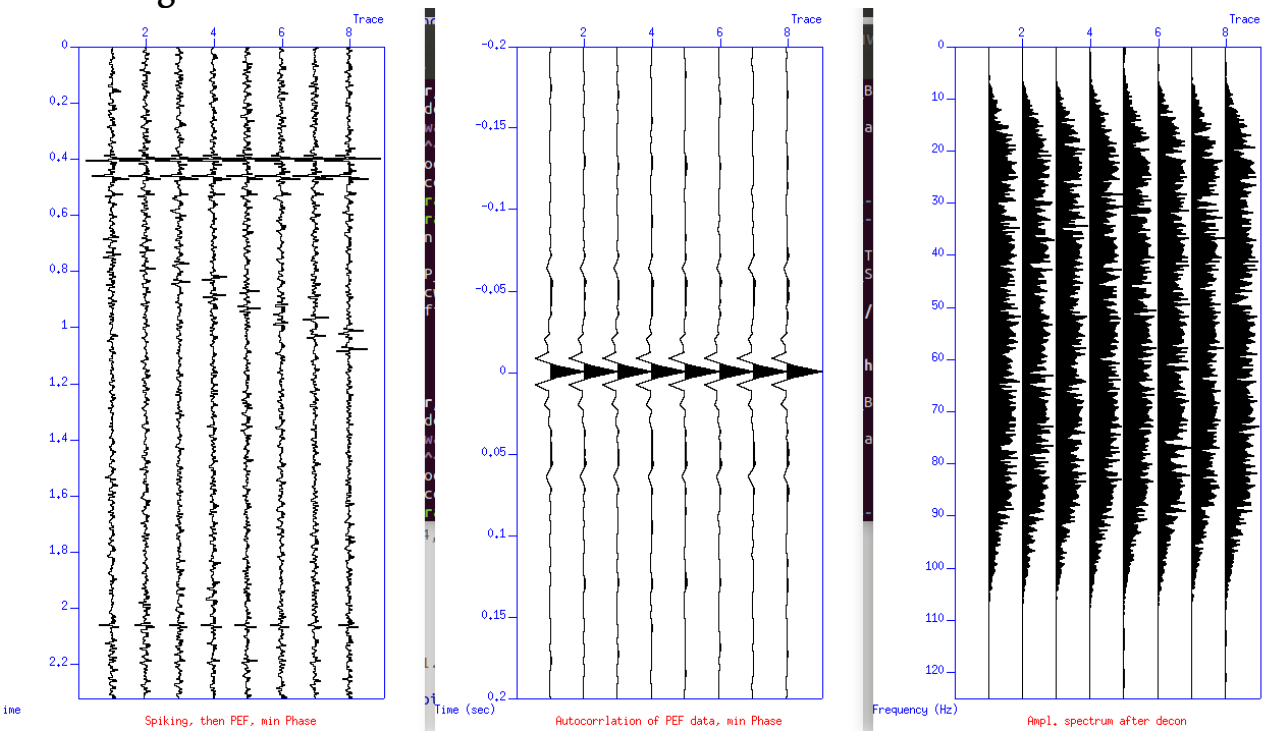
SNR : 50
MIN LAG: 0.005 sec
MAX LAG : 0.5 sec
Whitening Noice: 0.2%



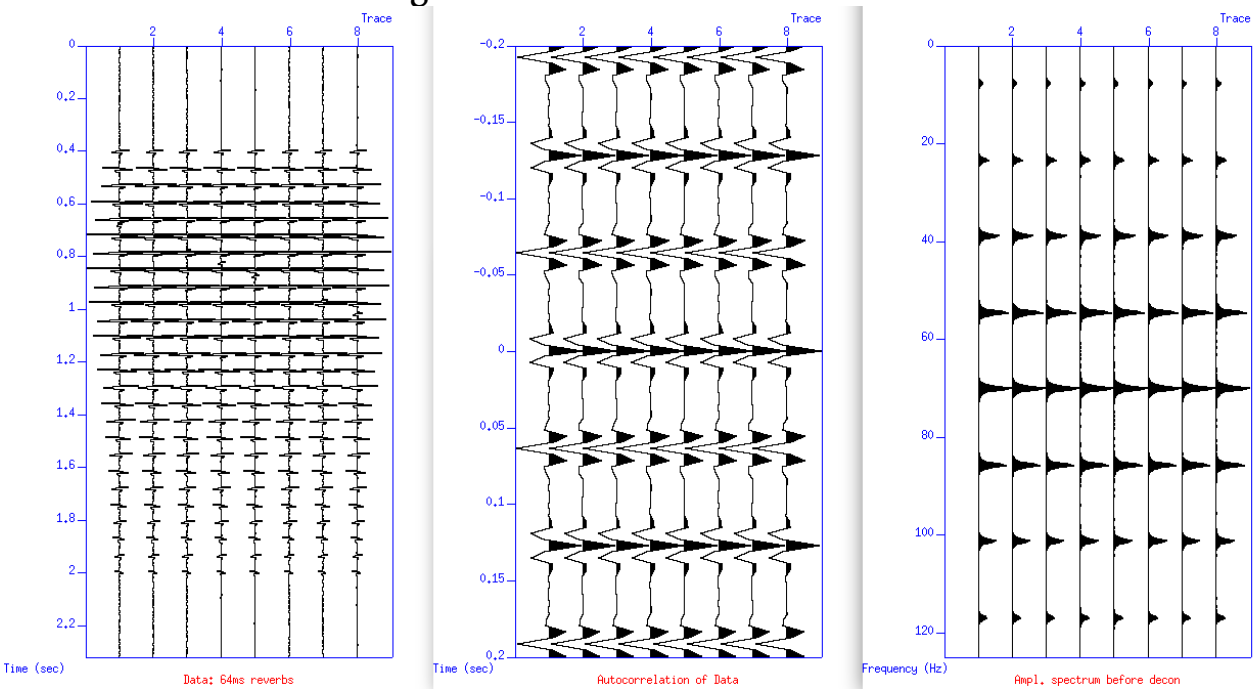
SNR : 50
MIN LAG: 0.005 sec
MAX LAG : 0.6 sec
Whitening Noice: 0.2%



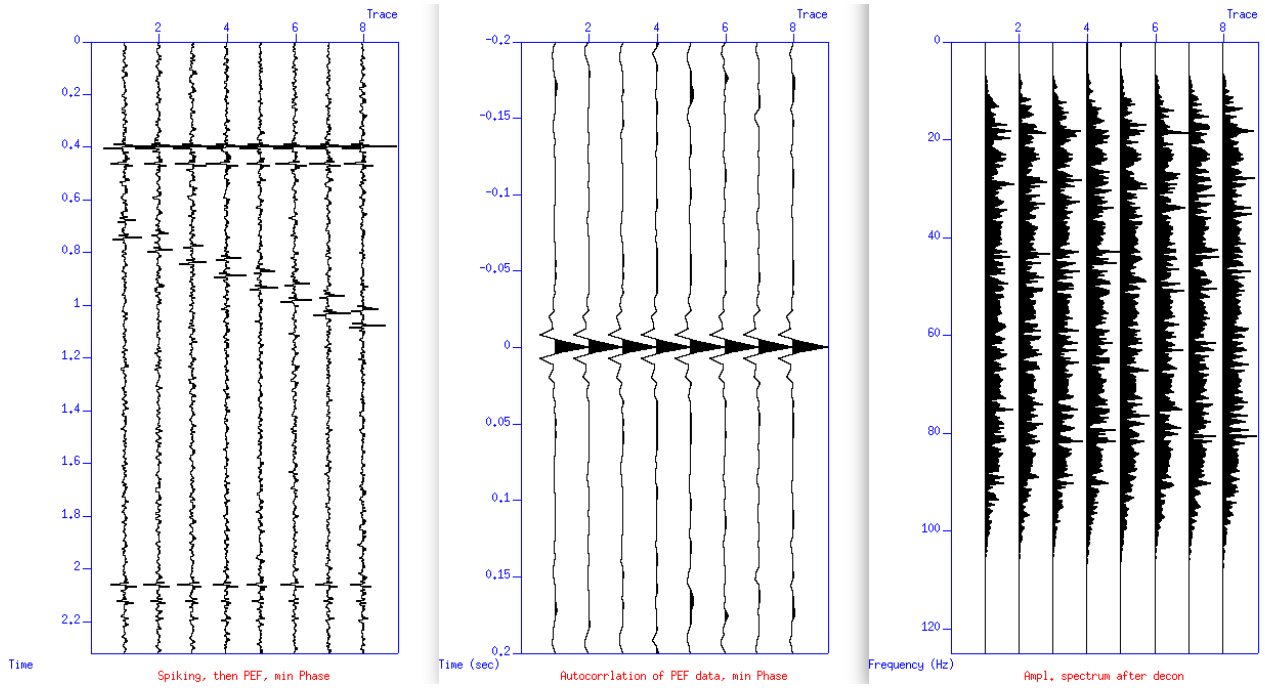
SNR : 50
MIN LAG: 0.005 sec
MAX LAG : 1.2 sec
Whitening Noice: 0.2%



