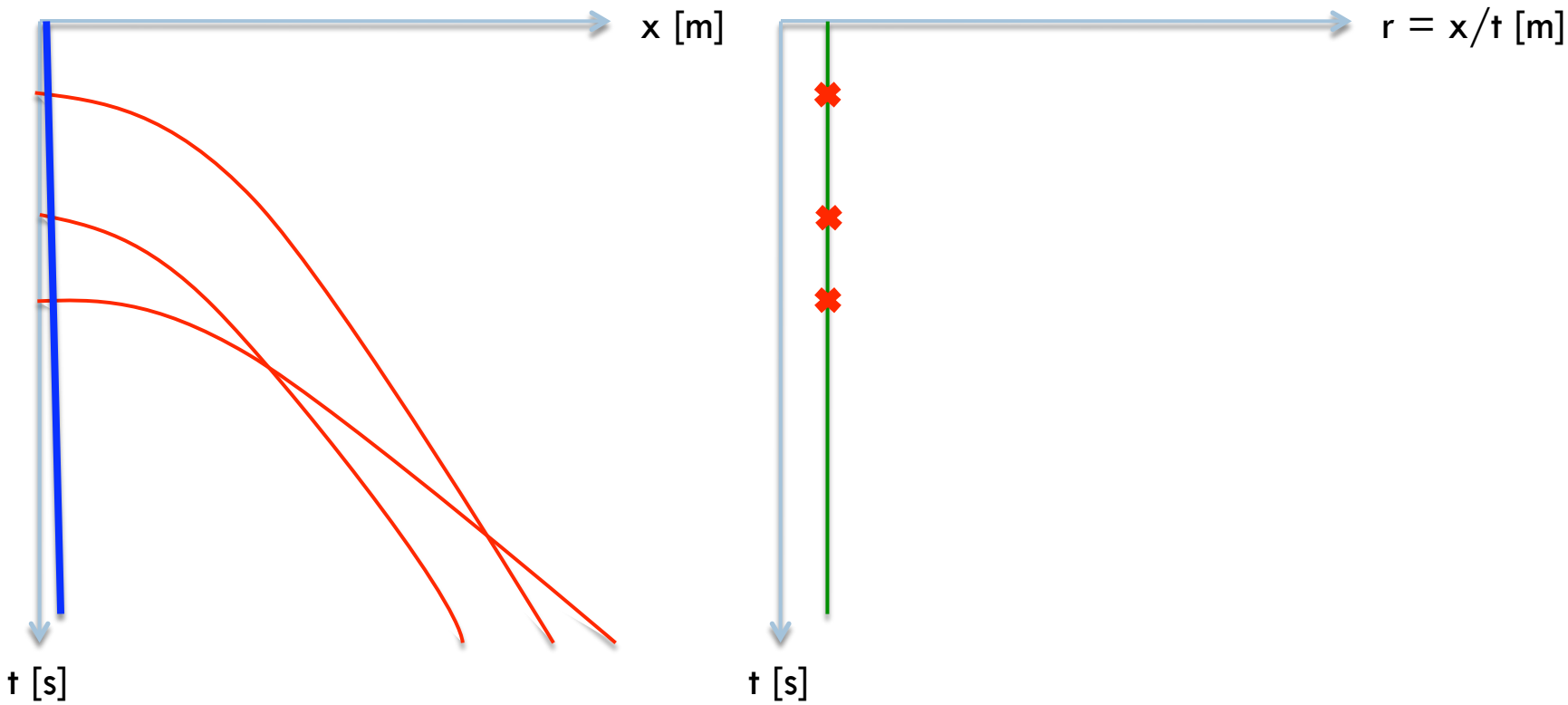
RICKER-DECONVOLUTION OF WESTERN AUSTRALIA CHEVRON DATA IN (R,T) SPACE

Taylor Dahlke

Outline

- Radial Transform Explanation
- Theoretical Advantages
- Processing Data
- Expectations
- Ricker-Deconvolution Results

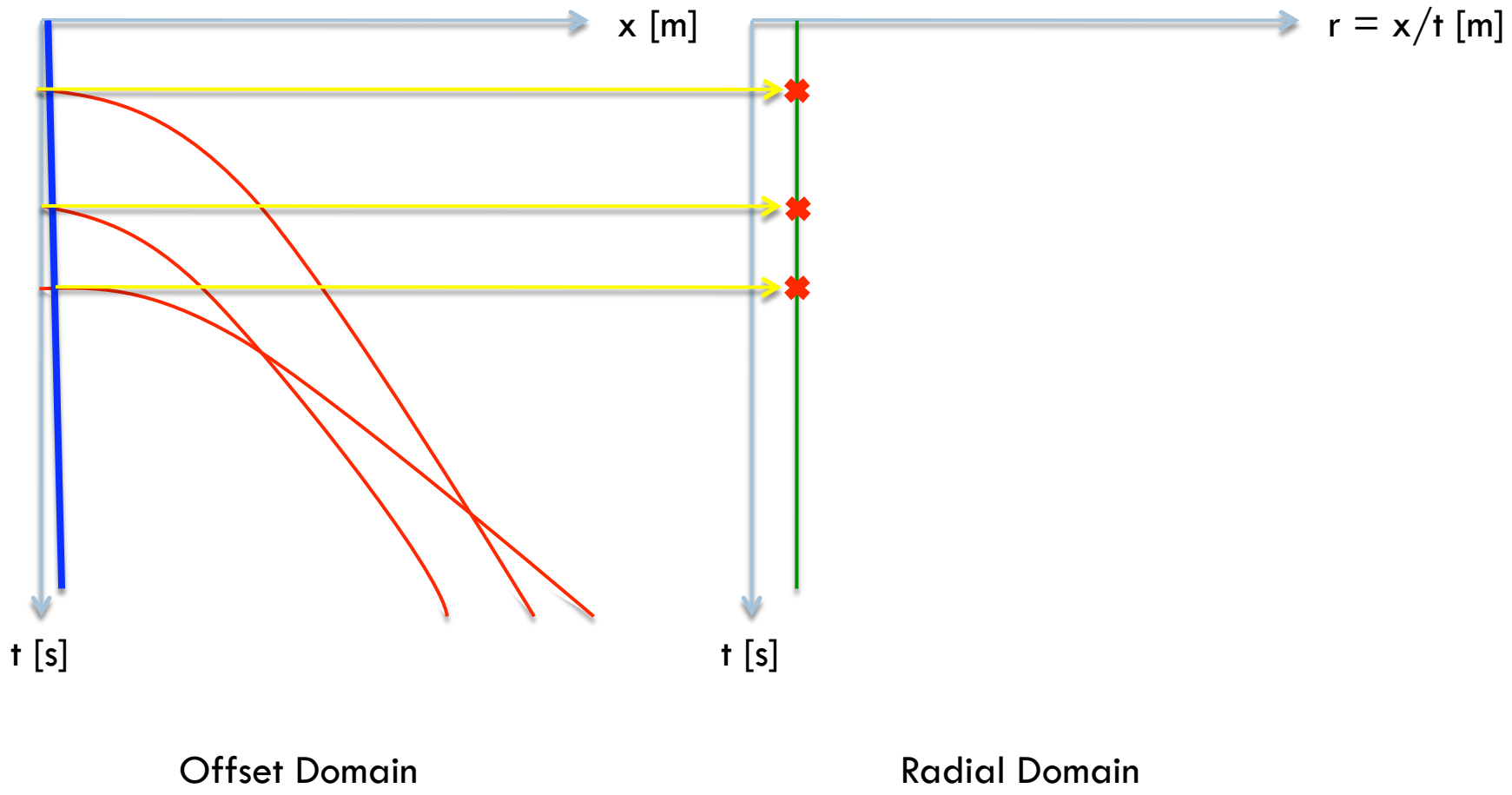
Radial Transform r = (x/t)



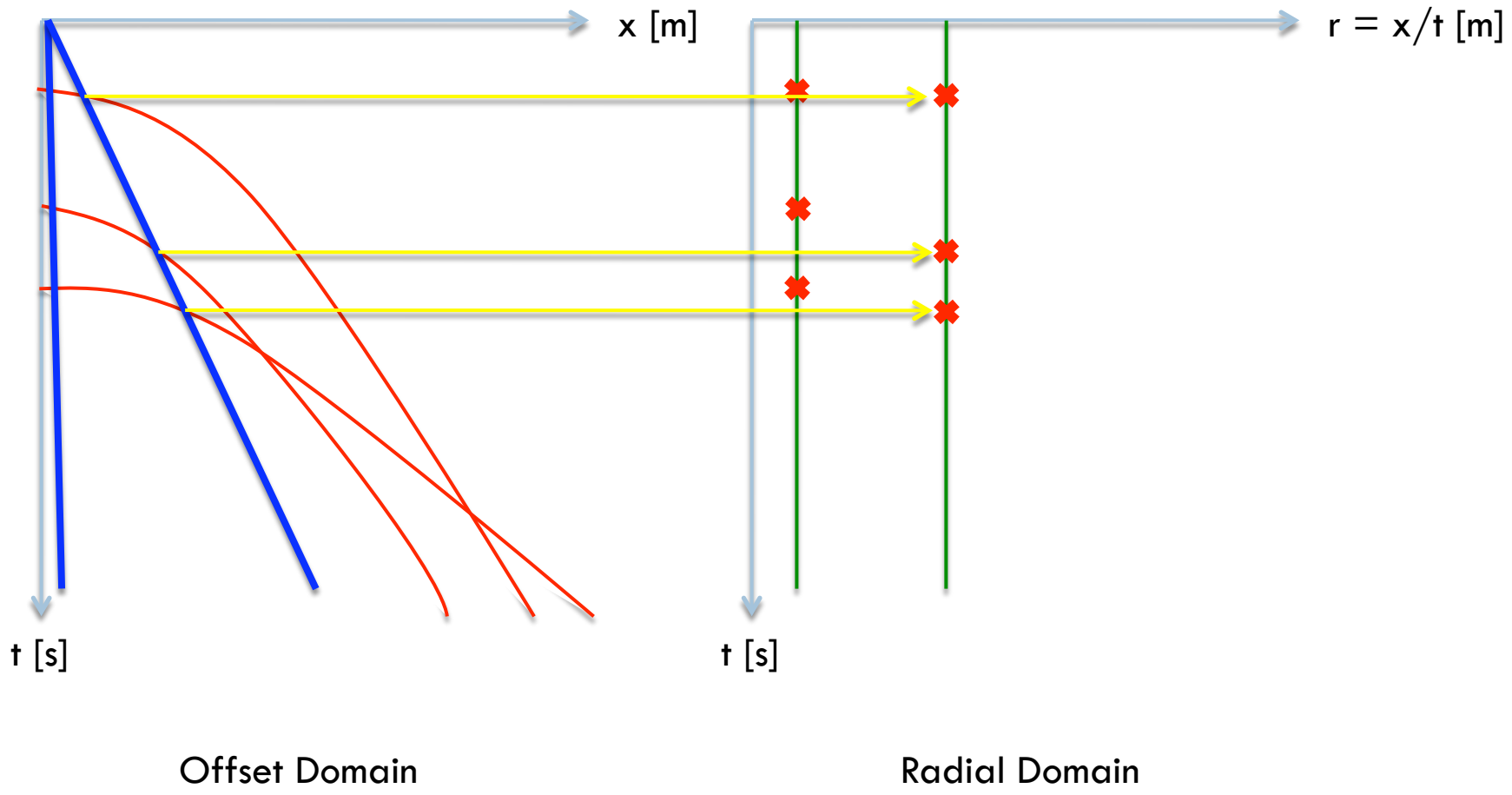
Offset Domain

Radial Domain

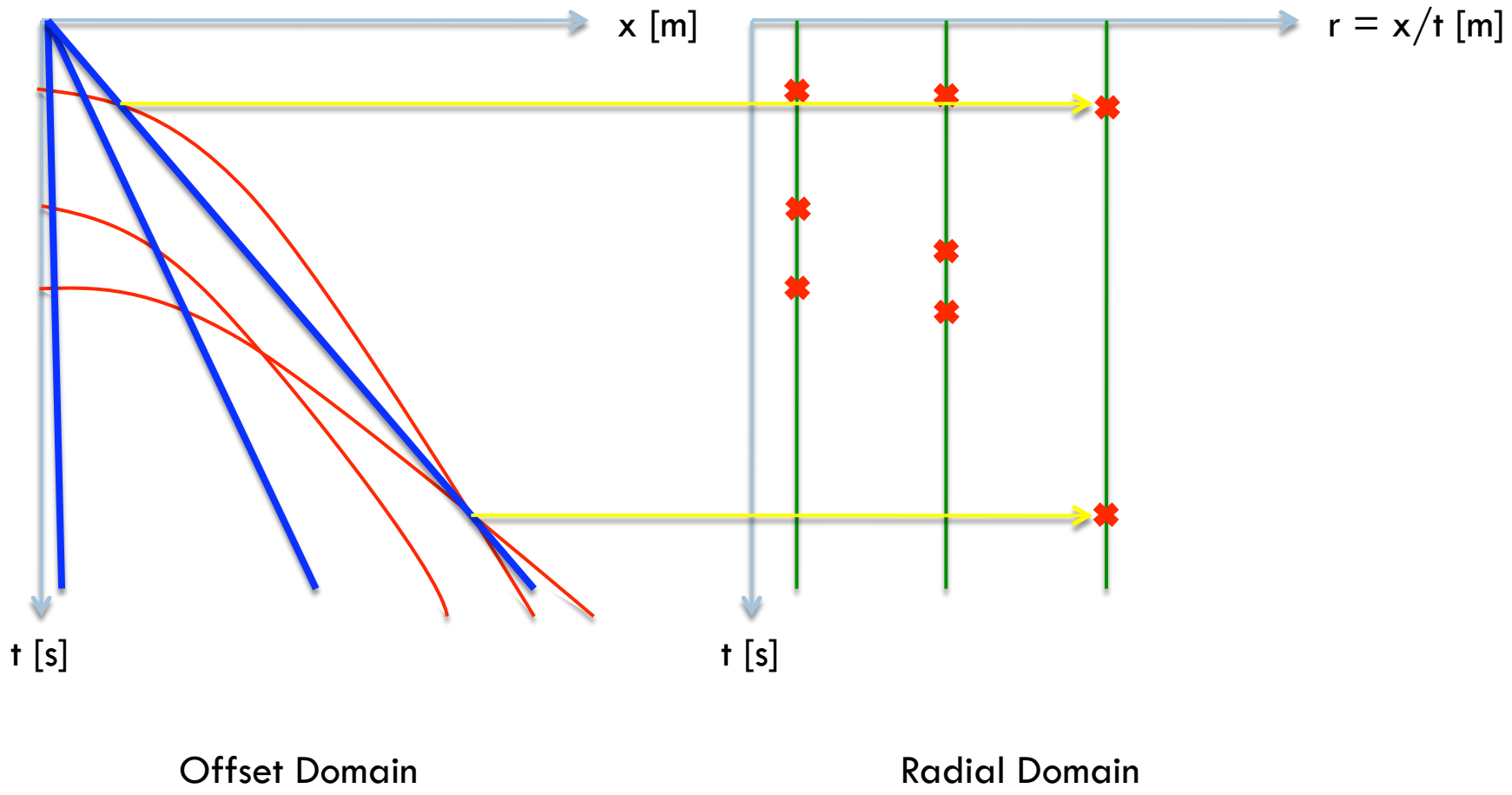
Radial Transform r = (x/t)



