

Signal-to-noise ratio



Raw seismic data is usually affected by various kinds of noises that is considered as unwanted data



•Types of Seismic noises :-

1. Coherent Noise.
2. Incoherent Noise.



1. Coherent Noise: undesirable seismic energy that shows consistent phase from trace to trace.

- a. Interference from other seismic surveys.
- b. Interference from other vessels.
- c. Reflections/Diffractions from rigs or other objects.
- d. Cable noise.
- e. Mud roll.
- f. Multiples
- g. Ground roll.



2. Incoherent Noise: undesirable seismic energy that lack the phase relationship between adjacent traces and cannot be correlated to the seismic energy source.

- a. Ambient noise.
- b. Swell noise.
- c. Electronic noise (spikes).



•Noise Attenuation

1. Trace editing and muting.
2. Gain recovery.
3. Filtering.
4. Static correction.
5. NMO correction.
6. Deconvolution.
7. CMP gather (stacking).
8. Velocity analysis.
9. Multiple attenuation.
- 10 . Migration.



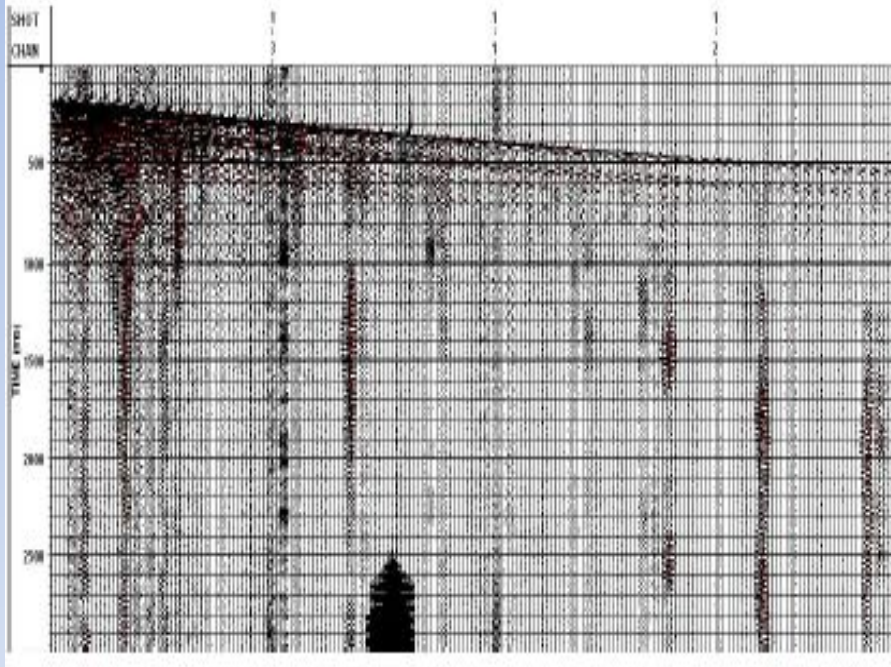
1. Trace editing and muting

- Remove dead traces.
- Remove noisy traces.
- Switch polarity on reversed traces.

