Science Camp #170802.8

02-04 August 2016 @ the Condo, the Nelson Cabin, and surrounding area

Advisors

H. Roice Nelson, Jr., Andrea S. Nelson,
Paul F. Nelson, Benjamin B. Nelson

Attendees

Ethan E. Nelson, Grant M. Nelson, Colby C. Wright, Taylor R. Wright, Ella D. Nelson, Halle N. Wright, Bobbie Sophia Waldron, Dallin Spencer Nelson, Avalyn Joyce Wright, Rachel Lee, & Ian Lee

Seismic Acquisition

A

B

C

Figure 1-5. Typical land crew operations in southwestern Utah. (A) Surface shooting using ten 5-lb sacks of explosives on a primachord string. The environmental damage is temporary, but overshooting, like overgrazing, can cause long-term problems. (B) Shallow hole shooting of, say, 10 lbs of dynamite per shotpoint is better in agricultural areas. (C) The most common land seismic source is Vibroseis.™ Normally, four of these trucks vibrate in synchronization.

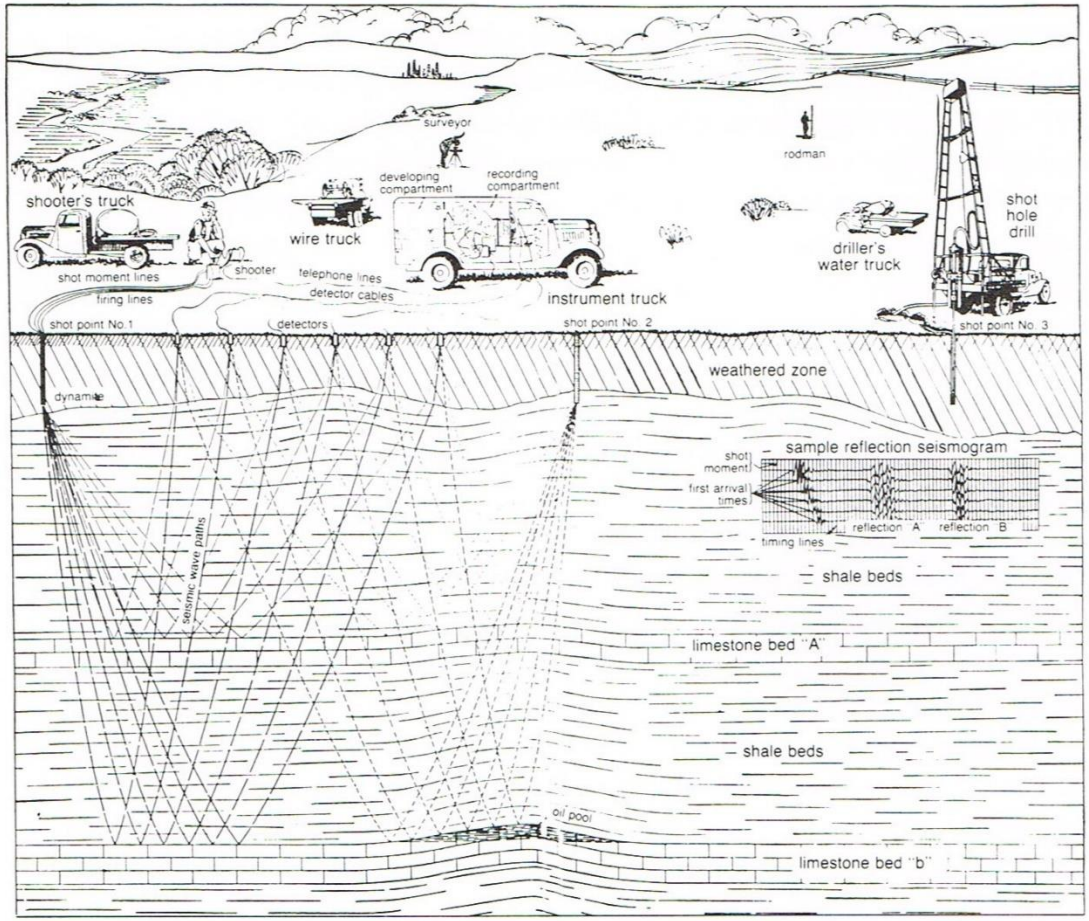


Figure 1-7. This diagram of a 1940s seismic shothole crew reflects the same basic configuration used today, except crews now use many more channels, various seismic sources, and sophisticated instrumentation. (After Nettleton.[2])

http://www.walden3d.com/photos/Grandkids_Science_Camps/170802-04_Science_Camp/7_2-D_Seismic.pdf