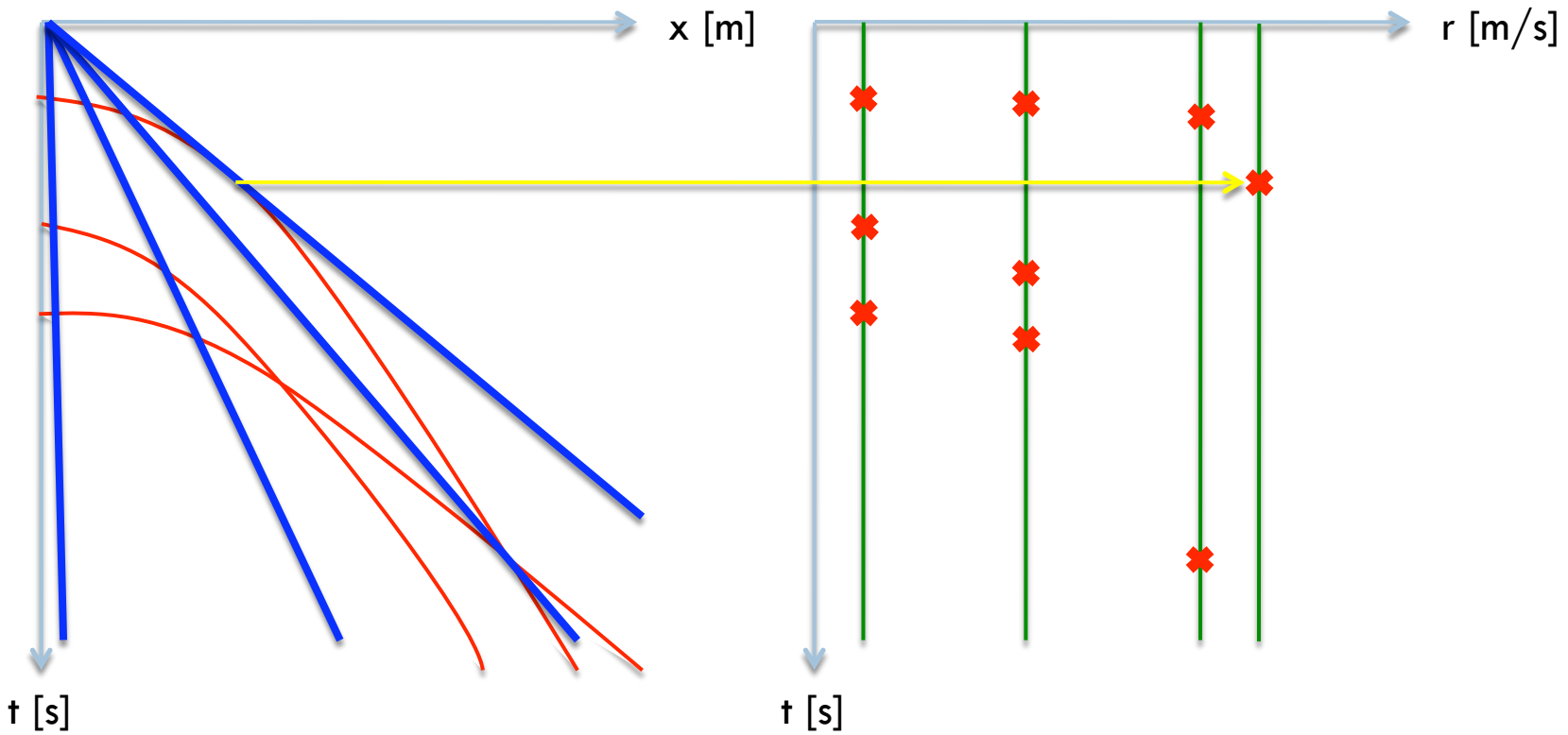
Radial Transform r = (x/t)



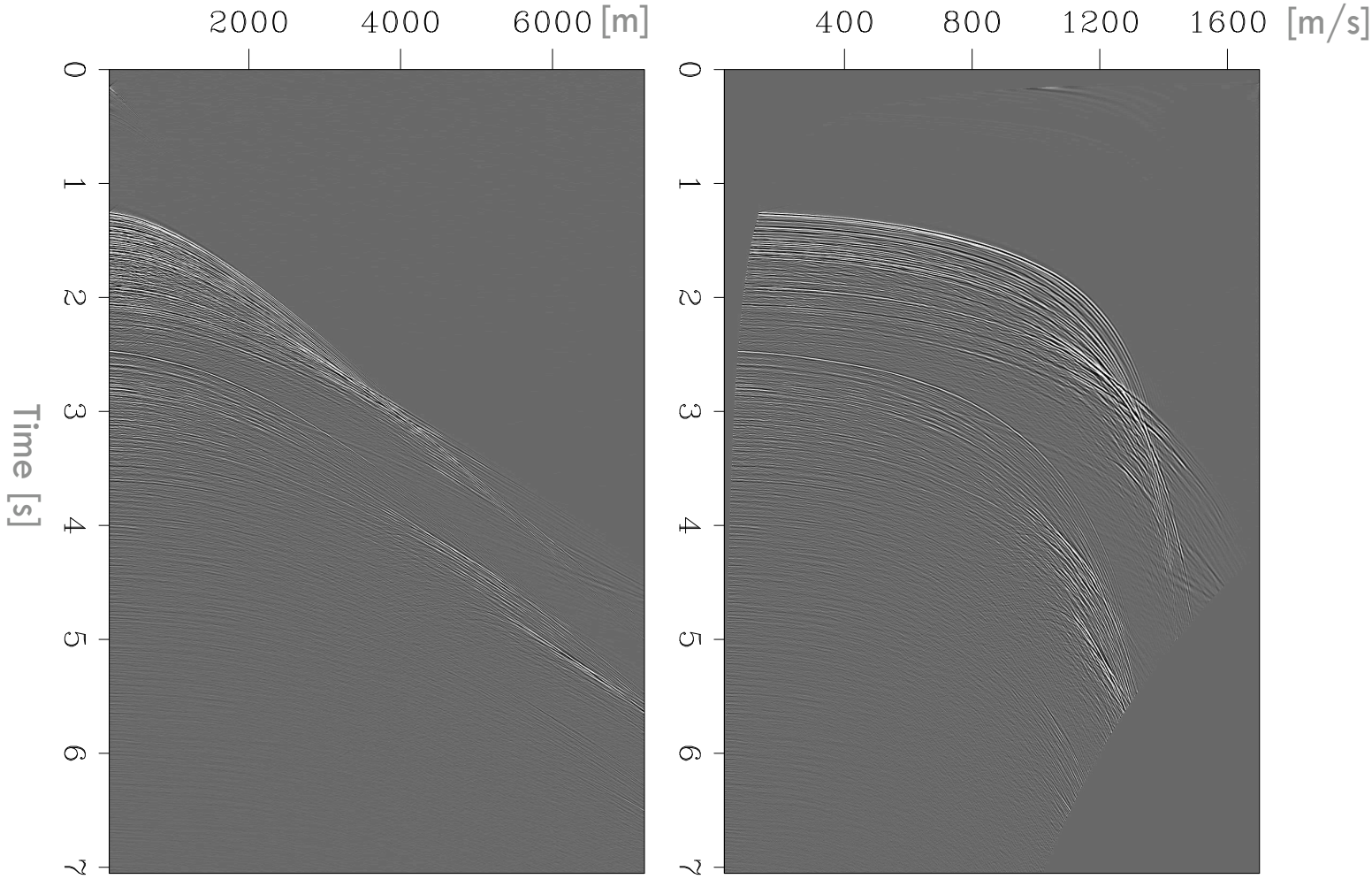
Radial Transform r = (x/t)



Radial Transform r = (x/t)



(r,t) Transform Results



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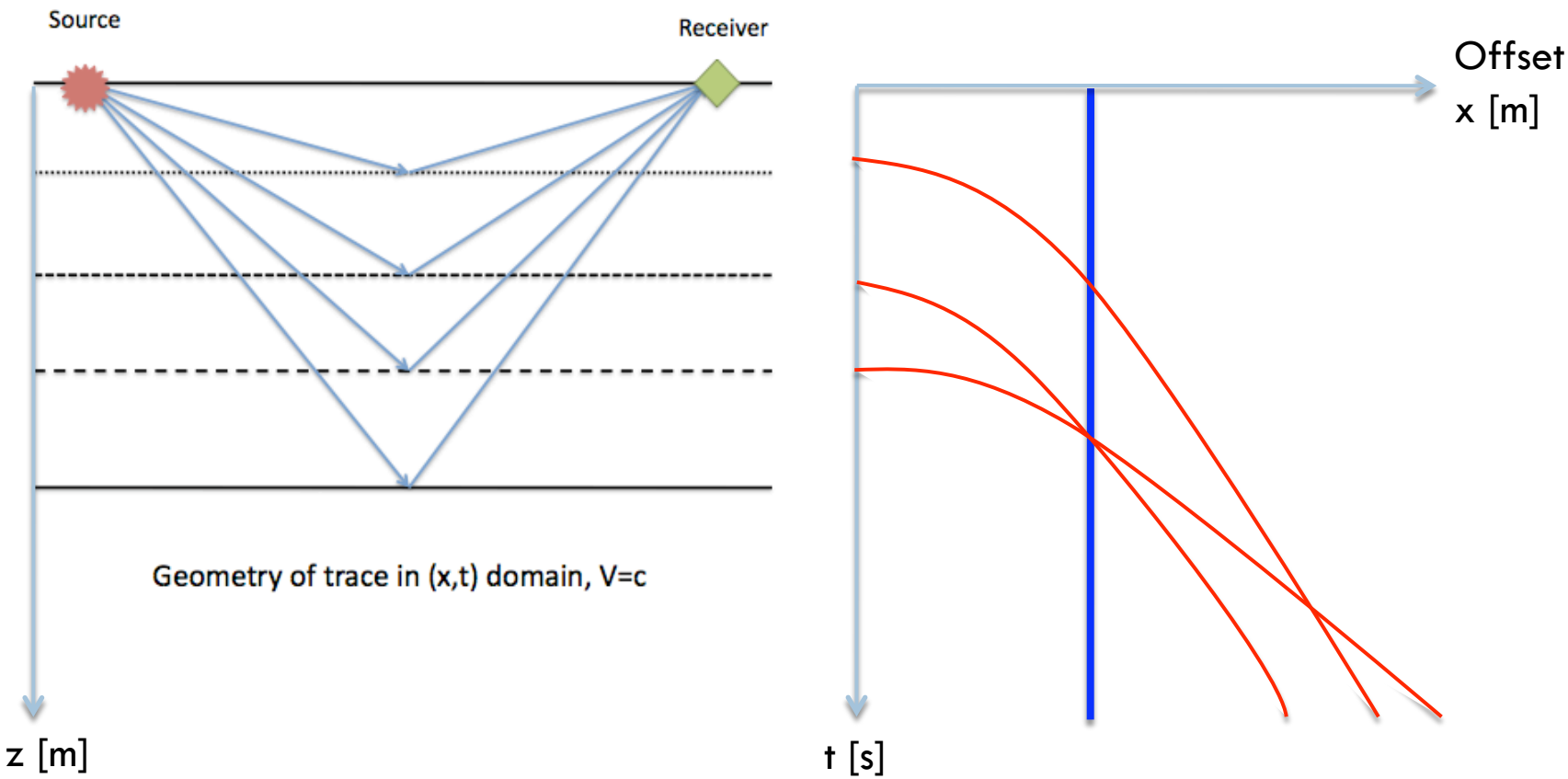
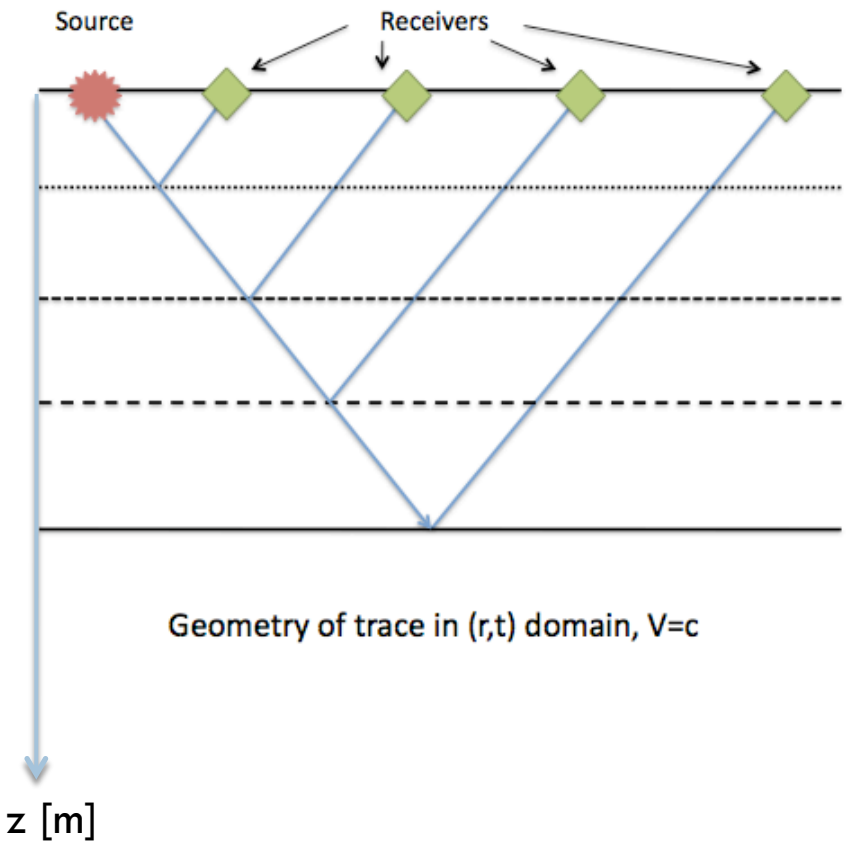
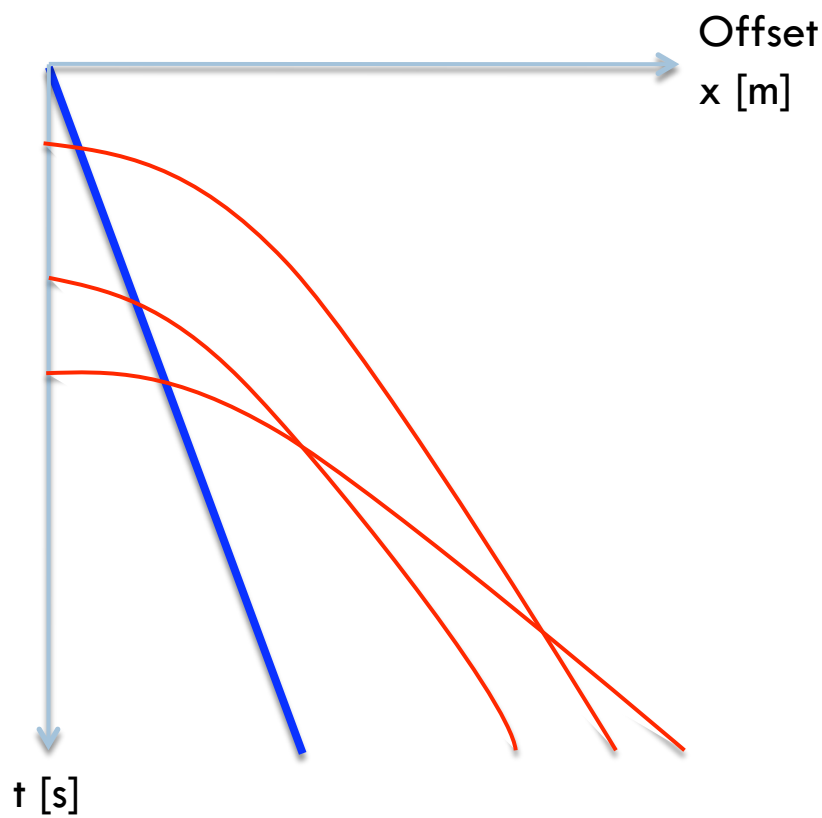
Single Trace: Offset Domain