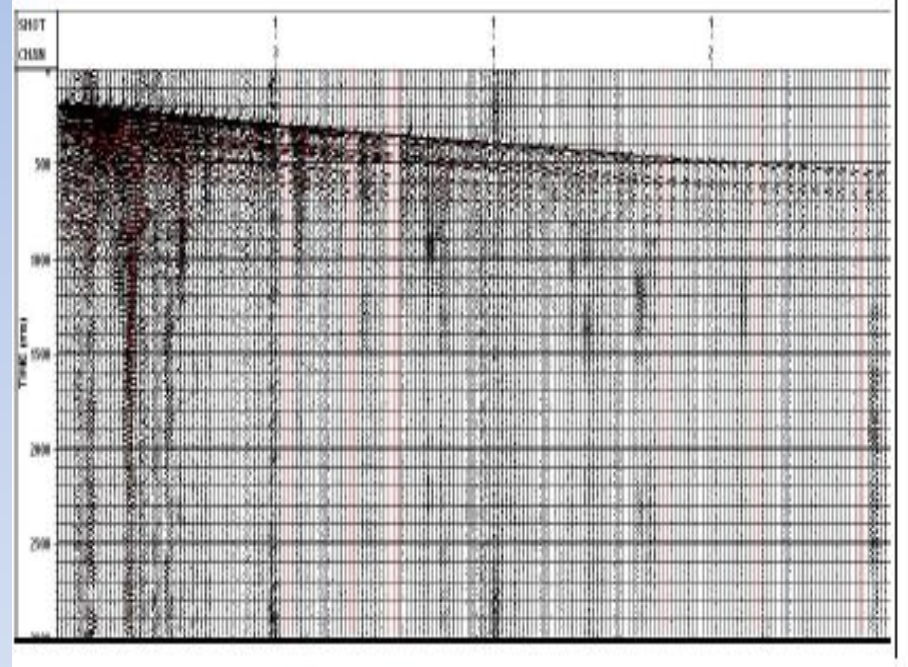


.Trace editing and muting

Before:



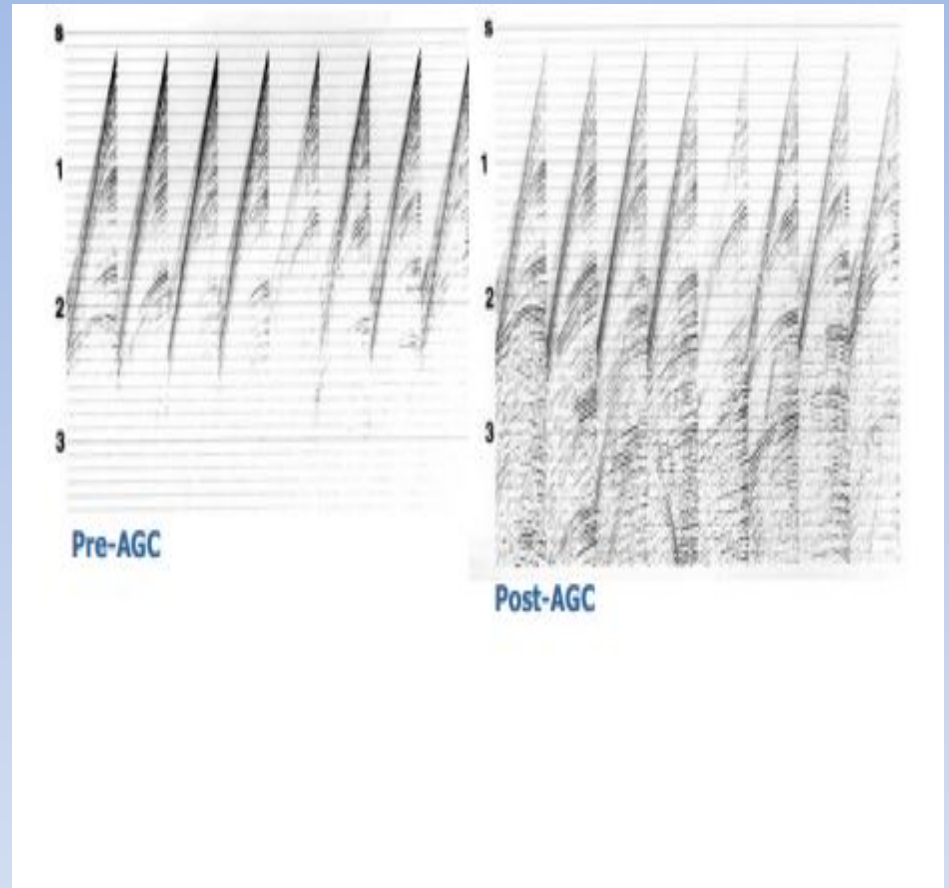
After:



2. Gain recovery :-

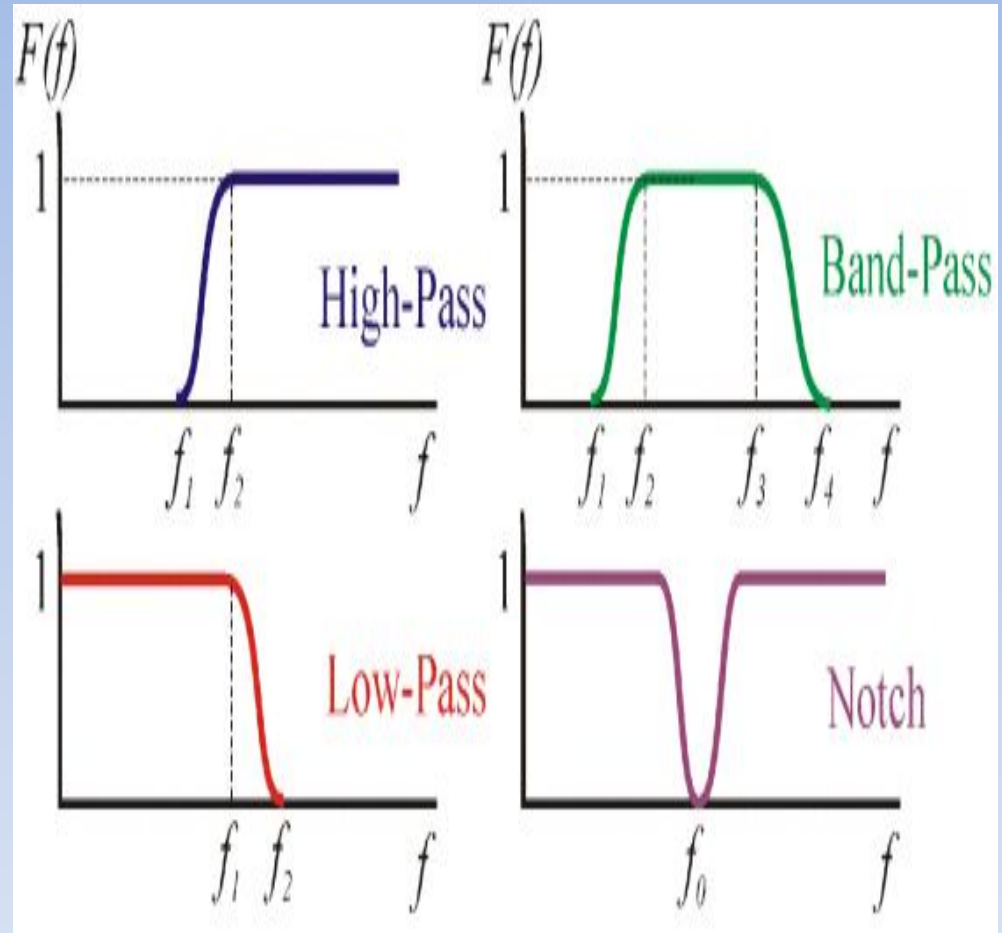
Seismic energy gets lost in many different ways.

- And as a result of amplitude decay with depth this technique is used to equalize the amplitude along the trace using “Automatic gain control”.



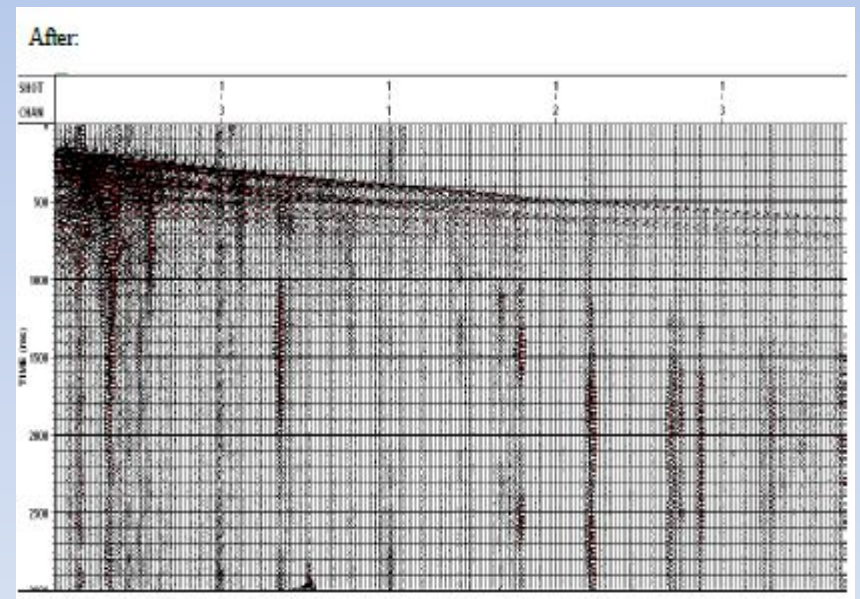
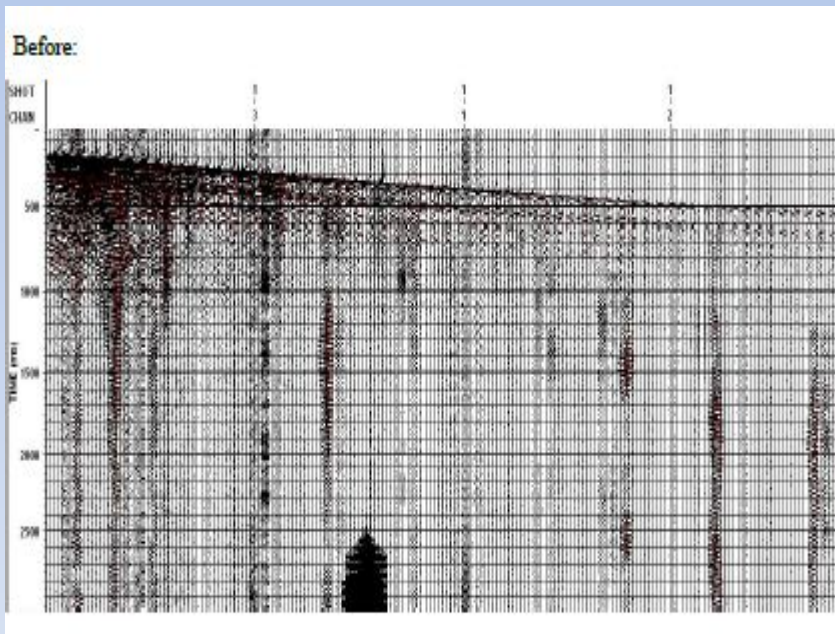
3. Filtering :-