Reflection Seismology

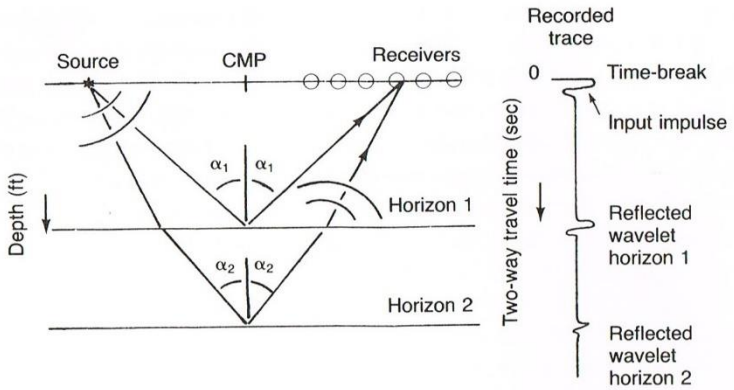


Figure 1-1A. This diagram shows the concept of common mid-point (CMP). Note that boundaries act as sources for new wavefront paths and that the angle of incidence equals the angle of reflection.

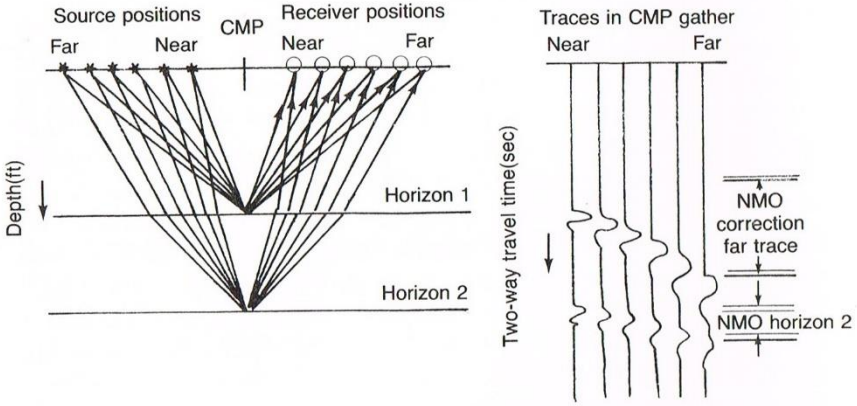


Figure 1-1B. In this CMP gather, reflections are recorded by six different sets of source/receiver locations. The data is sorted into a CMP gather during processing. Dispersion, or the widening of the wavelet with offset, is exaggerated in the traces drawn on the right.

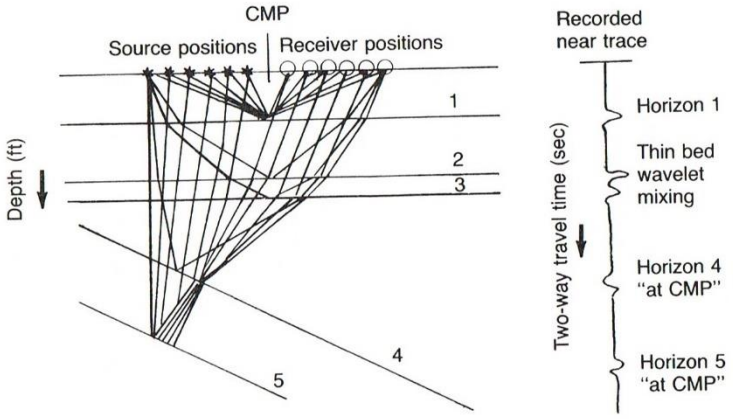


Figure 1-1C. A CMP gather over dipping beds shows one of the problems with the CMP method. Not only are the ray-traced reflection points at horizons 4 and 5 not located spatially at the CMP, but also note how the spatial locations of different source/receiver combinations move as a function of offset on horizon 5.