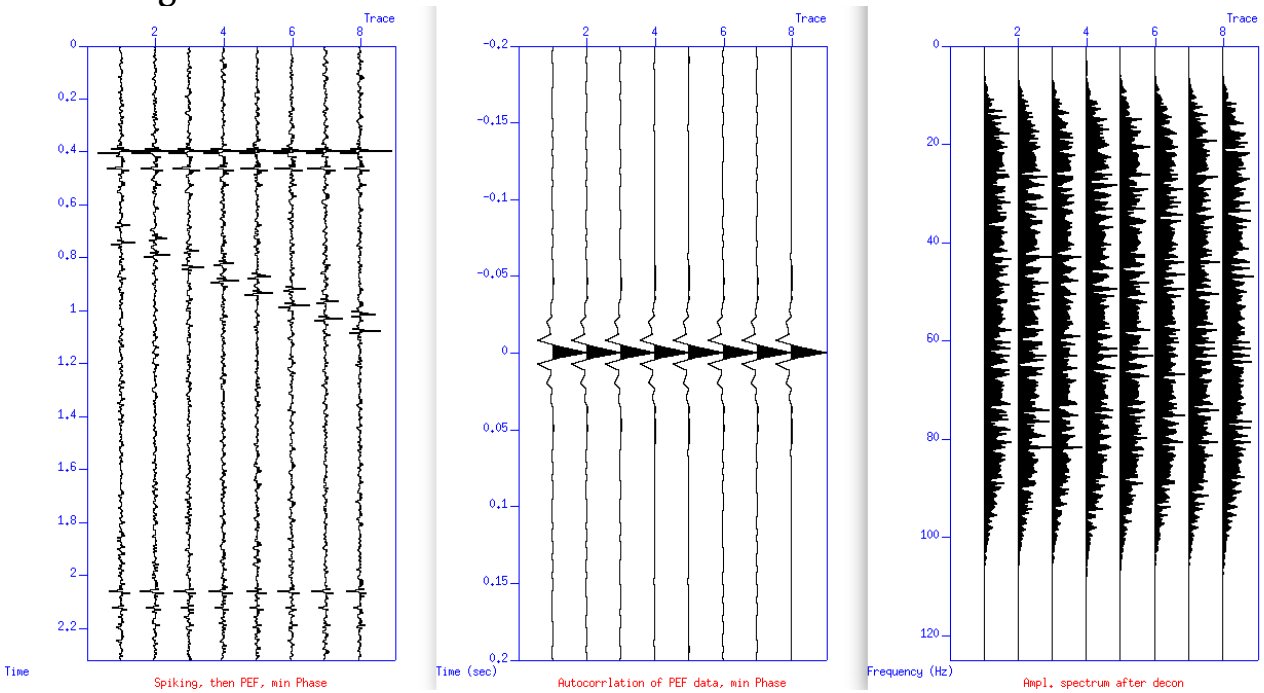
SNR 100
Characteristic of seismogram:



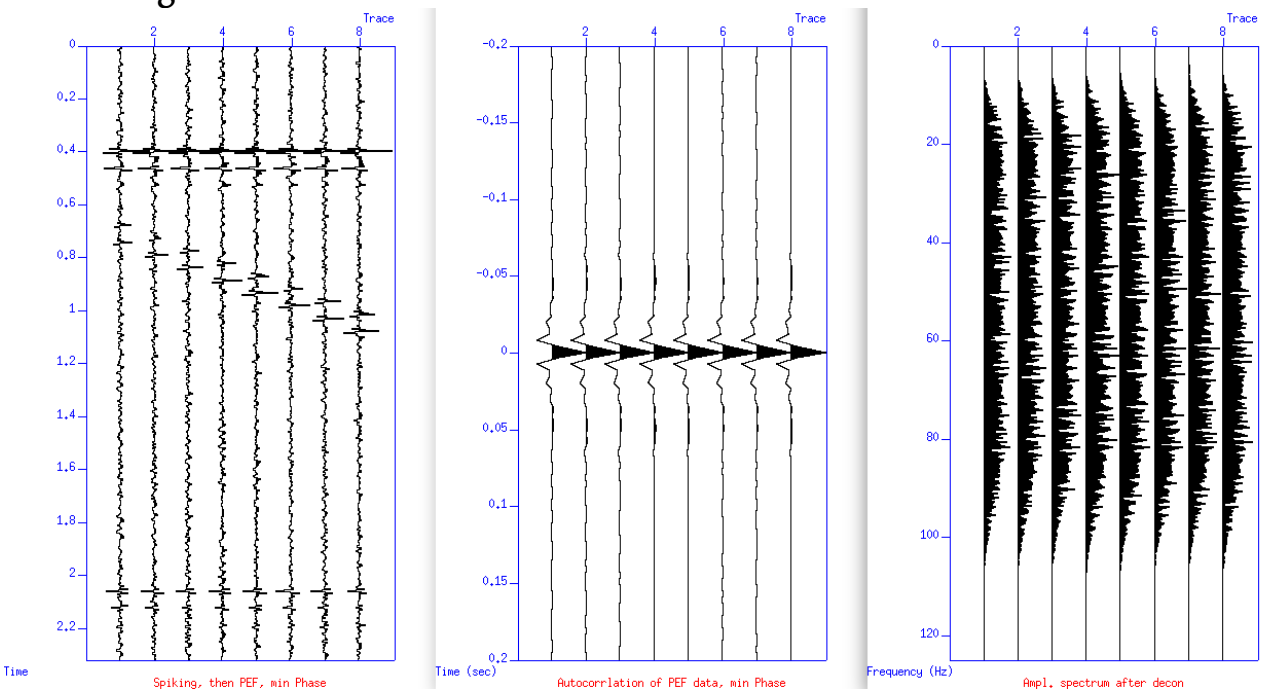
SNR : 100
MIN LAG: 0.005 sec
MAX LAG : 0.2 sec
Whitening Noice: 0.2%



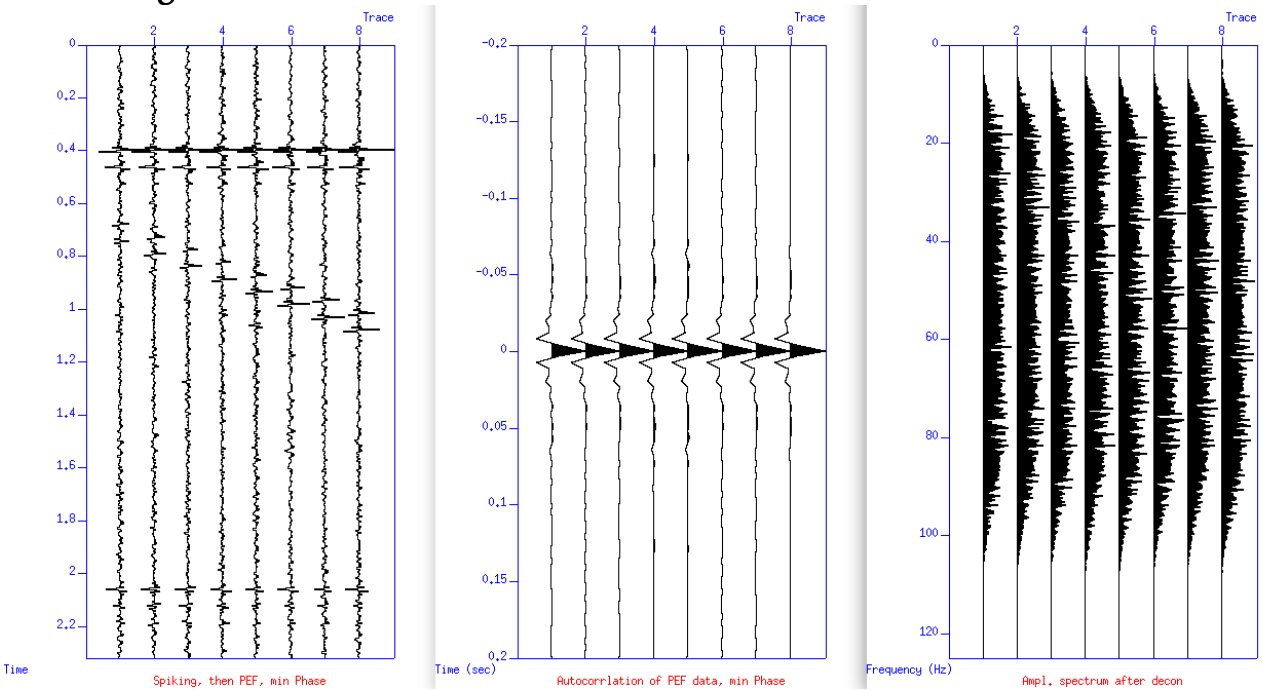
SNR : 100
MIN LAG: 0.005 sec
MAX LAG : 0.4 sec
Whitening Noice: 0.2%