- This technique is used to remove the unwanted parts of the frequency spectrum.
- Low pass (high cut), high pass (low cut), band pass and notch filter.



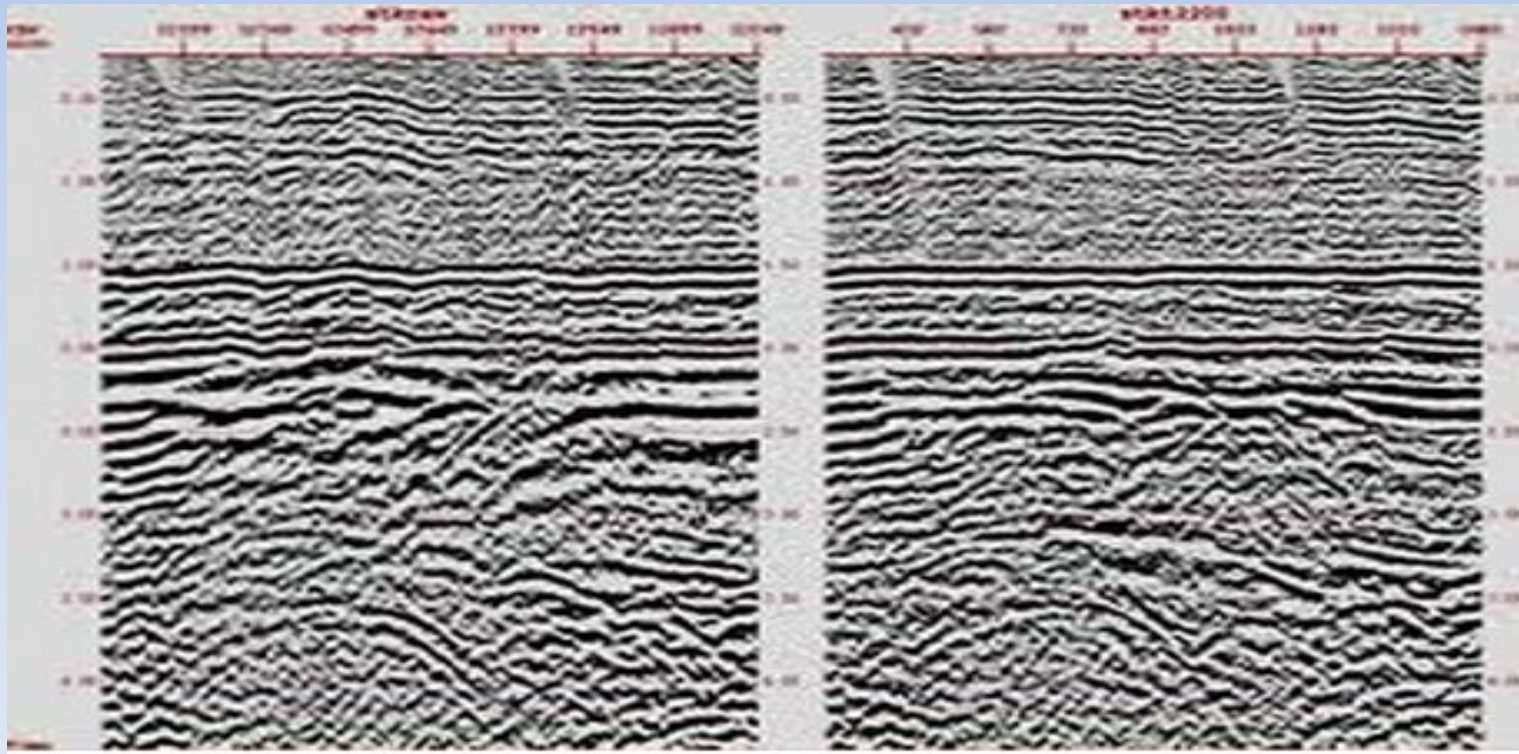
- Fk filter :-