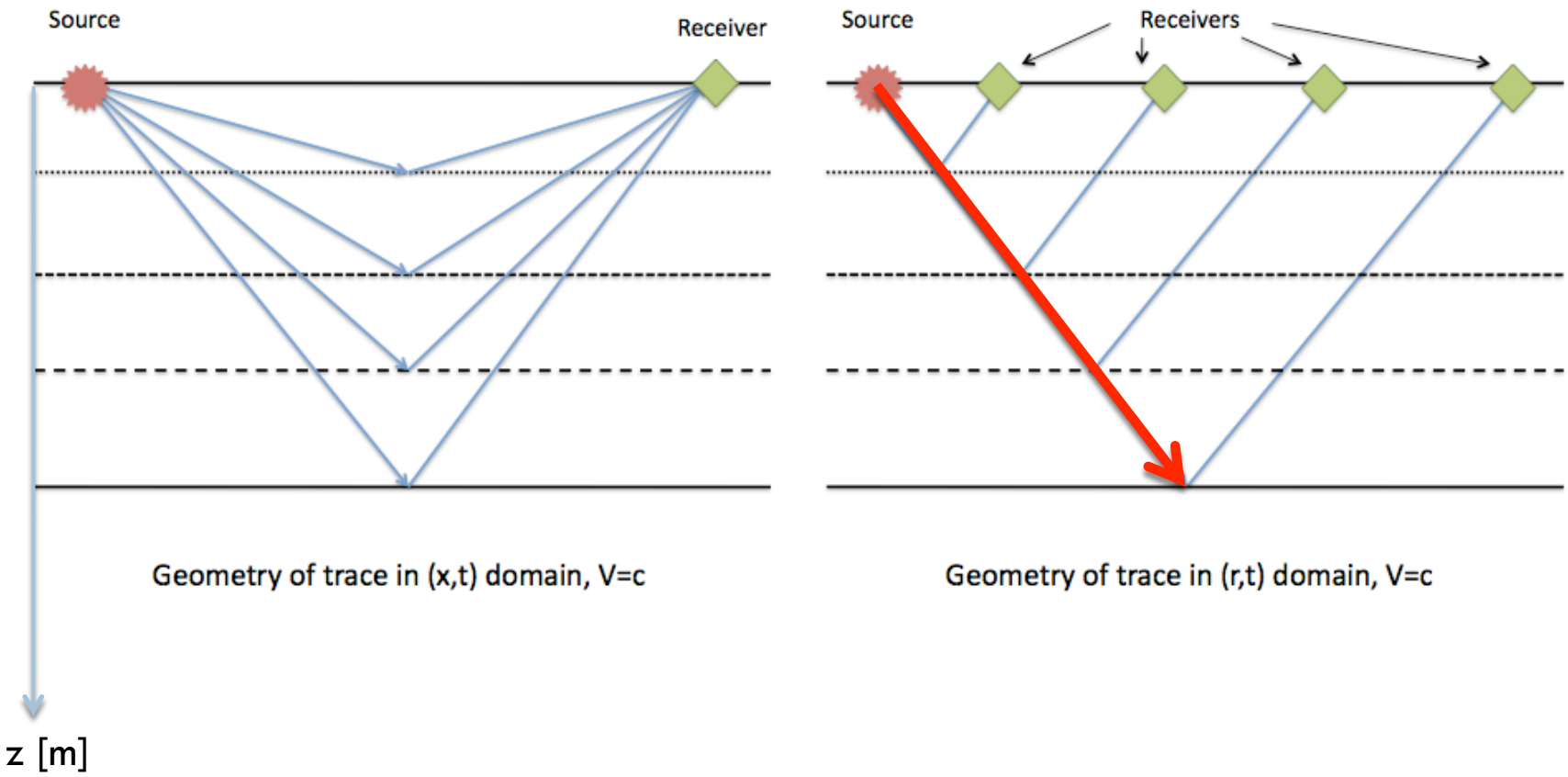


Single Trace: Radial Domain



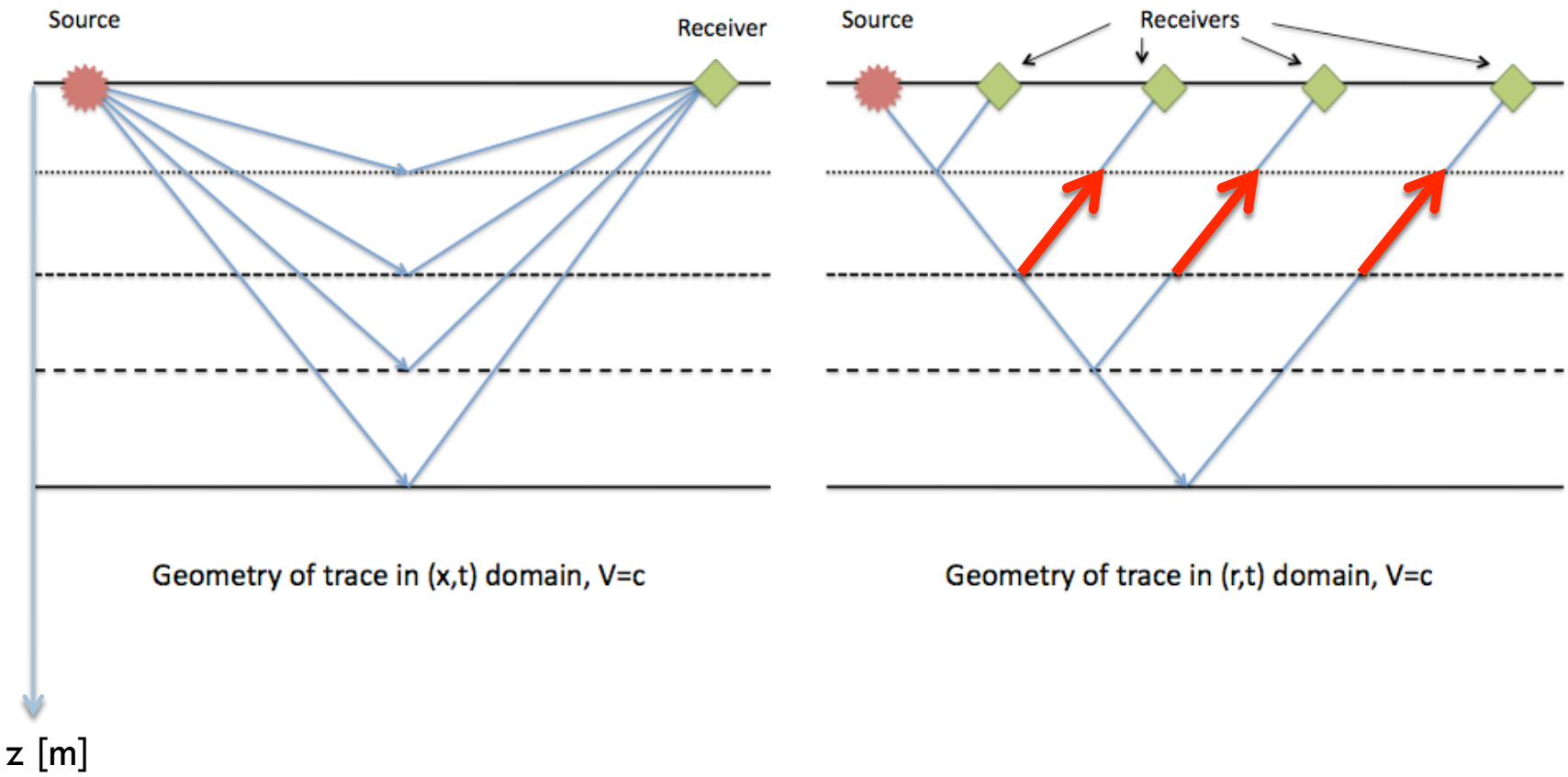


Geometric Advantages of (r,t) Space



~ Same shared downward pathway through layered media

Geometric Advantages of (r,t) Space



~ Same take off angle for each reflector

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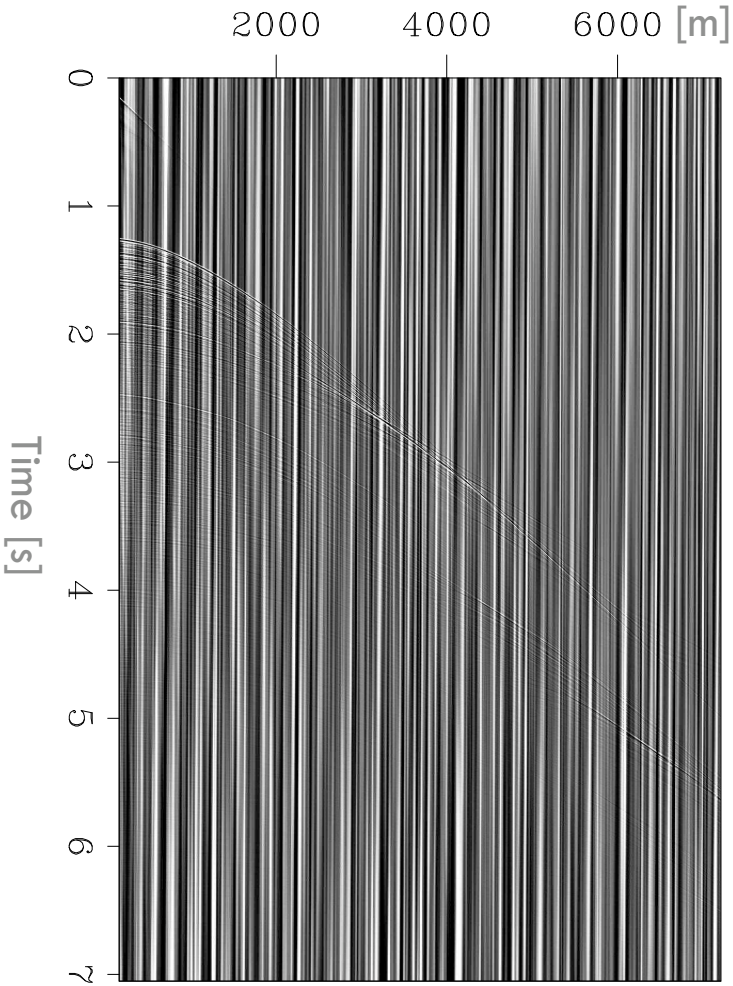
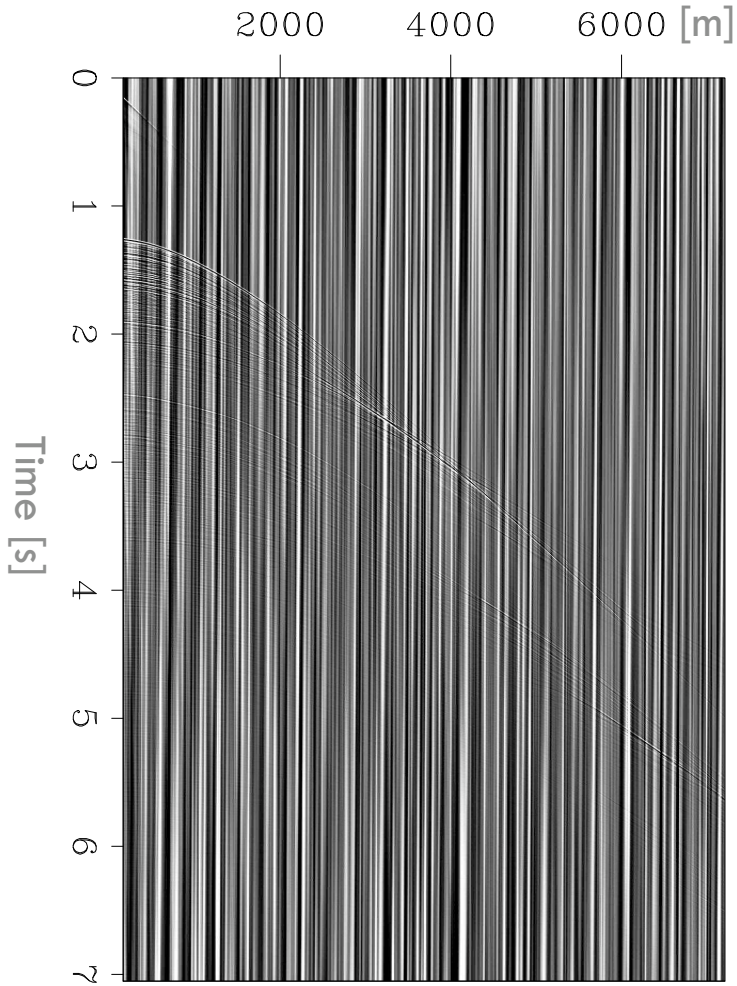
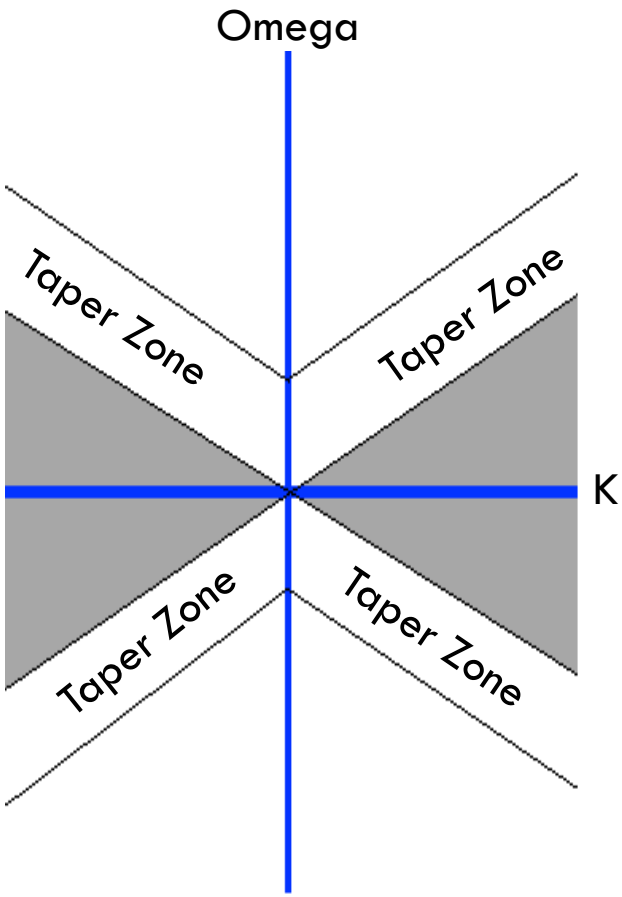
Raw Data Input