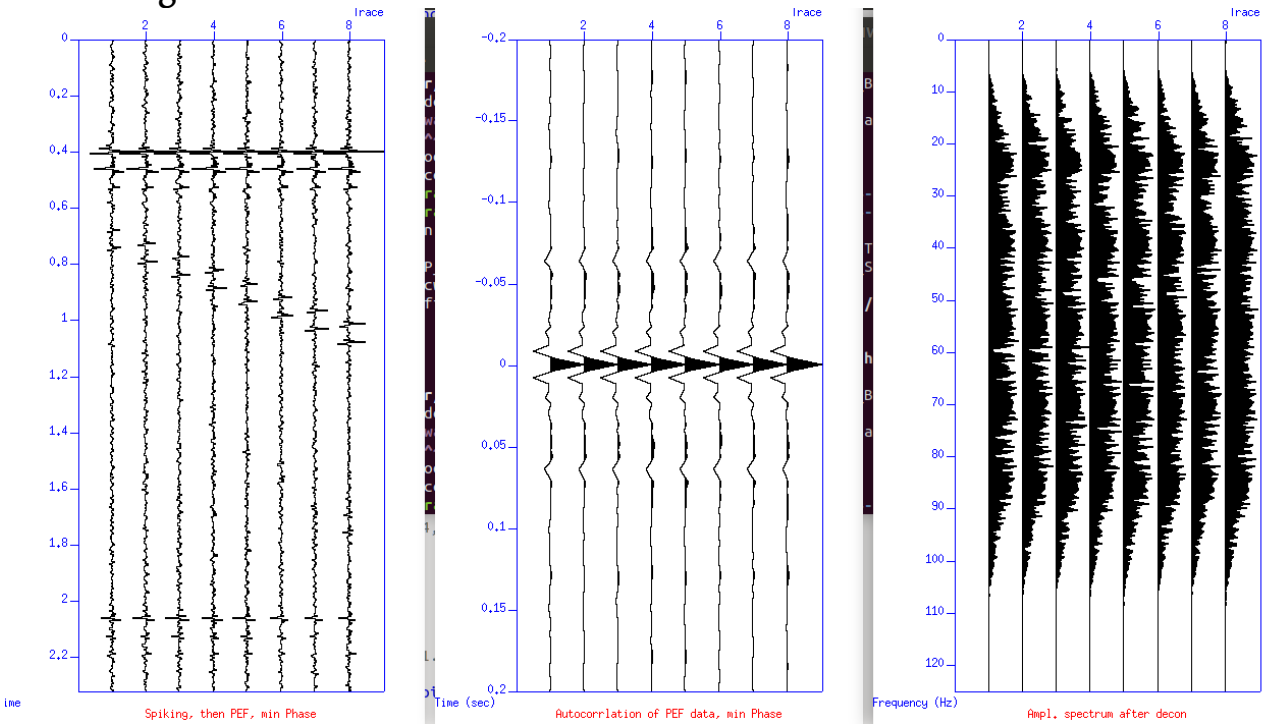
SNR : 100
MIN LAG: 0.005 sec
MAX LAG : 0.5 sec
Whitening Noice: 0.2%



SNR : 100
MIN LAG: 0.005 sec
MAX LAG : 0.6 sec
Whitening Noice: 0.2%



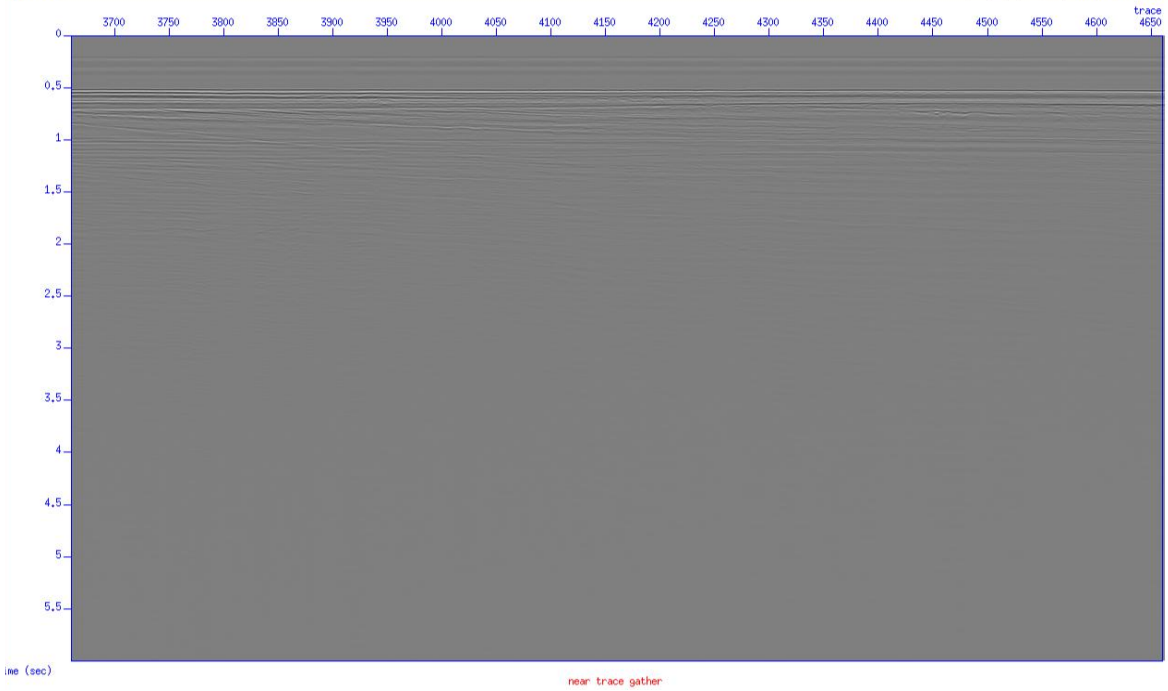
SNR : 100
MIN LAG: 0.005 sec
MAX LAG : 1.2 sec
Whitening Noice: 0.2%



Solution of question 2:

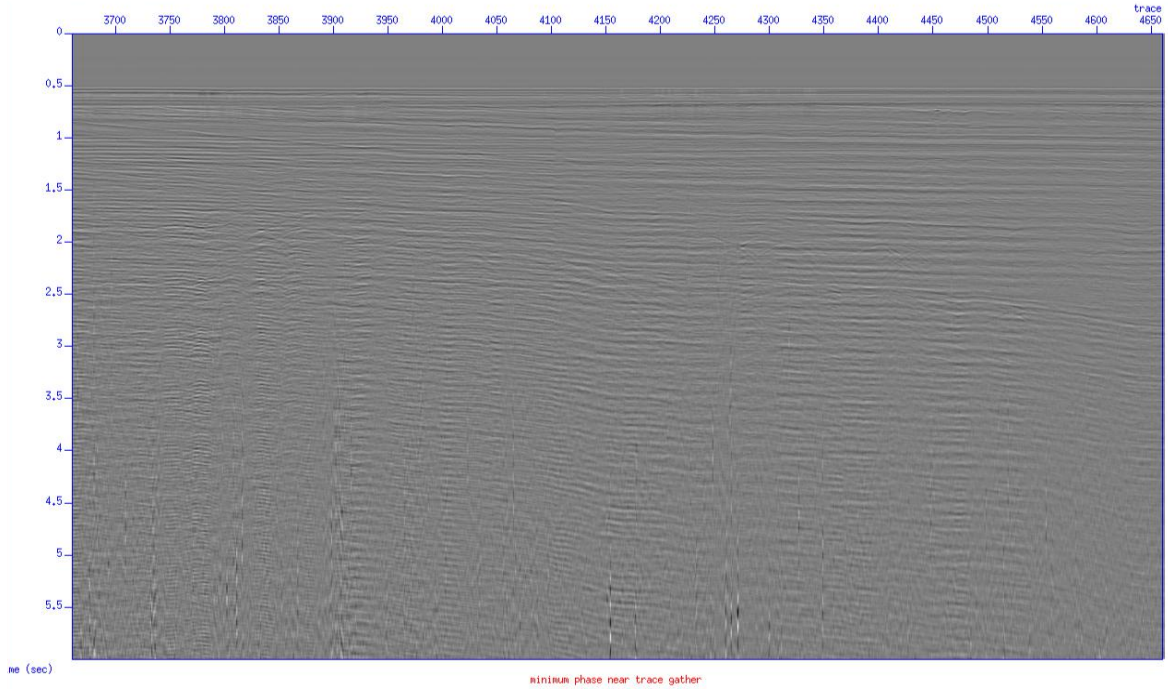
We took static corrected near trace gather with t^2 gain and farfield wavelet and made a minimum phase equivalent.