This technique is used to remove the linear noise.



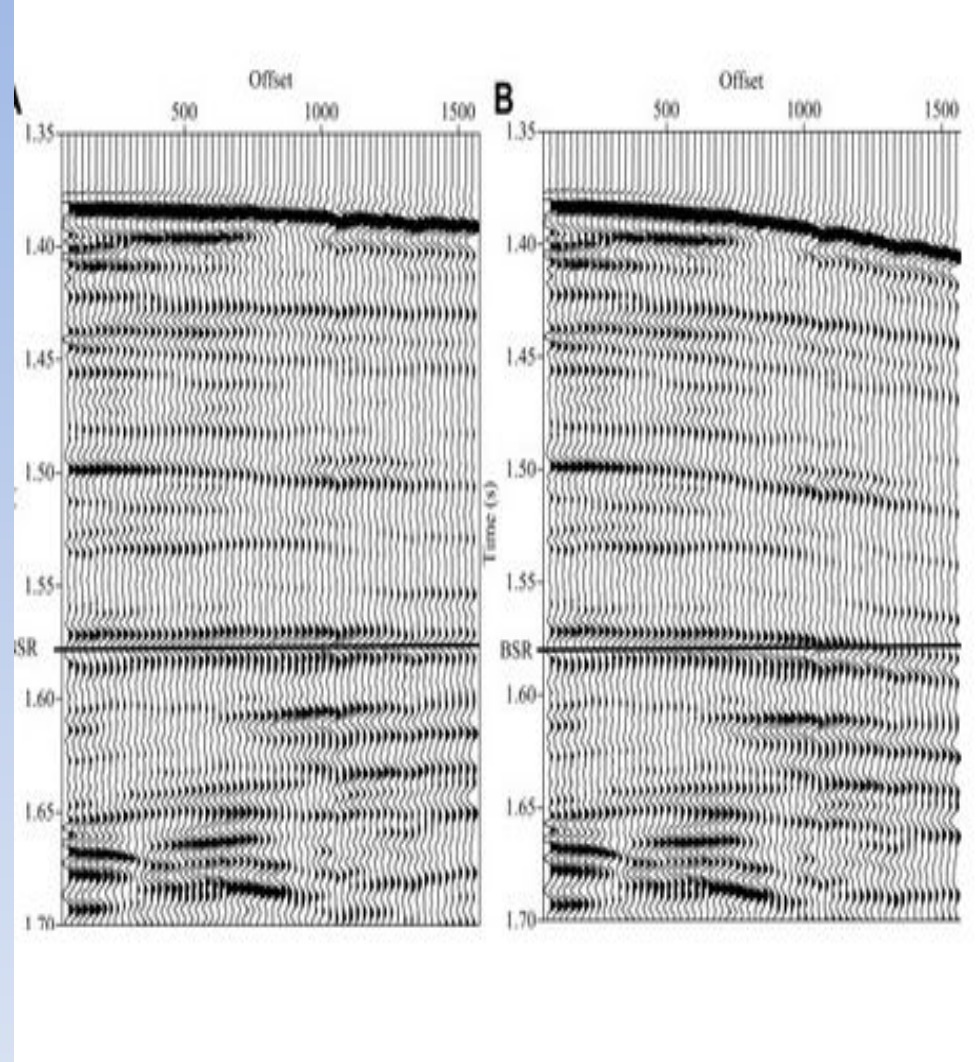
4. Static correction :-

this technique is essential for removing the effect of the topography from the seismic data.



