## Signal-to-noise ratio



Raw siesmic 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.



### 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.



 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





- 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 streched 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 شكل 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.

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#### 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.

