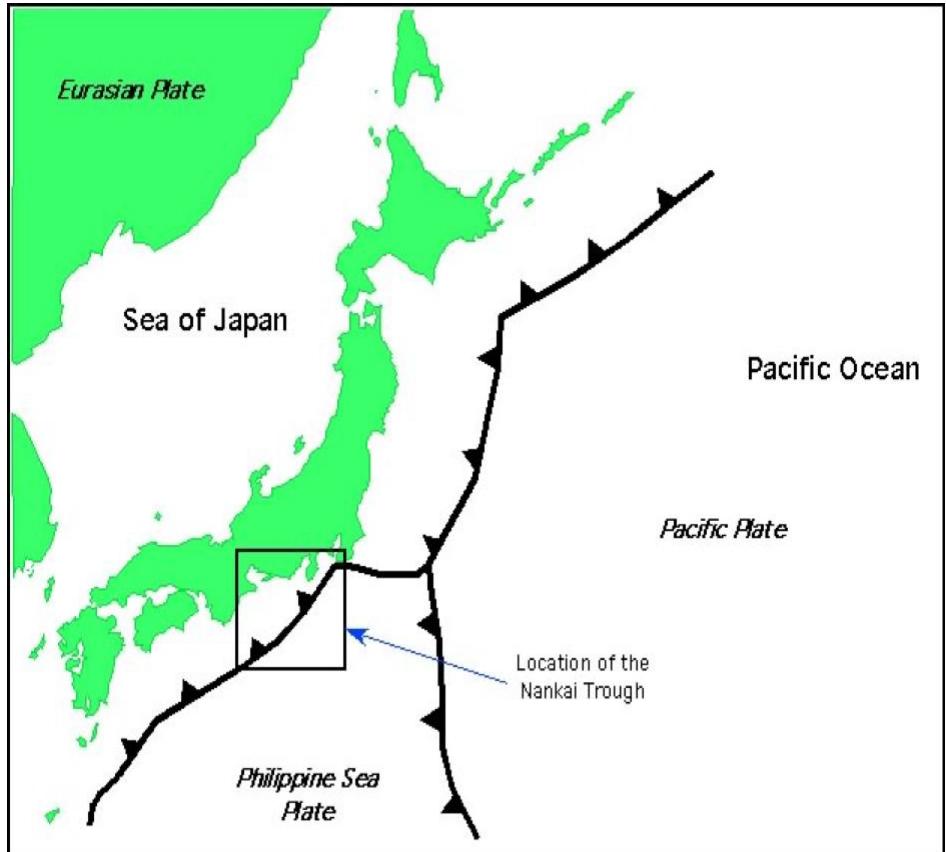


Nankai Trough 2D seismic line processing

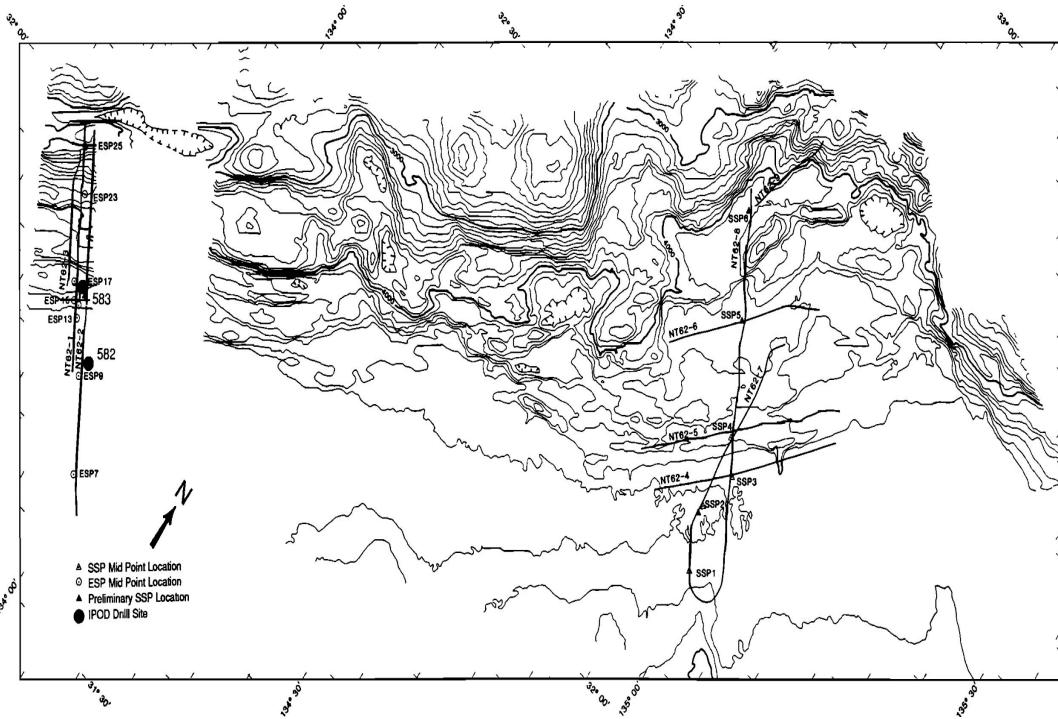
Location

- Nankai Trough
 - 900 km S Japan
- The Shikoku Basin
- Relatively shallow trench.

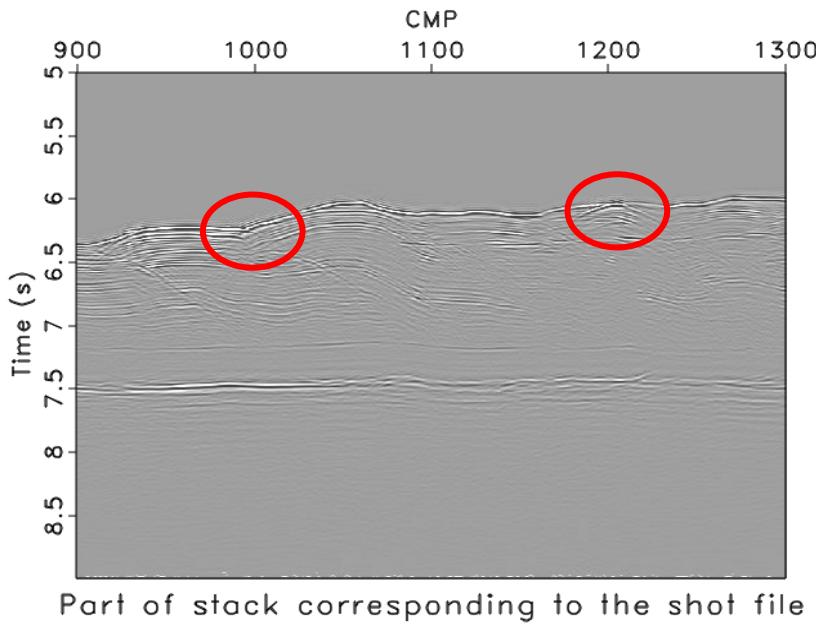
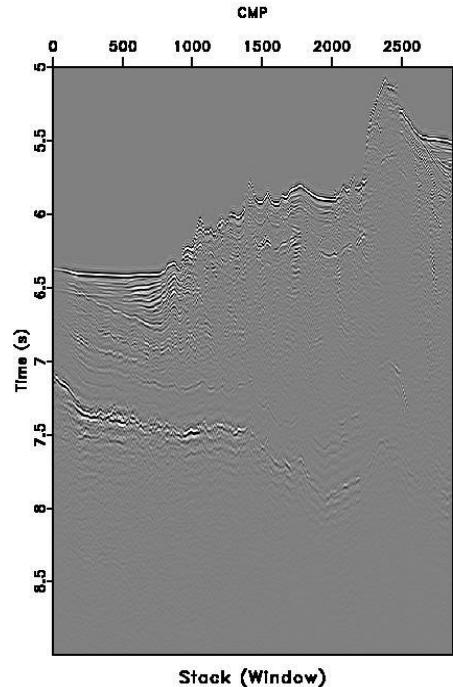
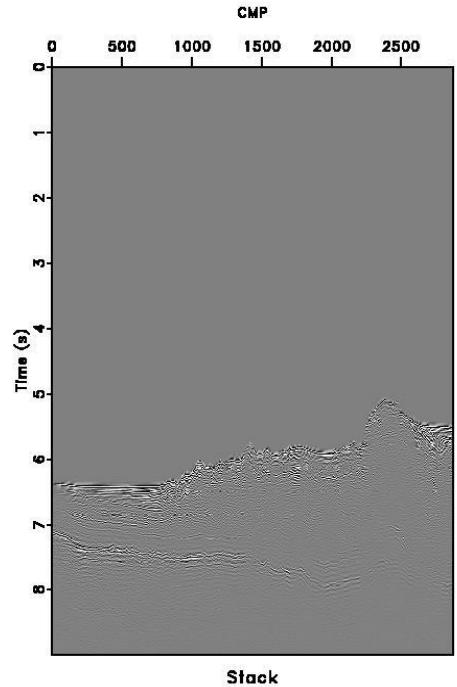


Seismic acquisition

- The data were collected by the University of Texas and the University of Tokyo.
- High-resolution multichannel seismic
- Sources: Tuned array of 6 air guns
- Receivers: Analog hydrophone streamer
- Field data sorted into 16.66-m bins.

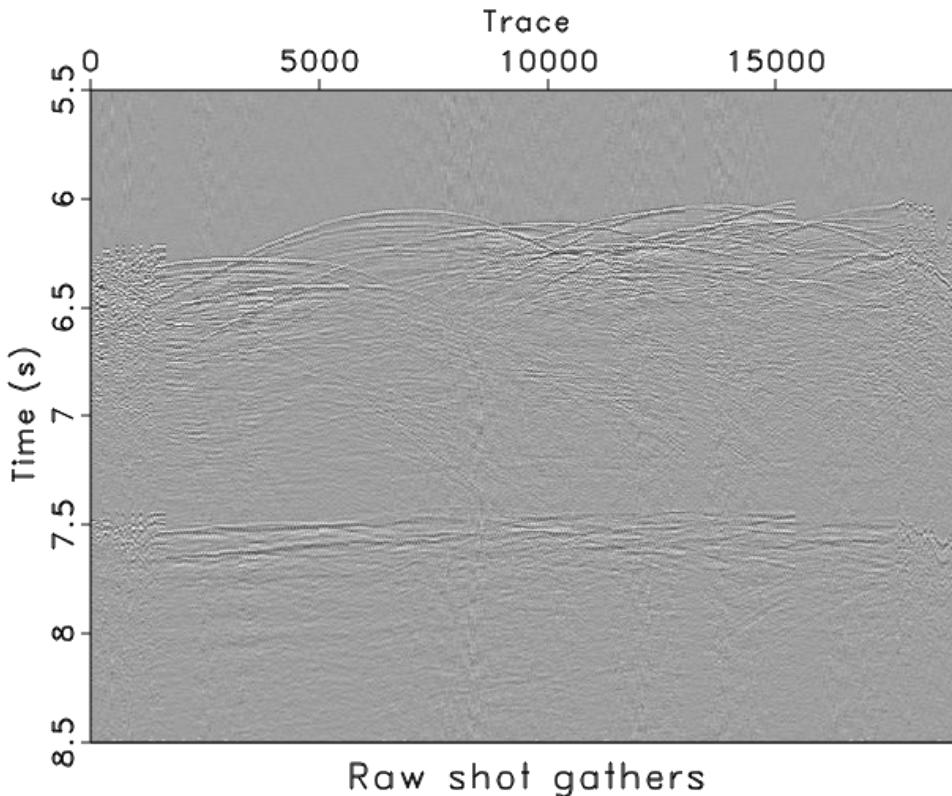


Published migrated stack



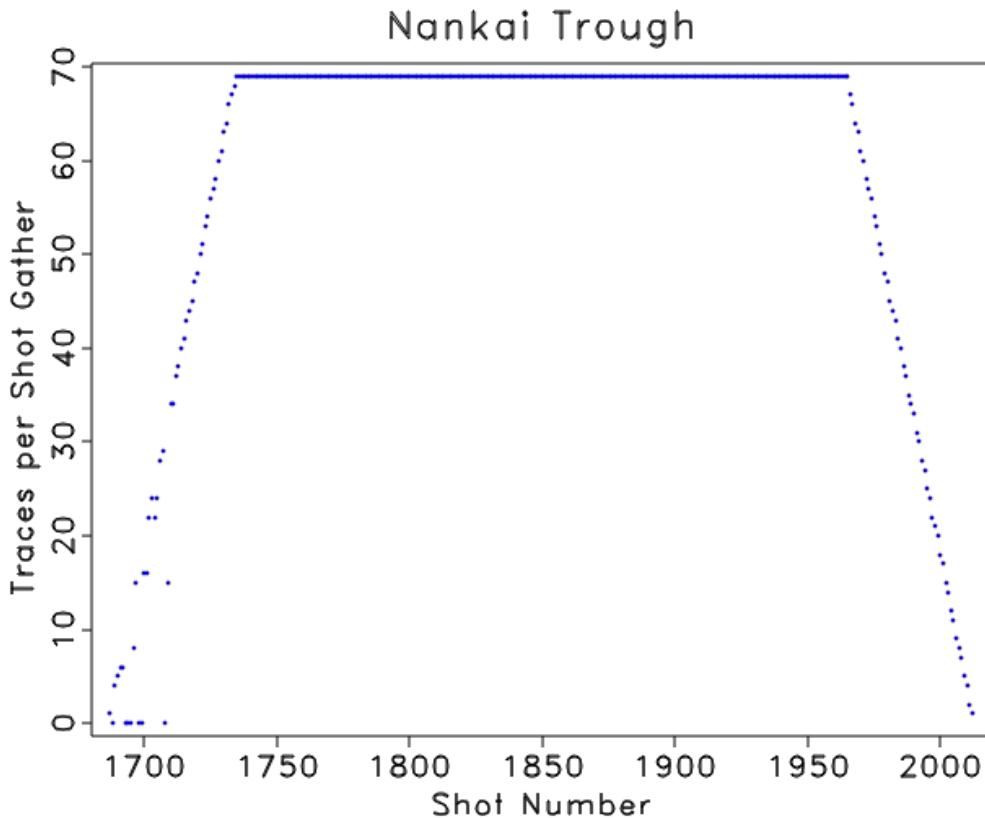
Part of stack corresponding to the shot file