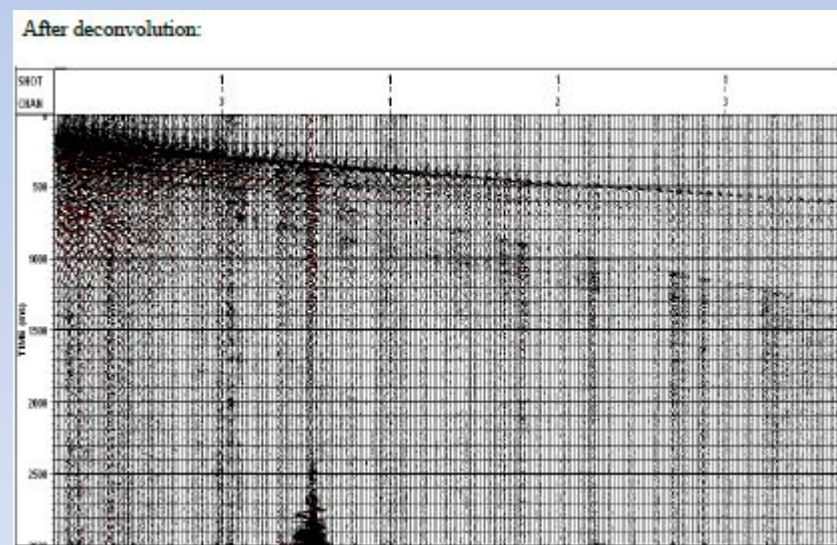
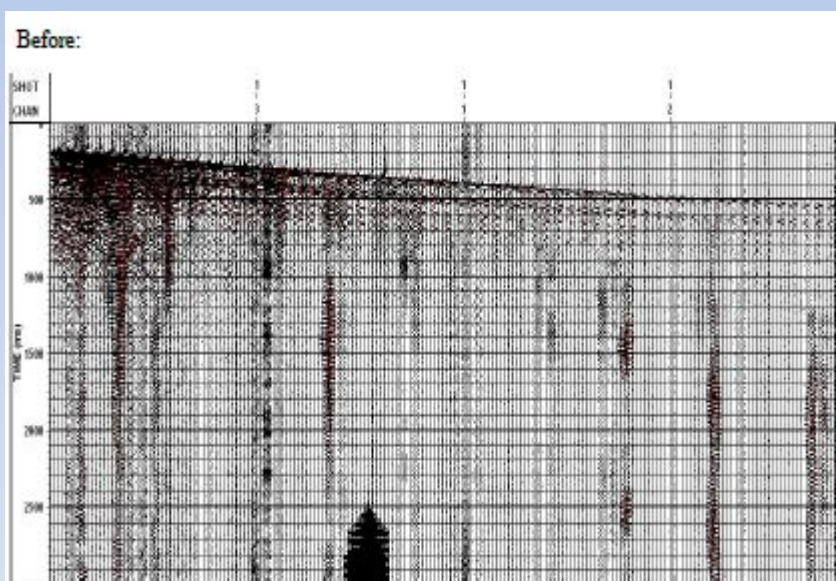
5. NMO correction :-

- This refers to the increase of travel time with increasing offset distance.
- This increase make the reflectors look dipping, and make the dipping reflectors even more dipping.
- The amount of correction needed decreases with depth , so the shallower ones get more stretched than the deeper ones do.



