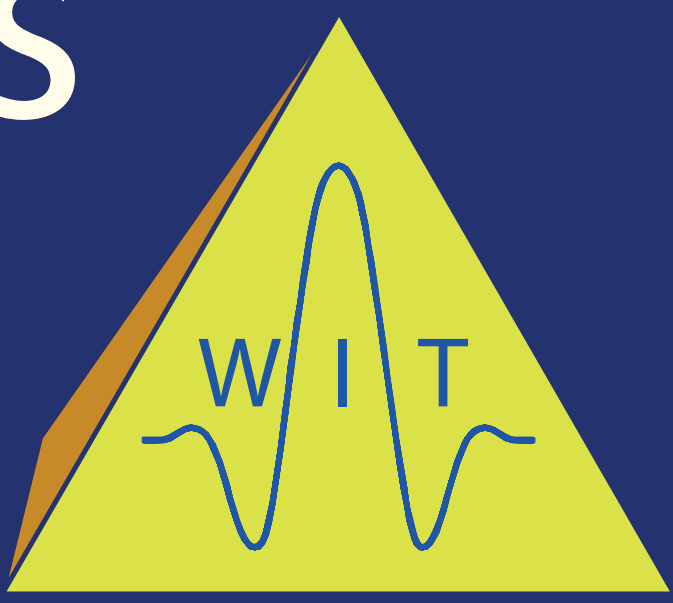# Trace interpolation with partial CRS stacks

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## Summary

Trace interpolation, pre-stack data enhancement, and regularization of data are important tasks in seismic data processing. Partial CRS stacks provide a robust and fast tool to handle these tasks. We present vintage field and synthetic data to demonstrate the performance of partial CRS stacks.

## Theory on PCRS

- Common reflection surface
  - Multiparameter stack
    - Half-offset
    - Midpoint-displacement
  - Stacked ZO trace in $P_0$
- Partial CRS stacks
  - Limited offset aperture
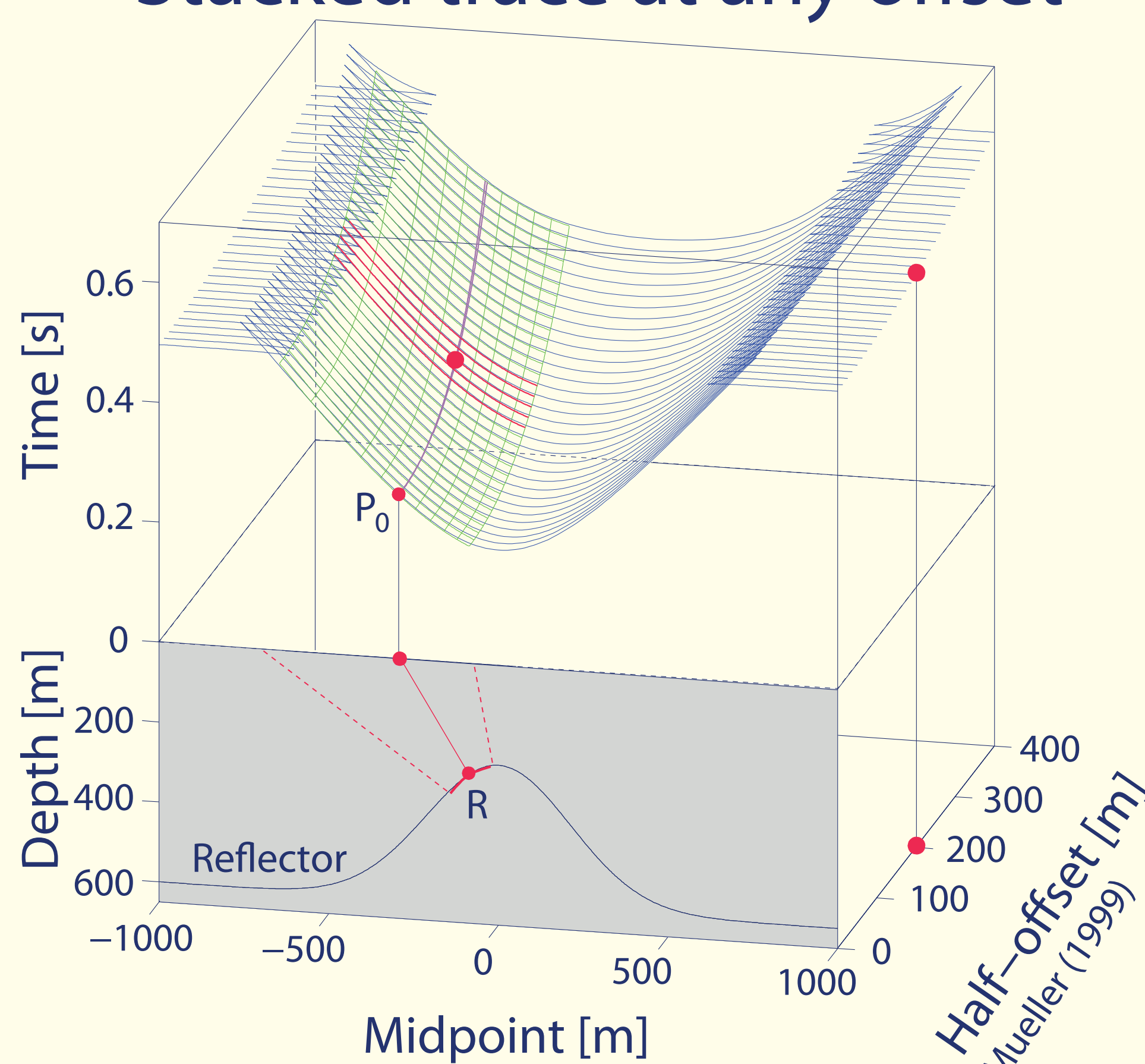  - Stacked trace at any offset



