David C. Henley
Joe Wong
Peter M. Manning
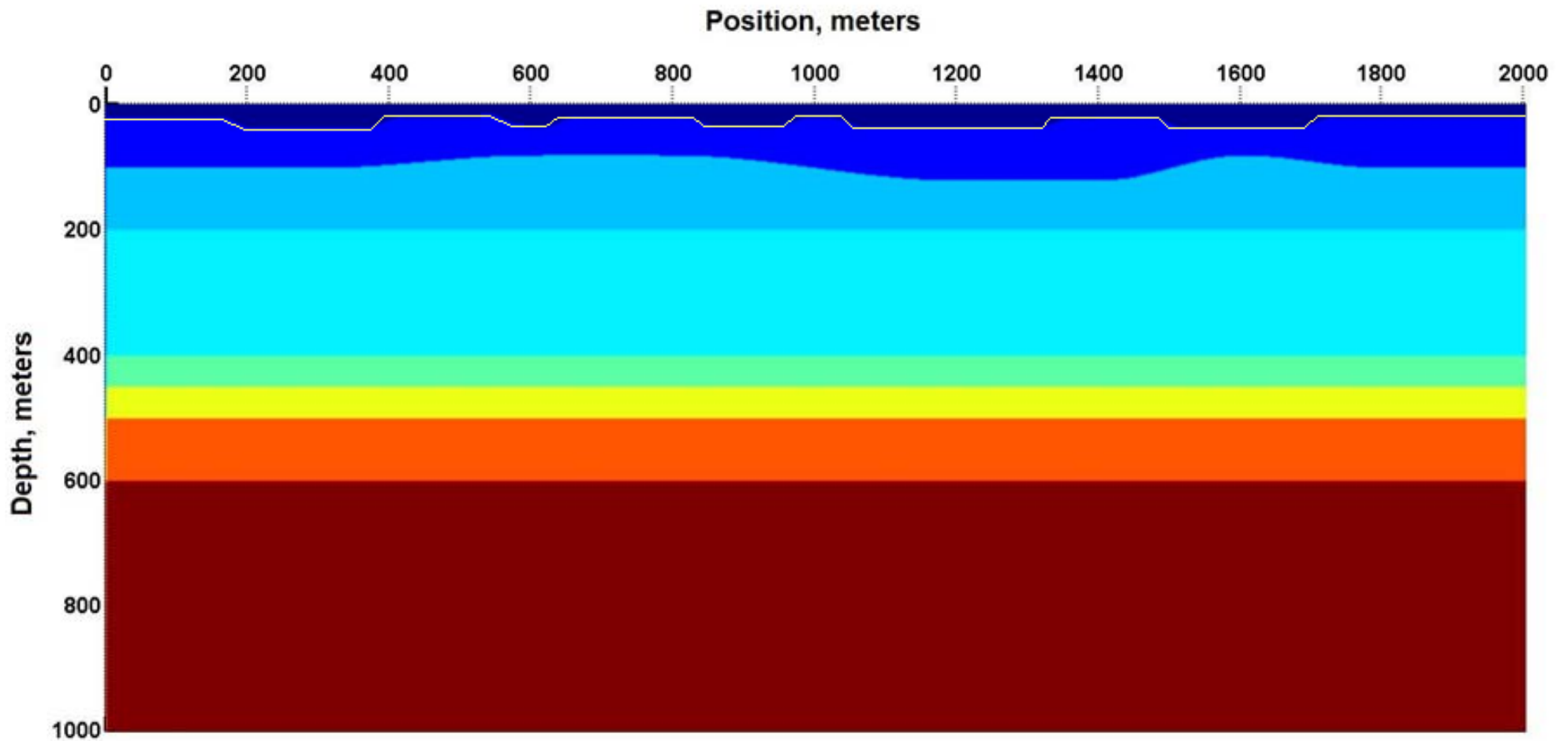
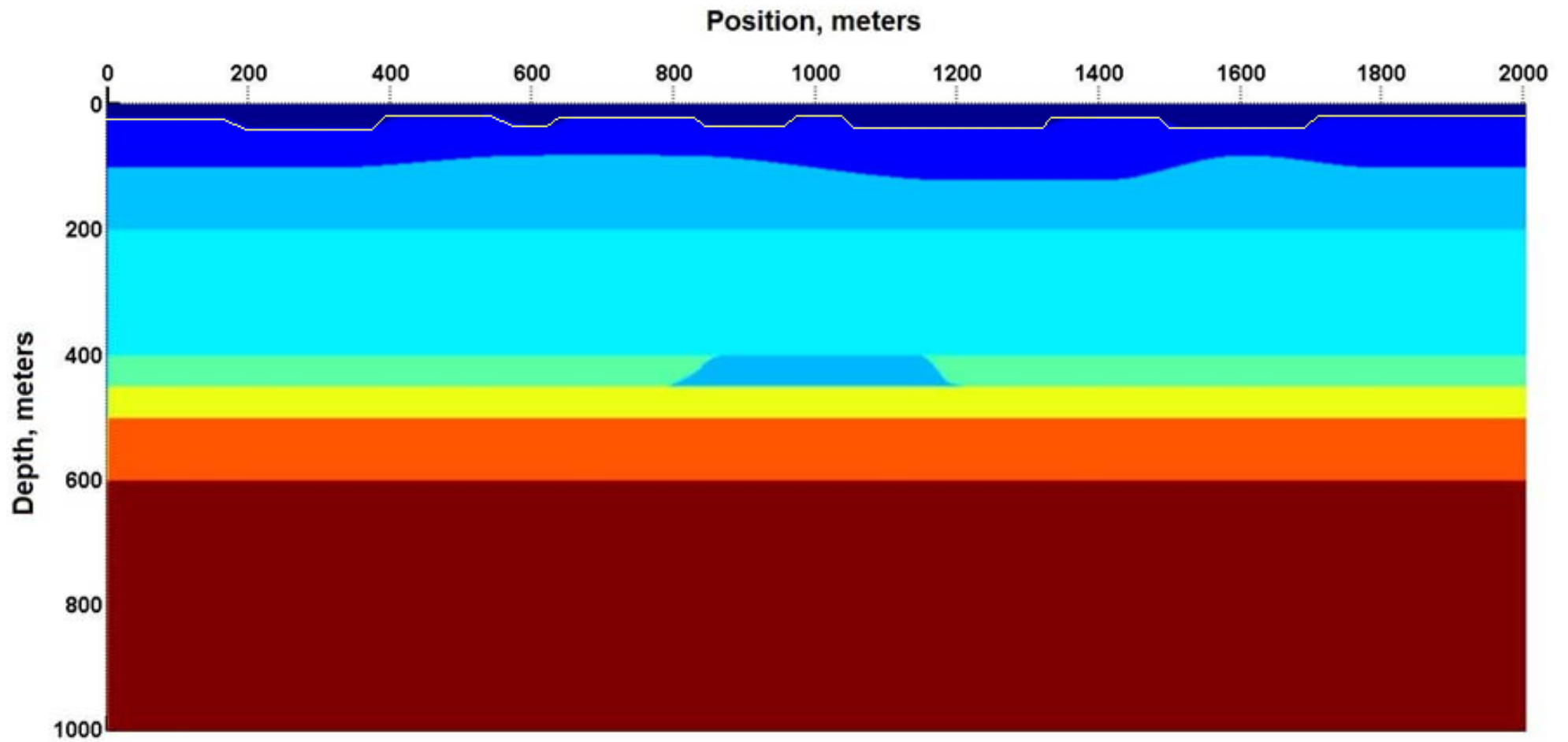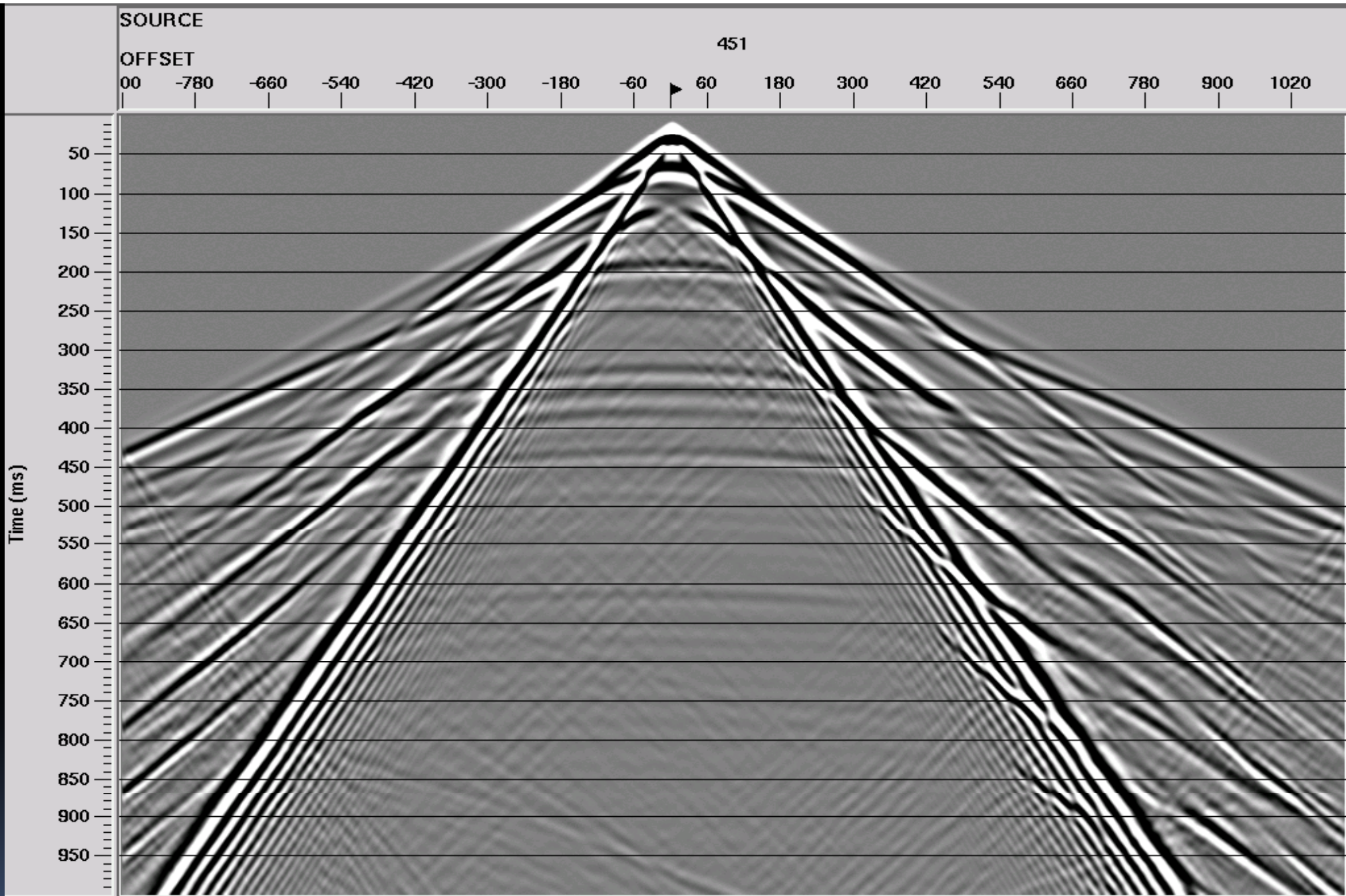# A BRIEF LAPSE IN TIME:

PROCESSING TIME-LAPSE MODEL DATA

Outline

- Two models
- Possible test variations—additive noise, seasonal variations, increased spatial sampling, missing data
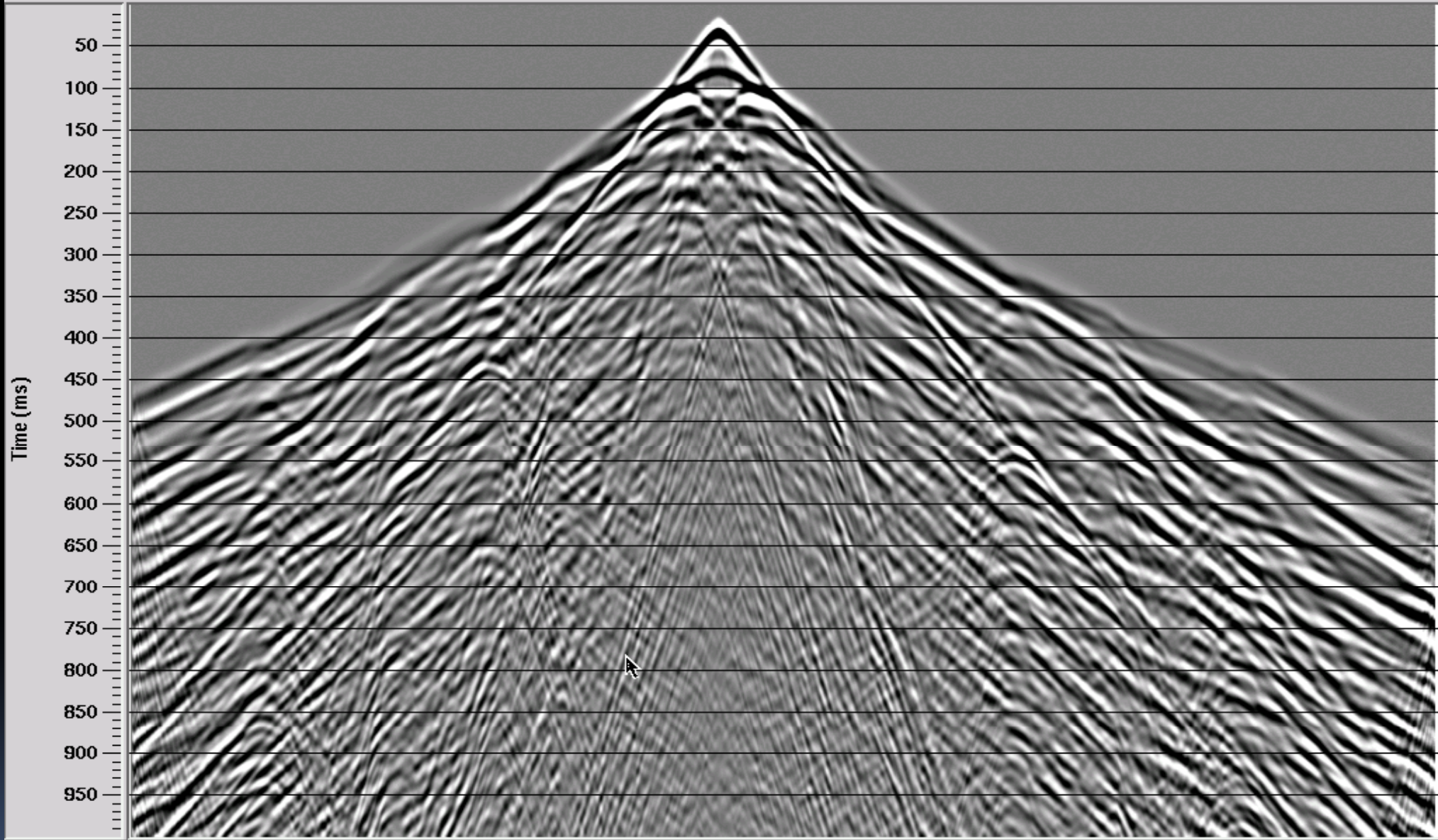- Processing steps
- Comparisons