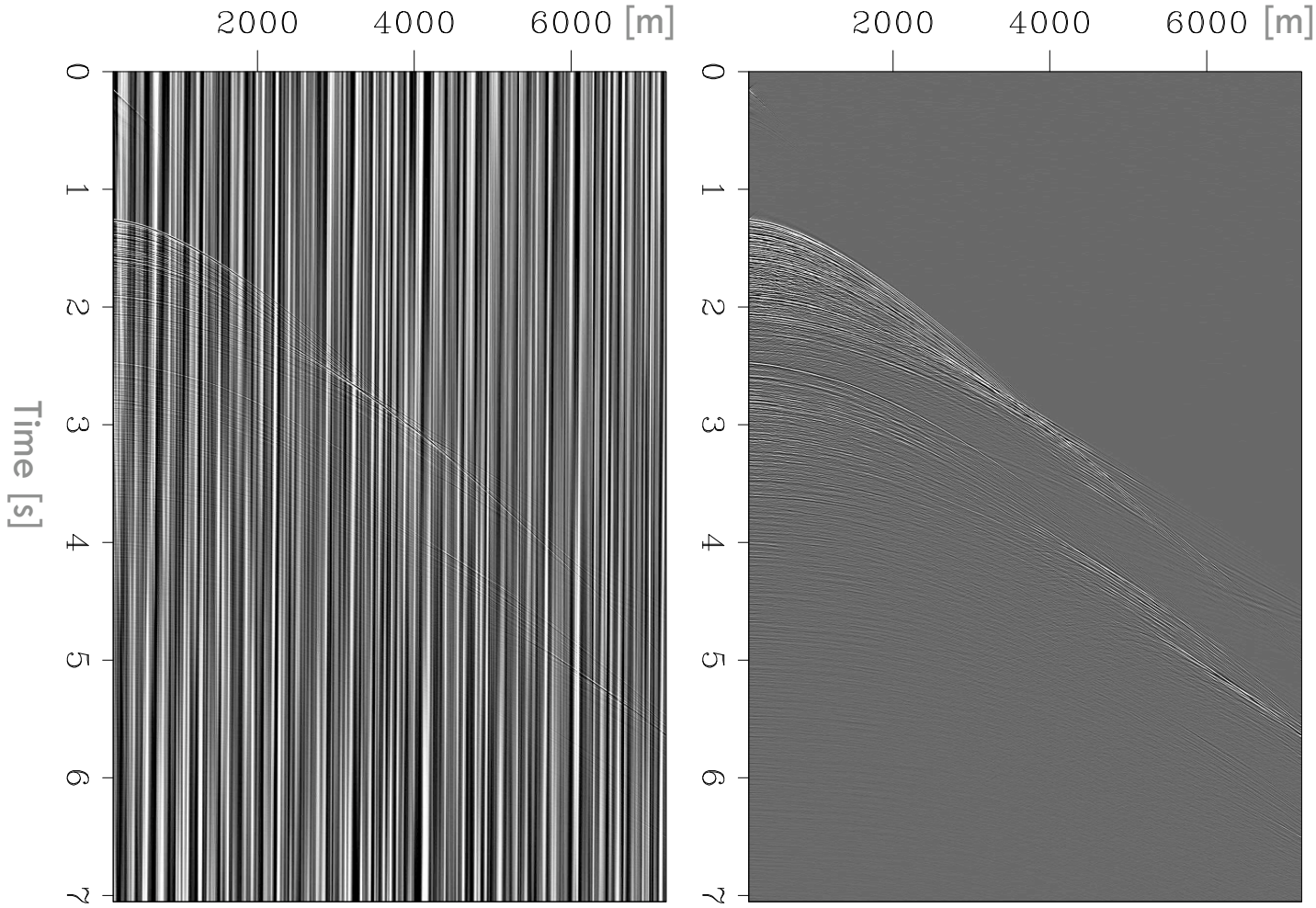


Low Velocity Filtering





Low Velocity Filtering



Processing Steps

- Invert from (x,t) to (r,t) domain

$$m = (R^T R)^{-1} R^T d$$

Processing Steps

- Invert from (x,t) to (r,t) domain

$$m = (R^T R)^{-1} R^T d$$

R = (r,t) to (x,t) transform operator

Processing Steps

- Invert from (x,t) to (r,t) domain

$$m = (R^T R)^{-1} R^T d$$

m = Transformed data in (r,t) domain

Processing Steps

- Invert from (x,t) to (r,t) domain

$$m = (R^T R)^{-1} R^T d$$

- Apply Ricker-Deconvolution operator

$$Dm = D(R^T R)^{-1} R^T d$$

D = Ricker-Deconvolution operator

Processing Steps

- Invert from (x,t) to (r,t) domain

$$m = (R^T R)^{-1} R^T d$$

- Apply Ricker-Deconvolution operator

$$Dm = D(R^T R)^{-1} R^T d$$

- Forward model back to (x,t) domain

$$RDm = RD(R^T R)^{-1} R^T d$$

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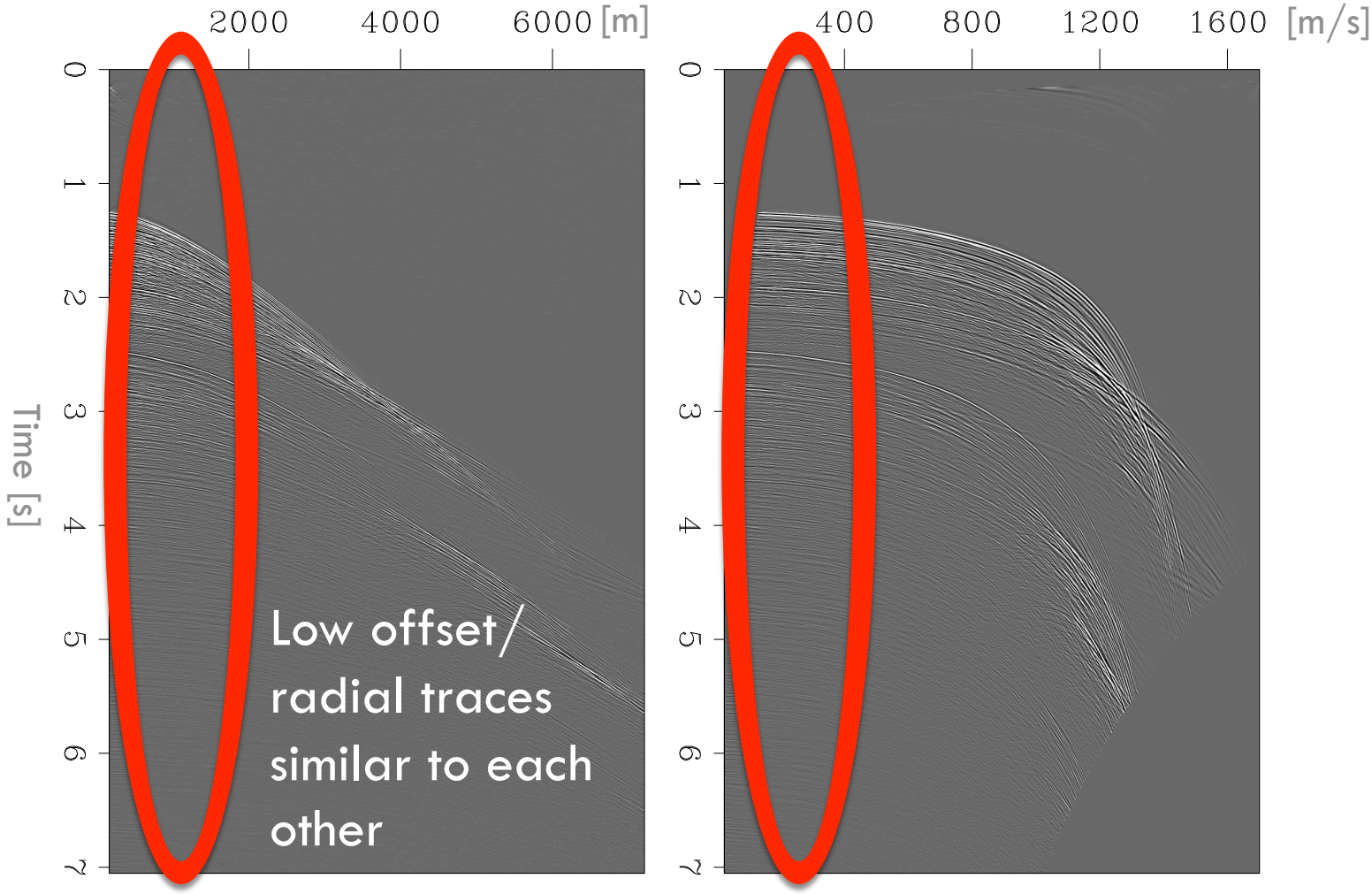
- **Expectations**
- Ricker-Deconvolution Results

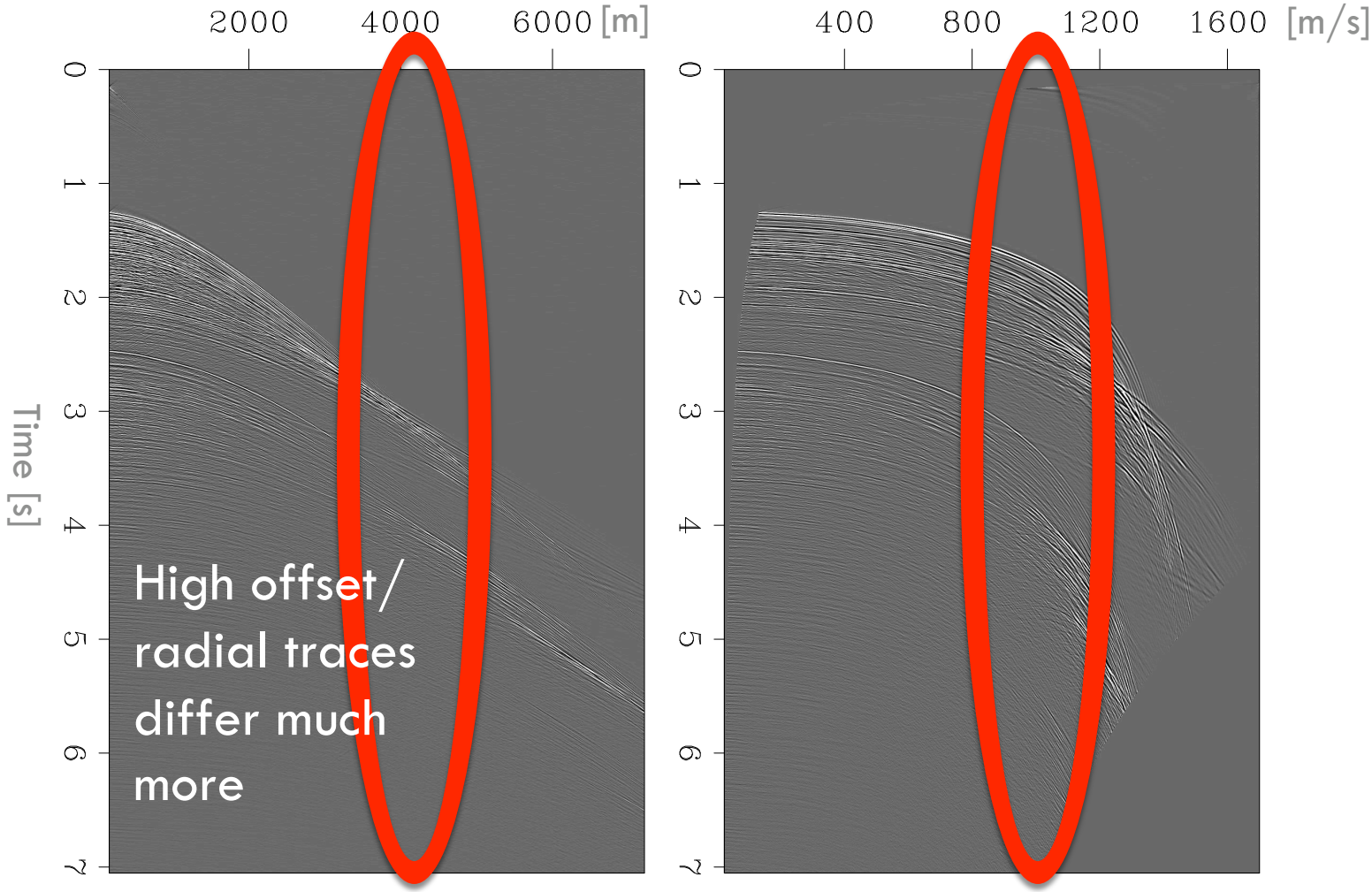
Expectations

- Similar results for (x,t) and (r,t) results when we look at close offsets.