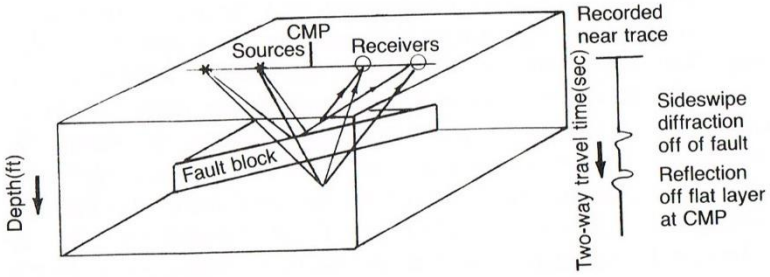


Figure 1-1D. Sideswipe reflections can come from steeply dipping layers. This example shows how diffractions from a fault block put out-of-plane events on a CMP trace.

Processing

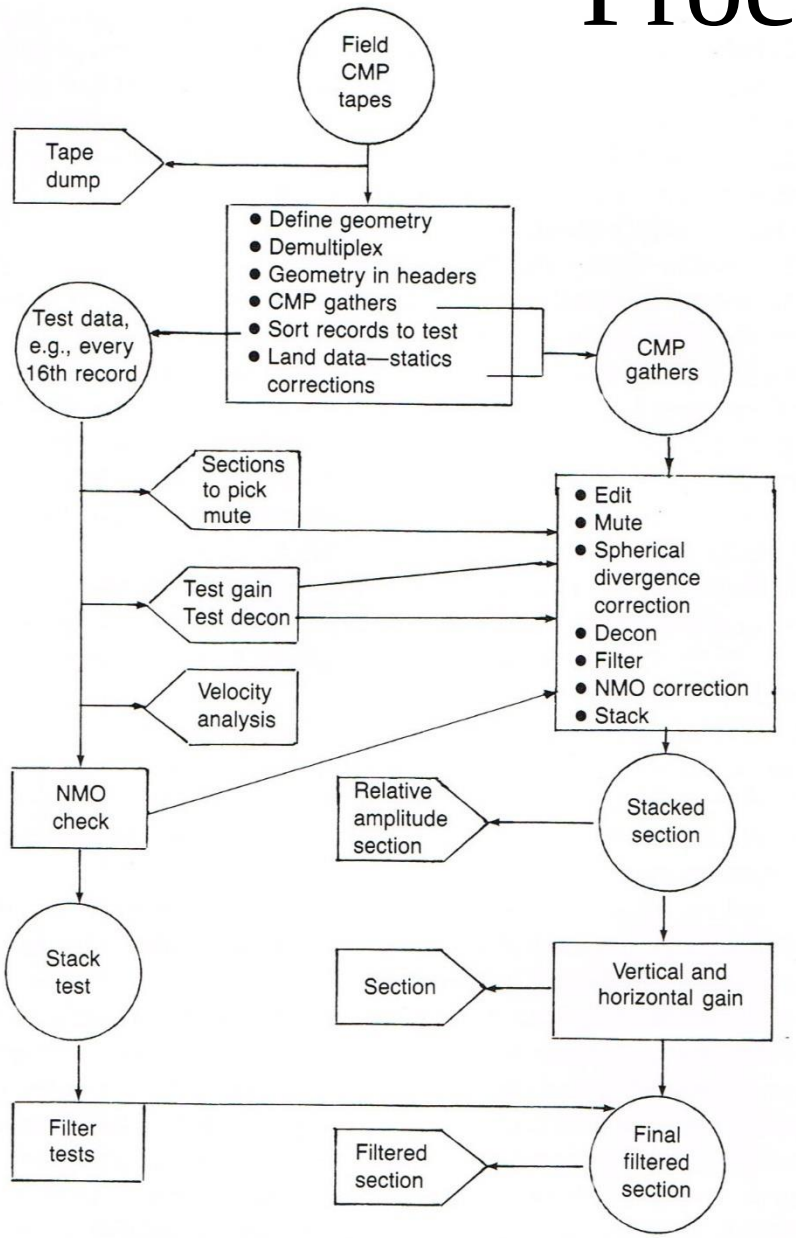


Figure 1-8. Flow chart of the processing steps involved in compositing CMP gathers into a stacked seismic section.