BASELINE MODEL

MONITOR MODEL

Source gather from baseline model with no near-surface variations

Shot gather from baseline model with low-velocity surface layer, strong near-surface variations
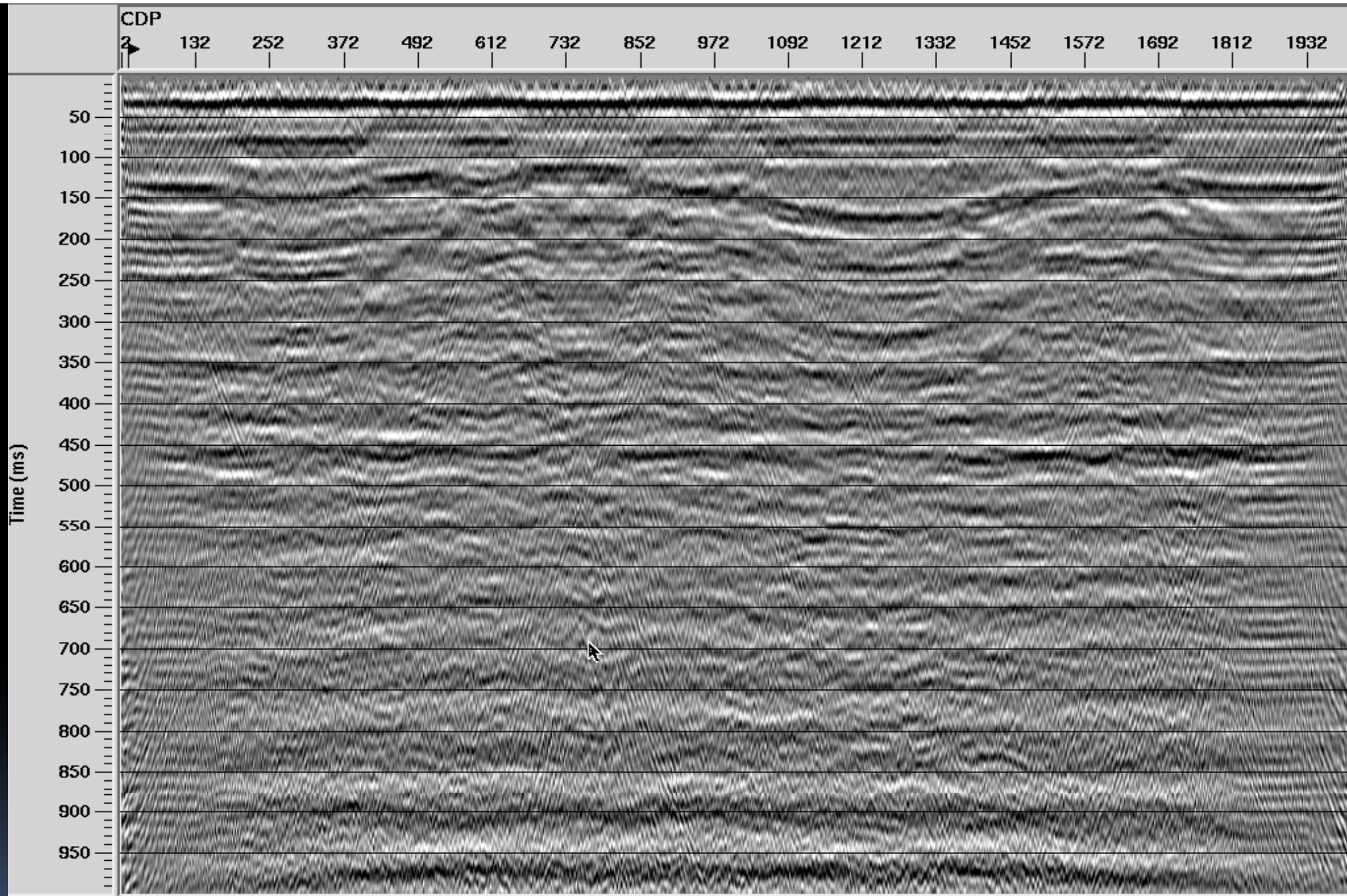
Processing steps