(r,t) Transform Results



(r,t) Transform Results

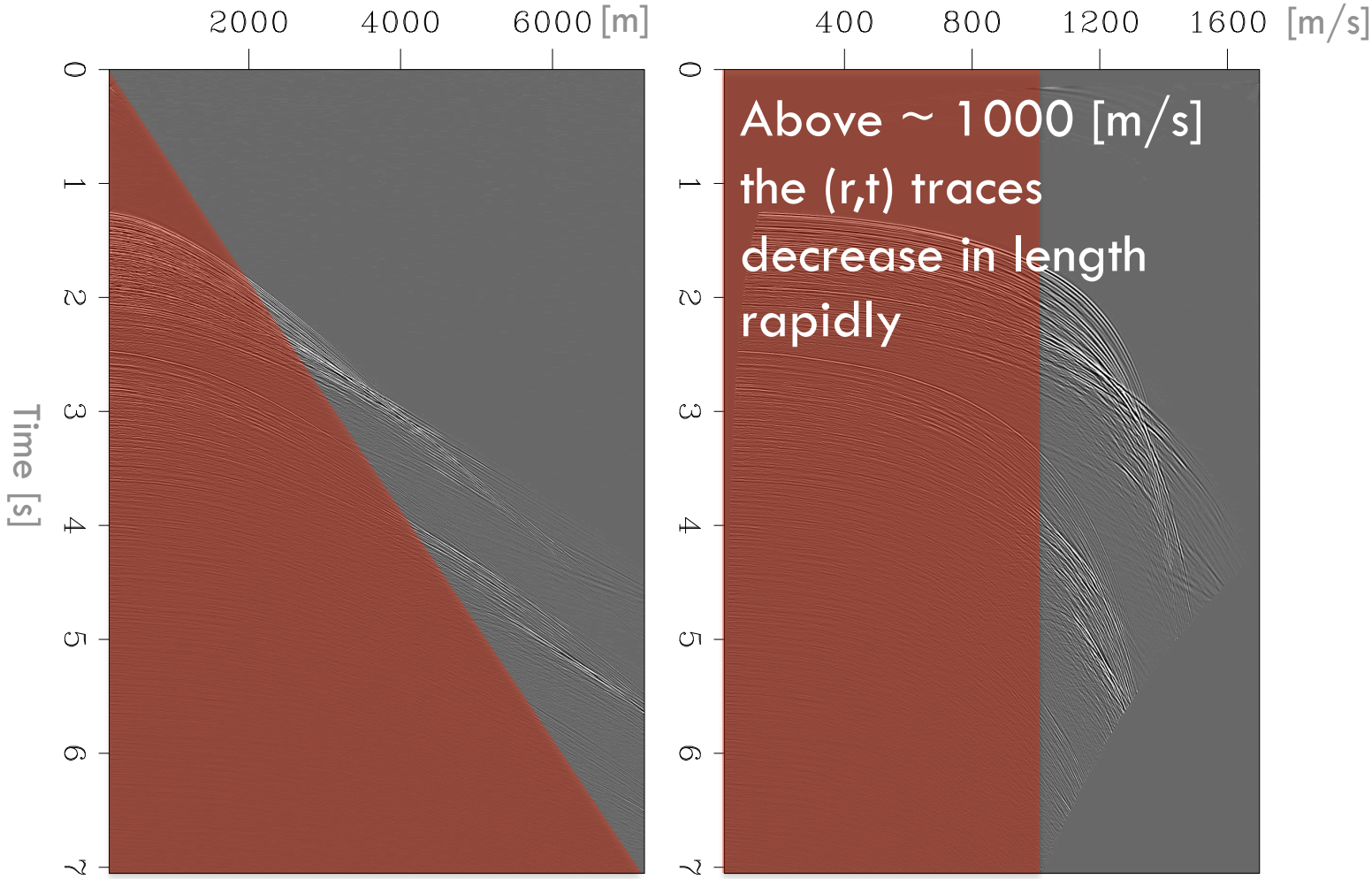


Expectations

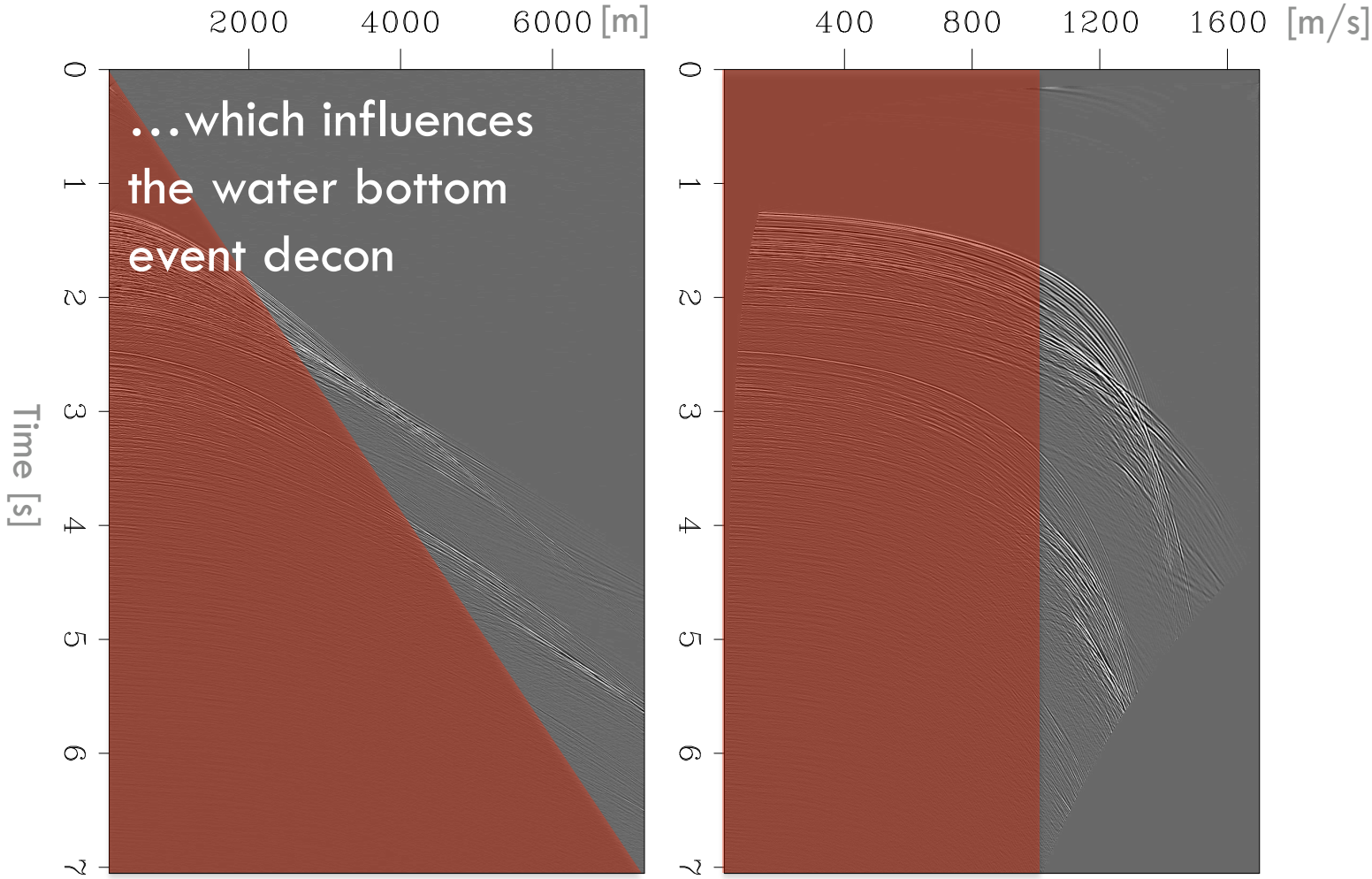
- Similar results for (x,t) and (r,t) results when we look at close offsets.

- Shorter traces at high radial values means distorted earlier events in when viewed in (x,t) space.

(r,t) Transform Results



(r,t) Transform Results



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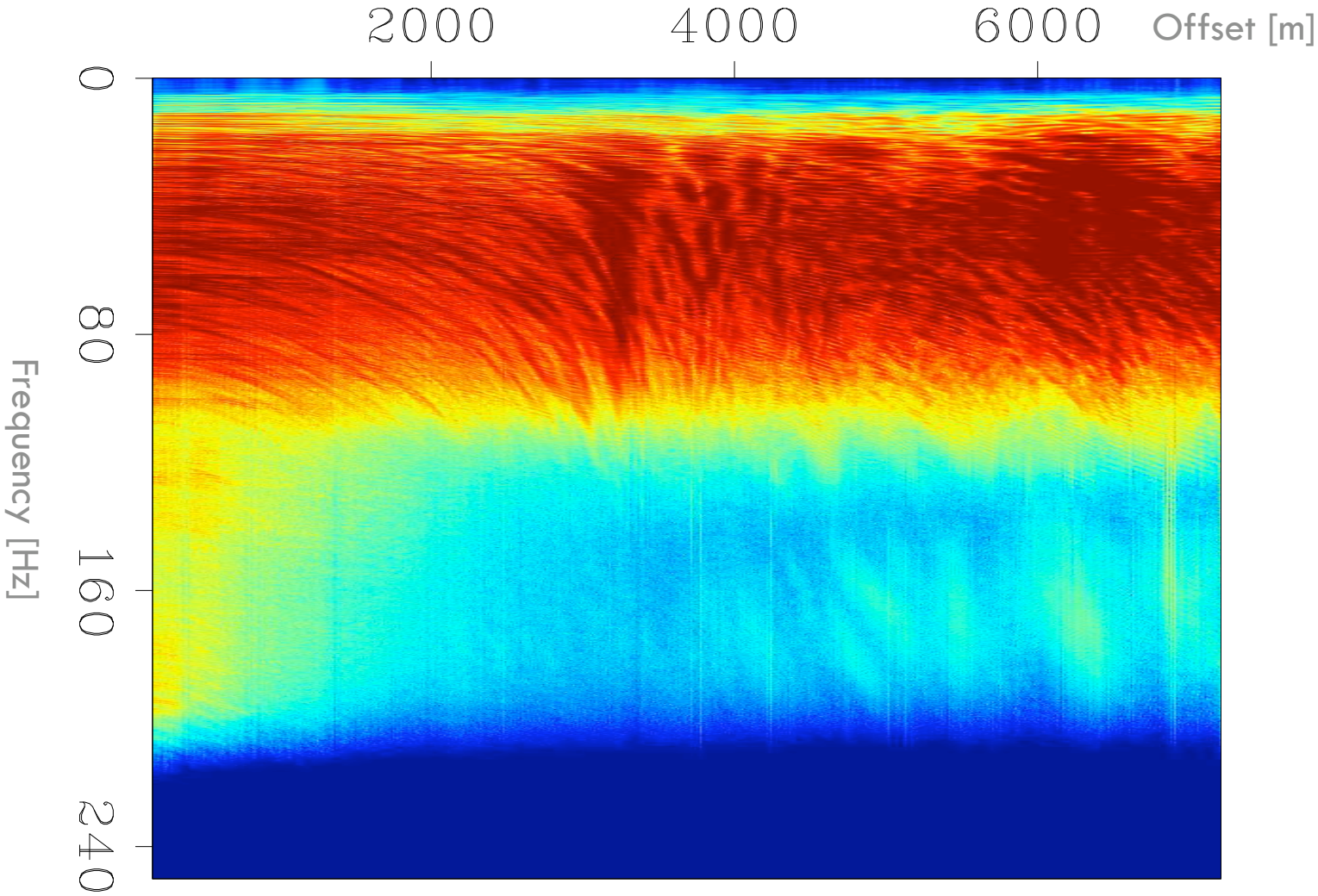
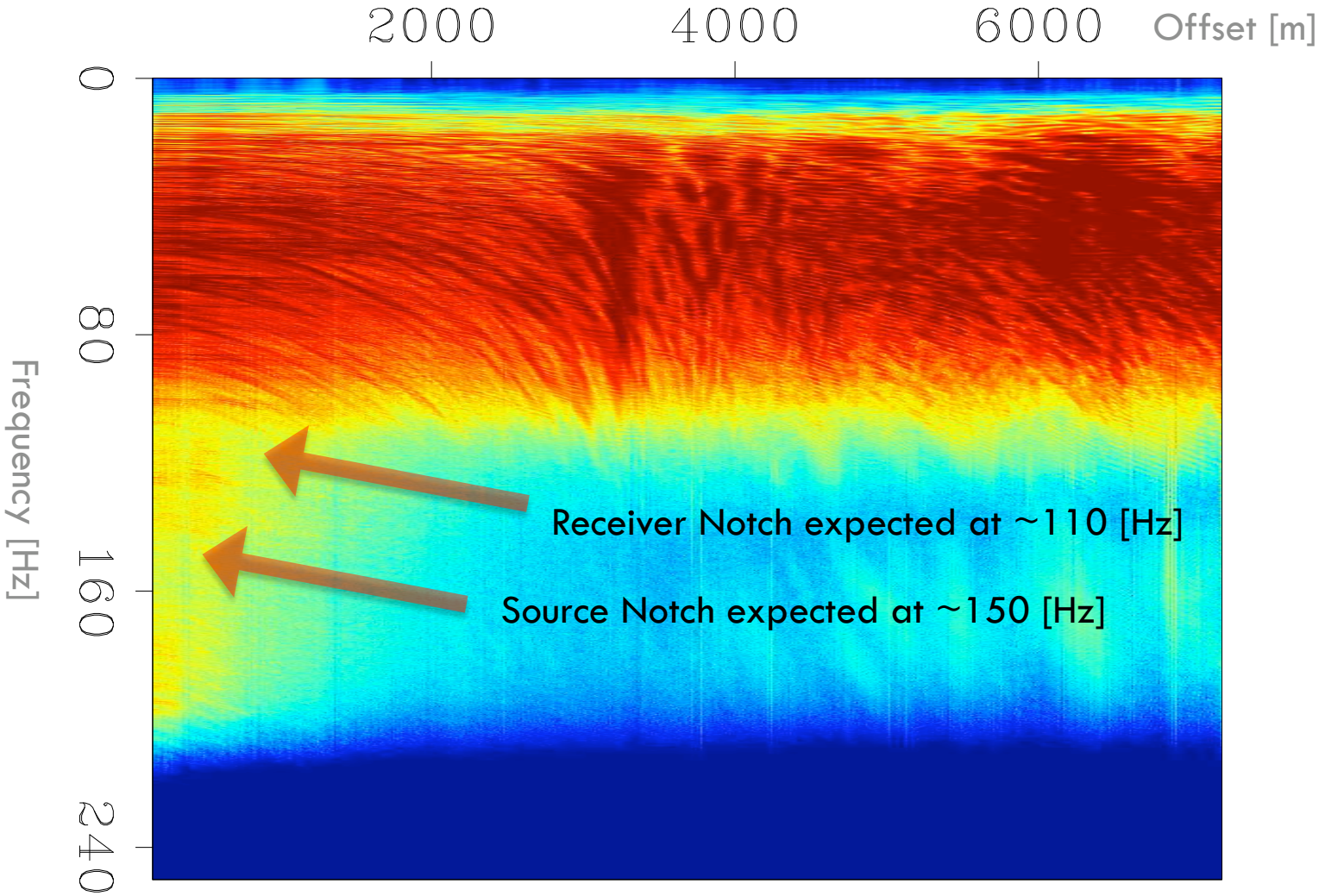
- **Ricker-Deconvolution Results**