Shot gathers first look



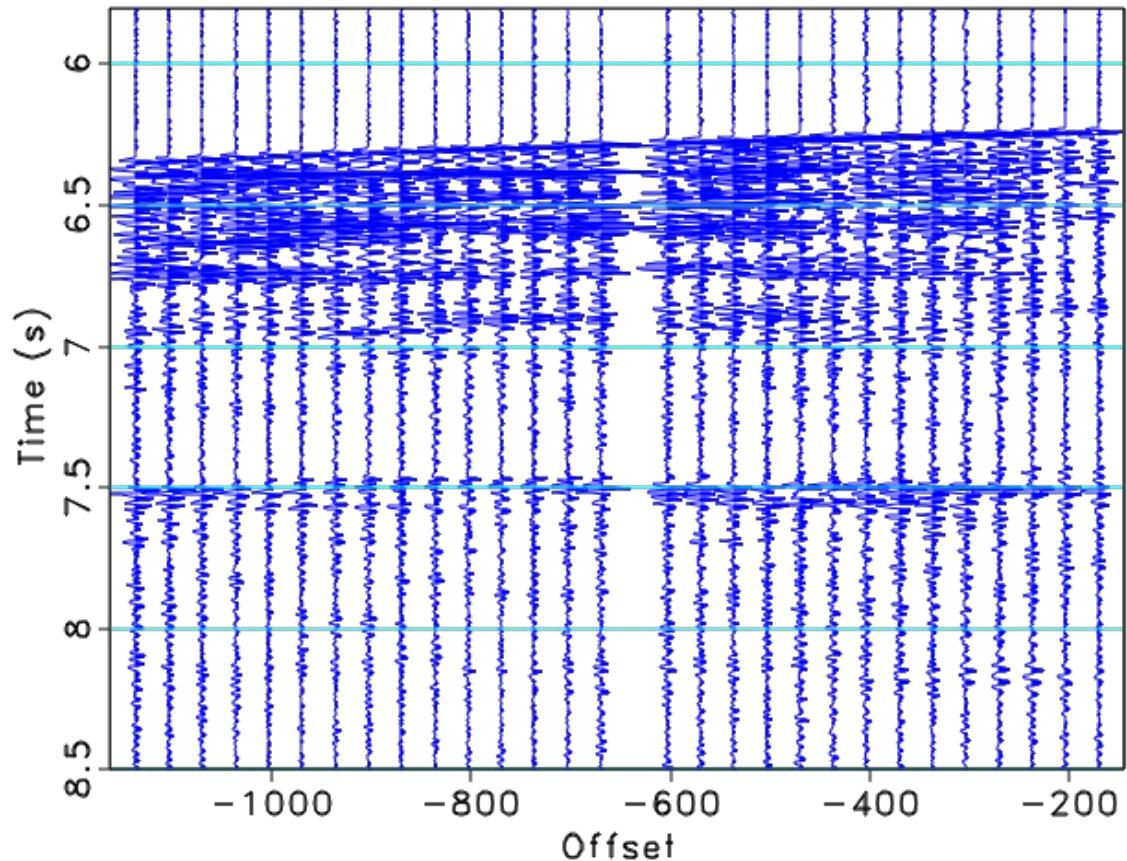
- 326 shot gathers with 19057 traces. Total time sample is 11 seconds with interval 0.002 seconds.
- The published stacked data has 2250 traces with total time length of 9 seconds and 0.004 seconds sample interval.
- The shot-gather data has 401 CMPs while the stacked data has 2869 CMPs.

Shot gathers first look

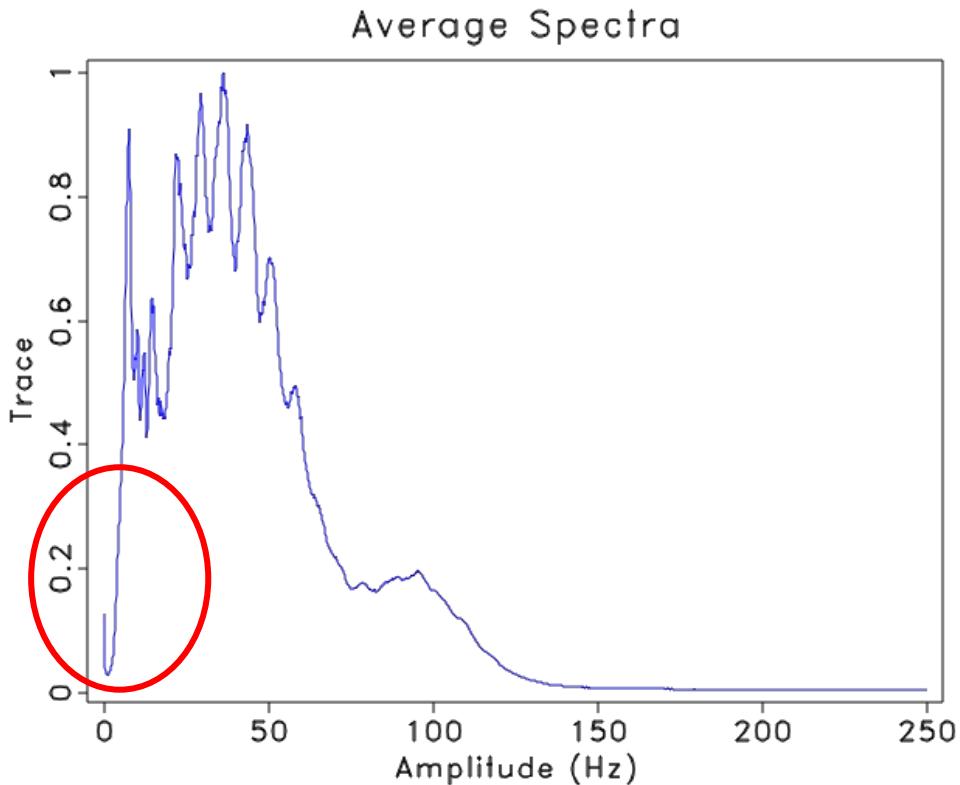


- The first shot gather has one trace. The number of traces per gather increases to a maximum of 69 at gather 1735.
- The number of traces per gather keeps constant through gather 1965 and decreases to 1 at the last gather 2012.
- There are missing traces at some shot gathers.

Shot 1707

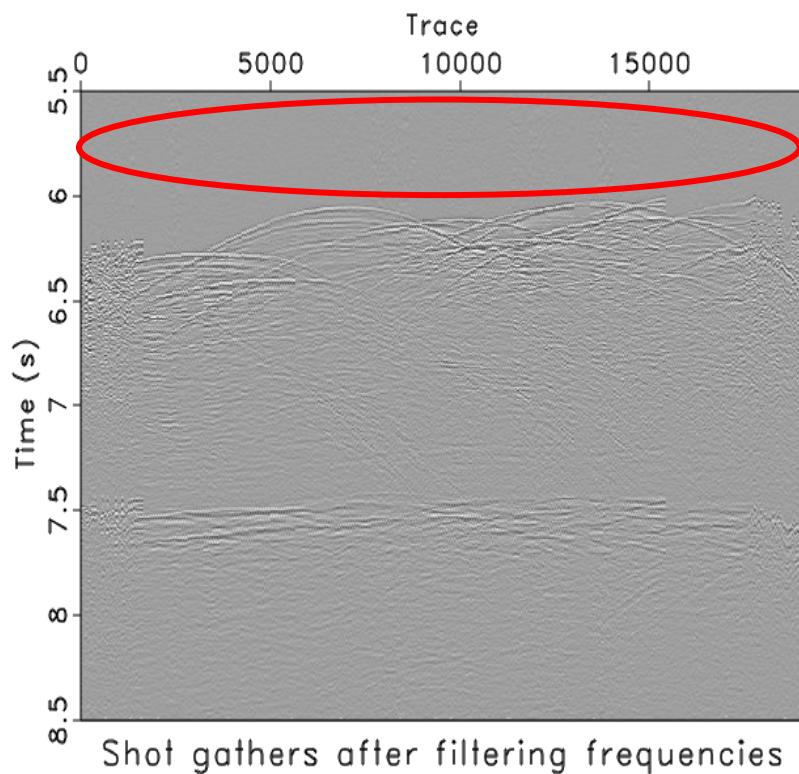
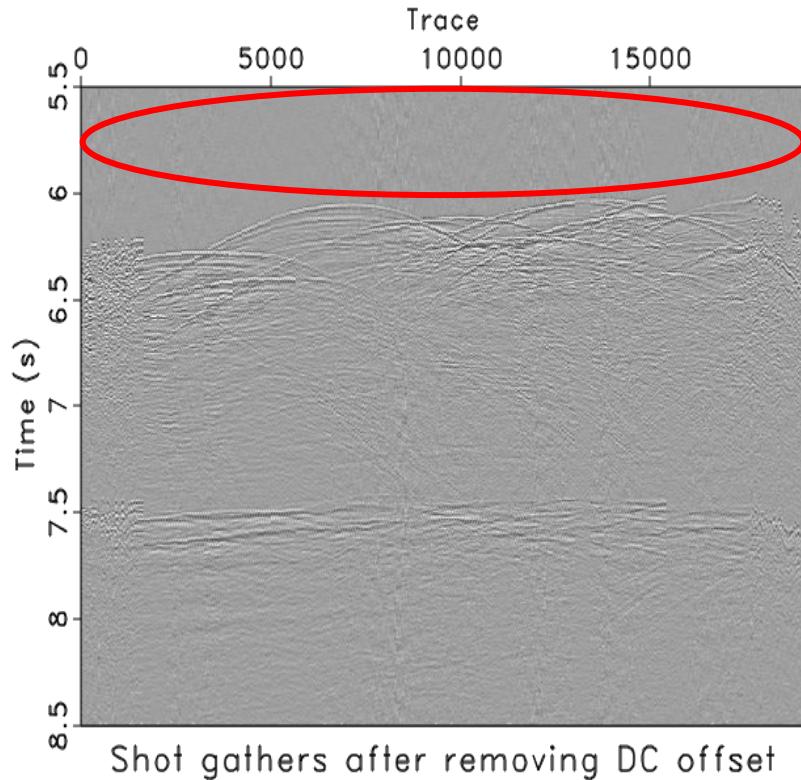


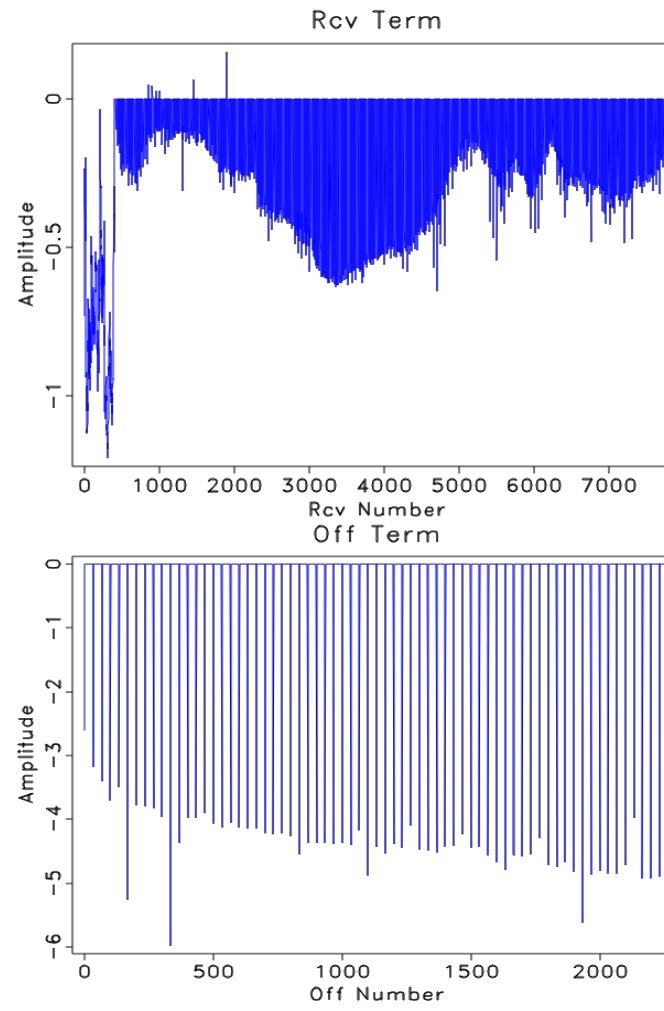
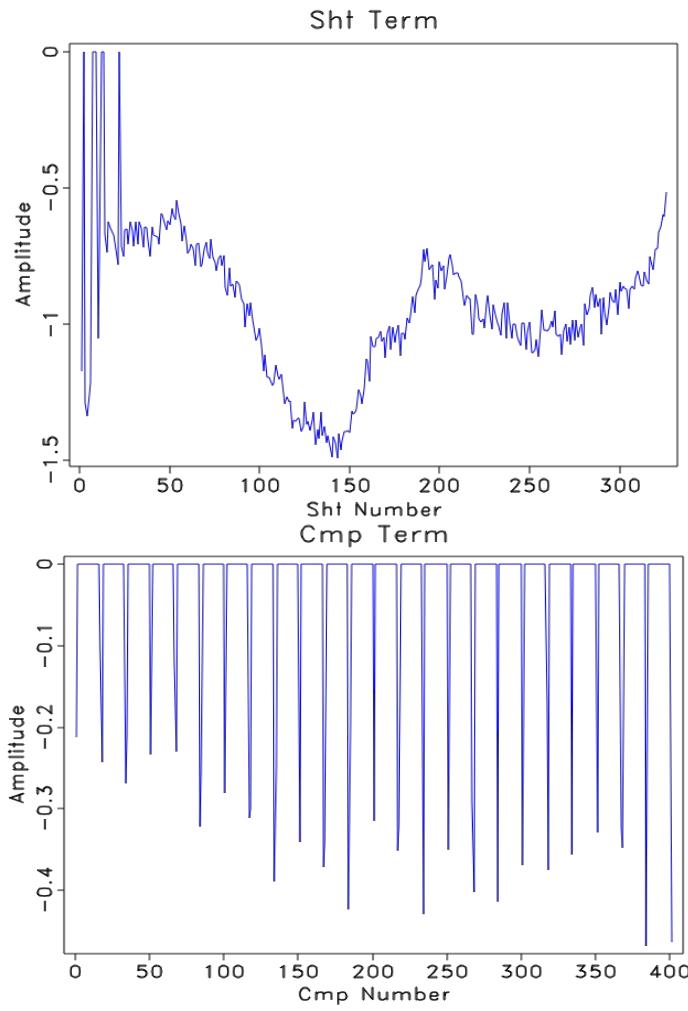
Shot gathers first look