$\underline{T^2}$ gain static corrected near trace gather



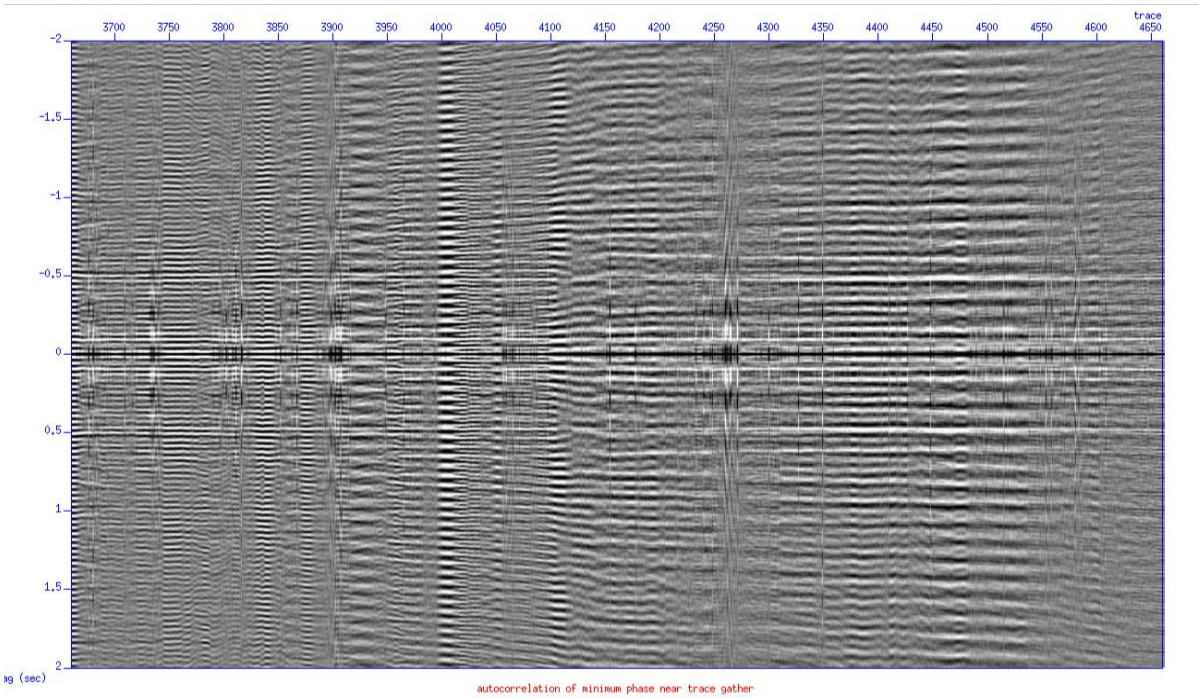
<u>Minimum phase near trace gather</u>

sushape < stat_t2_ntgather.su wfile=resamp_farfield.su dfile=minphs_farfield.su showshaper=1 nshape=1500 2>shaper.asc >minphs_ntgather.su



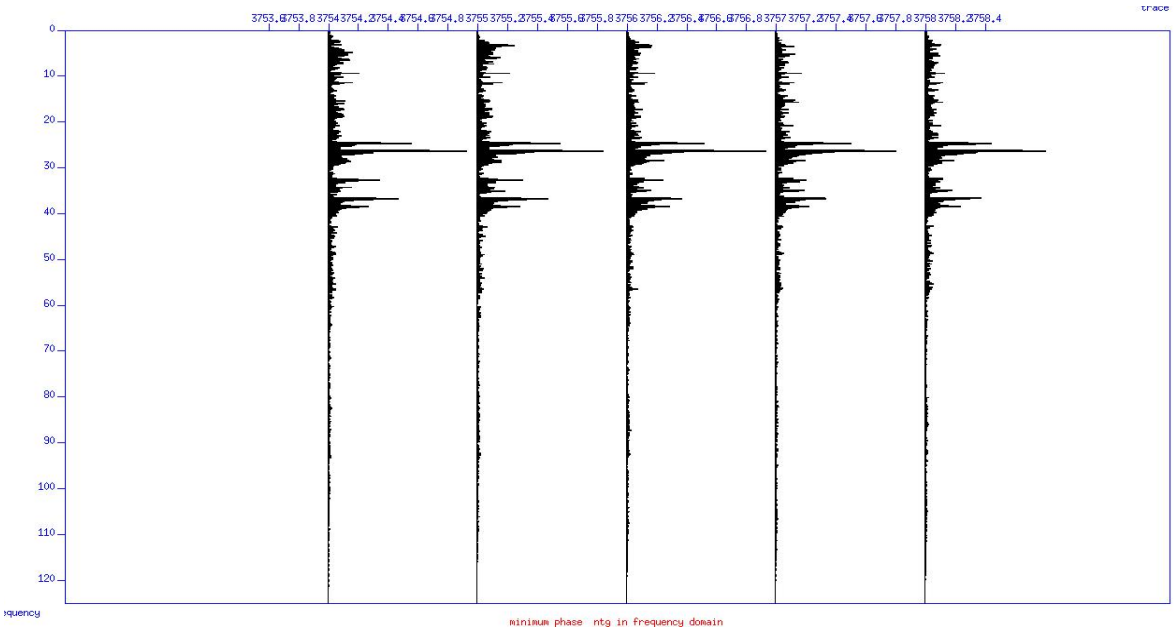
Autocorrelation of minimum phase near trace gather:

suacor <minphs_ntgather.su ntout=1001 | suximage f1=2.0 perc=99 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase near trace gather" windowtitle="autocorrelation of minimum phase near trace gather" &



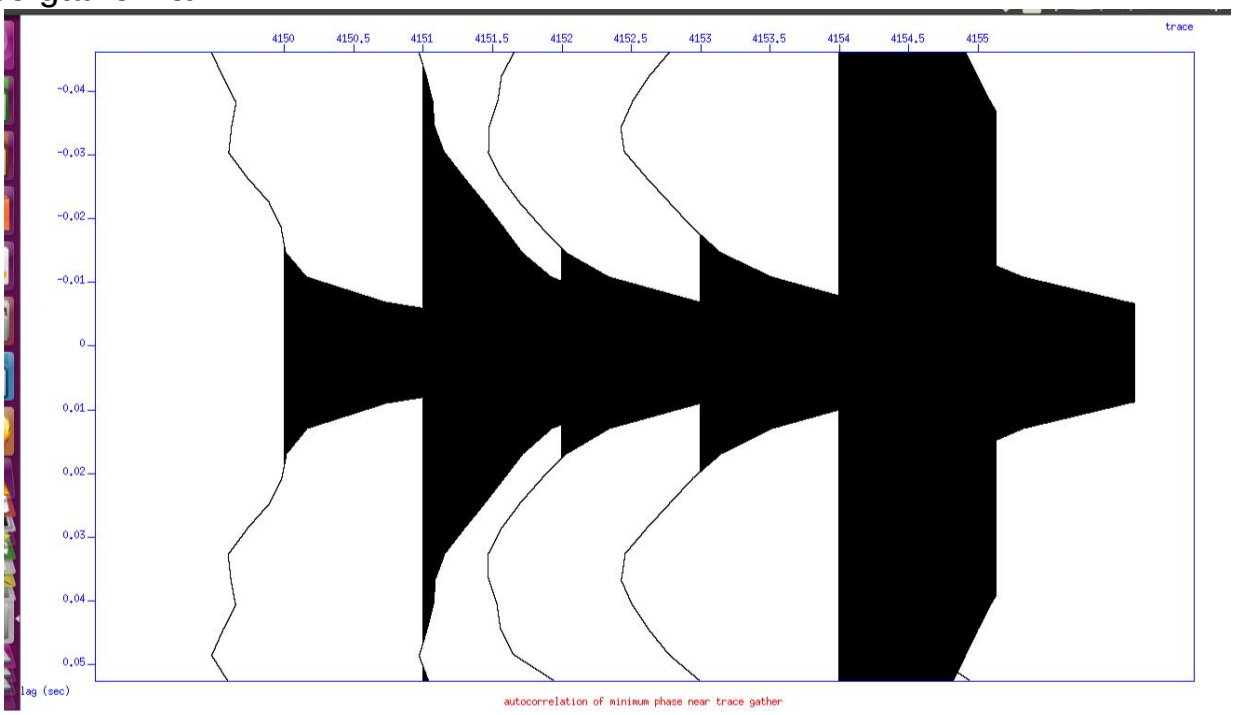
Amplitude spectrum of minimum phase near trace gather:

$ sufft <minphs_ntgather.su | suamp mode=amp| suxwigb label1="frequency" label2="trace" title="minimum phase ntg in frequency domain" &



Autocorrelation of minimum phase near trace gather

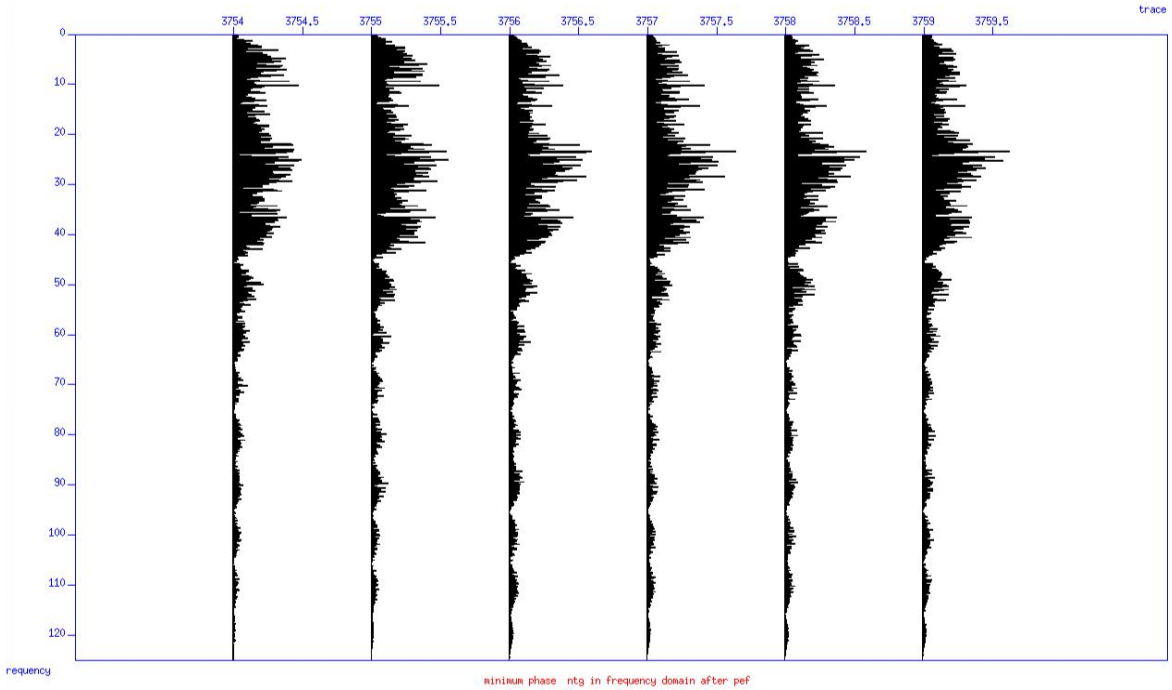
suacor <minphs_ntgather.su ntout=1001 | suxwigb f1=2.0 perc=99 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase near trace gather" &