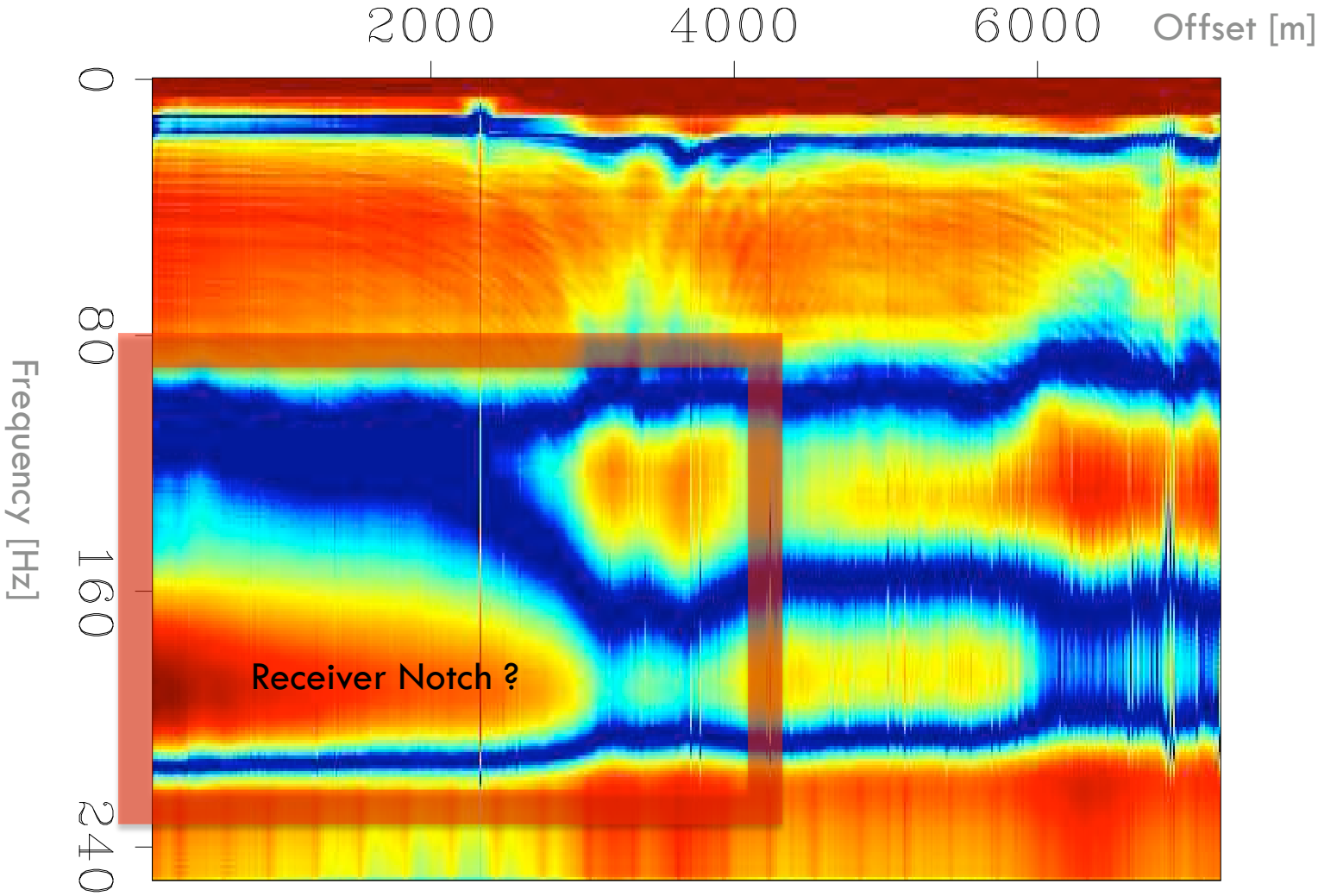
Spectra of Input Data



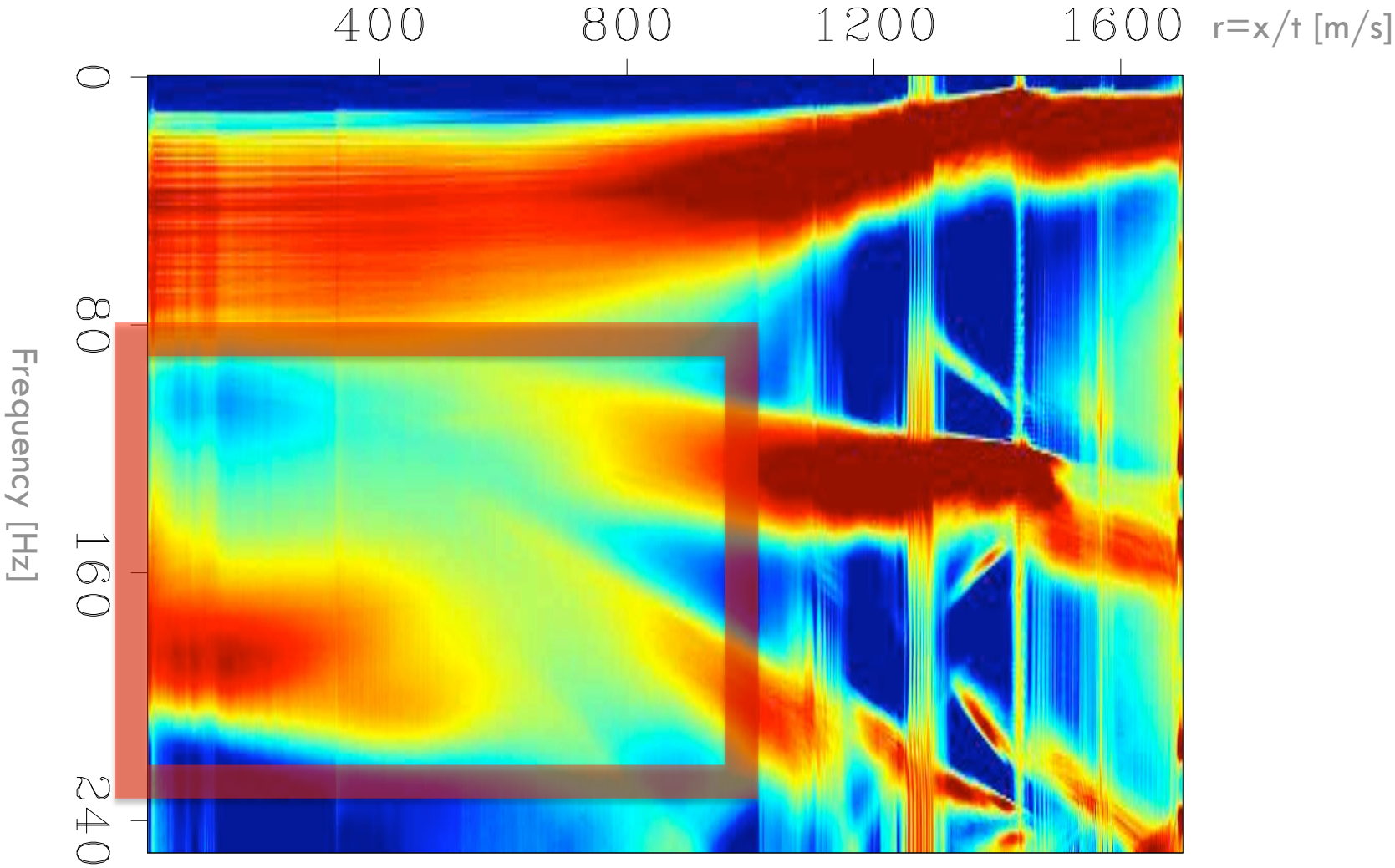
Spectra of Input Data



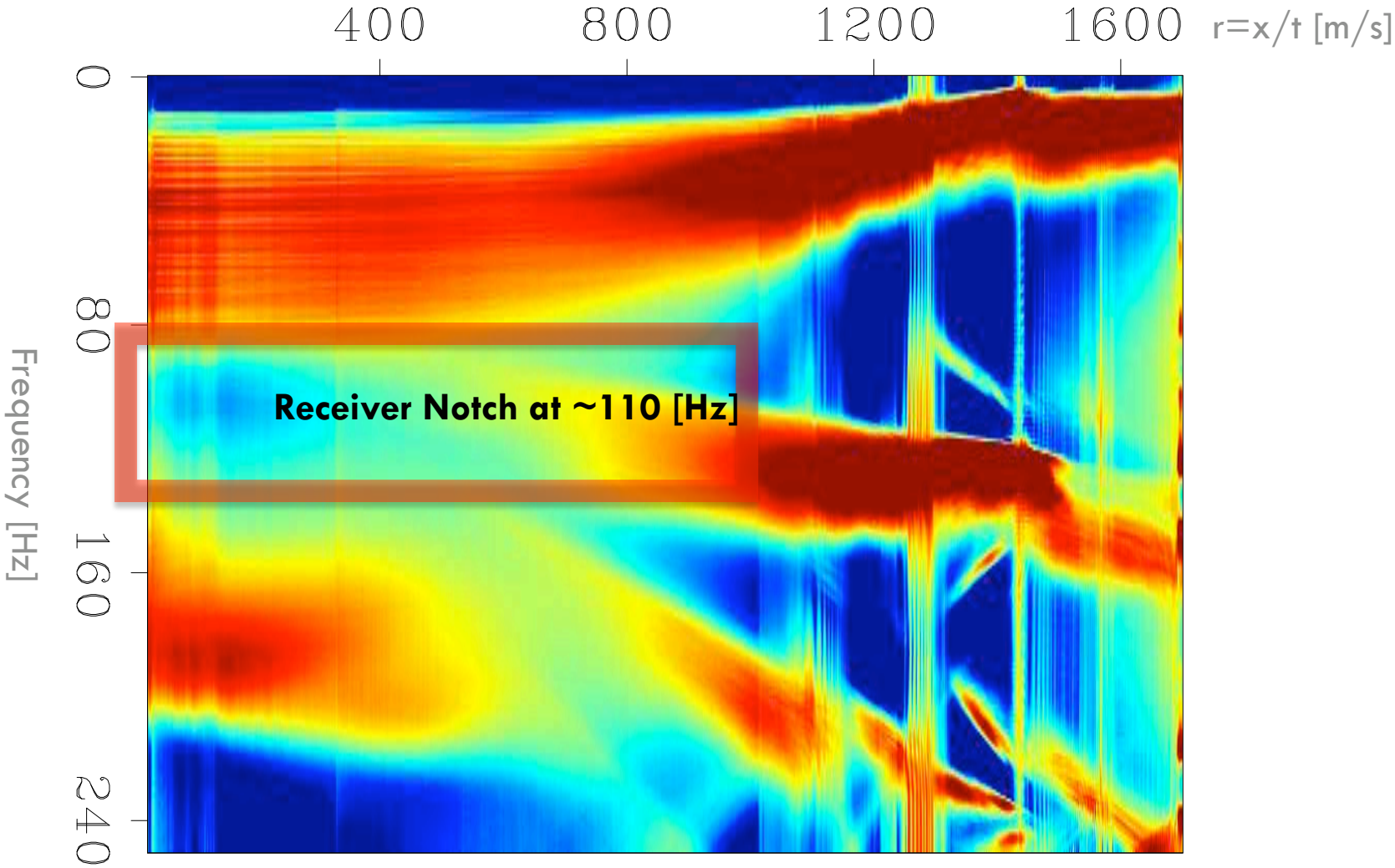
Spectra of Extracted Wavelet (x,t)



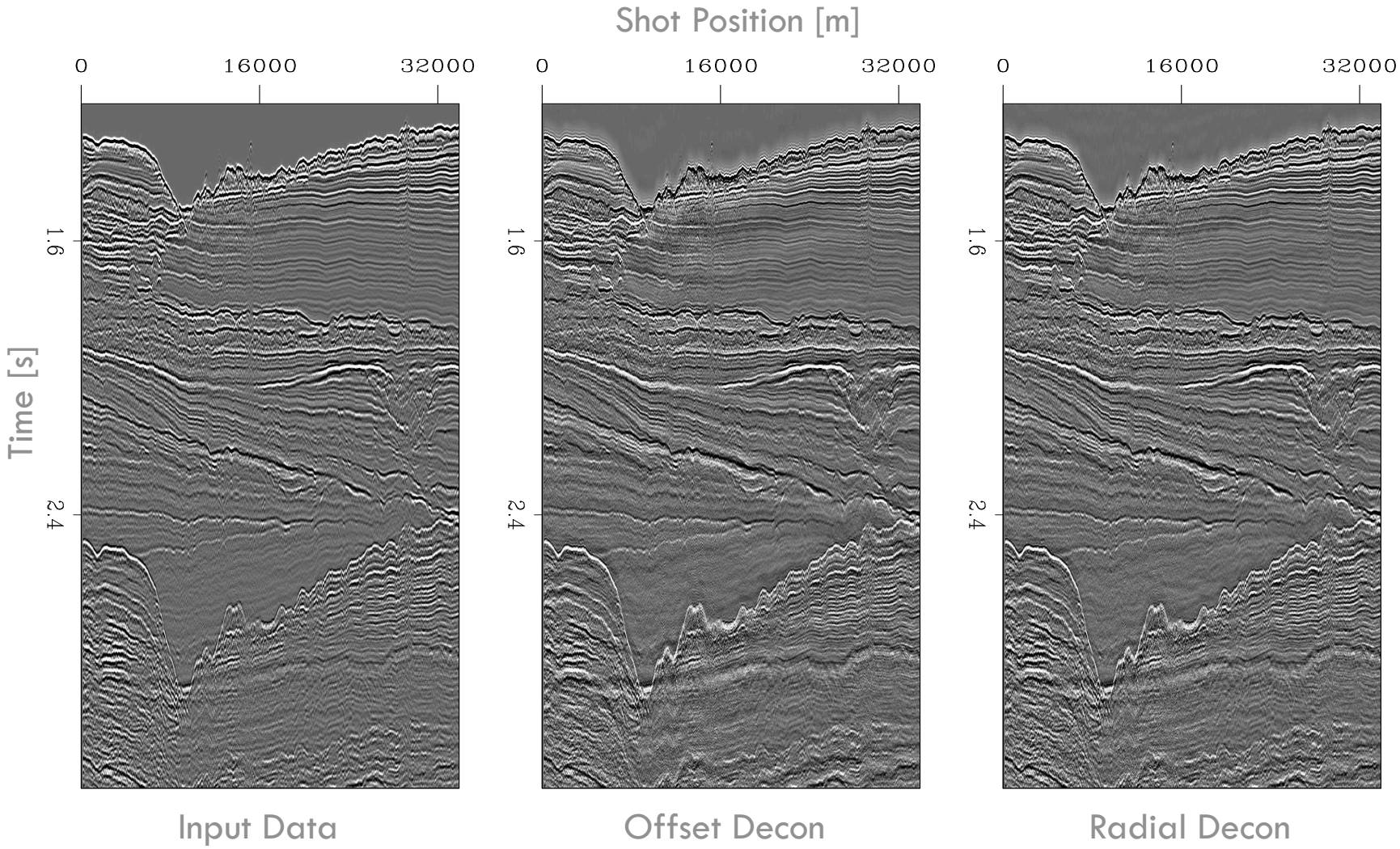
Spectra of Extracted Wavelet (r,t)