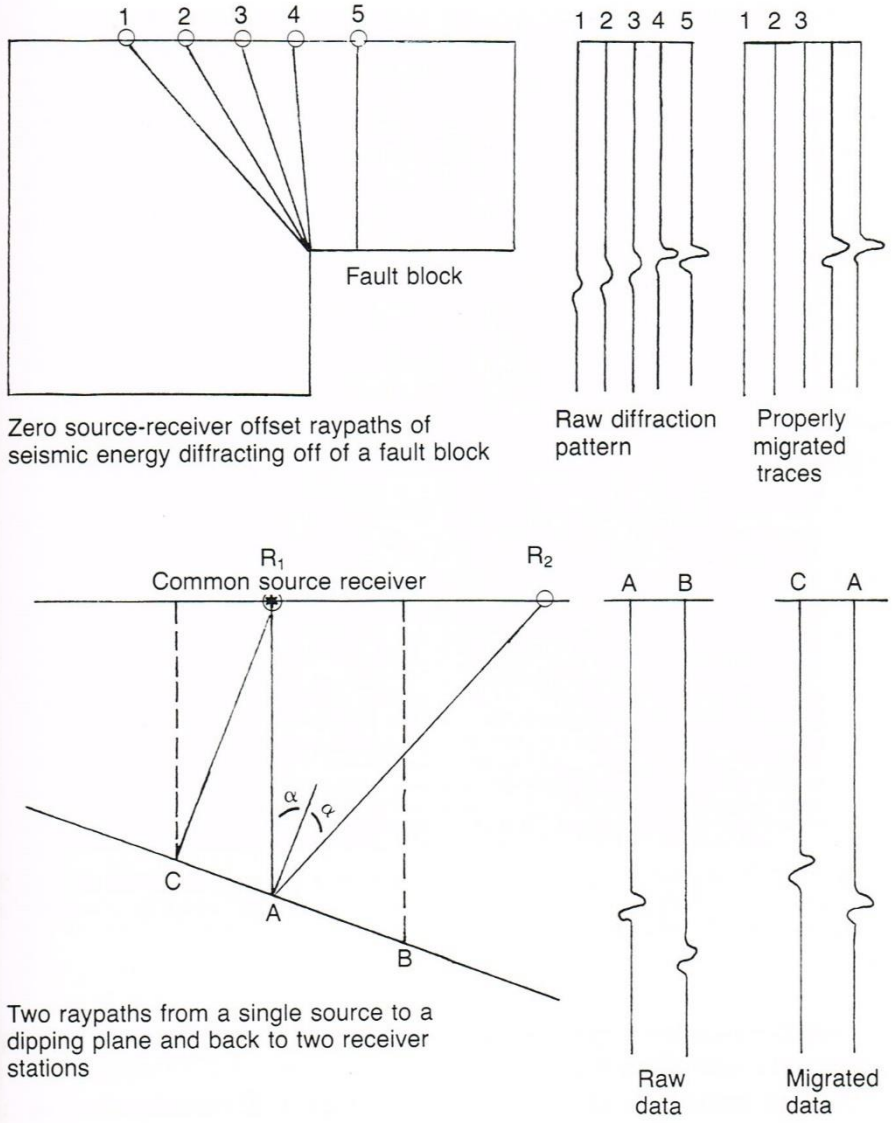


Figure 1-11. Migration is a mathematical, computer focusing procedure that collapses diffractions (top) and plots reflections from dipping layers in their actual spatial location instead of at the CMP (bottom).