Predictive Deconvolution with minlag=0.1 maxlag=0.7

supef <minphs_ntgather.su minlag=0.1 maxlag=0.7 >minphs_pef_ntgather.su

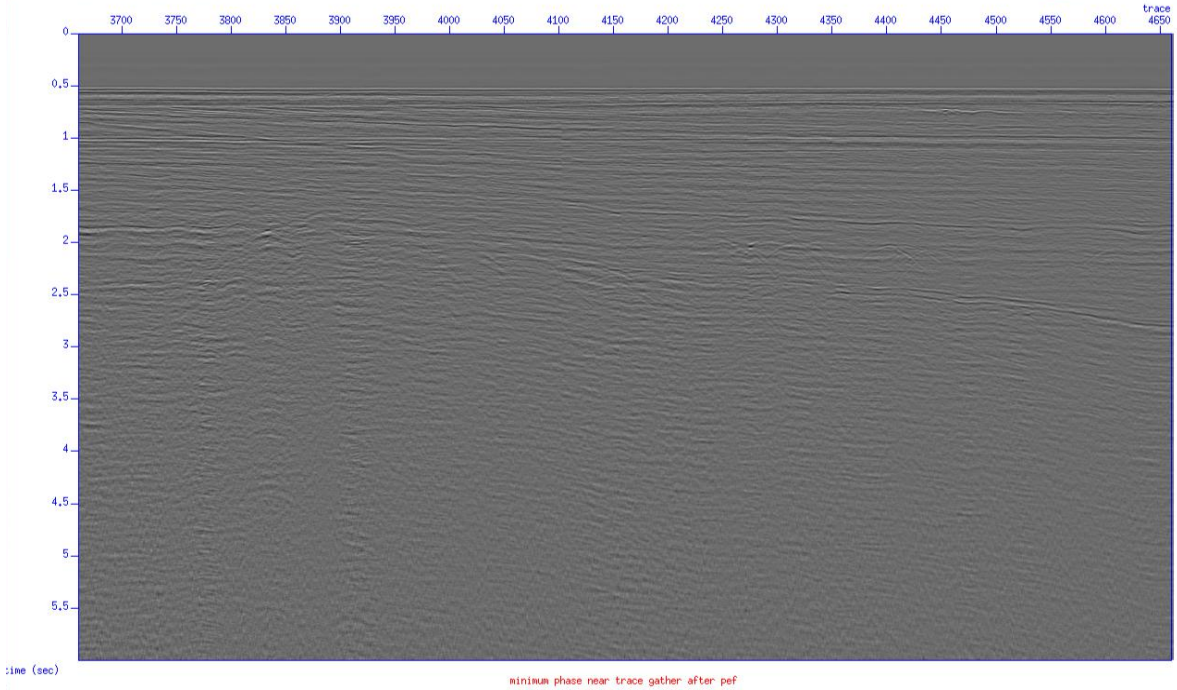
sufft <minphs_pef_ntgather.su | suamp mode=amp| suxwigb label1="frequency" label2="trace" title="minimum phase ntg in frequency domain after pef " &



Minimum Phase near trace gather after Predictive Deconvolution and bandpass filter:

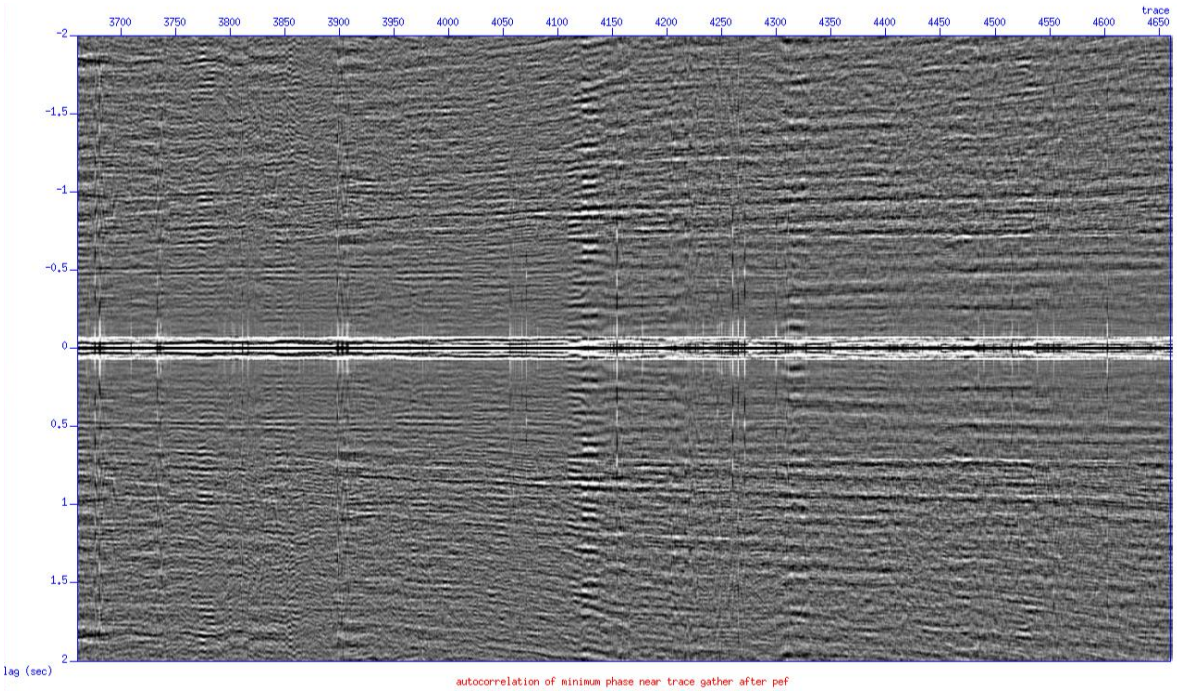
We applied filter as we can see that there is not much energy after 60 Hz.

sufilter <minphs_pef_ntgather.su f=0,3,50,60 amps=0,1,1,0 >minphs_filt_ntgather.su



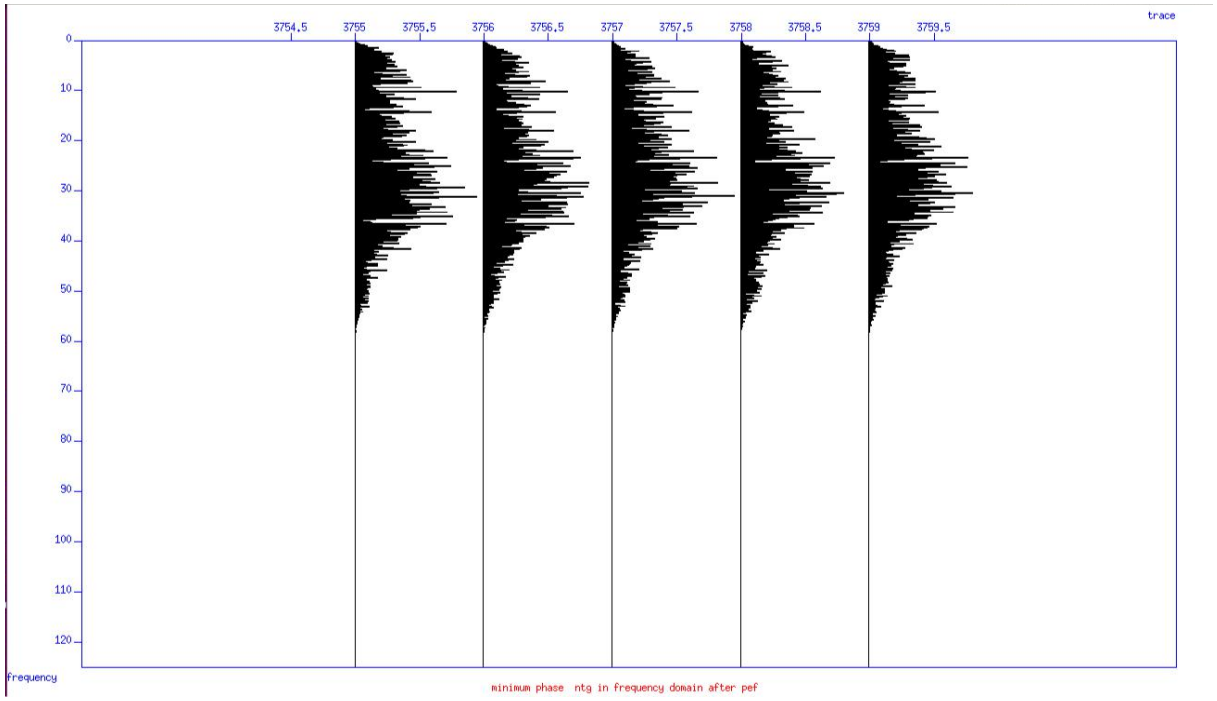
Autocorrelation of PEF minimum phase near trace gather:

suacor <minphs_filt_ntgather.su ntout=1001 | suximage f1=2.0 perc=99 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase near trace gqather after pef" &