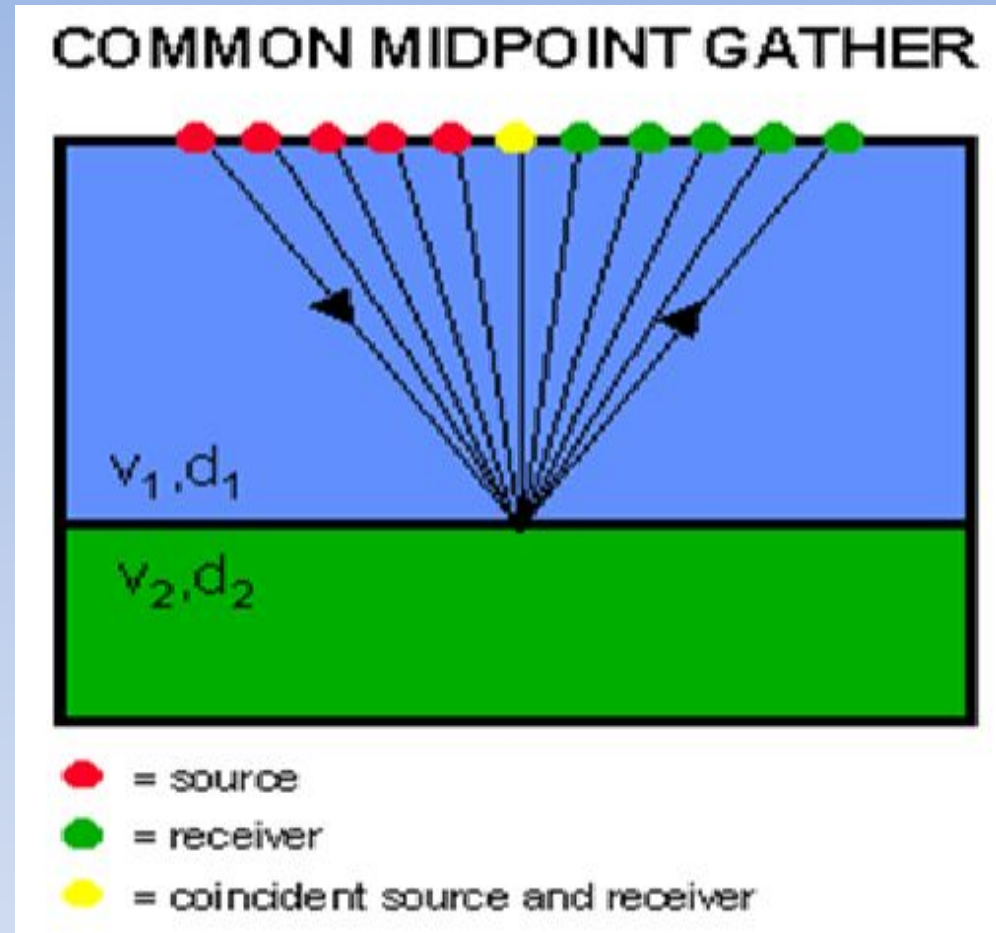
6. Deconvolution :

This technique make the reflectors look better by increasing the temporal resolution and remove echoes