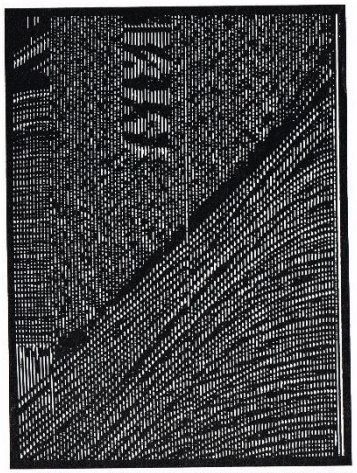
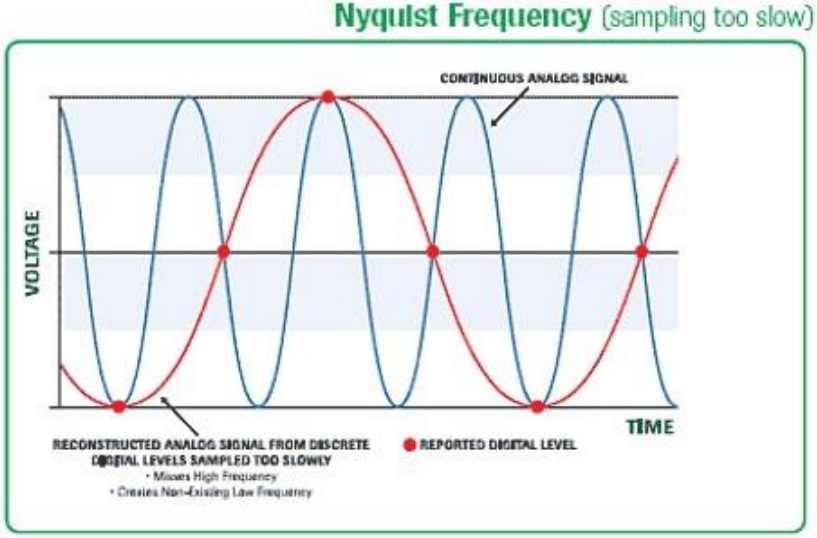


Figure 2-3. The seismic field record is displayed on a vector refresh graphics terminal. Seismic data displays require large amounts of trace data to be viewed simultaneously so that correlation between traces can be analyzed. (Courtesy Adage, Inc.)



Seismic Shot Gathers

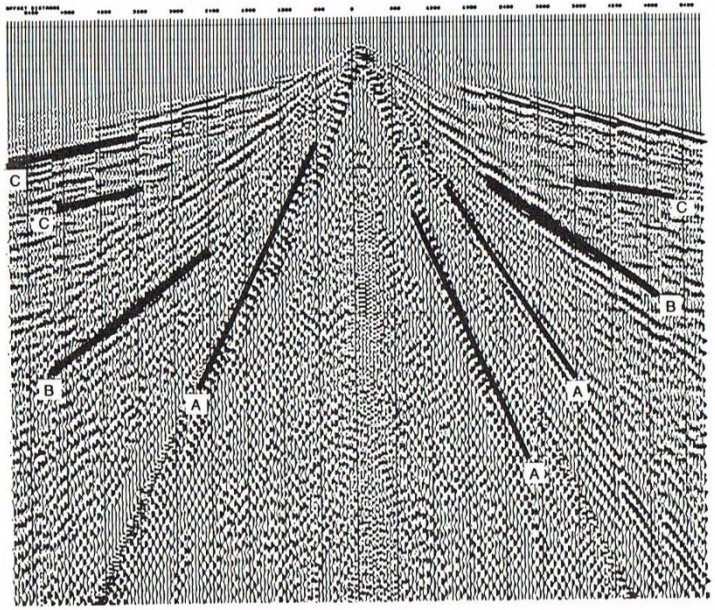


Figure 1-6A. A noise survey showing example air waves (A), ground roll (B), and reflections (C). The receivers were grouped at each of 12 receiver stations and the vibrators moved out to 8 source positions in each direction.