Amplitude Spectrum of minimum phase PEF filter gather:

sufft <minphs_filt_ntgather.su | suamp mode=amp| suxwigb label1="frequency" label2="trace" title="minimum phase ntg in frequency domain after pef " &



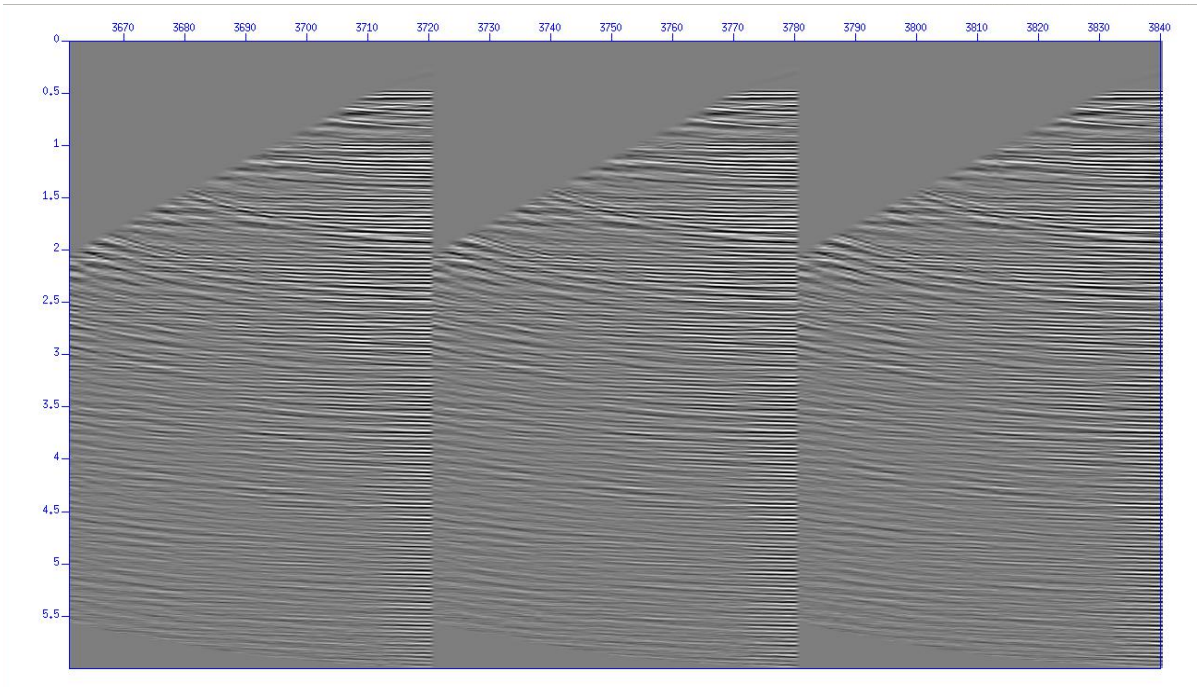
Optimum parameter for minimum phase near trace gather are minimum lag=0.1 and and maxlag=0.7. Which almost removes multiples in ntg gather.

Solution of qustion 3:

We took static corrected 3 cdp gather with t^2 gain and farfield wavelet and made a minimum phase equivalent.

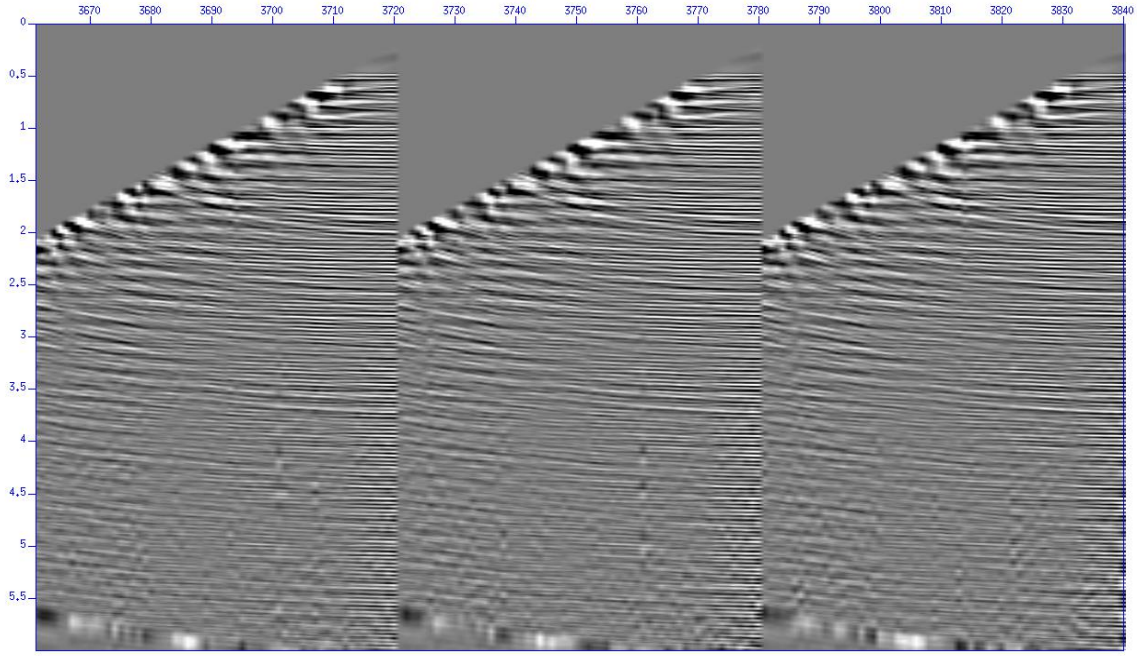
NMO Correction-

sunmo <stat_t2_3cdphdrs1.su >3cdpnmocorrected.su vnmo=1440



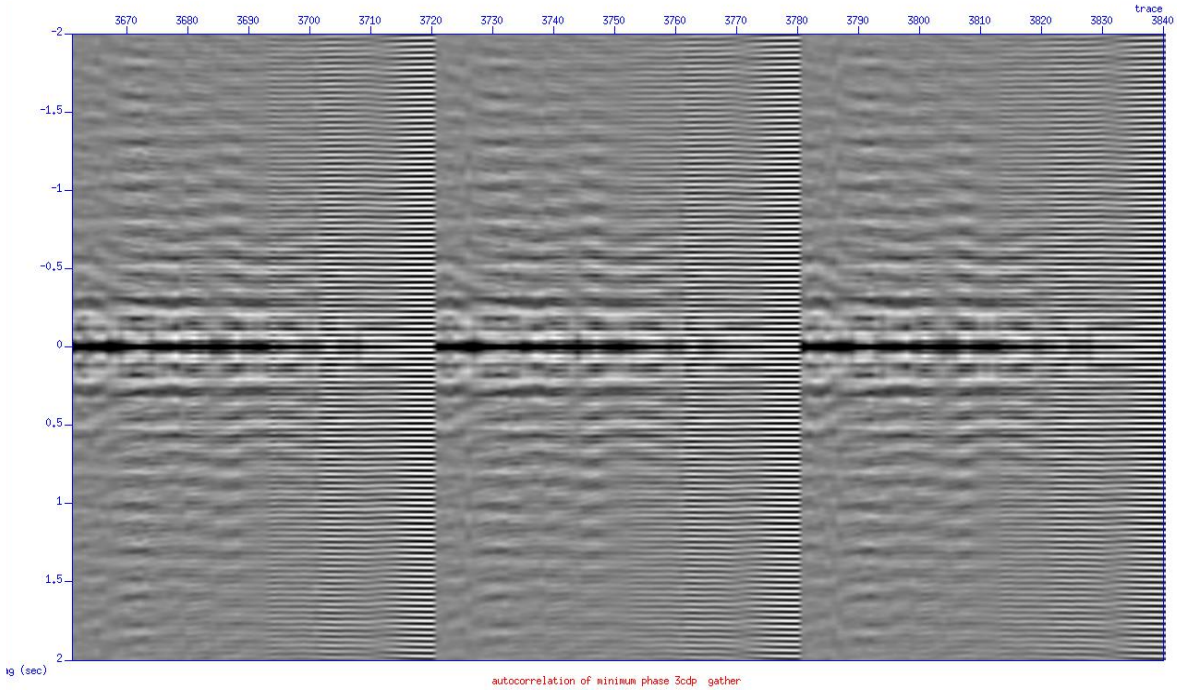
Minimum Phase 3 CDP gather:

sushape <3cdpnmocorrected.su wfile=resamp_farfield.su dfile=minphs_farfield.su showshaper=1 nshape=1500 2>shaper.asc >minphs_3cdpgather.su