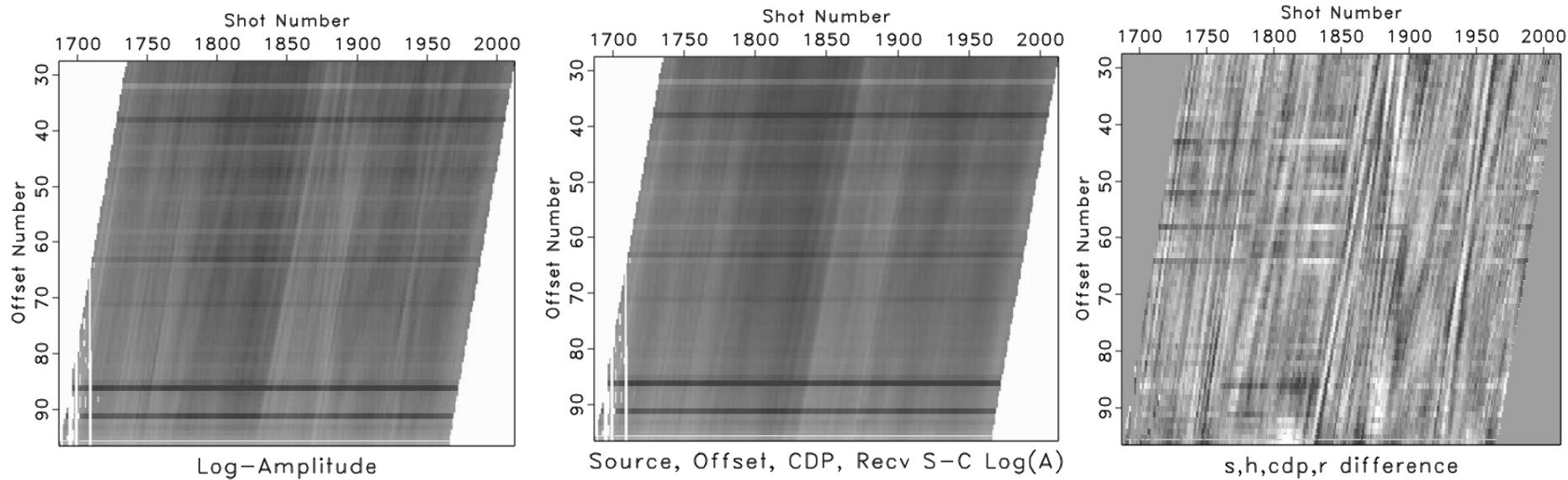
- Low frequencies smaller than 10 Hz need to be filtered.
- The data was resampled to 4 ms sample interval later so high frequencies above 125 Hz need to be filtered to prevent aliasing and remove noise.

Surface-consistent amplitude balancing



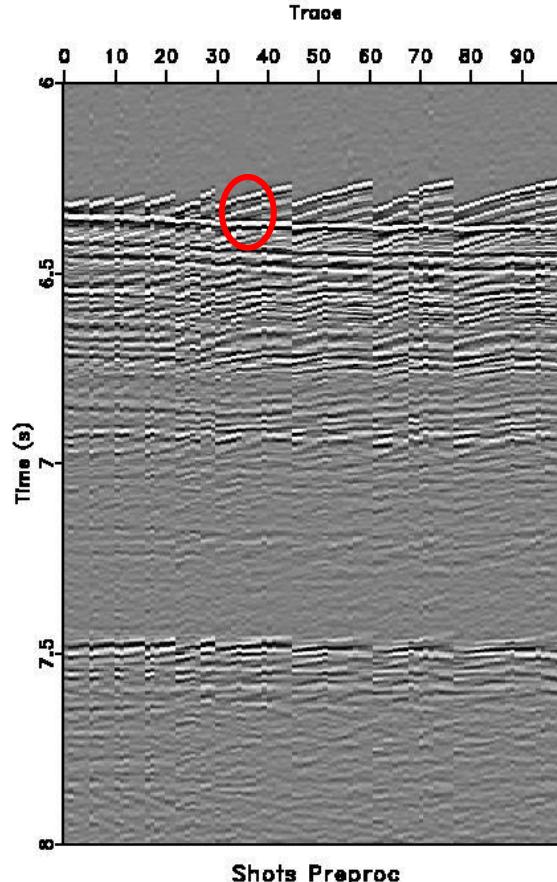
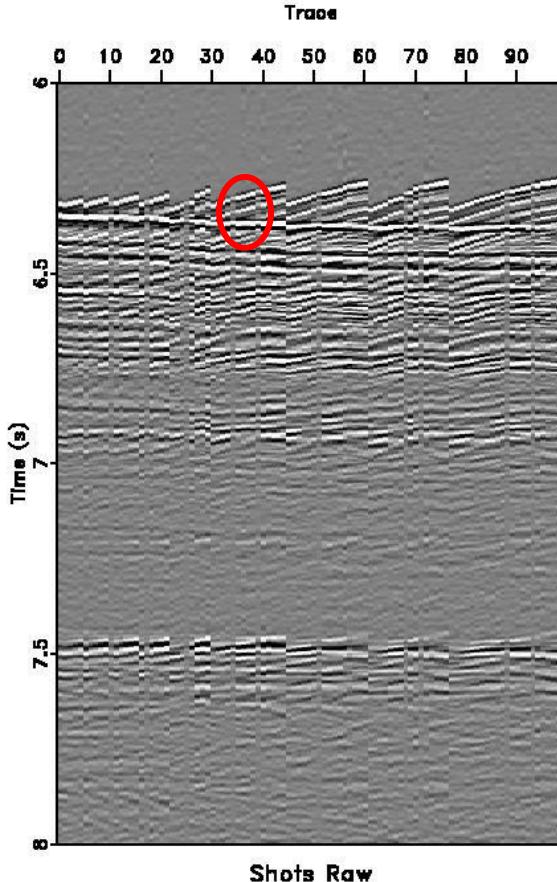


Surface-consistent amplitude balancing

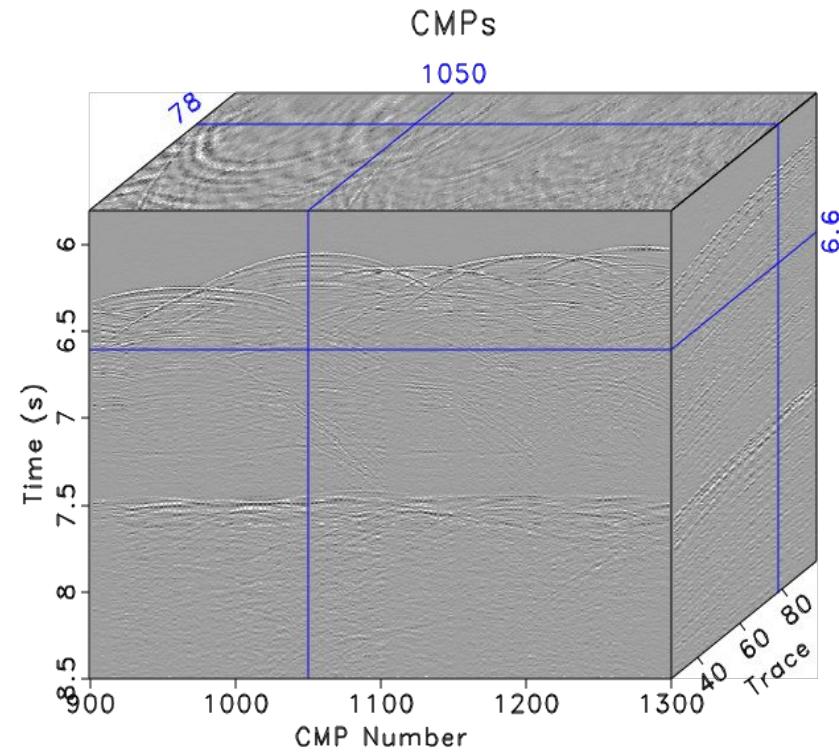
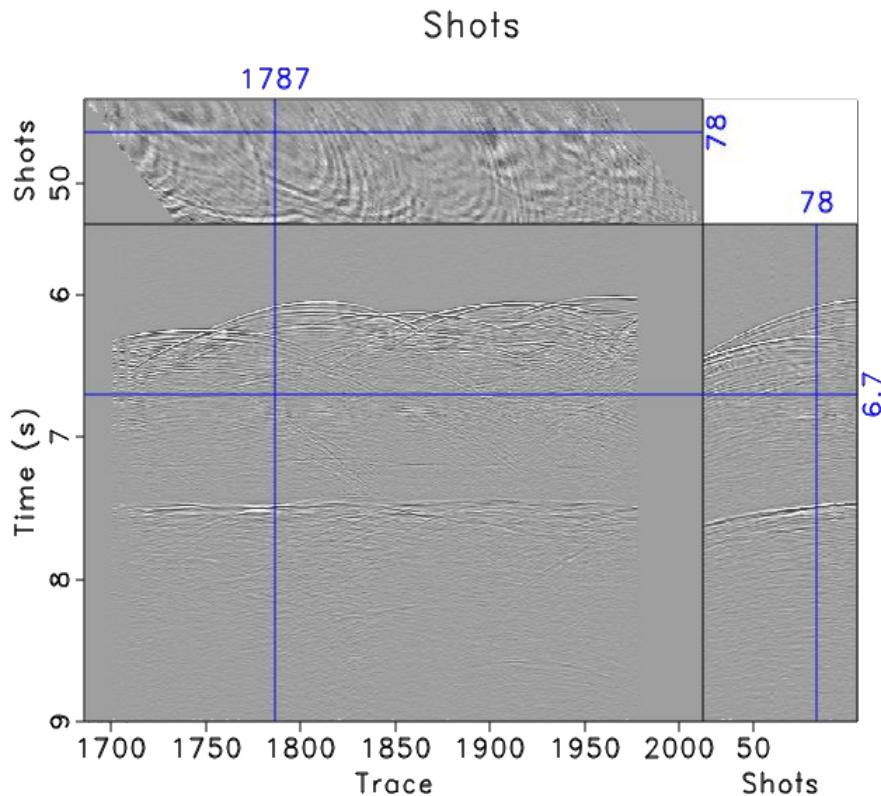


- Zero traces were removed. The surface-consistent model tries to explain the trace amplitude using a product of source, receiver, offset, and midpoint factors.
- The horizontal stripes come from the offset term. The vertical stripes come from the shot term. The diagonal stripes come from the CMP and receiver terms.