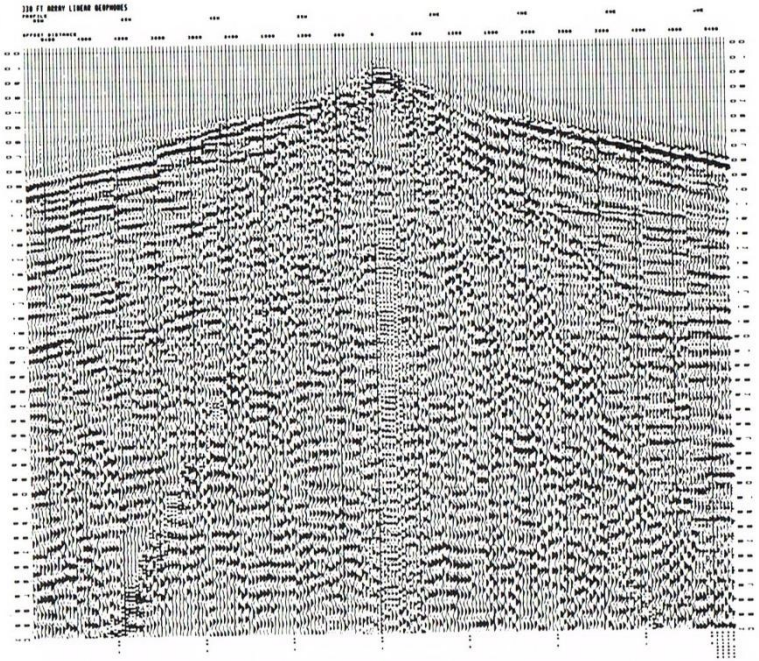


Figure 1-6B. A noise survey showing how a 330-ft linear receiver array cancels the strong air wave and ground roll. This same procedure can be done in processing if receiver stations are close enough together.