- Multi-pass radial trace (RT) filtering
- Gabor deconvolution
- NMO correction
- 3 passes max-stack-power autostatics OR raypath interferometry
- CMP stack
- Gabor decon, FX decon
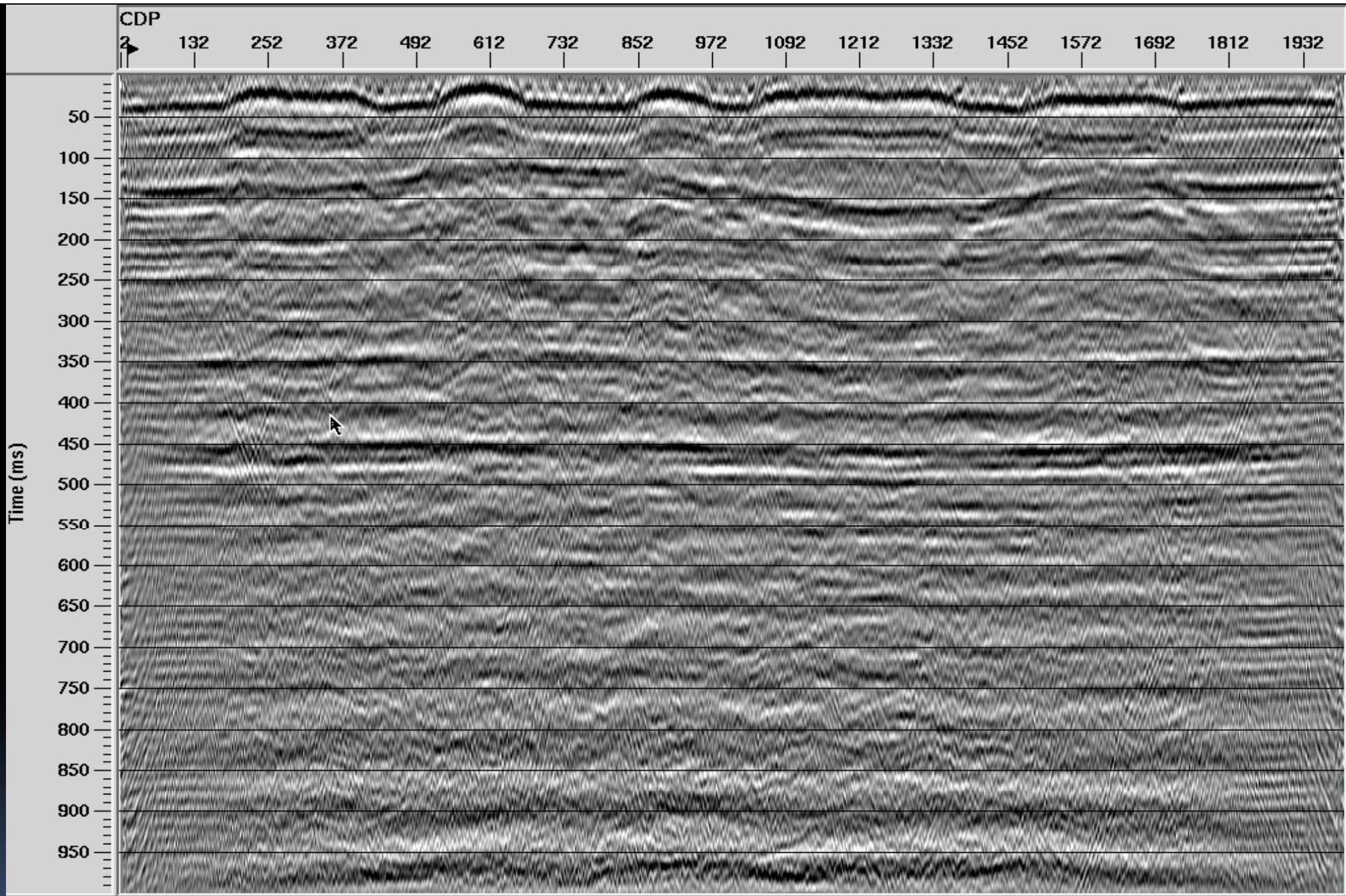
Difference detection

- Stack baseline and time-lapse surveys and subtract

- Subtract baseline and time-lapse shots and stack
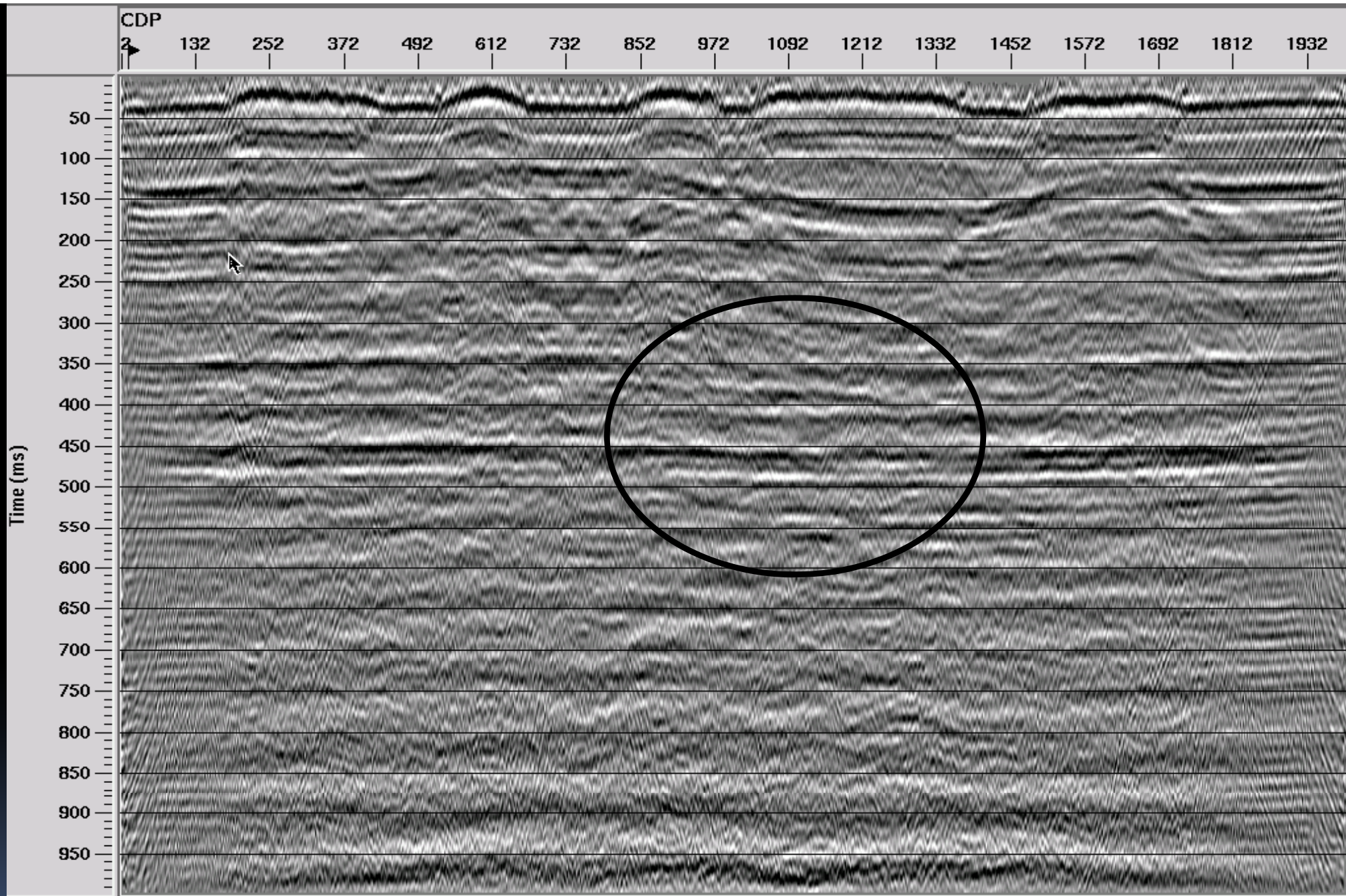
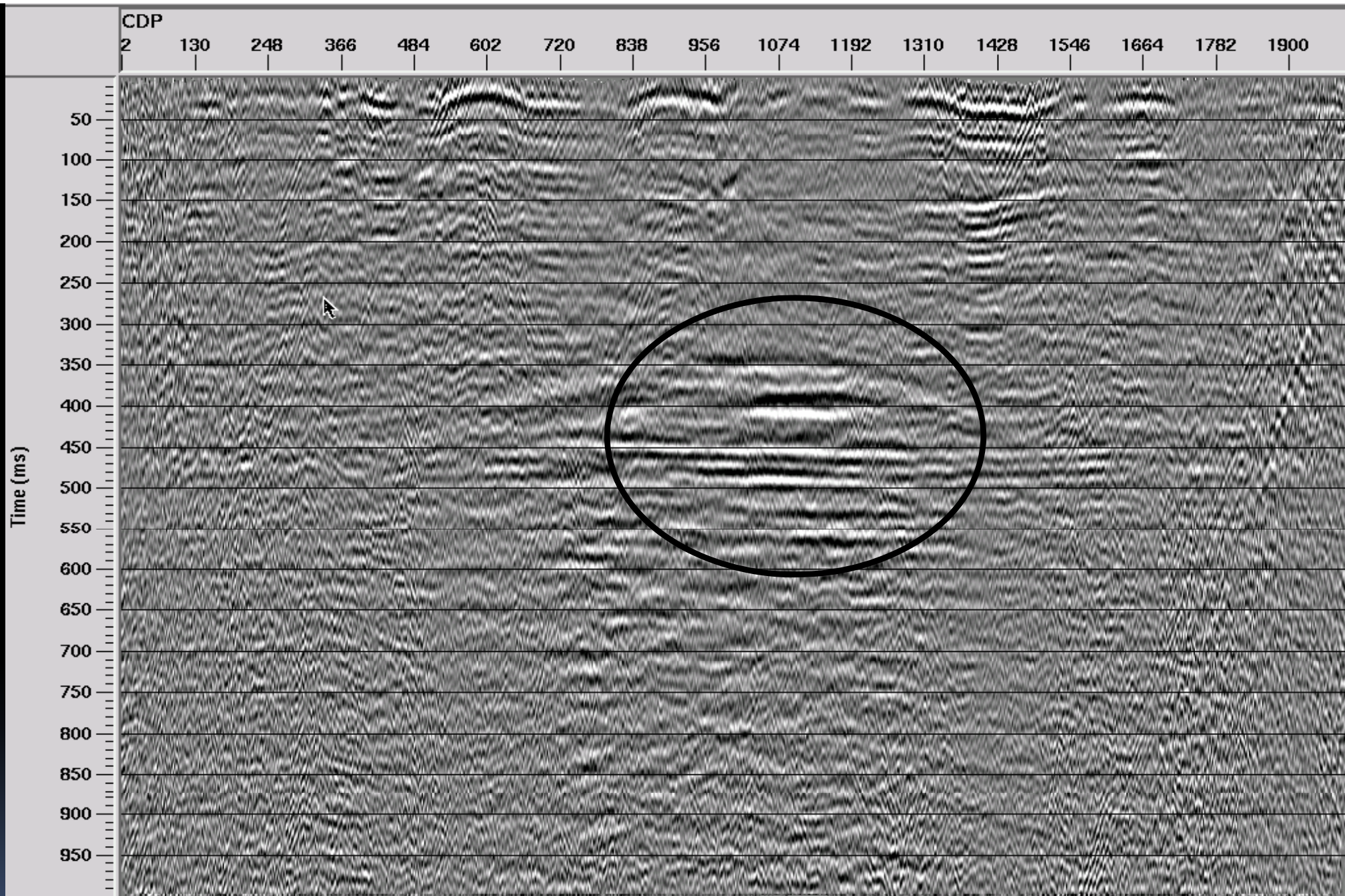- Match filter analysis—not tested