Figure 1: Visualization of Common Reflection Surface

blue:    Traveltime surface

green:  CRS aperture

red:     Partial CRS aperture

## Conclusion

- Interpolation
  - Near offset: very well
  - Far offset: reasonably well
  - Amplitude preservation
- Regularization
  - Precise at any offset interval
- Pre-stack data enhancement
  - Significant increase of SNR
  - Increased number of traces
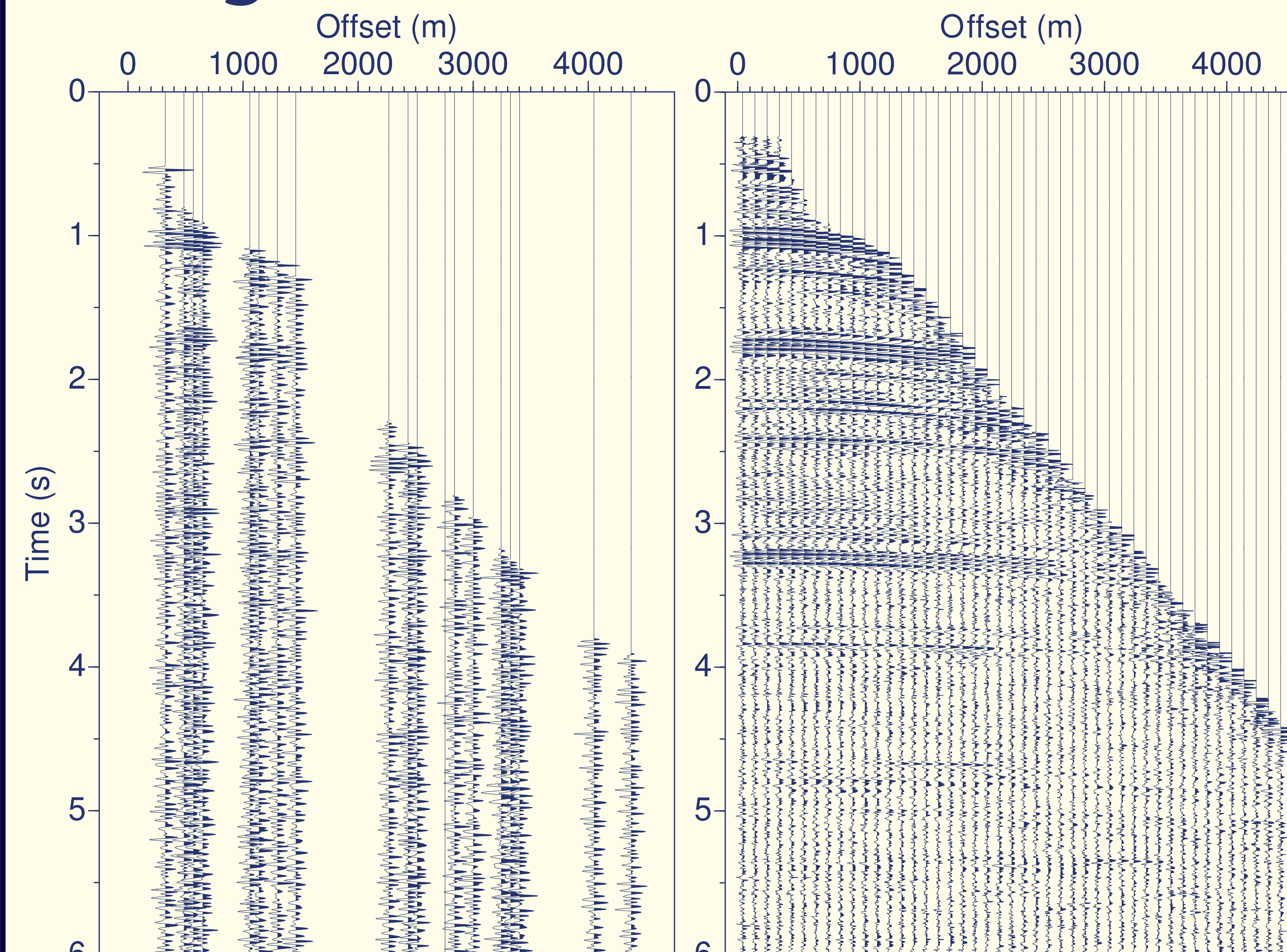
## Vintage Data