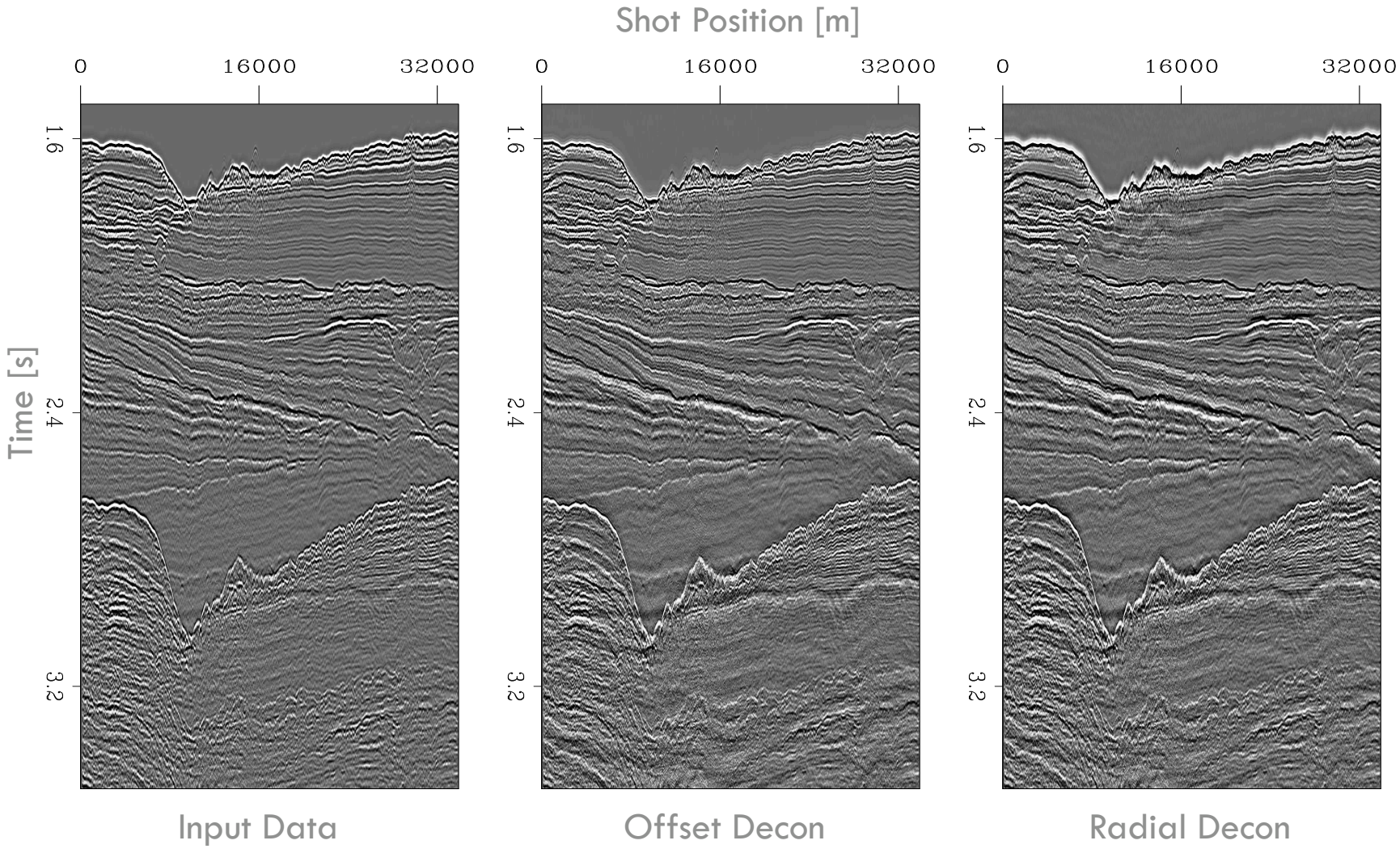
Spectra of Extracted Wavelet (r,t)



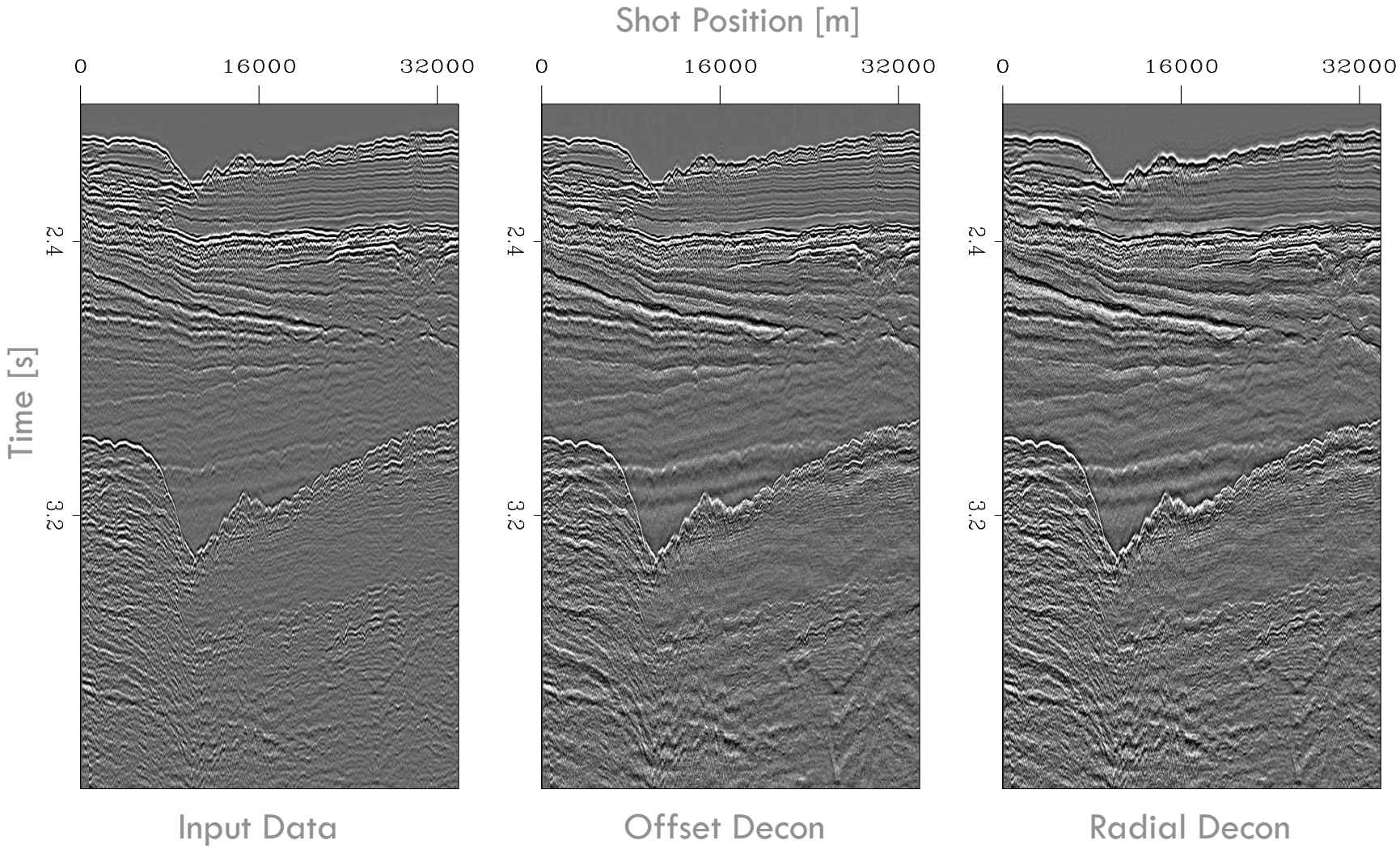
Deconvolved Data: Offset= 500 [m]



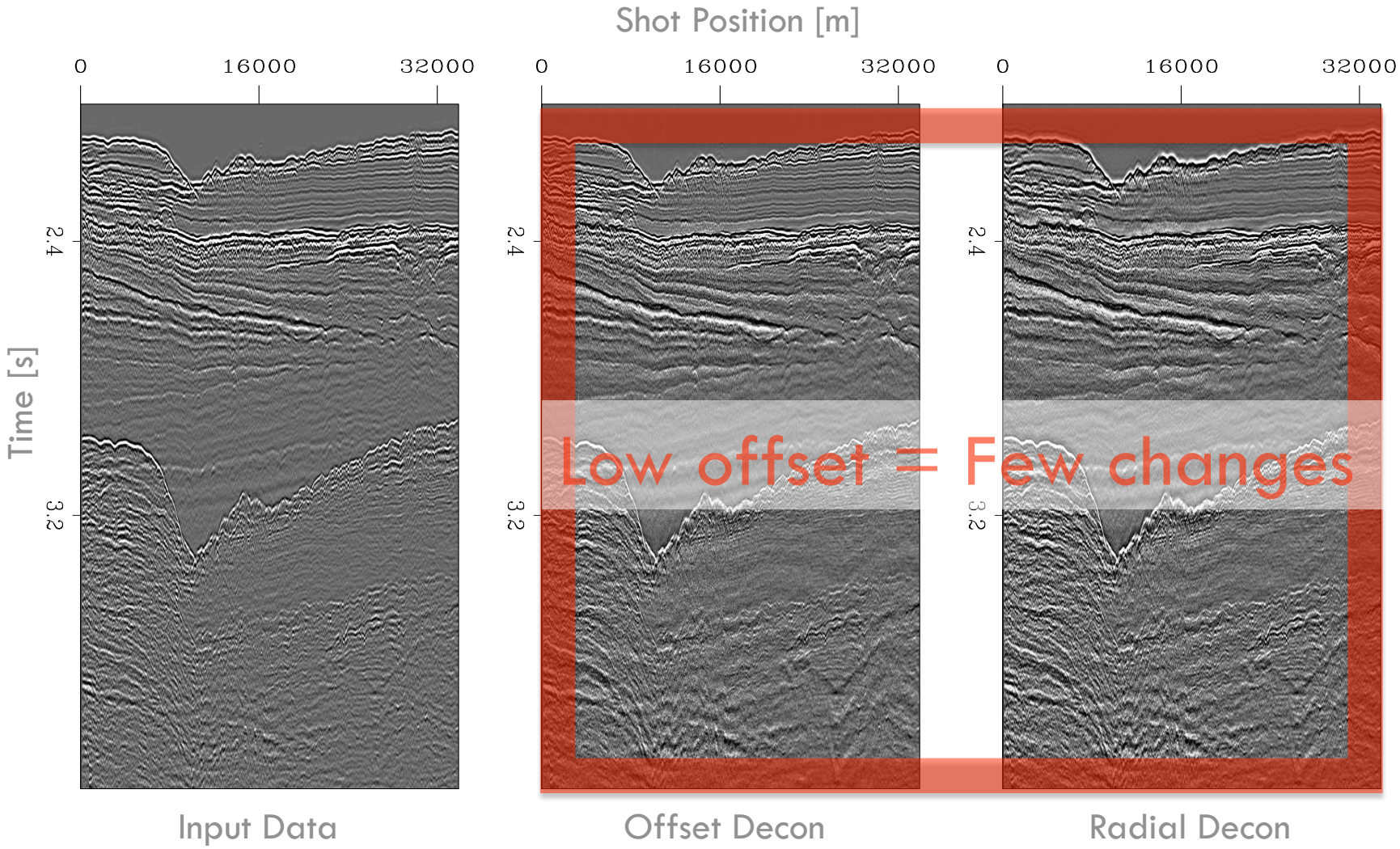
Deconvolved Data: Offset=1500 [m]



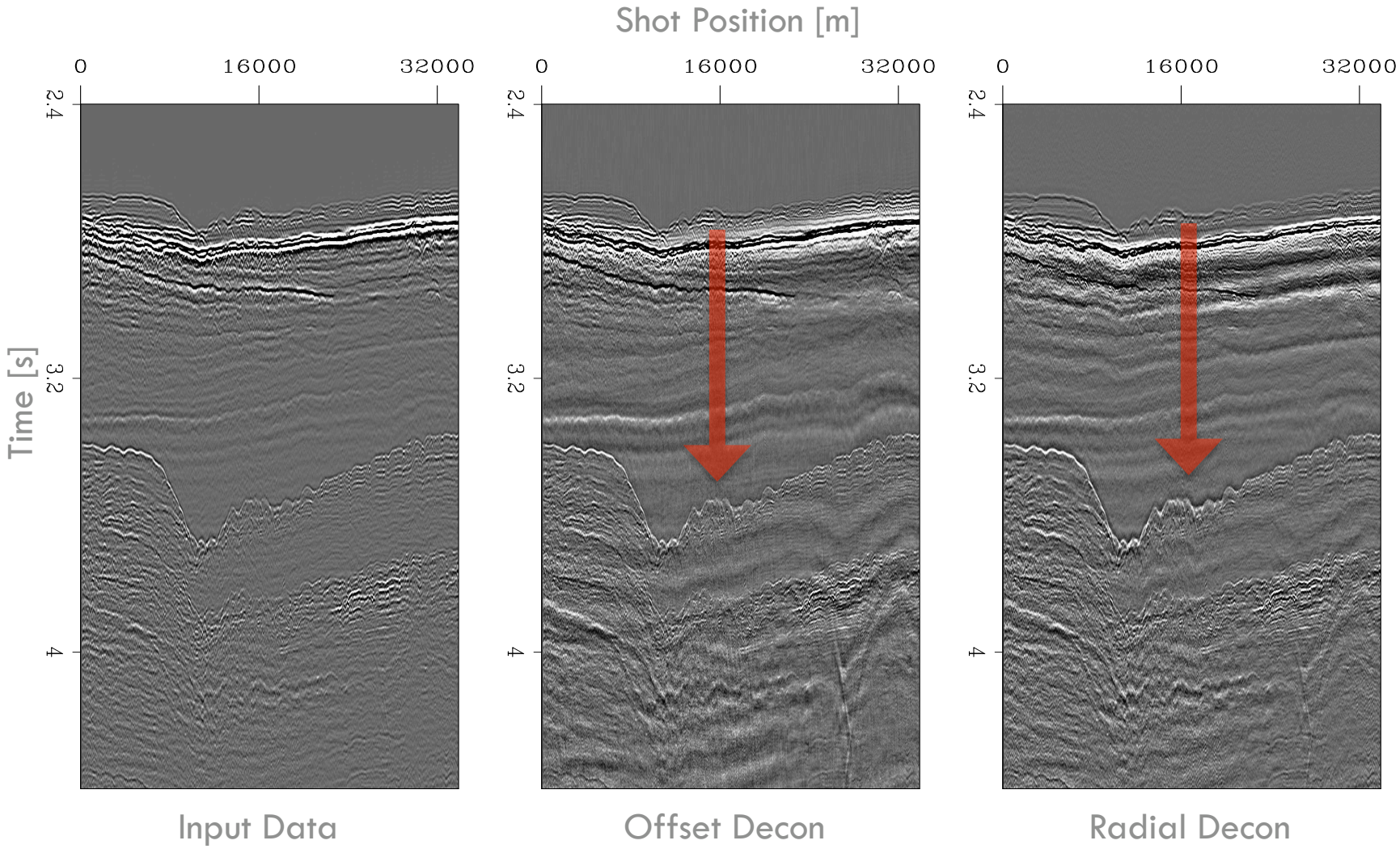
Deconvolved Data: Offset=2500 [m]