Seismic Interpretation

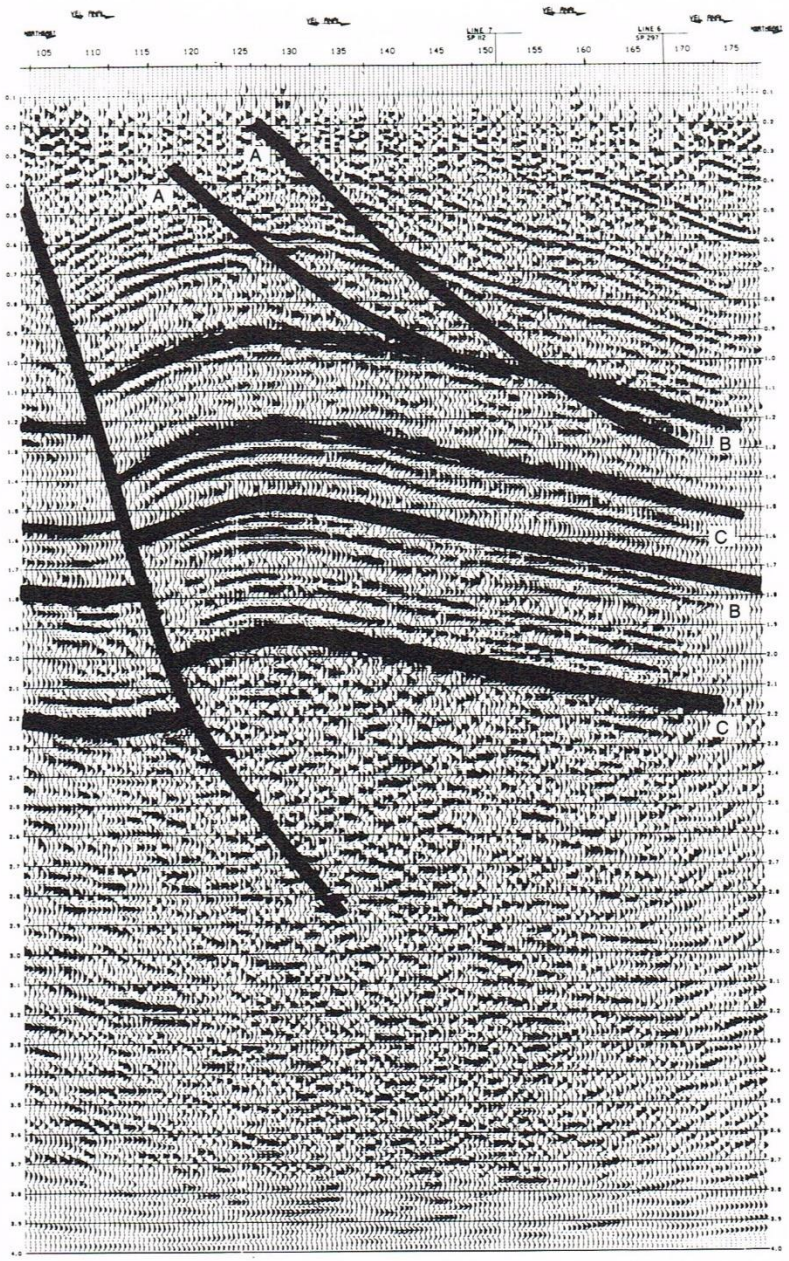


Figure 1-17. An interpreted seismic section across the Wind River Overthrust. (After Steiner.[36])

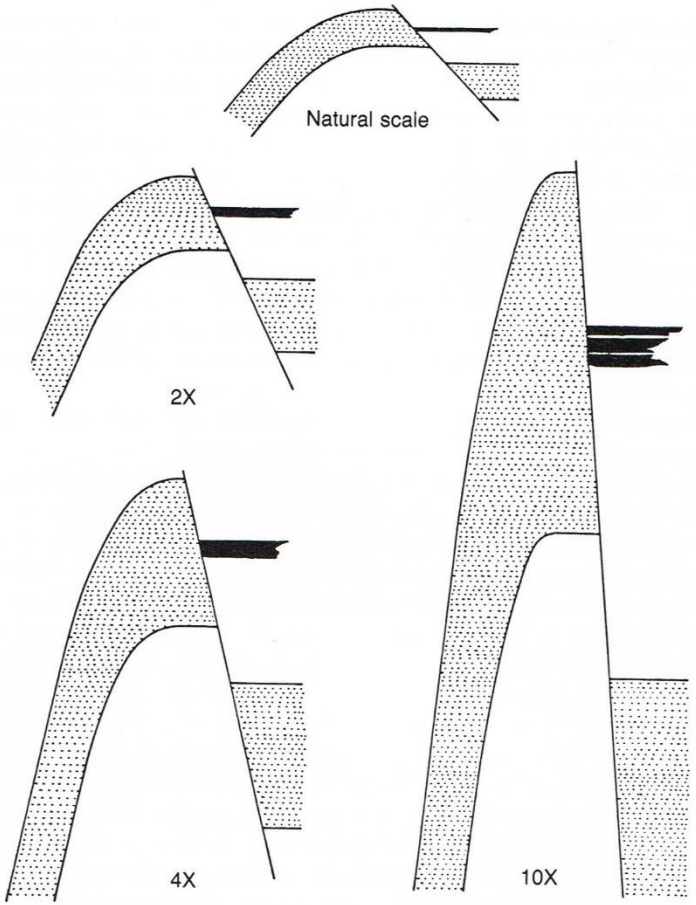


Figure 1-15. Vertical exaggeration allows one to see vertical and horizontal context, but severely distorts bed thickness, structural relationship, fault dip, etc. The vertical exaggeration on a seismic section varies as a function of the velocity of the rocks, but is typically within this range. (After Sheriff.[17])