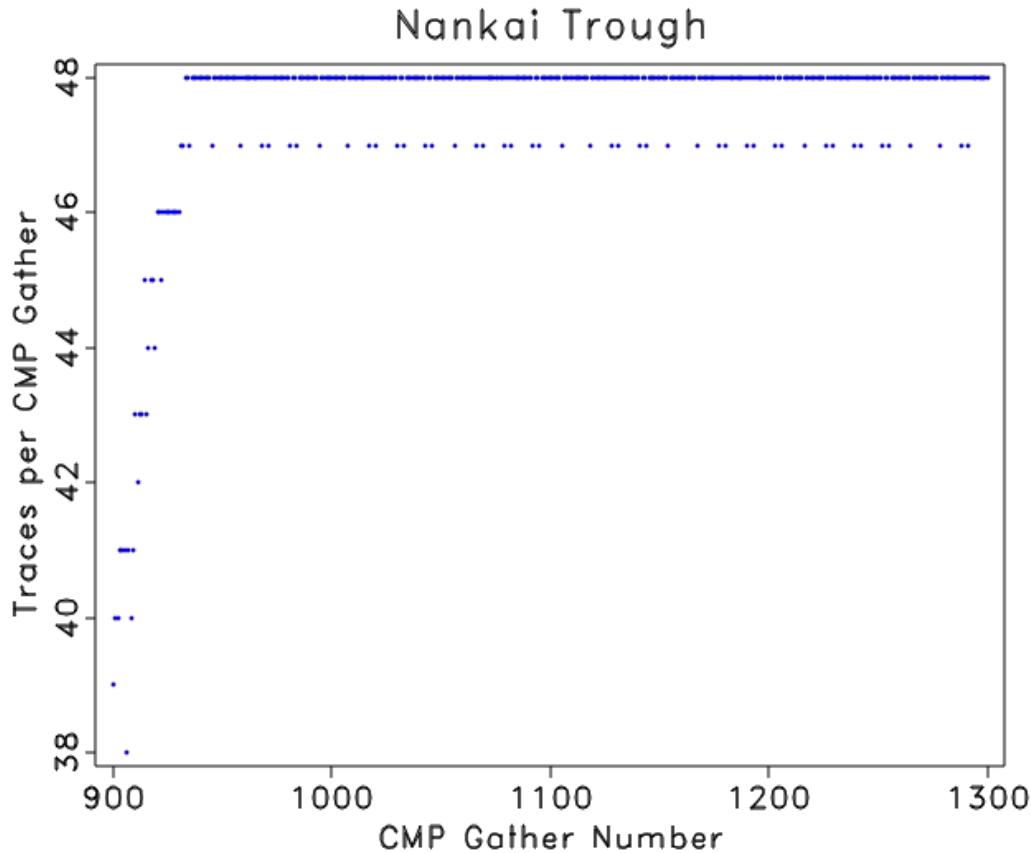
Surface-consistent amplitude balancing



CMP sorting

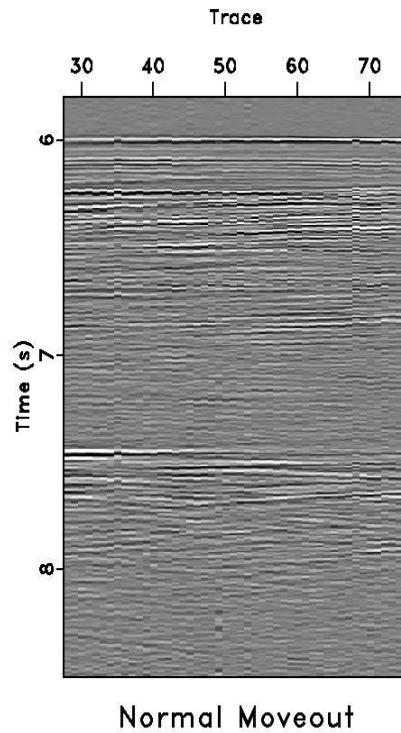
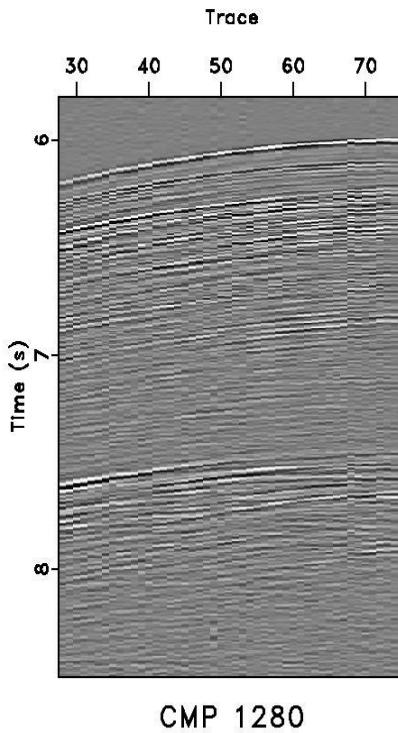
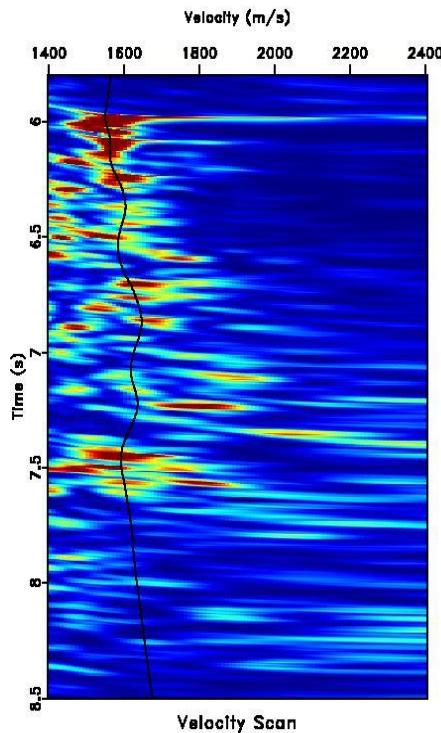
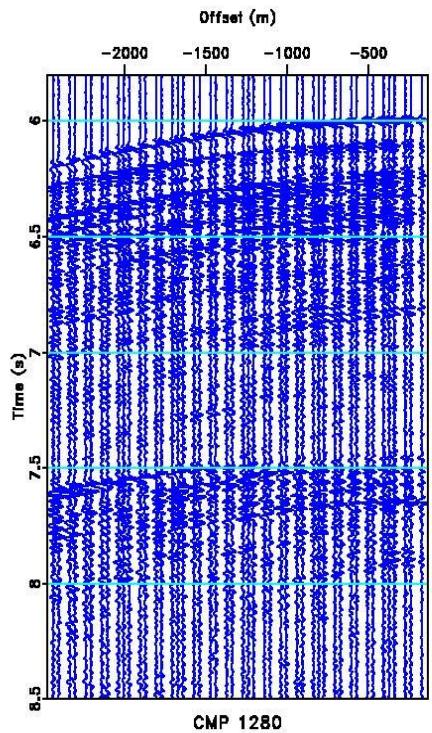


Fold distribution

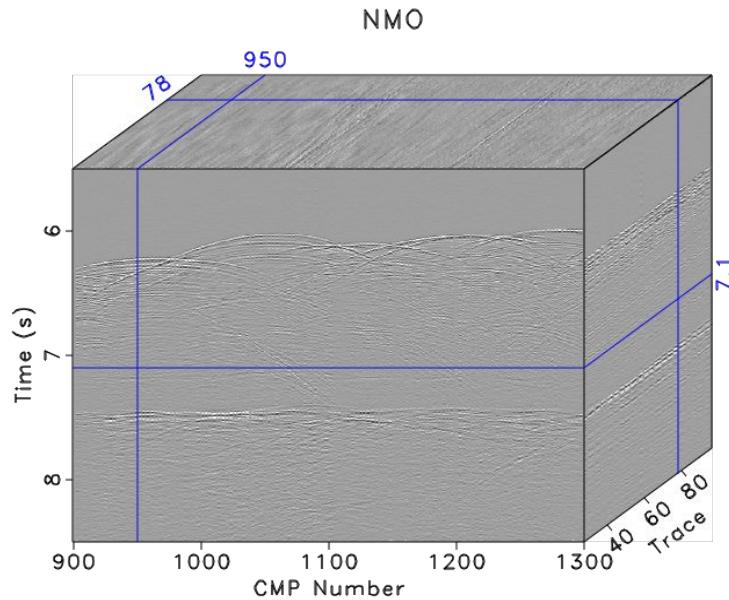
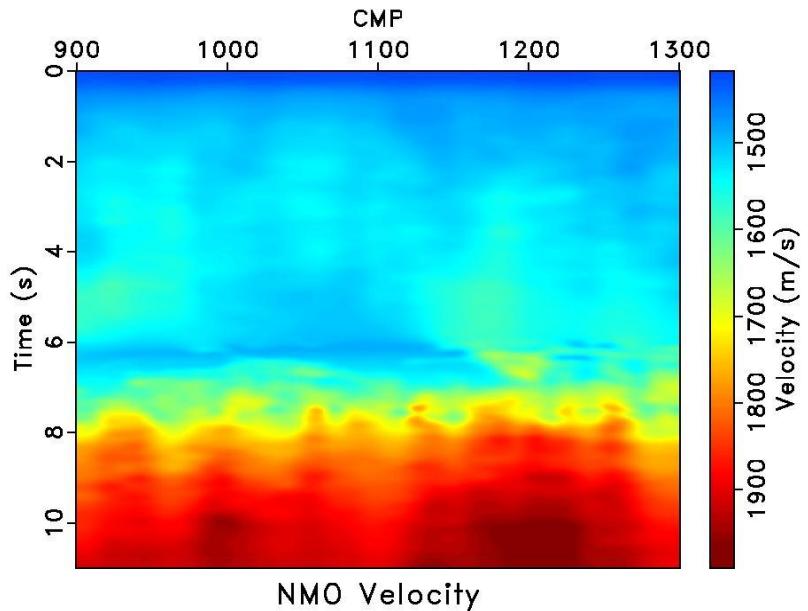


- First CMPs are not full fold.
- The first full-fold CMP gather is CMP 933 with 48 traces.

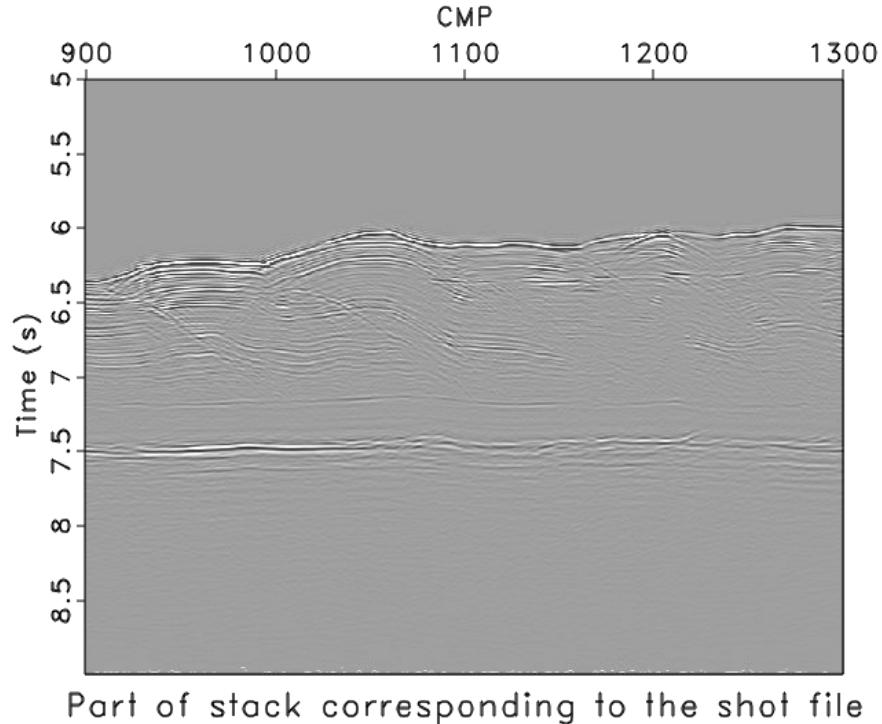
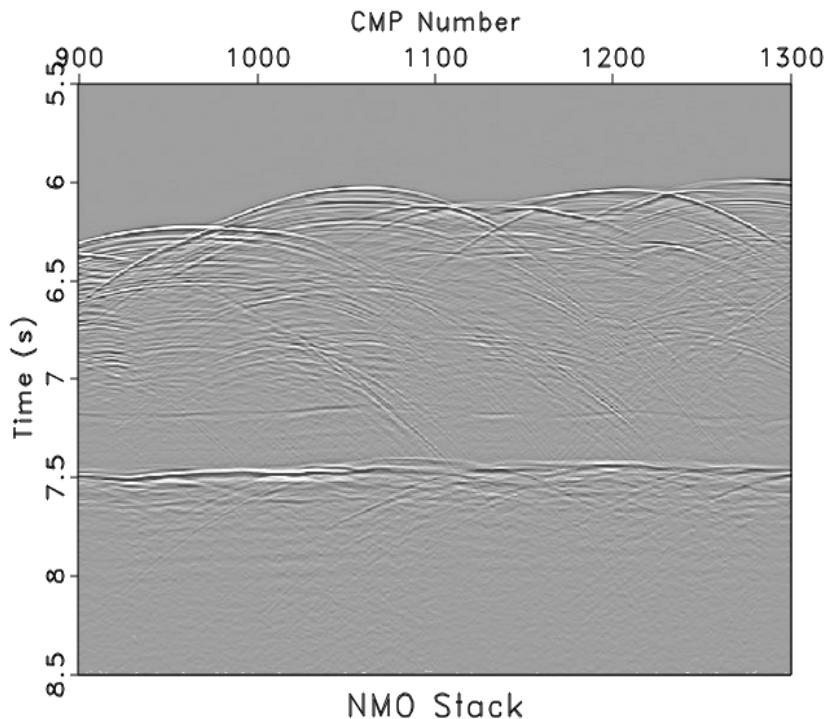
Velocity analysis and NMO



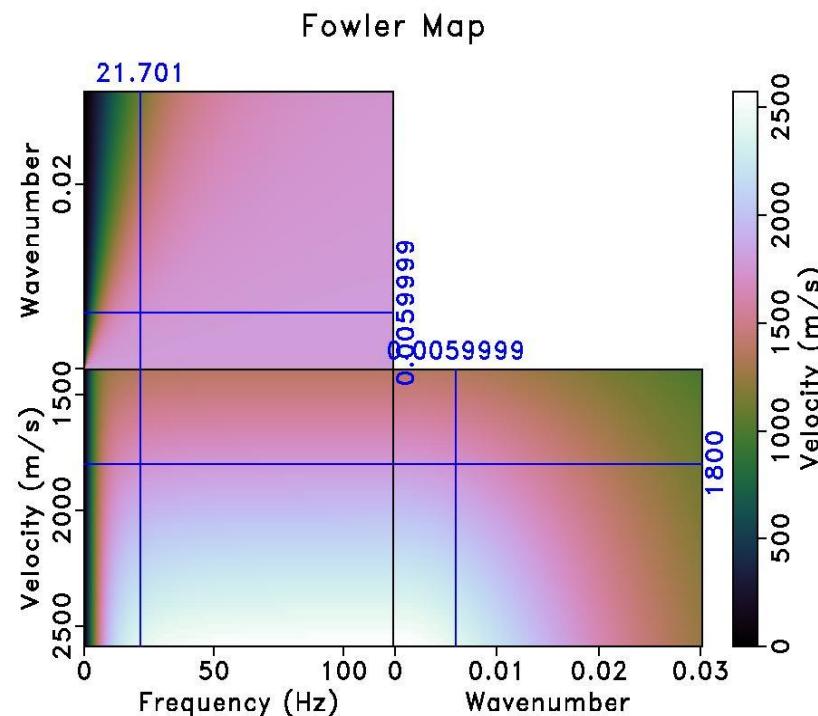
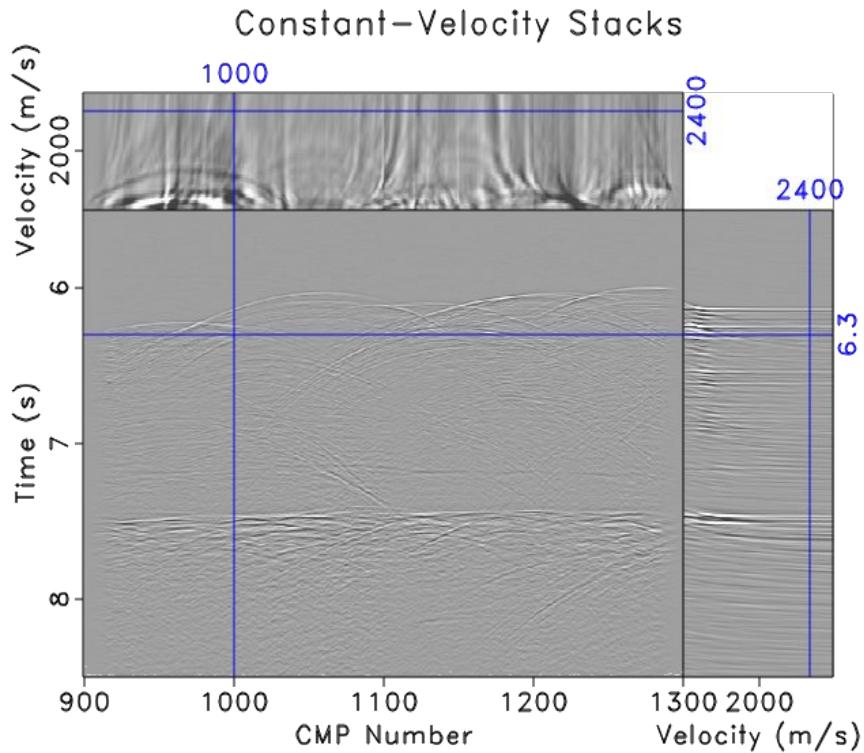
Velocity analysis and NMO