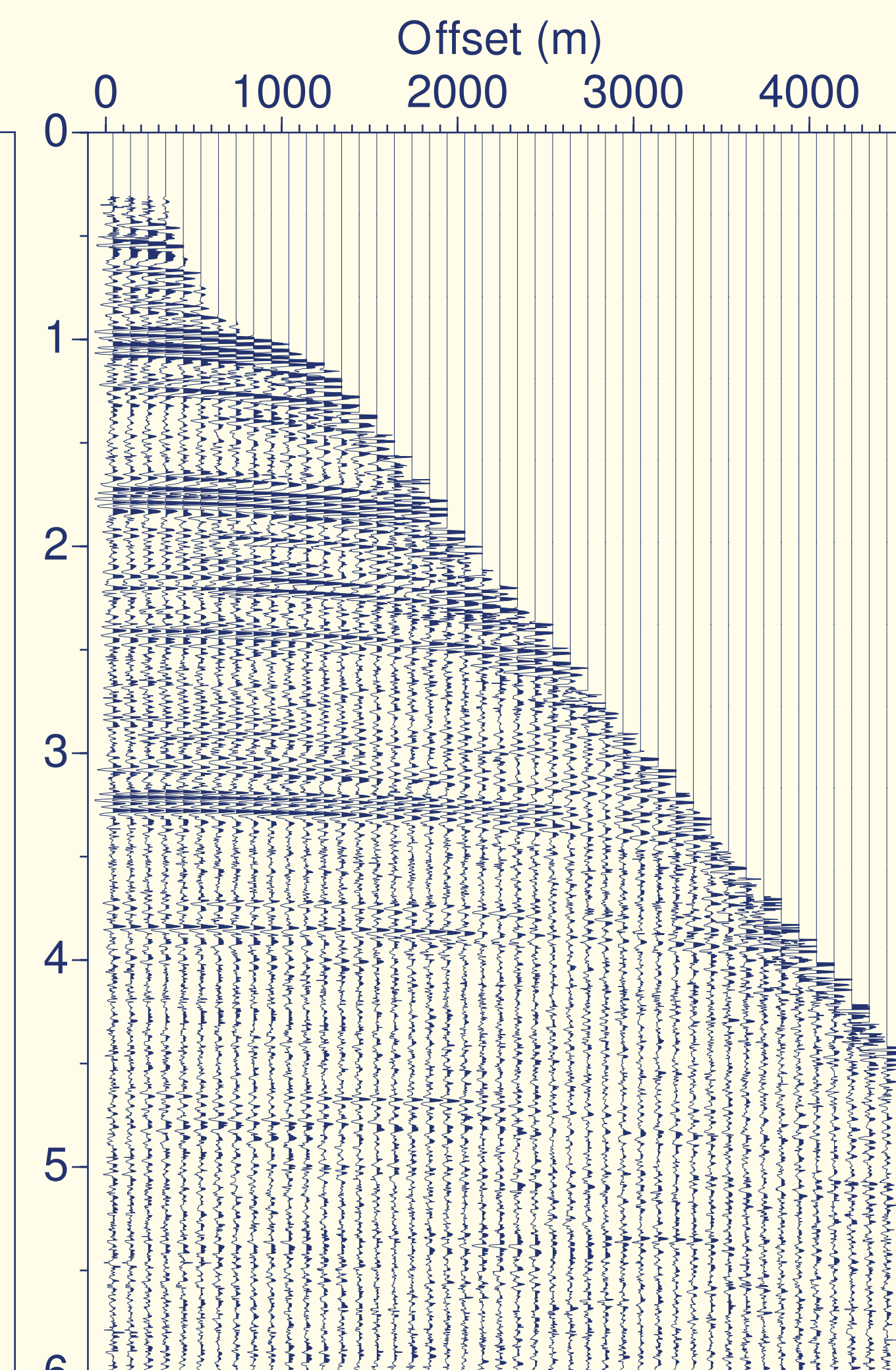Figure 2: Sparse irregular vintage data



Figure 3: Regularized supergather by PCRS

- Vintage data
  - Very low fold
  - Sparse
  - Very irregular
- Supergather
  - Increased number of traces
  - Filled gaps
  - Regularized