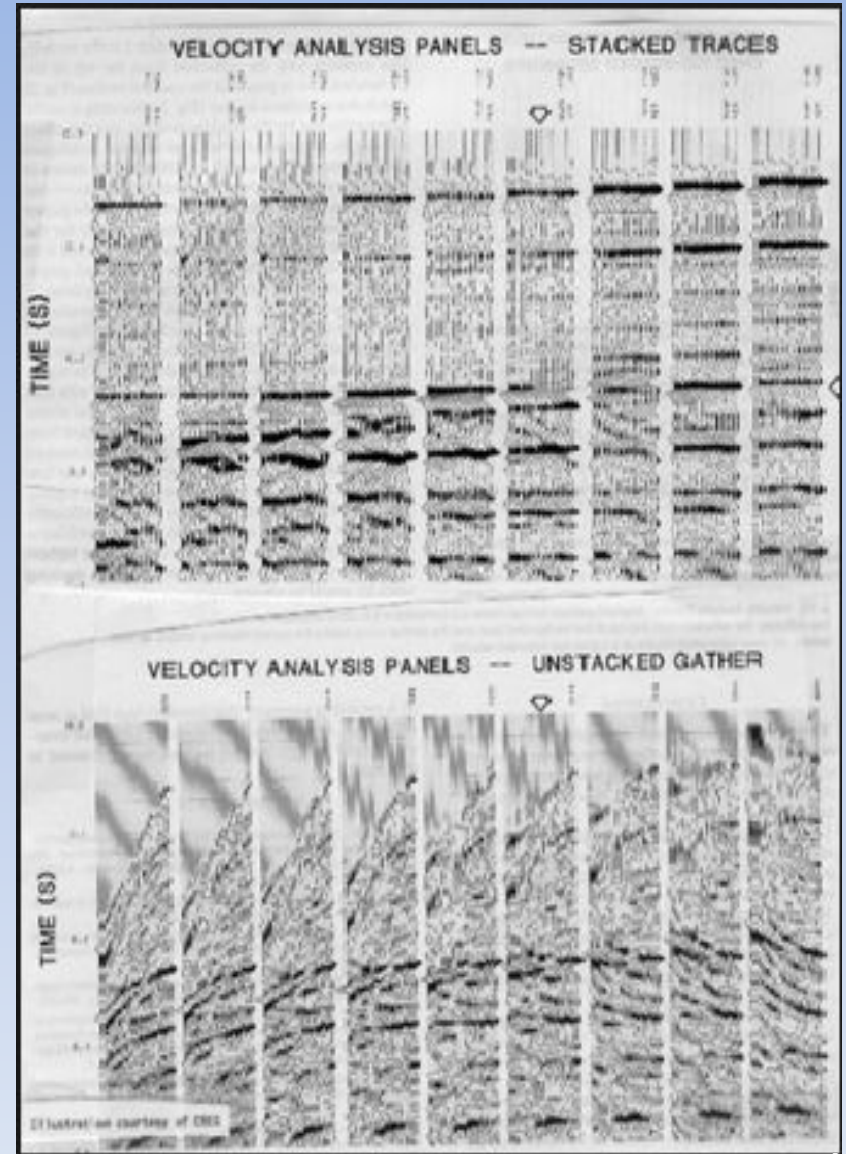
7. CMP Gathers :-

- To enhance signal to noise ratio we use more than one shot.
- Reflections from the same point are recorded by different source station pairs.
- The purpose of the CMP gather is to enhance where the seismic reflected energy was weak.



8. Velocity Analysis :-

- This technique give information about velocities in the subsurface.
- It finds the stacking velocity that best fits the data.
- Seismic semblance شکل is a quantitative measure of the coherence of seismic that is equal to the energy of stacked trace divided by the energy of all the traces that make up the stack.
- If data from channels are perfectly coherent, or show continuity from trace to trace, the semblance will have a value of unity.

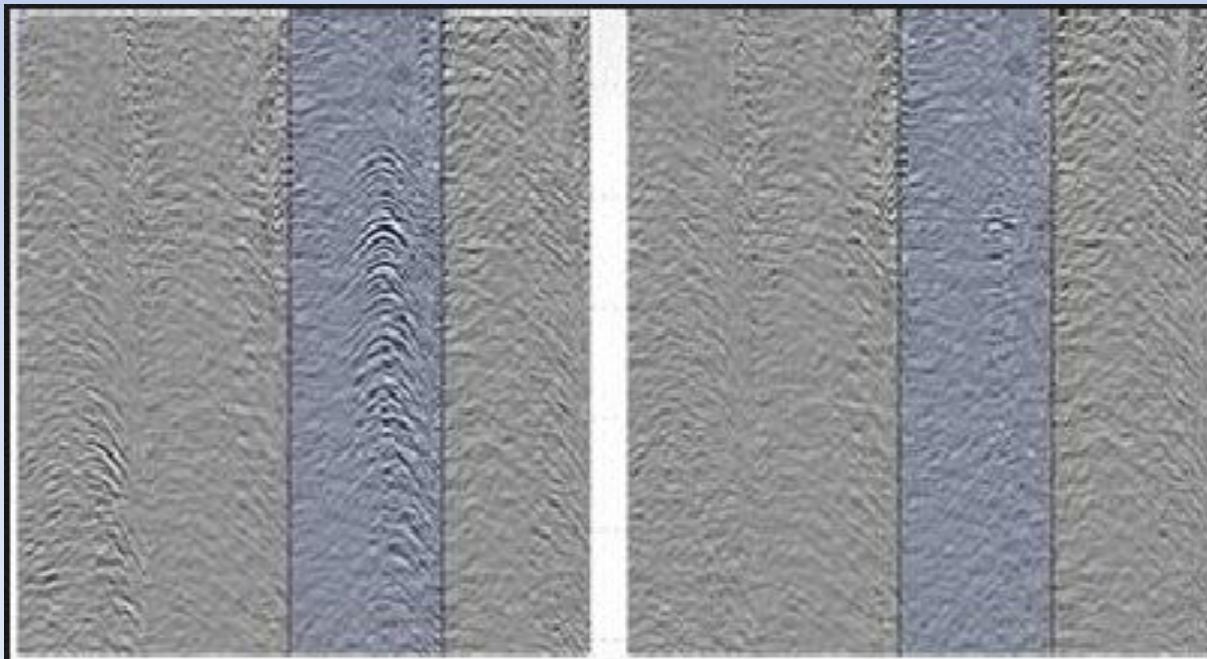


9. Multiple attenuation :-

Multiples are an event on the seismic record that has incurred more than one reflection, it can be either short-path or longer path depending upon whether they interfere with primary reflections or not, so this technique is used mainly to remove it

Before Demultiple

After Demultiple



10. Migration :-

- This process moves the reflectors into their right subsurface locations.
- It improves the lateral resolution and collapses diffractions into identifiable points in the seismic section.