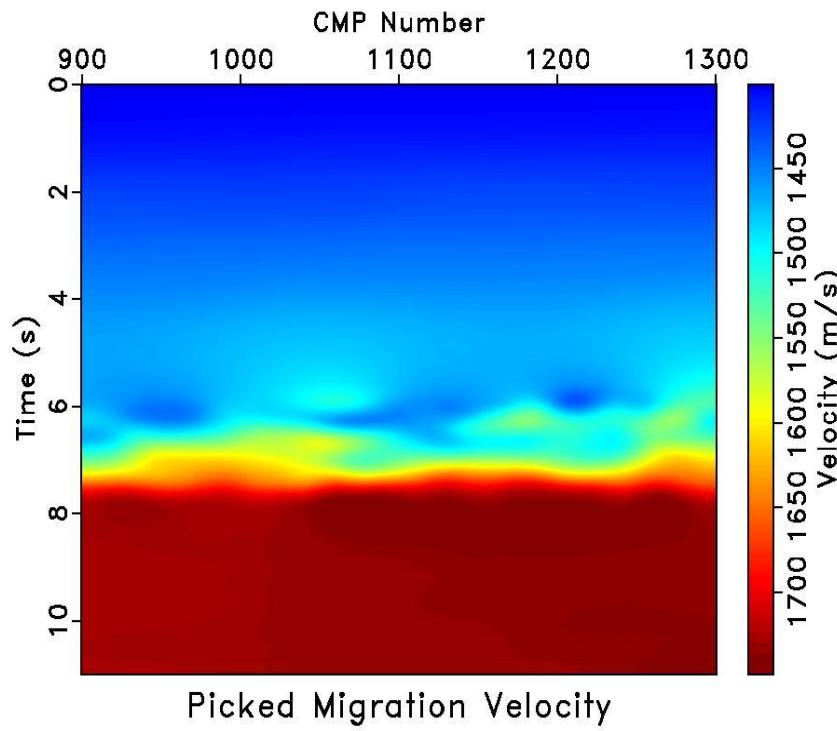
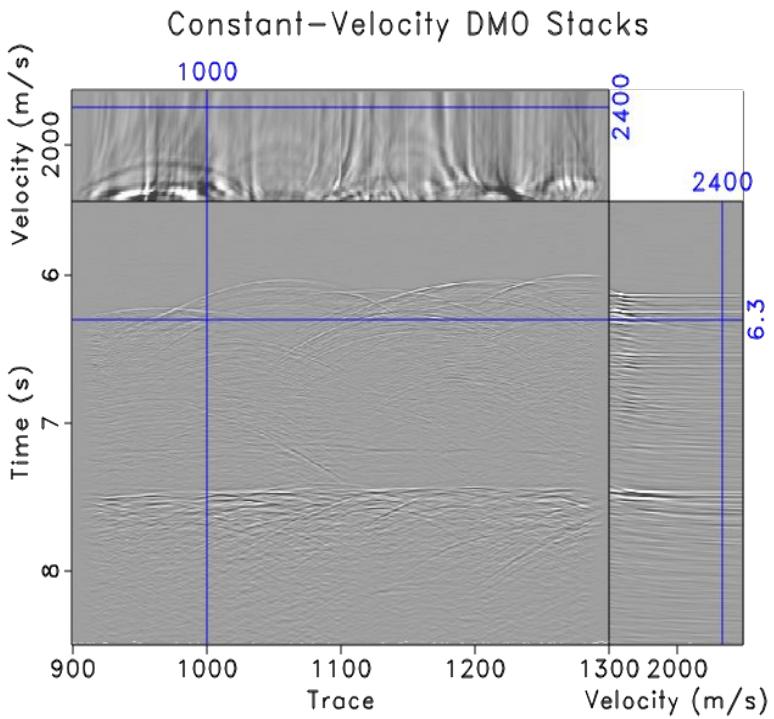
Stack



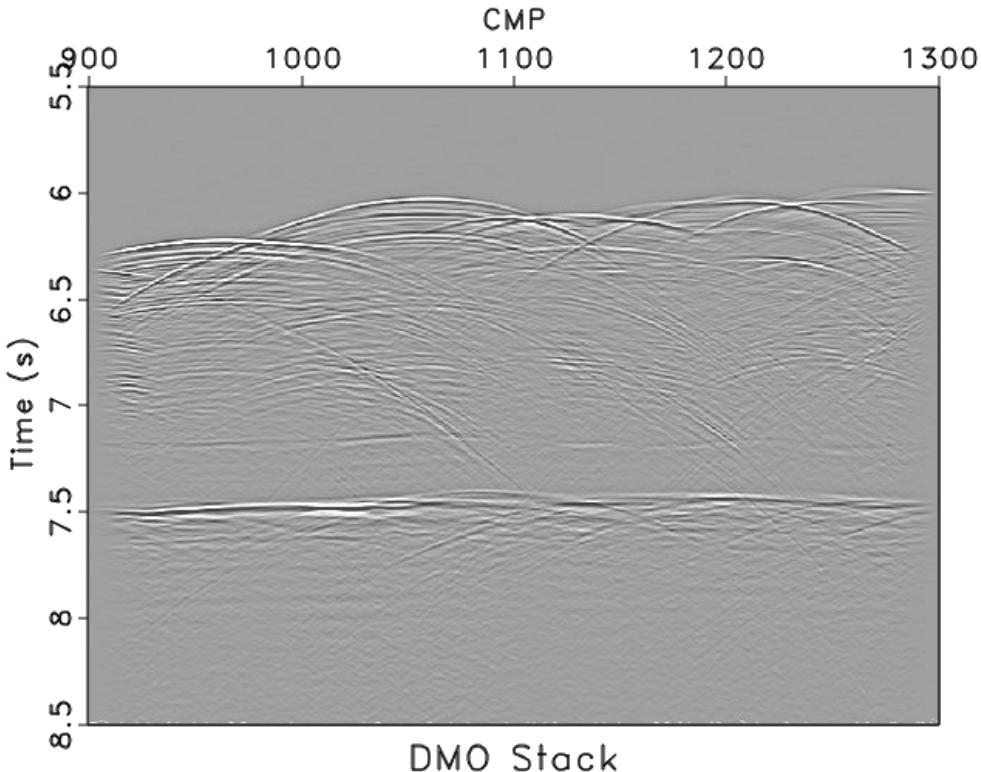
DMO



DMO

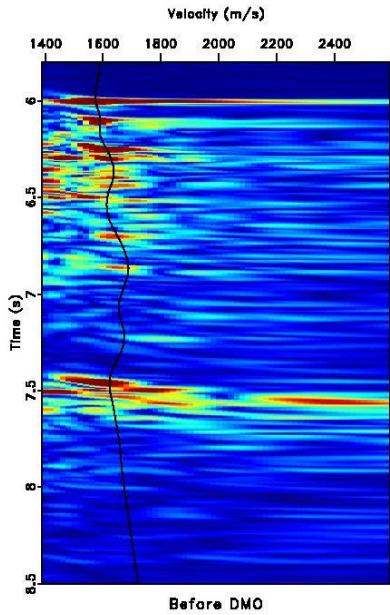


DMO

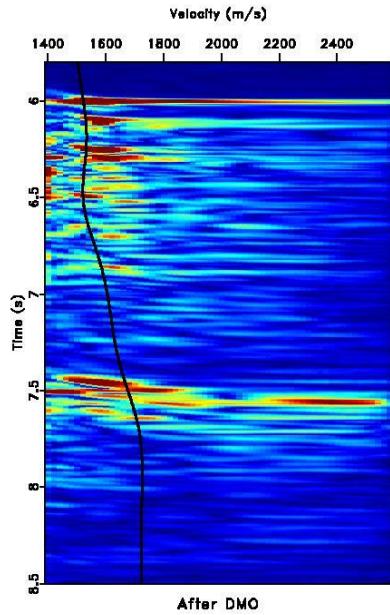


- DMO stack corrects for dips.
- Generated from an ensemble stack of different velocities.
- DMO velocities were picked automatically from the envelope.

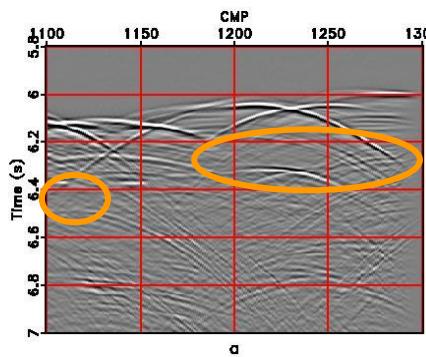
DMO



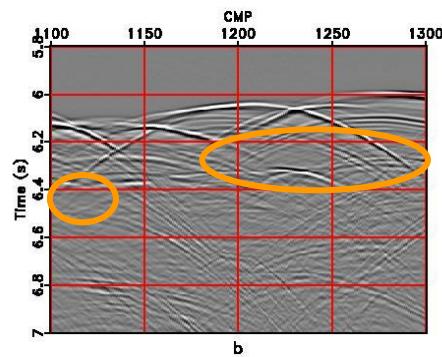
Before DMO



After DMO



a

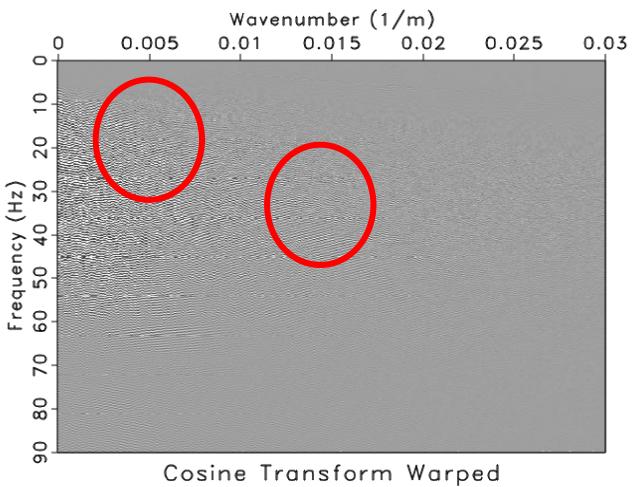
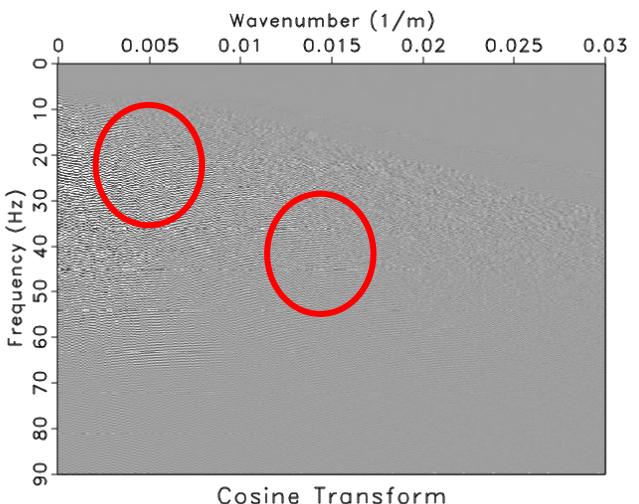
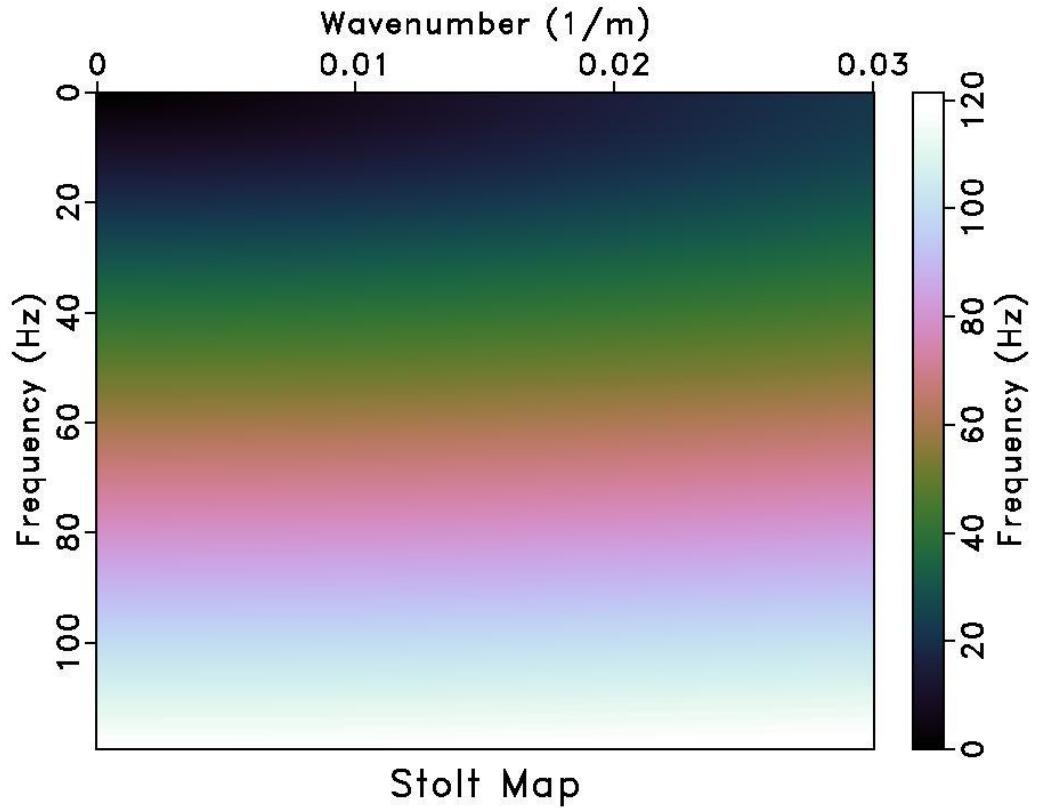