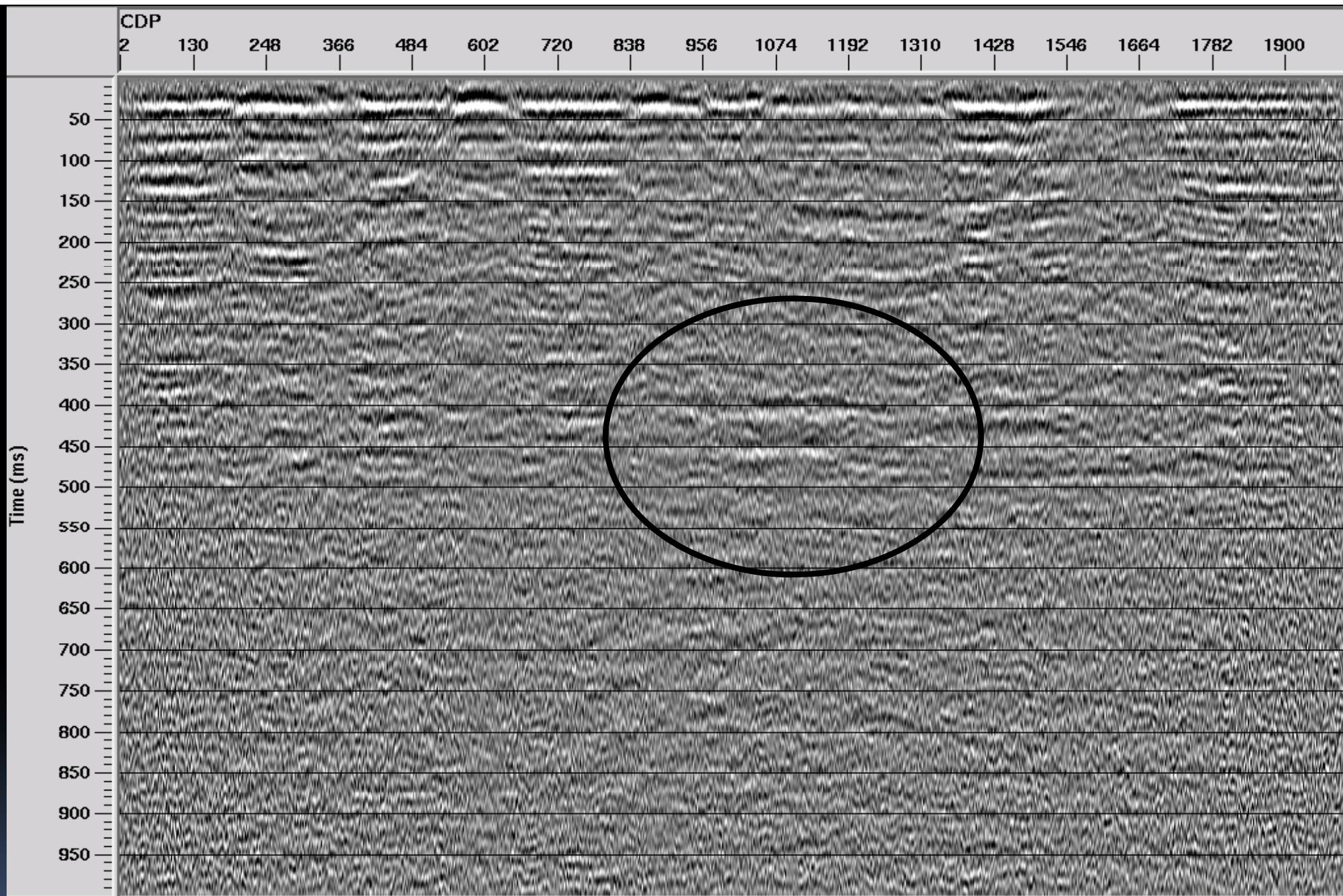**Baseline model A—Brute stack—no statics applied**