## Synthetic Data

- Time domain
  - Raised trace count
  - Noise reduction
- Frequency domain
  - Good match
  - Bandwidth fits
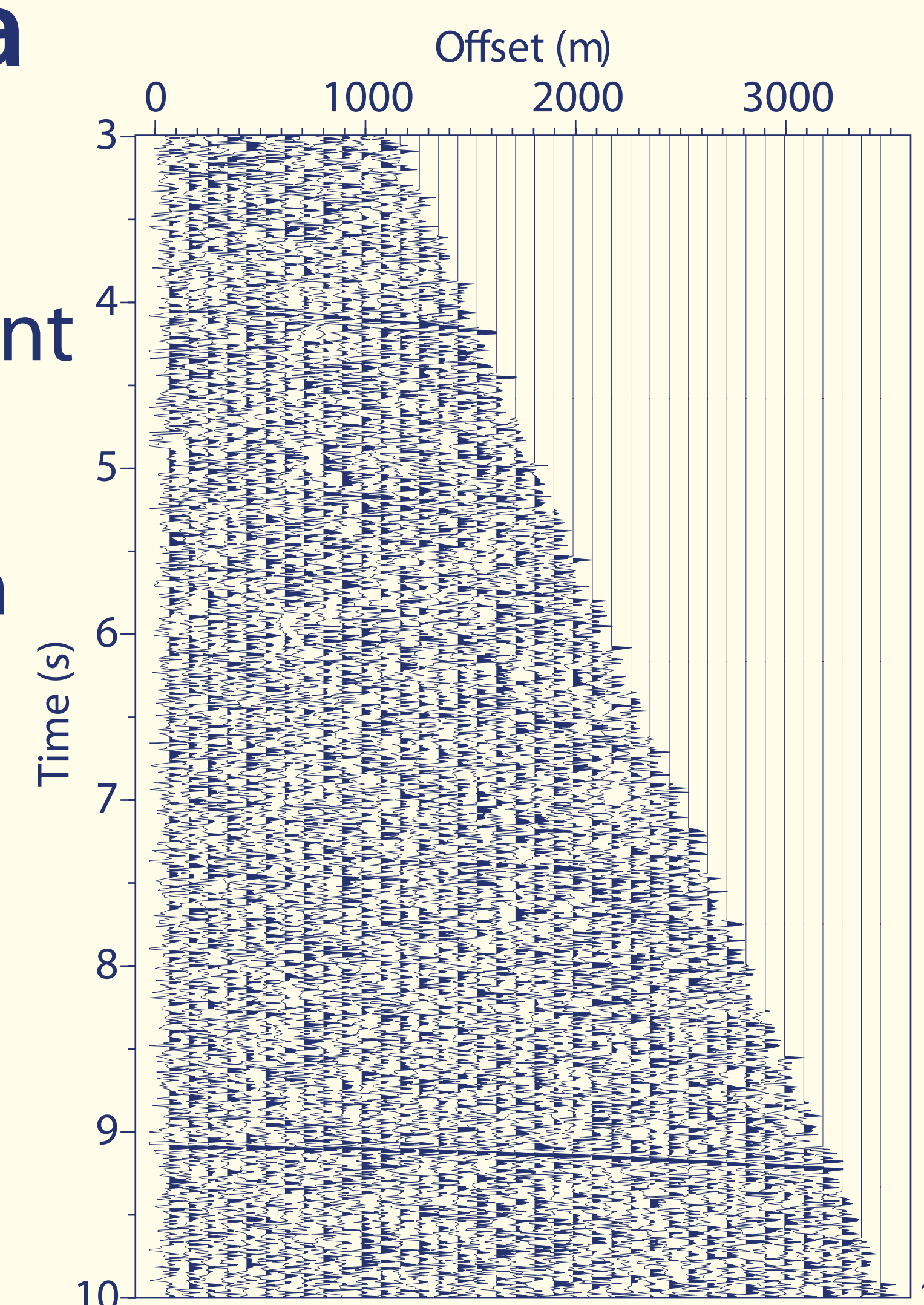  - Gap at 12Hz - 14Hz preserved
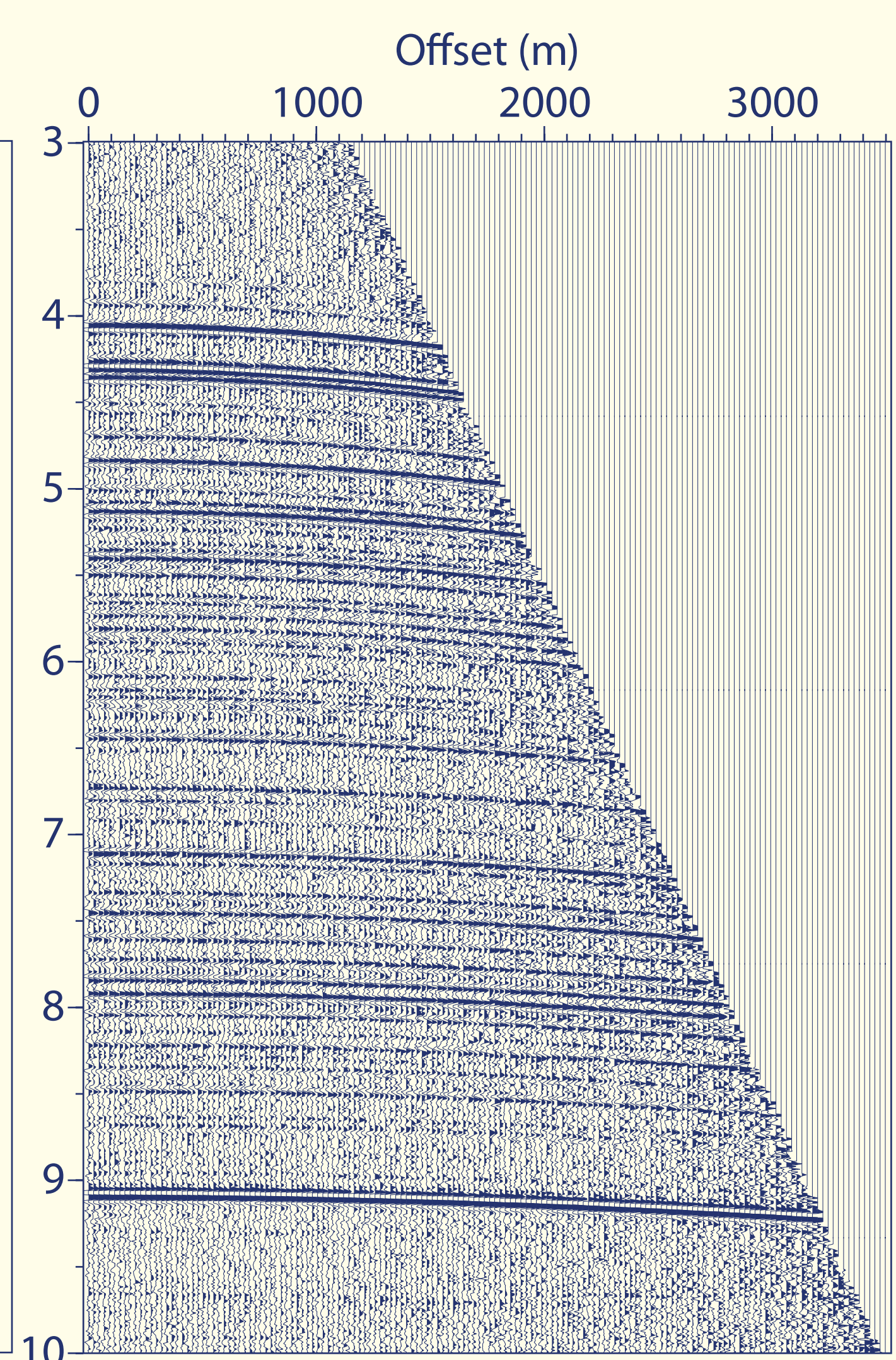  - Low intensity noise