NMO

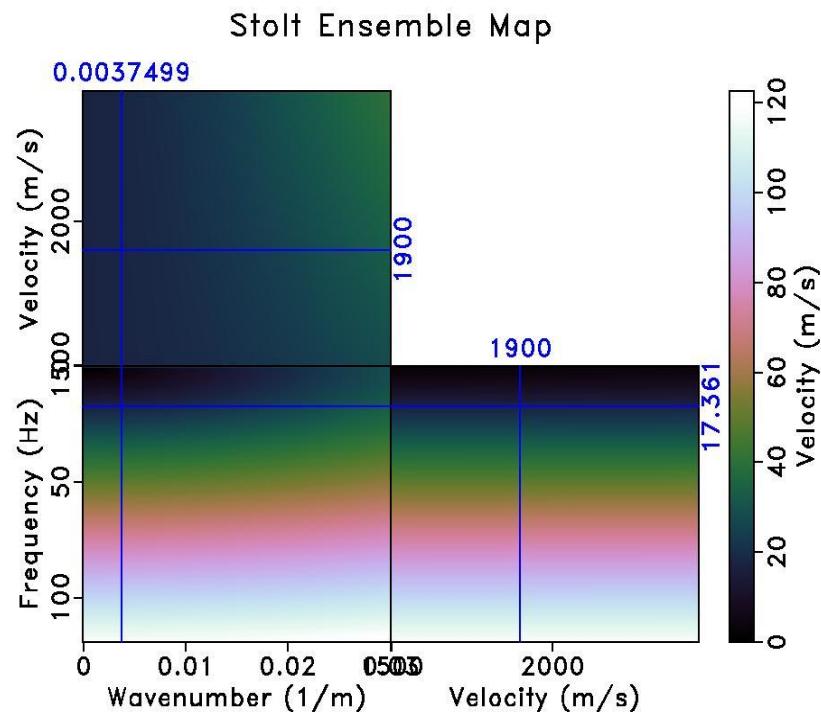
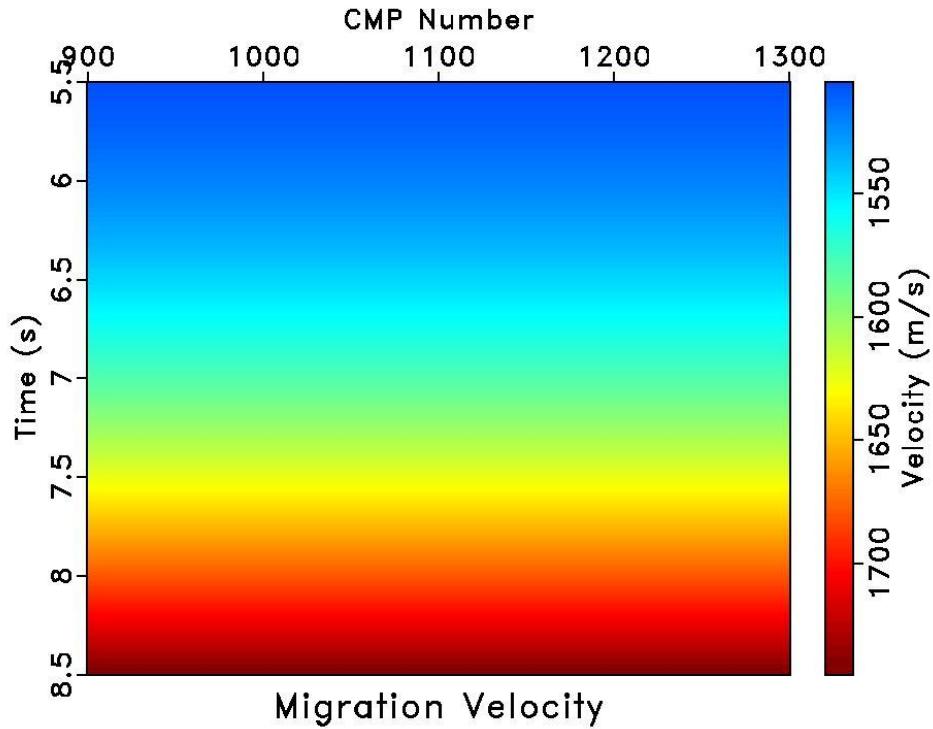
DMO

- Velocities are corrected for dips.
- Picked velocities are smoother and increase with depth.
- Events are clearer in DMO stack.

Stolt migration constant velocity

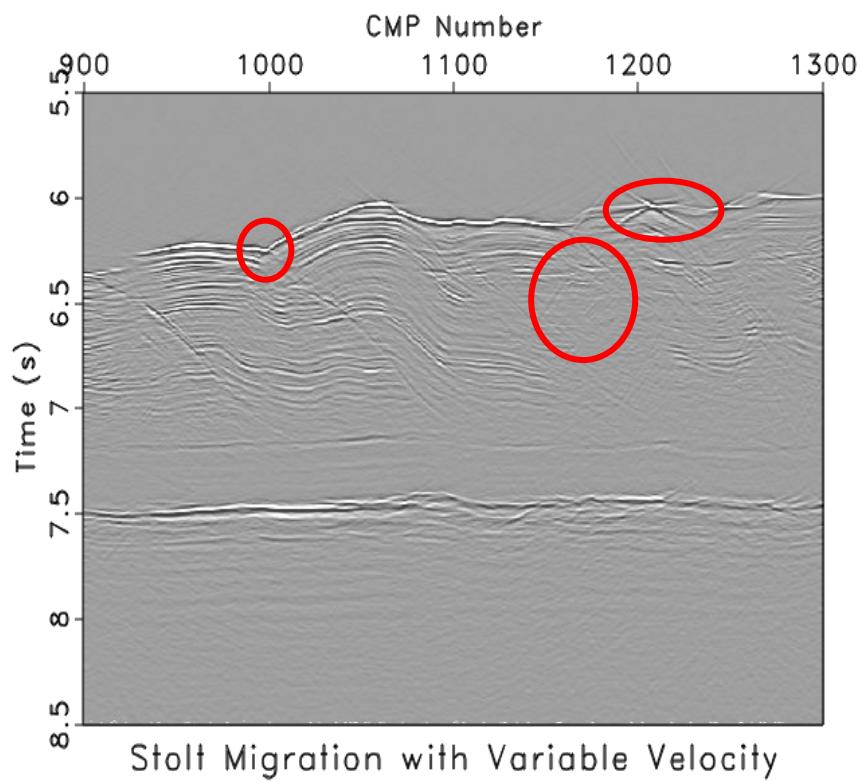
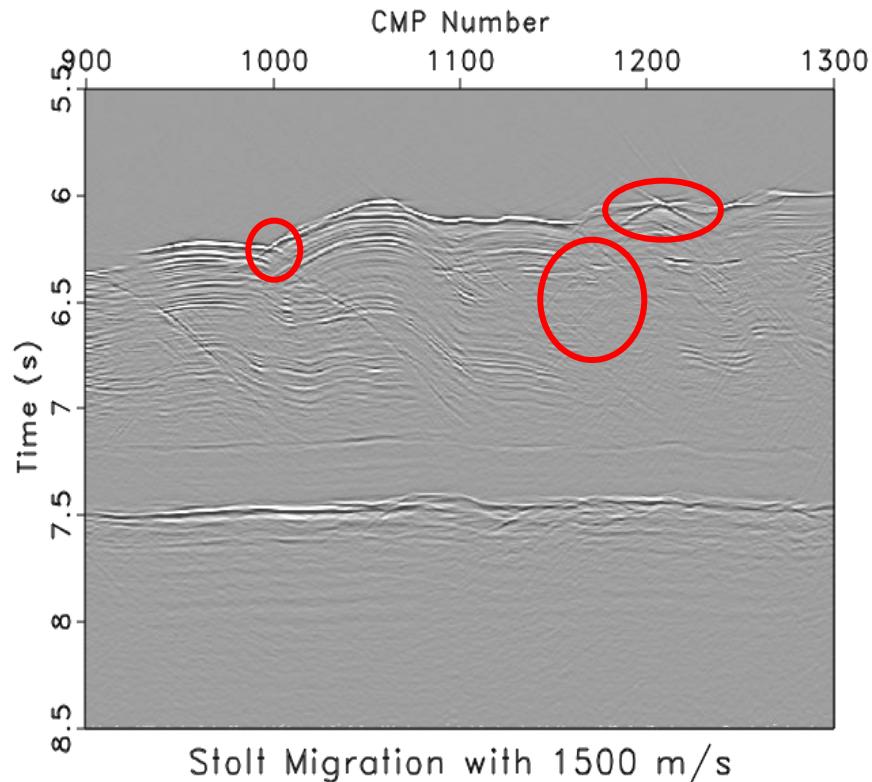


Stolt migration variable velocity

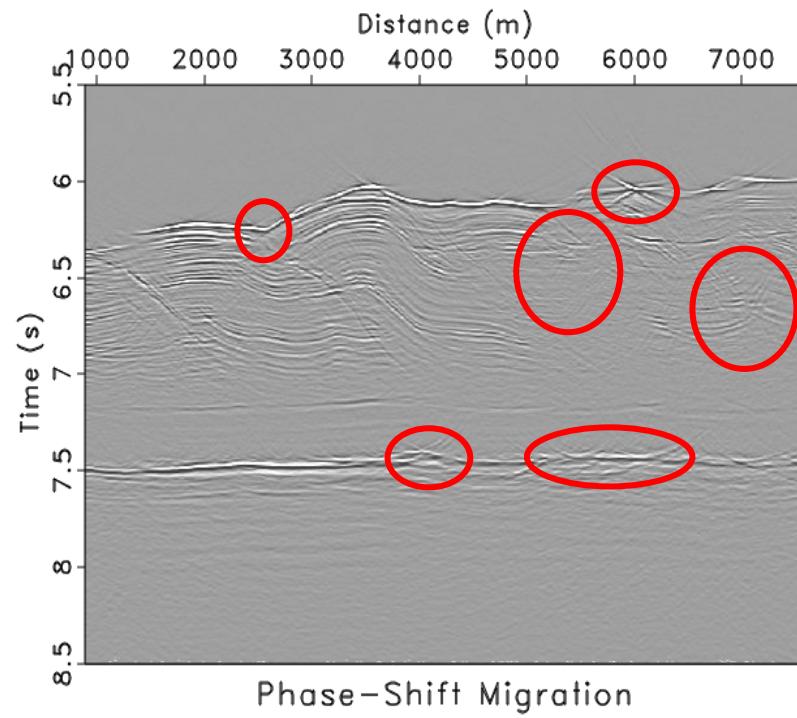
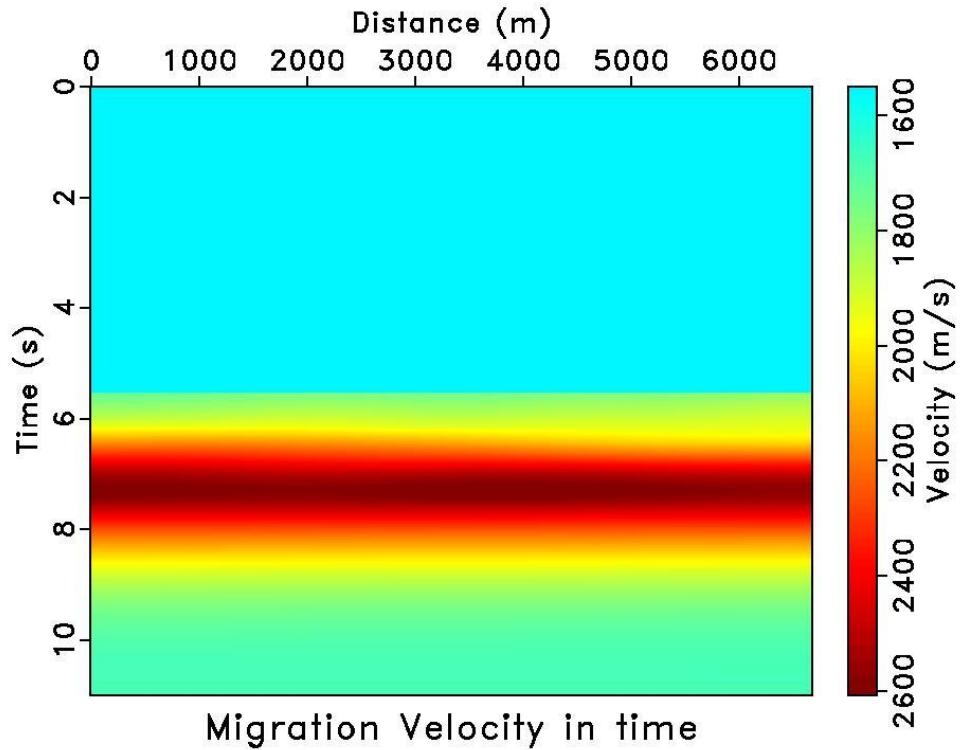


- More realistic velocity distribution.