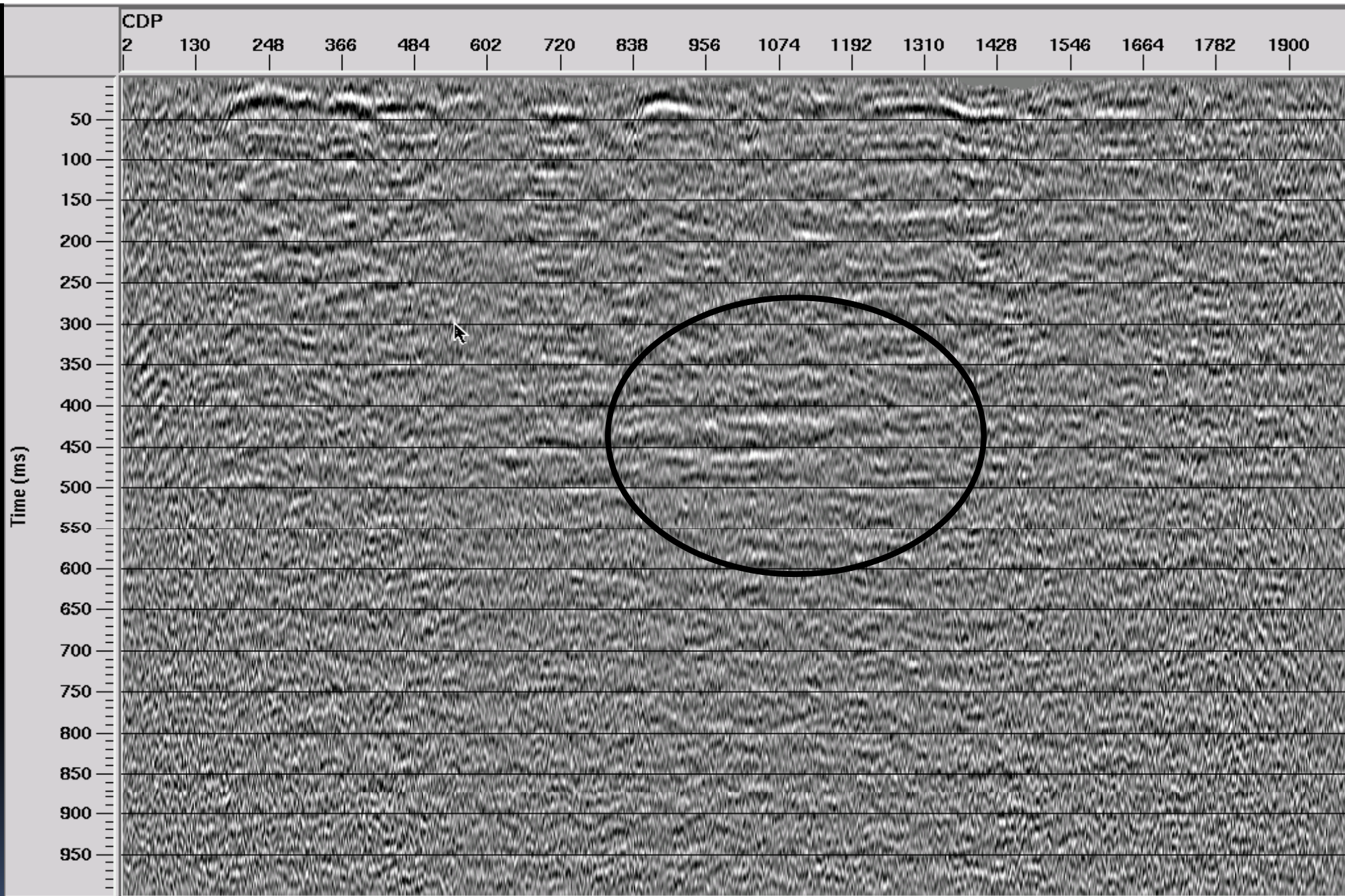**Baseline model A—static-corrected stack—max power autostatics**