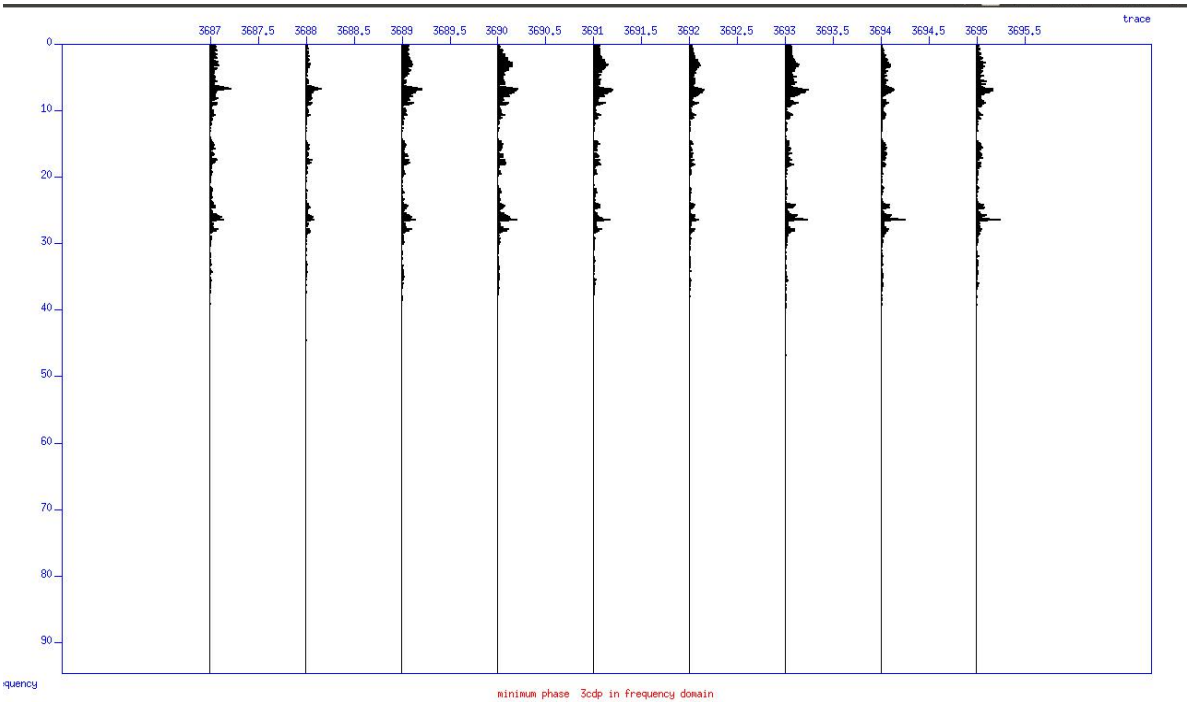
Autocorrection of minimum phase nmo corrected 3CDP gather:

suacor <minphs_3cdpgather.su ntout=1001 | suximage f1=-2.0 perc=99 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase 3cdp gather" windowtitle="autocorrelation of minimum phase 3cdp nmo corrected gather" &



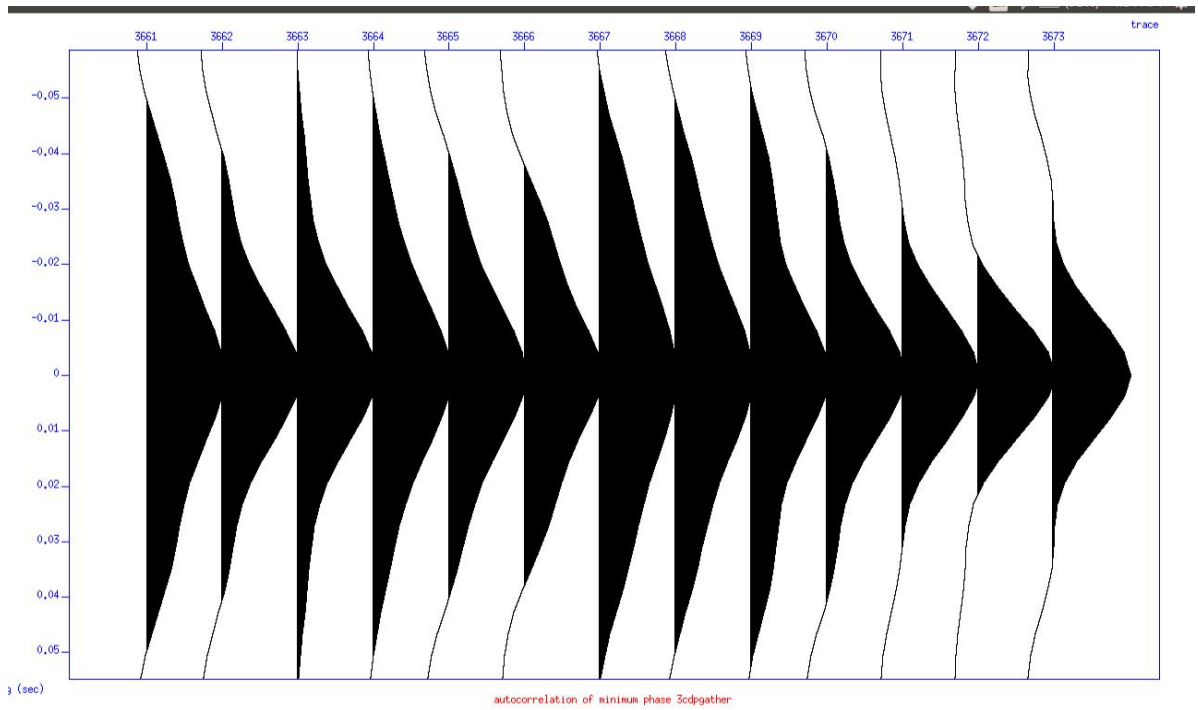
Amplitude Spectrum of minimum Phase 3CDP gather:

sufft <minphs_3cdpgather.su | suamp mode=amp| suxwigb label1= "frequency" label2="trace" title="minimum phase ntg in frequency domain" &



Autocorrelation of minimum phase 3CDP gather:

suacor <minphs_3cdpgather.su ntout=1001 | suxwigb f1=2.0 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase 3cdpgather" &

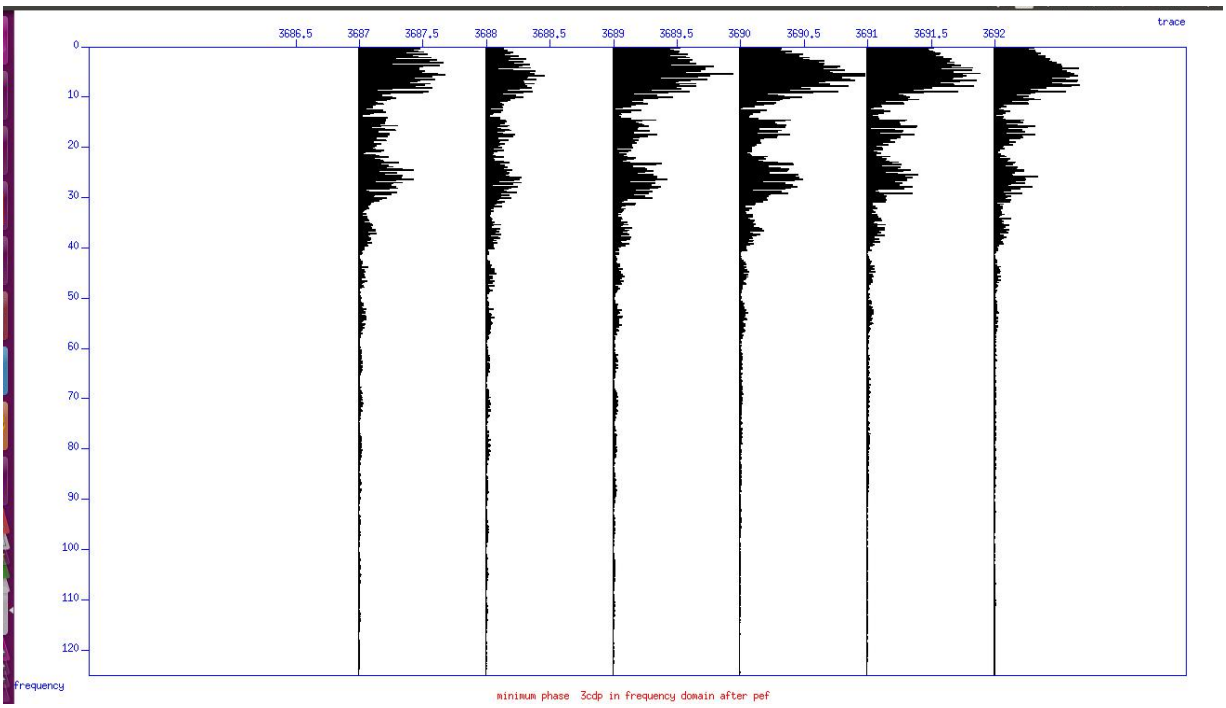


from here we select minimum lag=.12 sec.