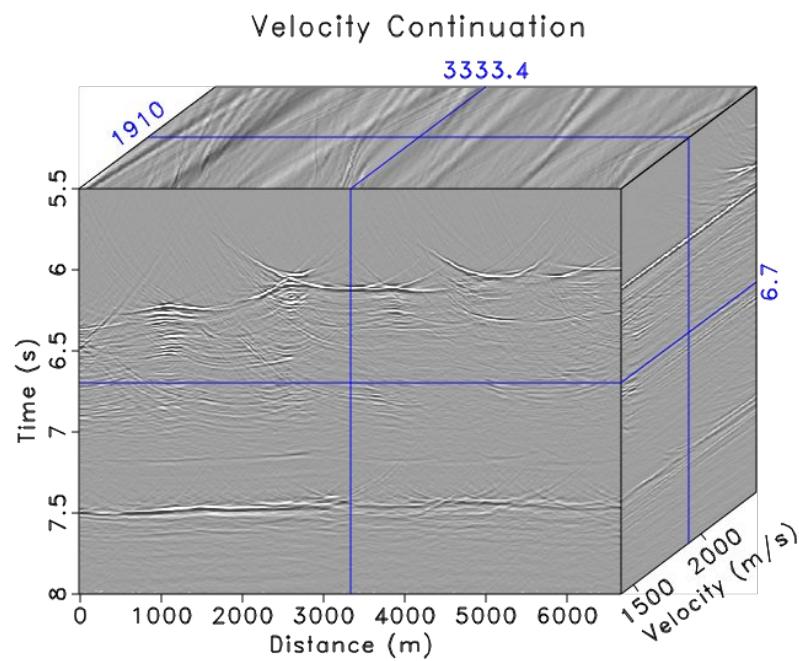
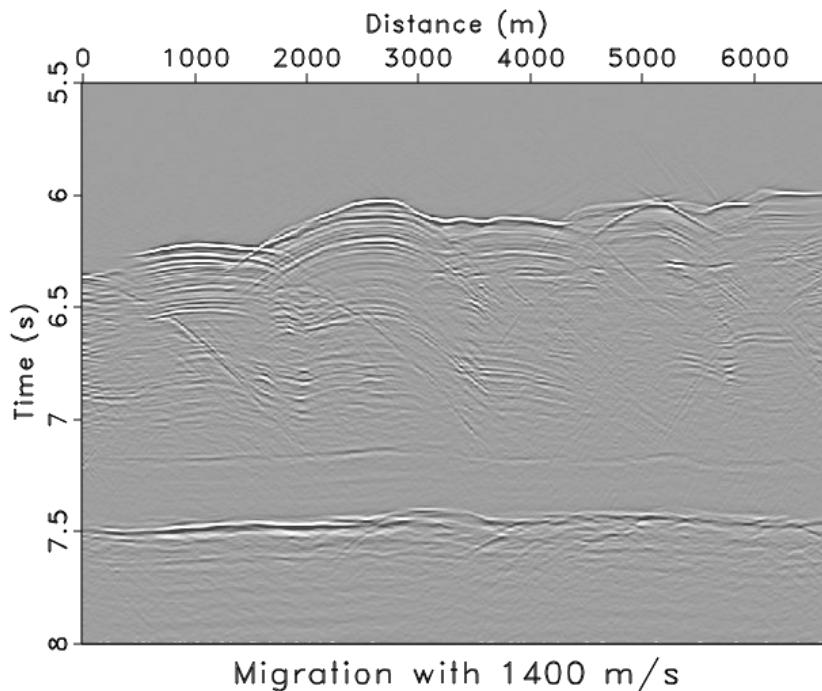
Stolt migration



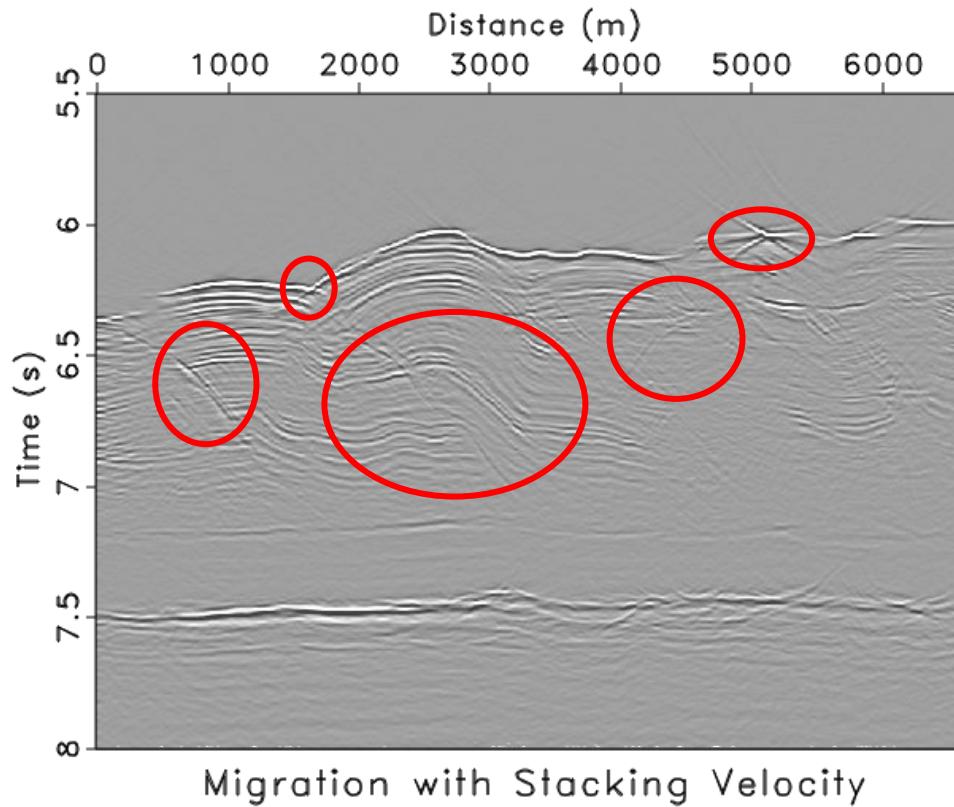
Gazdag migration



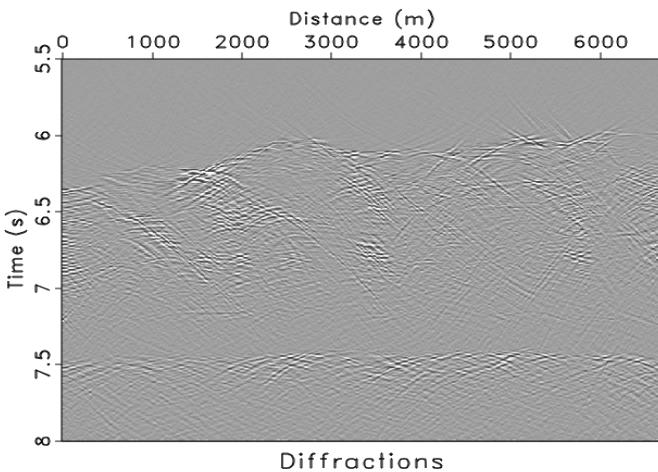
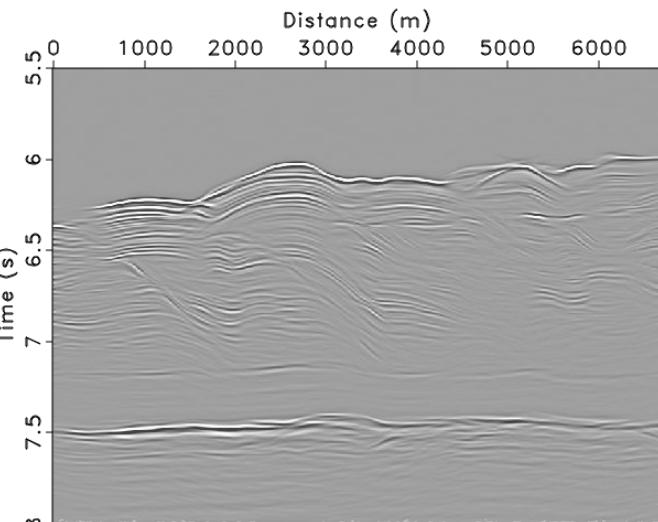
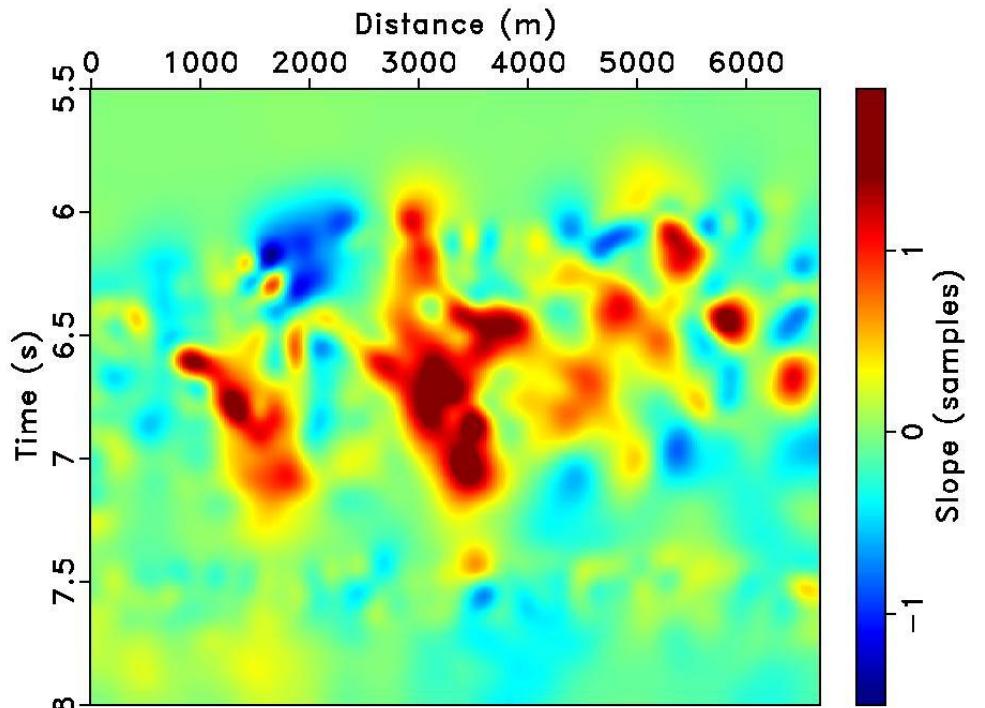
Velocity continuation



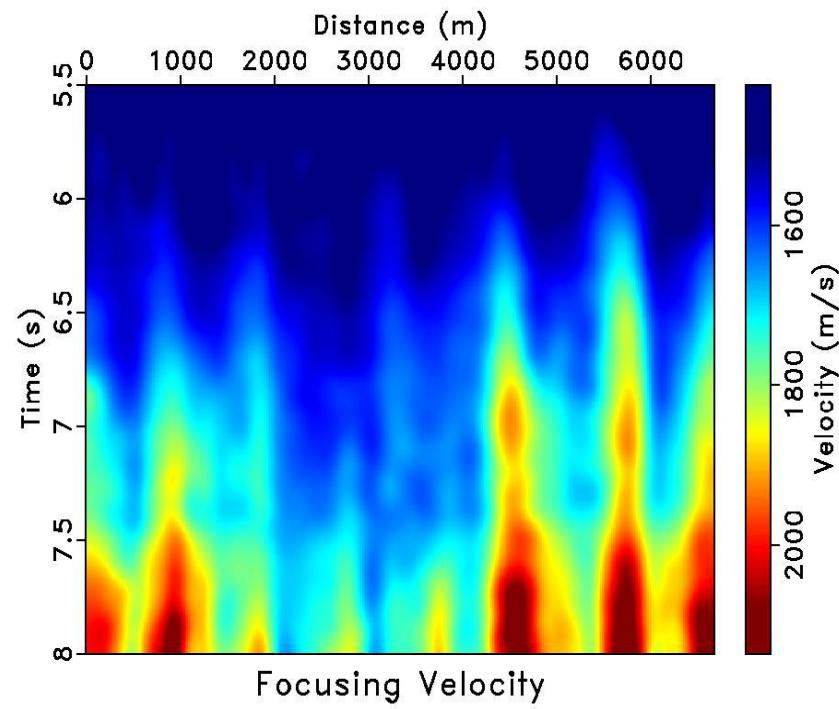
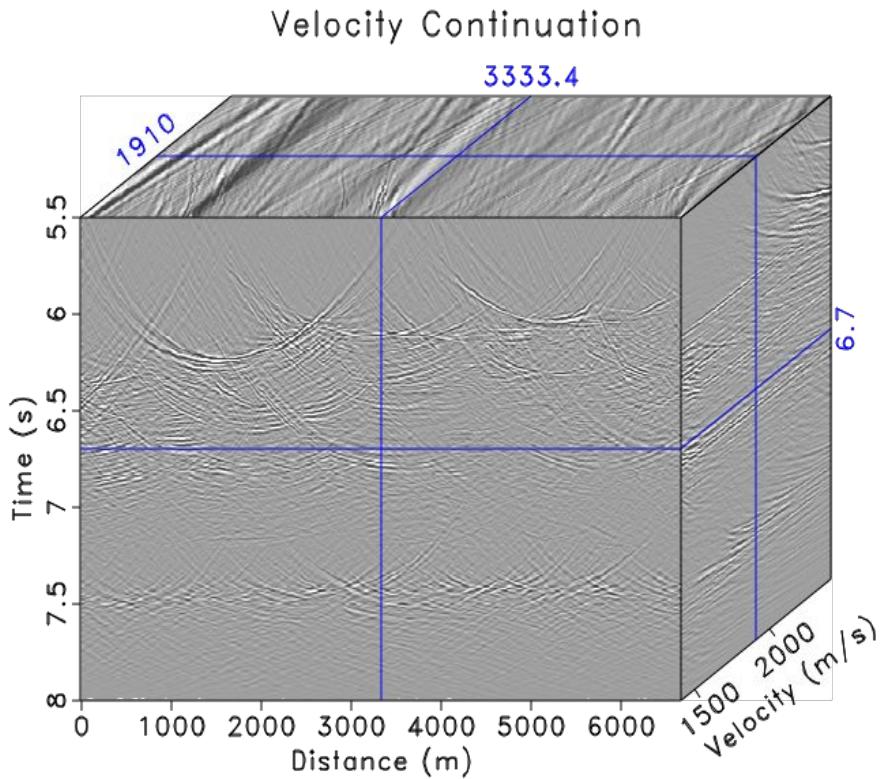
Velocity continuation