Time-lapse model B—static-corrected stack—max power autostatics
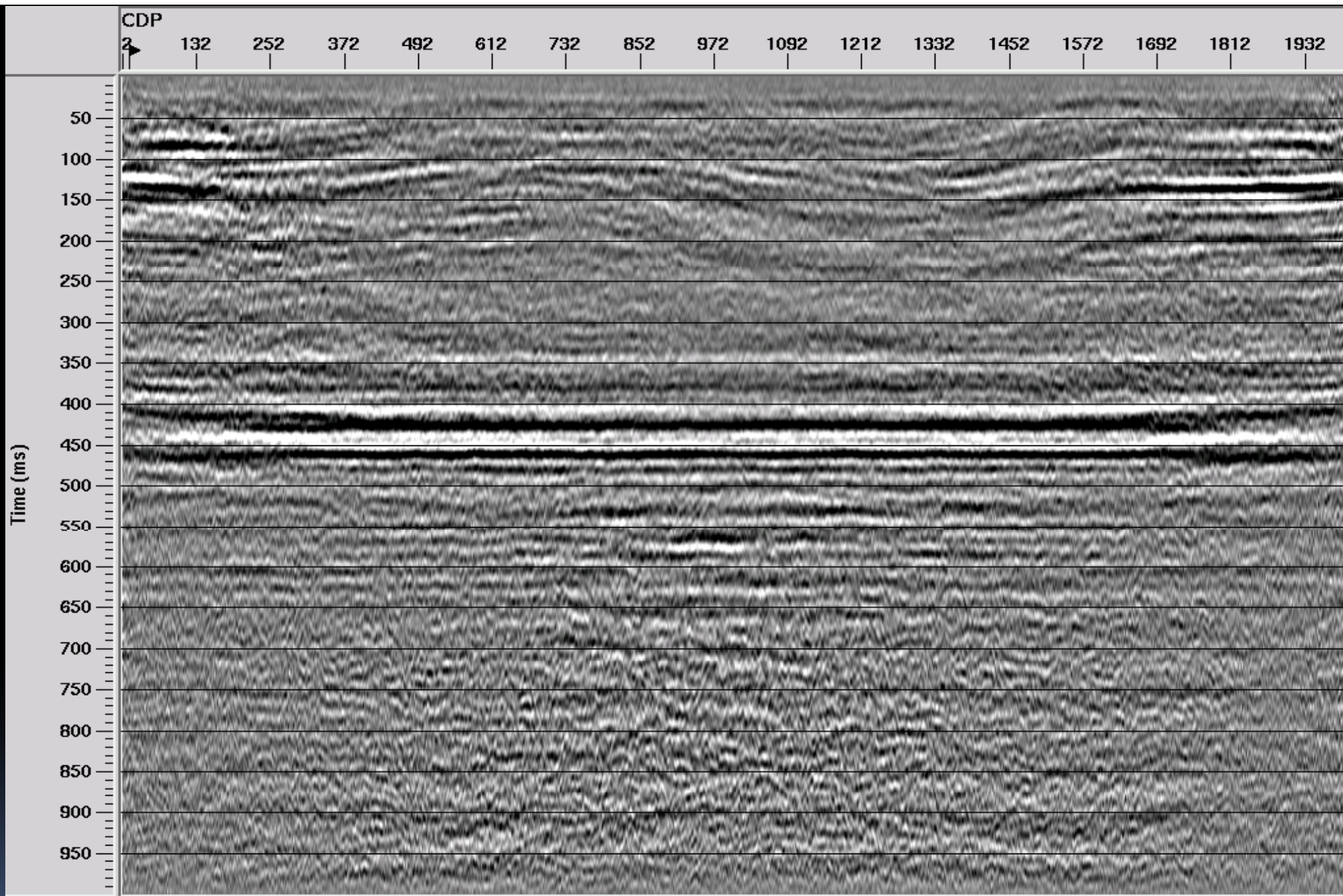
Stack difference—static-corrected time-lapse stack minus static-corrected baseline stack—no random noise
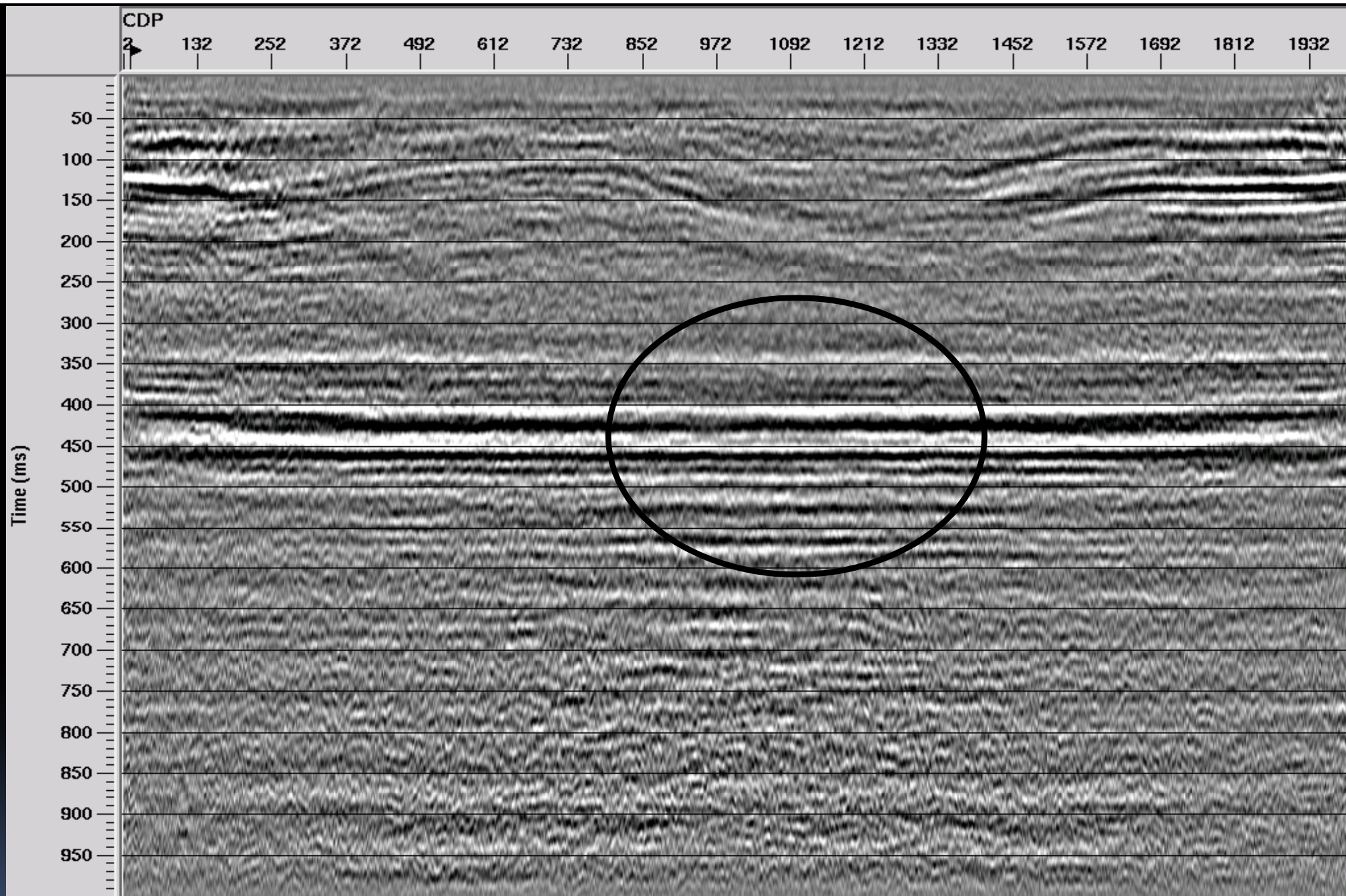
Stack difference—static-corrected time-lapse stack minus static-corrected baseline stack—raw shot S/N = 1.0