Figure 4: Data masked by noise



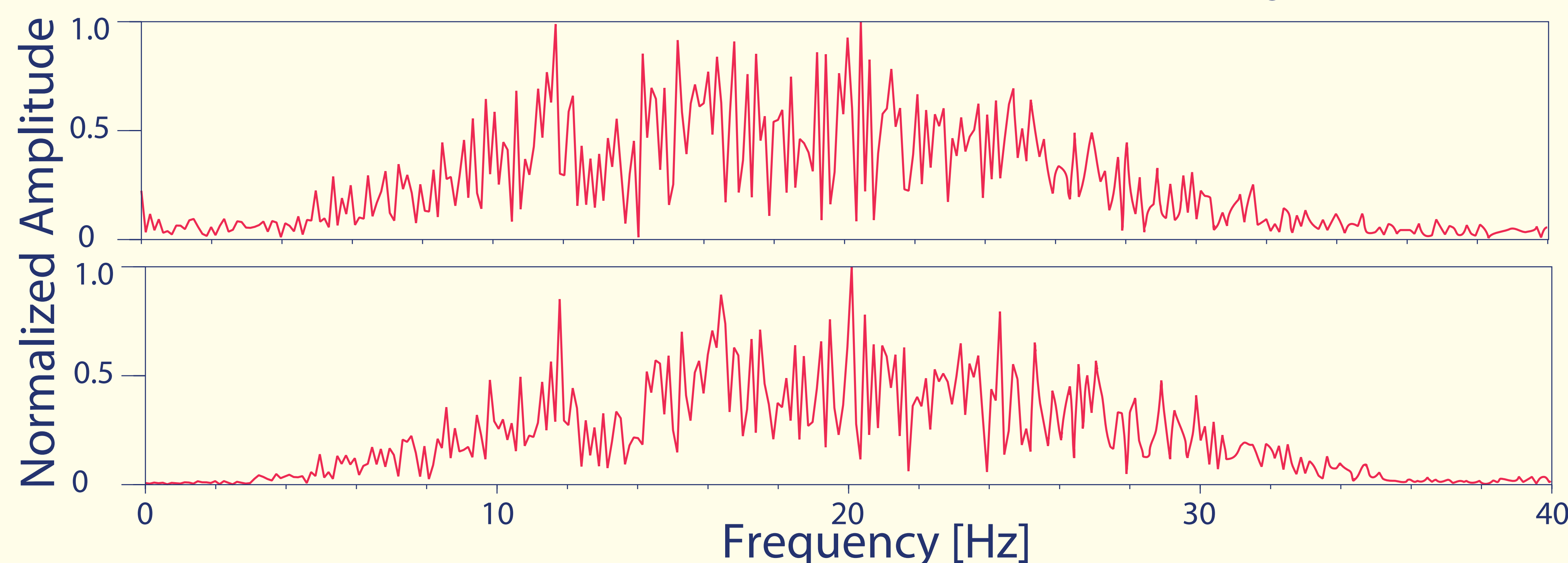Figure 5: Supergather with high SNR



Figure 6: Amplitude spectra of interpolated (top) and original (bottom) trace at near offset

## References

Baykulov, M. and Gajewski, D. [2009a] 3-D partial CRS stacks. WIT Report, 15–20.

Baykulov, M. and Gajewski, D. [2009b] Prestack seismic data enhancement with partial common reflection surface (CRS) stack. Geophysics, 74, 49 – 58, doi:10.1190/1.3106182.

Dümmong, S., Baykulov, M. and Gajewski, D. [2009] A workflow for the processing of reflection seismic data with CRS attributes. SEG, Expanded Abstracts, 28, 3173–3177.

Müller, T. [1999] The Common Reflection Surface Stack Method - Seismic imaging without explicit knowledge of the velocity model. Ph.D. thesis, Universität Karlsruhe (TH).

Naghizadeh, M. and Sacchi, M. [2009] F-x adaptive seismic-trace interpolation. Geophysics, 74, 9–16, doi: 10.1190/1.3008547.

Pann, K. and Fields, J.L. [1986] Seismic trace interpolation using f-k filtering. Patent

Spitz, S. [1991] Seismic trace interpolation in the f-x domain. Geophysics, 56, 785–796.

Verschuur, D. J., Berkhout, A. J. and Wapenaar, C.P.A. [1992] Adaptive surface-related multiple elimination. Geophysics, 57, 1166–1177.