Amplitude Spectrum of minphase 3CDP gather after Predictive Deconvolution:

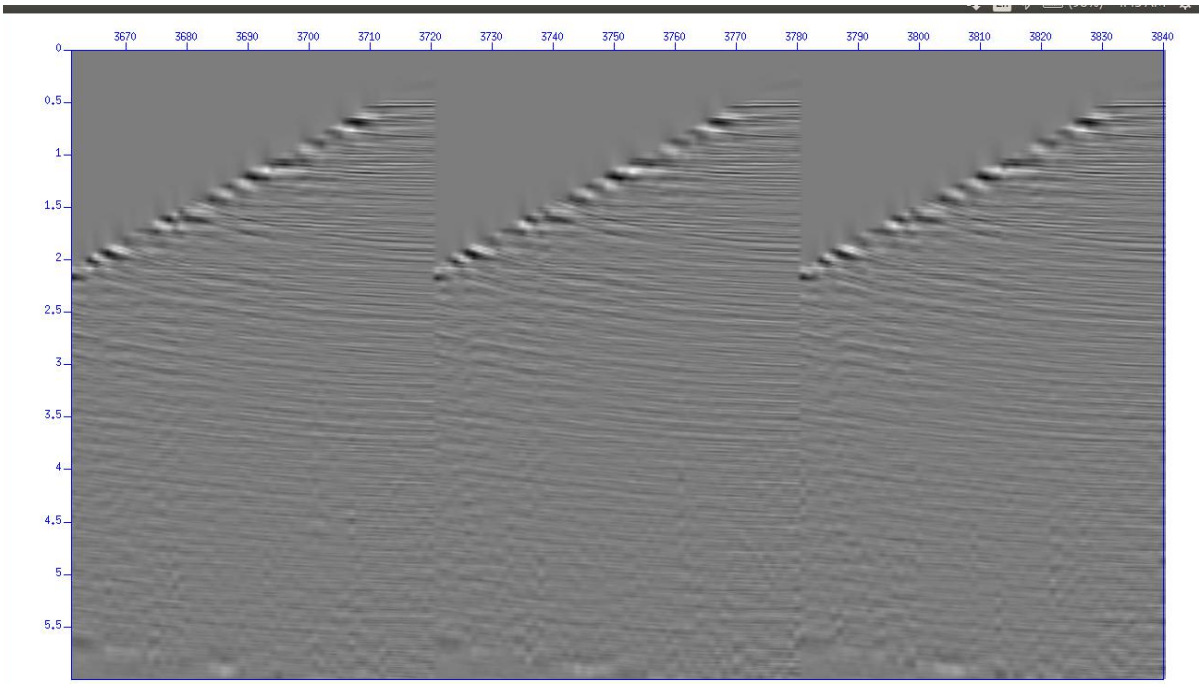
supef <minphs_3cdpgather.su minlag=0.12 maxlag=0.7 >minphs_pef_3cdpgather.su

sufft <minphs_pef_3cdpgather.su | suamp mode=amp| suxwigb label1="frequency" label2="trace" title="minimum phase 3cdp in frequency domain after pef " &



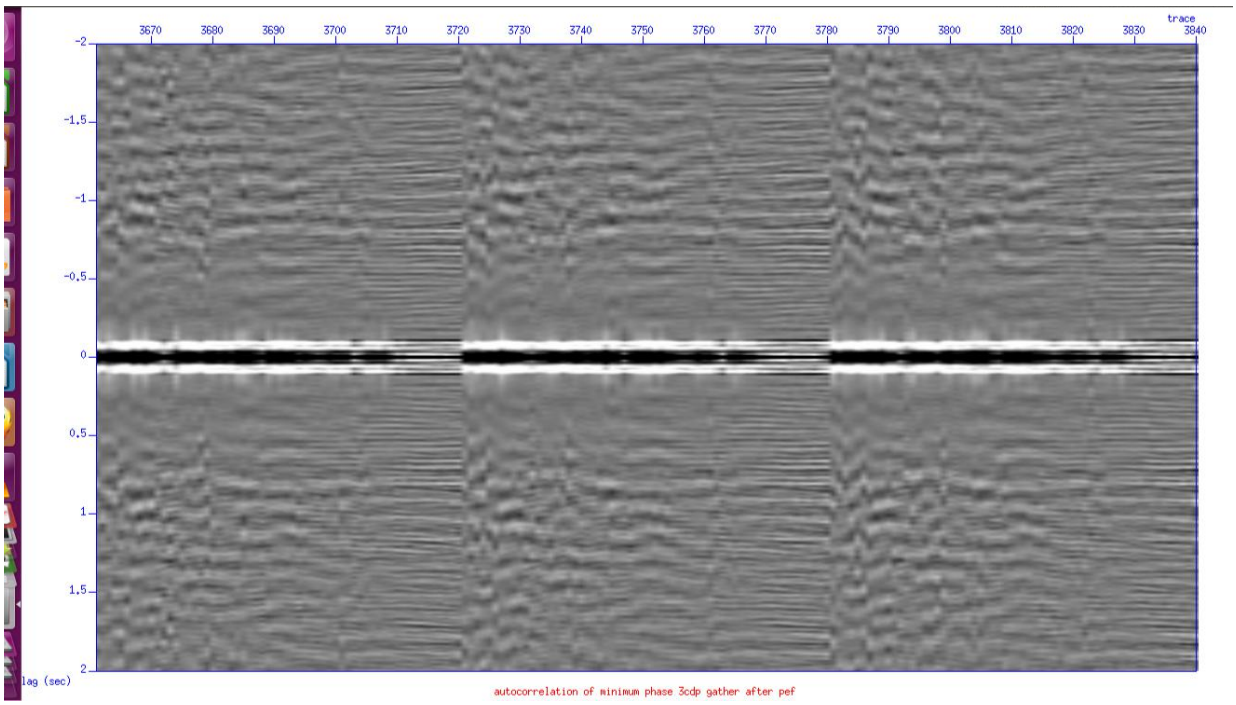
Band Pass Filtering of 3CDP gather after predictive Deconvolution:

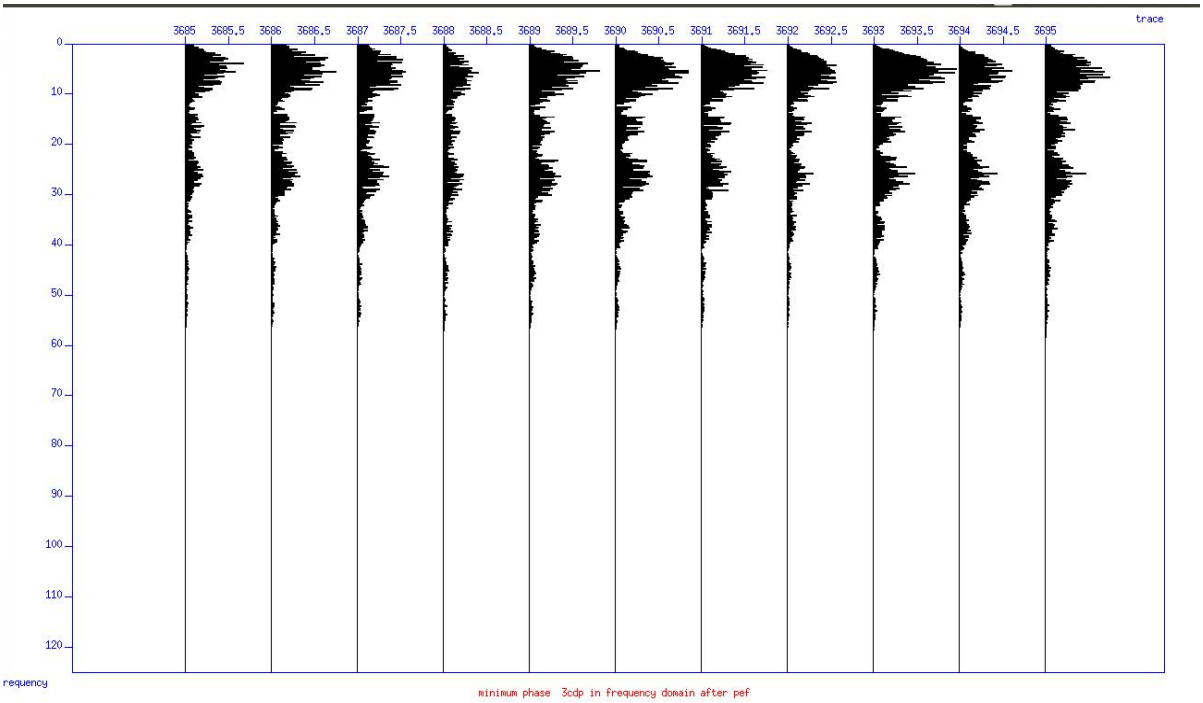
sufilter <minphs_pef_3cdpgather.su f=0,3,50,60 amps=0,1,1,0 >minphs_filt_3cdpgather.su



Autocorrelation of Minimum phase gather after Predictive Deconvolution:

suacor <minphs_filt_3cdpgather.su ntout=1001 | suximage f1=2.0 perc=99 label2="trace" label1="lag (sec)" title="autocorrelation of minimum phase 3cdp gather after pef" &



Amplitude Spectrum of Minimum phase 3CDP gather after PEF:

sufft <minphs_filt_3cdpgather.su | suamp mode=amp| suxwigb label1="frequency" label2="trace" title="minimum phase 3cdp in frequency domain after pef " &