Contouring and Seismic Attributes

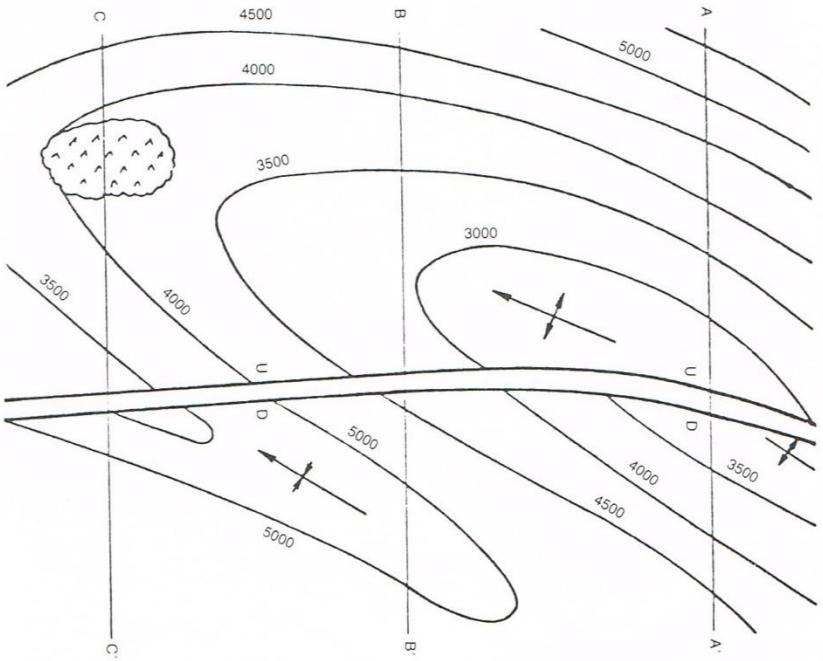
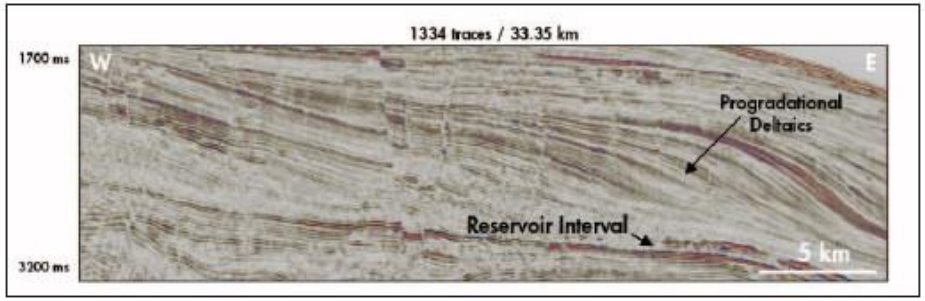
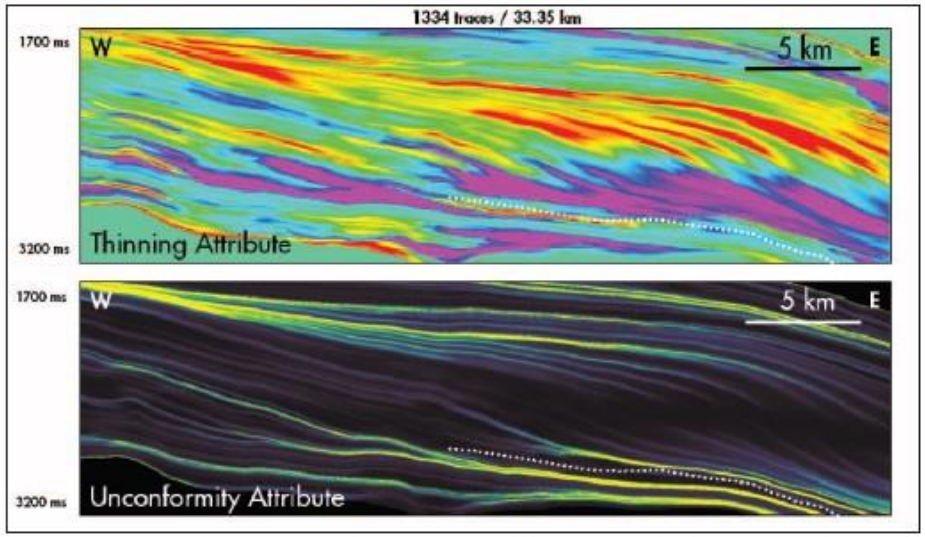


Figure 1-18. Contour map showing a fault, a salt piercement, and a basin. (After Sheriff.[17])



Barracuda Field seismic expression. Reservoir has single-cycle expression with relatively high negative amplitudes. Progradational deltaic packages, overlying reservoir interval, provide top seal. Faults offset feeder systems.



Barracuda geometric attribute expression. Thinning attribute demonstrates thinning to left in red and thinning to right in purple. Unconformity attribute: dark grey to black = areas of relatively parallel layers; yellow = areas of convergence. Reservoir interval is highlighted by dotted line in both images.

Notes

2017 Science Camp

- What was best about 2017 Science Camp?
  - _____
  - _____
  - _____

- What would be your ideal 2018 Science Camp Theme?
  - _____
  - _____
  - _____