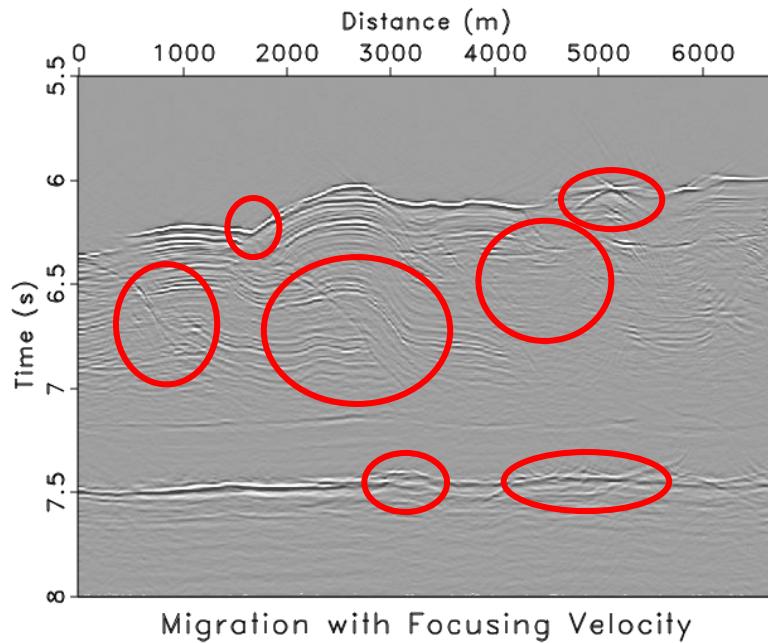
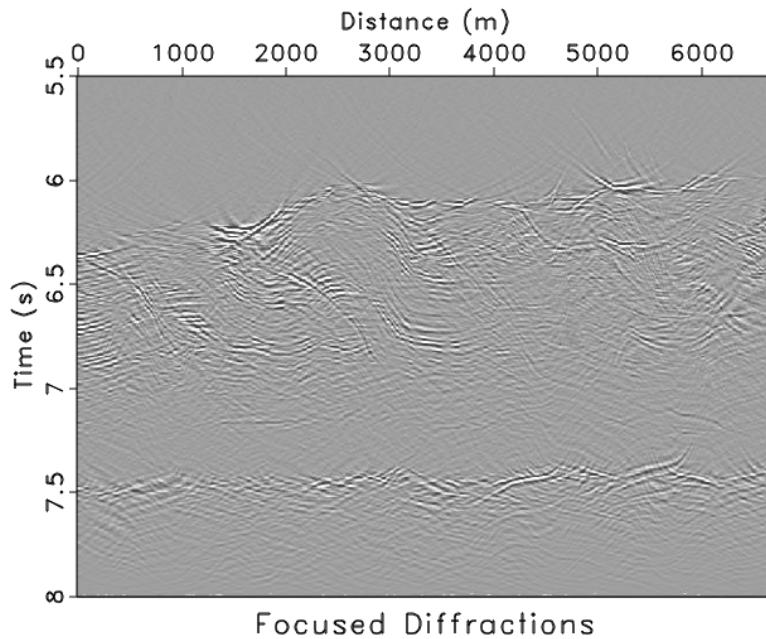
Velocity continuation



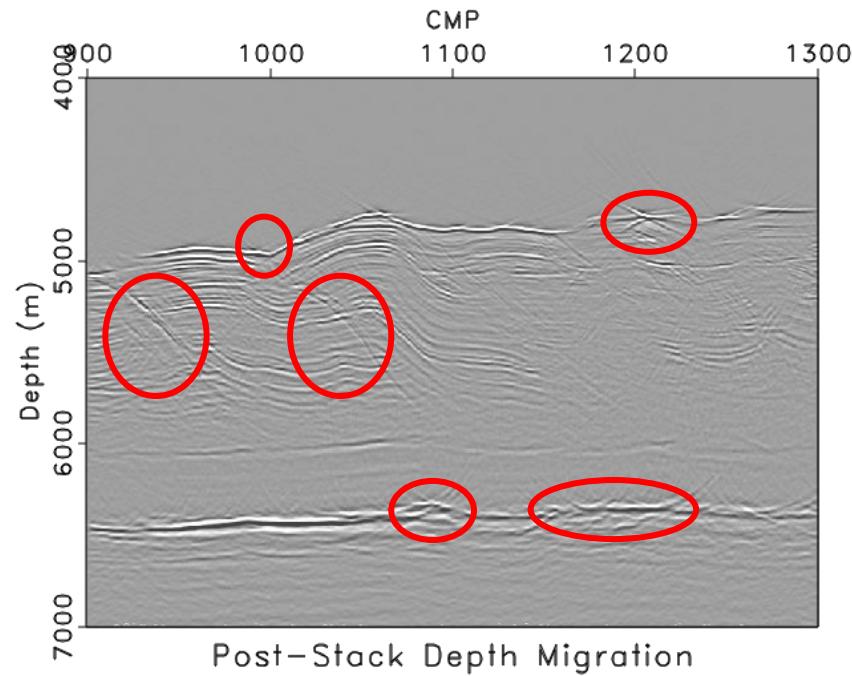
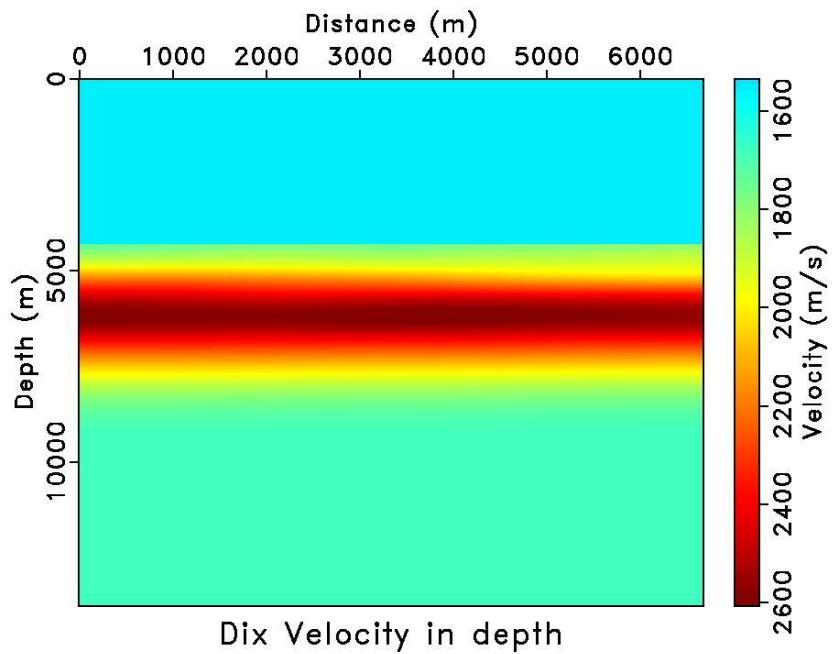
Velocity continuation



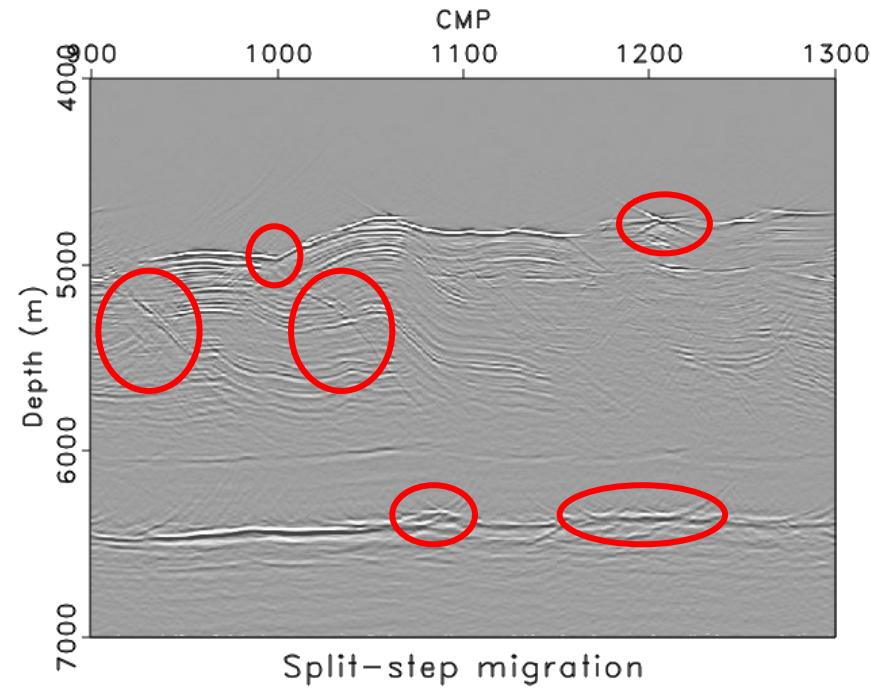
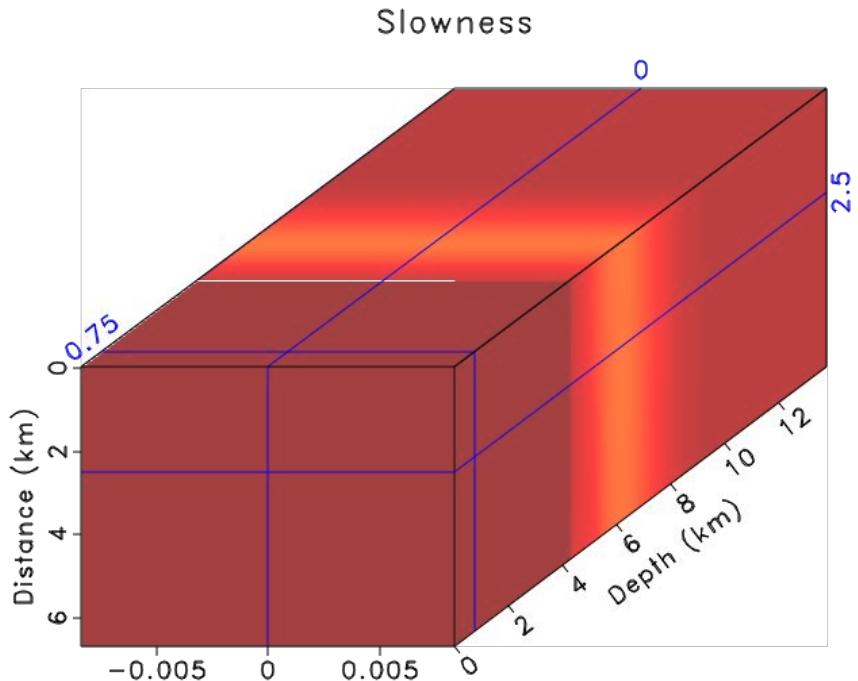
Velocity continuation



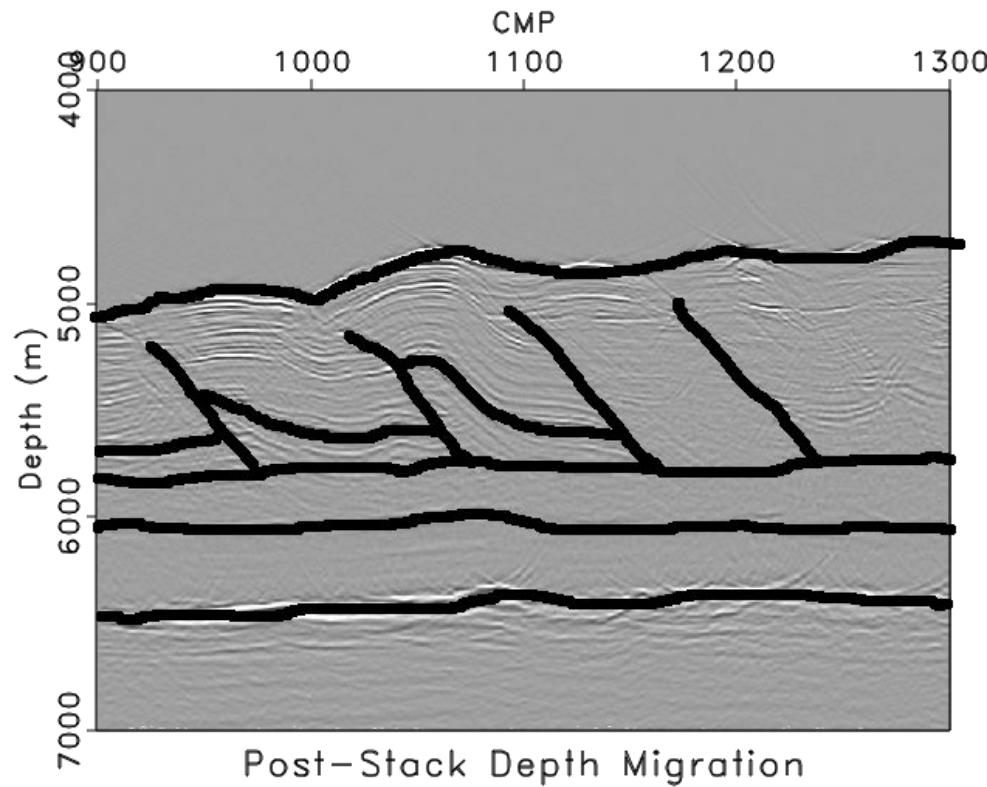
Reverse-time migration



Split-step migration



Interpretations



Conclusions

- Nankai data has many diffractions.
- The reflectors are generally flat geology.
- We processed from raw data to surface-consistent amplitude balancing, CMP sorting, velocity analysis, NMO, DMO, stack, and migration. The result can be used for interpretations.
- We improved the quality of the published migrated image by doing more detailed velocity analysis in migration to collapse the diffractions.