Stack difference—static-corrected time-lapse stack minus static-corrected baseline stack—raw shot S/N = 1.0—seasonal statics simulated on time-lapse survey
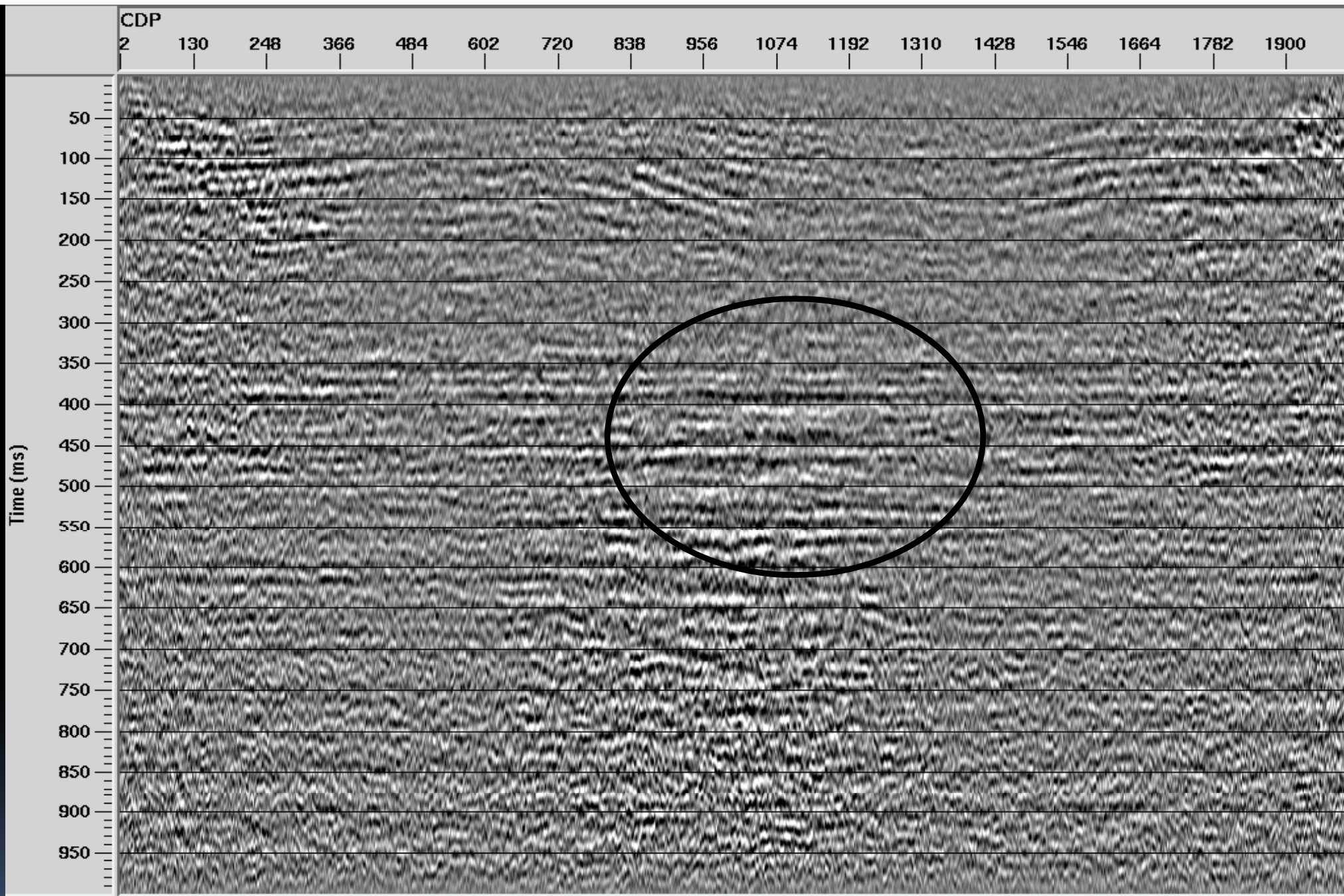
baselineA stack after raypath interferometry—random noise , S/N = 1.0 added to raw shots
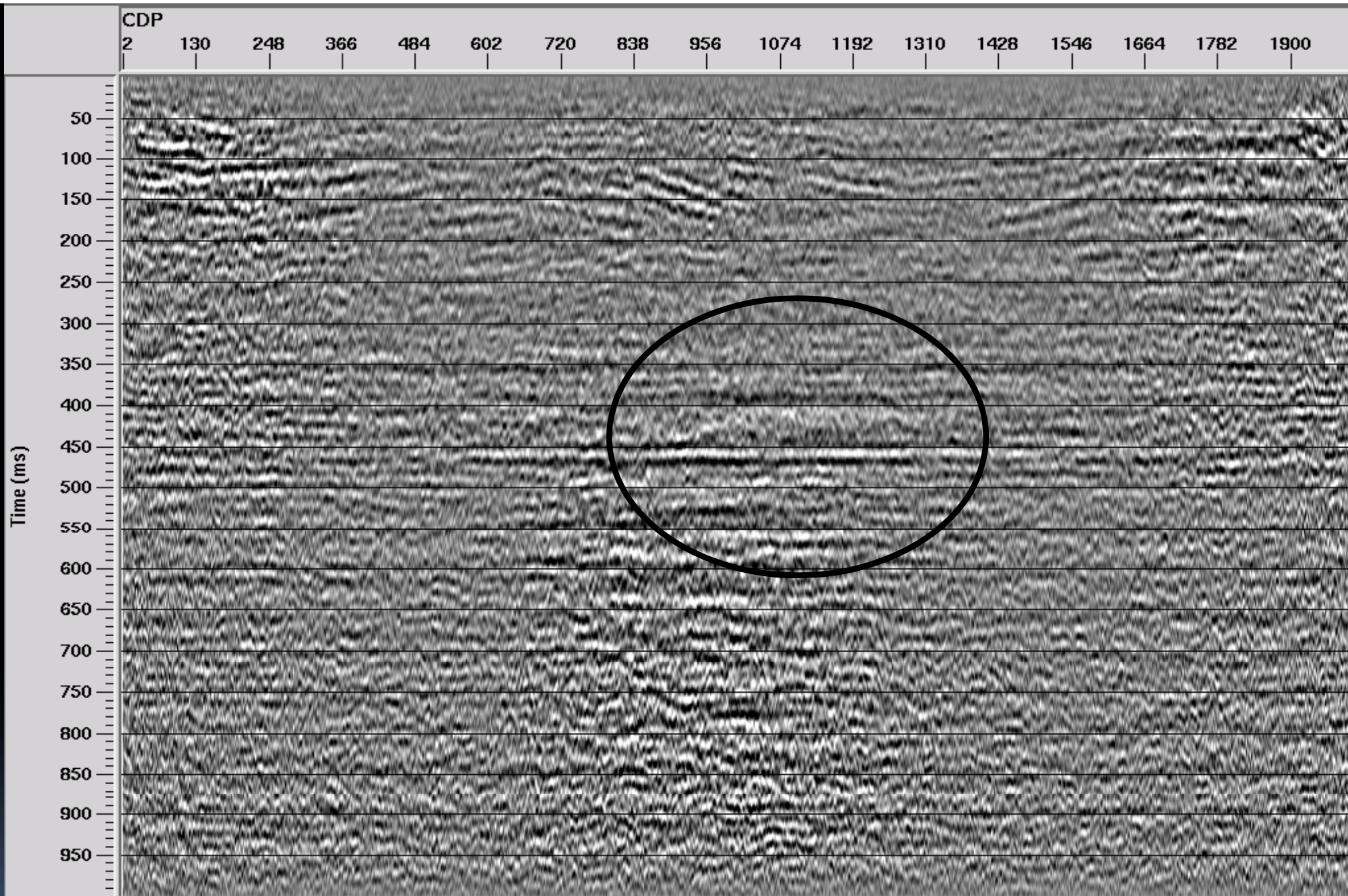
Time-lapse B stack after raypath interferometry—random noise, S/N = 1.0 added to raw shots

Stack difference—time-lapse stack minus baseline stack after interferometric statics—S/N = 1.0 on raw shots

Stack difference—time-lapse stack minus baseline stack after interferometric statics—S/N = 1.0 on raw shots—seasonal statics simulated

Conclusions

- 2D elastic modeling is a fast and convenient way to explore detectability issues for time-lapse surveys—many more possibilities than we show here

- Time-matching (including static correction) has the biggest influence on time-lapse anomaly detection, as long as acquisition and processing parameters are identical for two surveys

Acknowledgements

- Peter Manning—for the use of his code
- Joe Wong—for actually running it