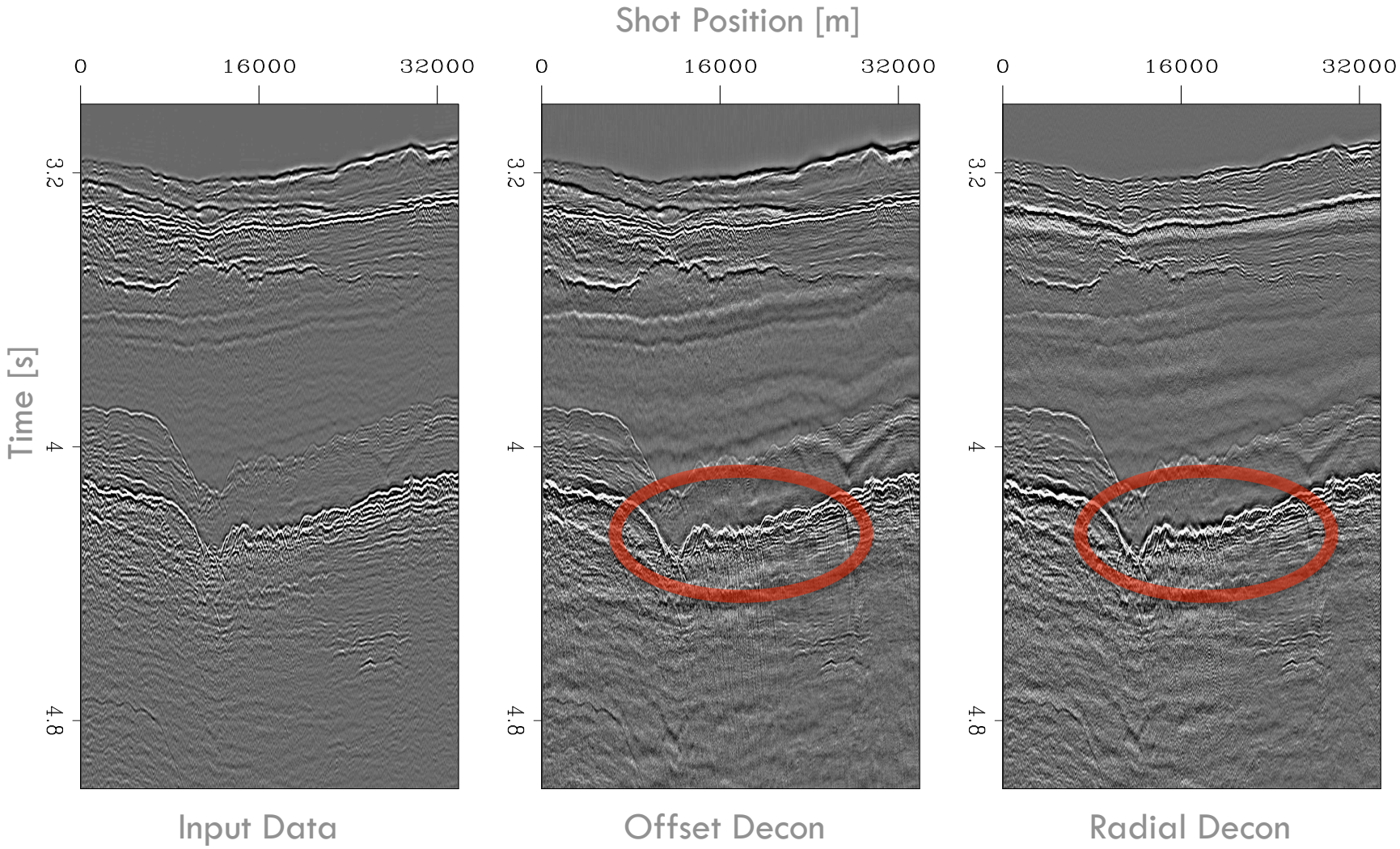
Deconvolved Data: Offset=2500 [m]



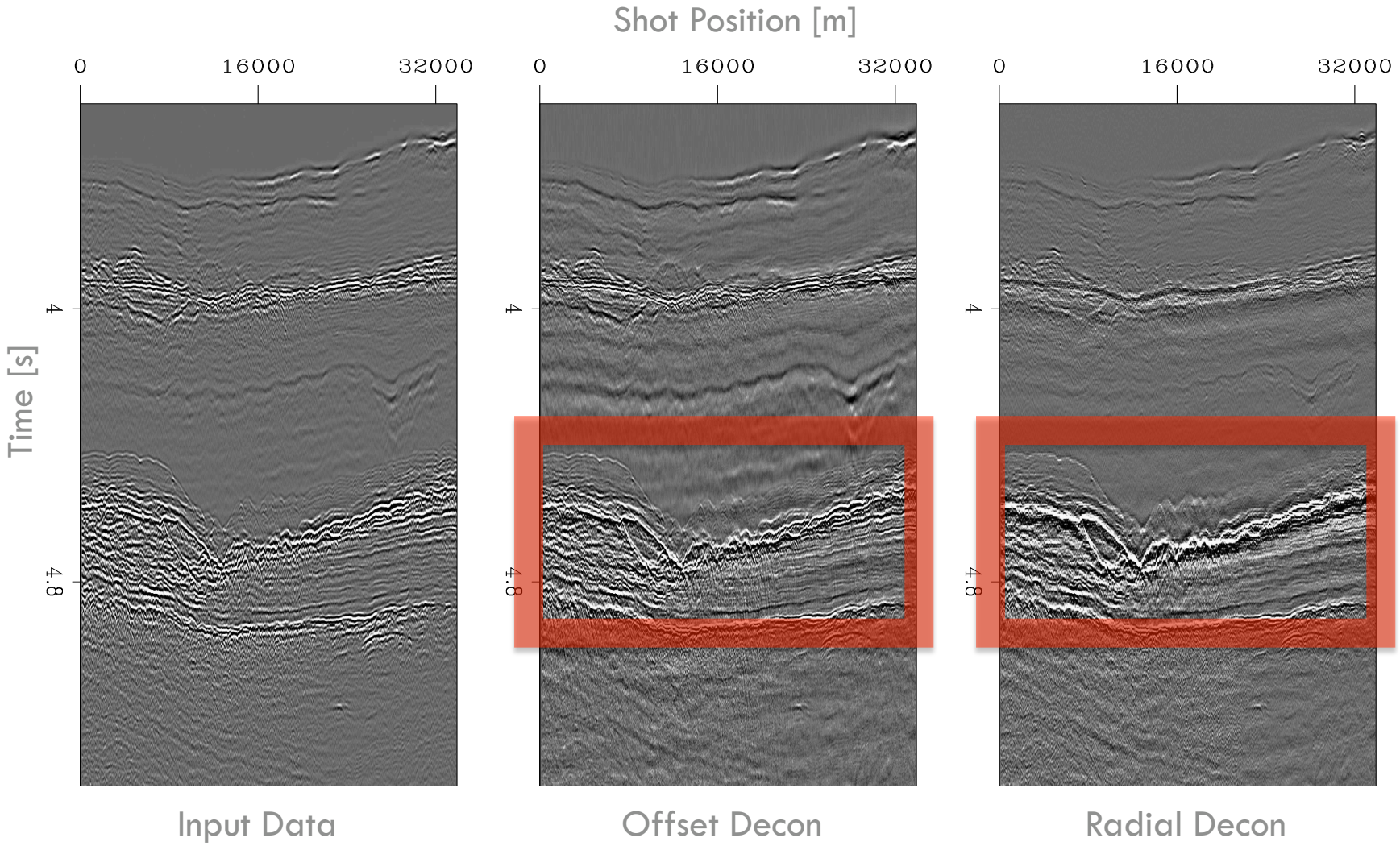
Deconvolved Data: Offset=3500 [m]



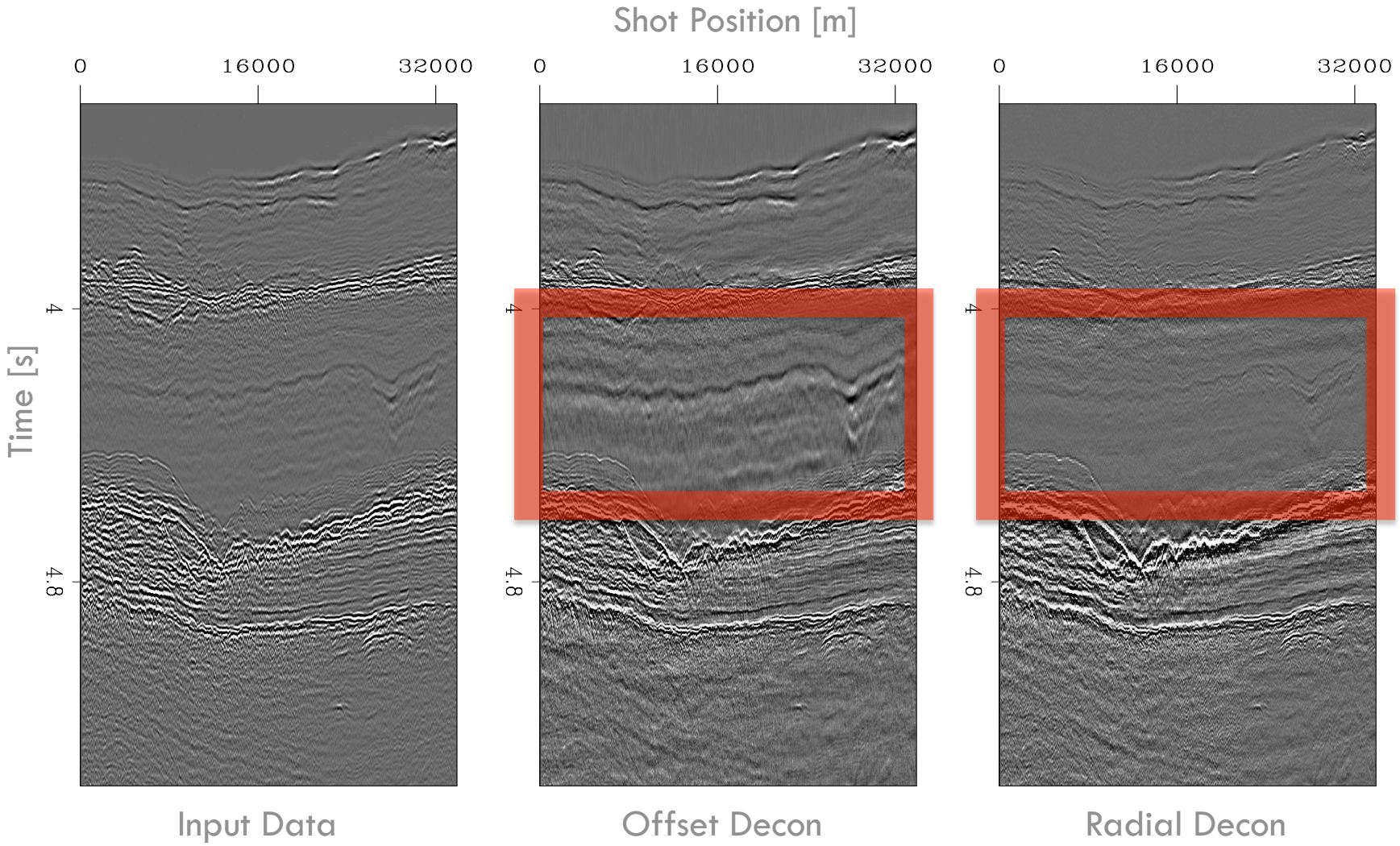
Deconvolved Data: Offset=4500 [m]



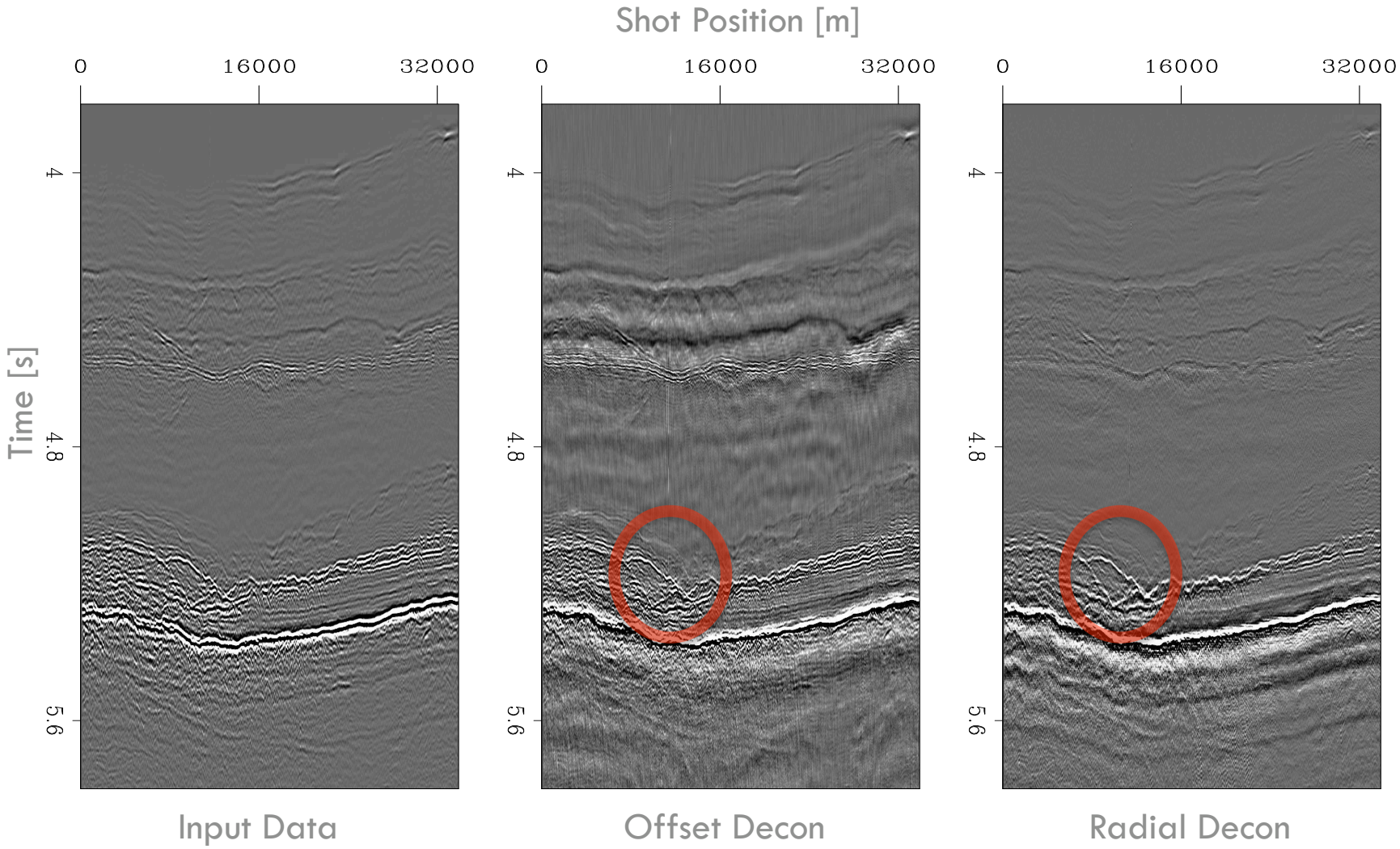
Deconvolved Data: Offset=5500 [m]



Deconvolved Data: Offset=5500 [m]



Deconvolved Data: Offset=6500 [m]



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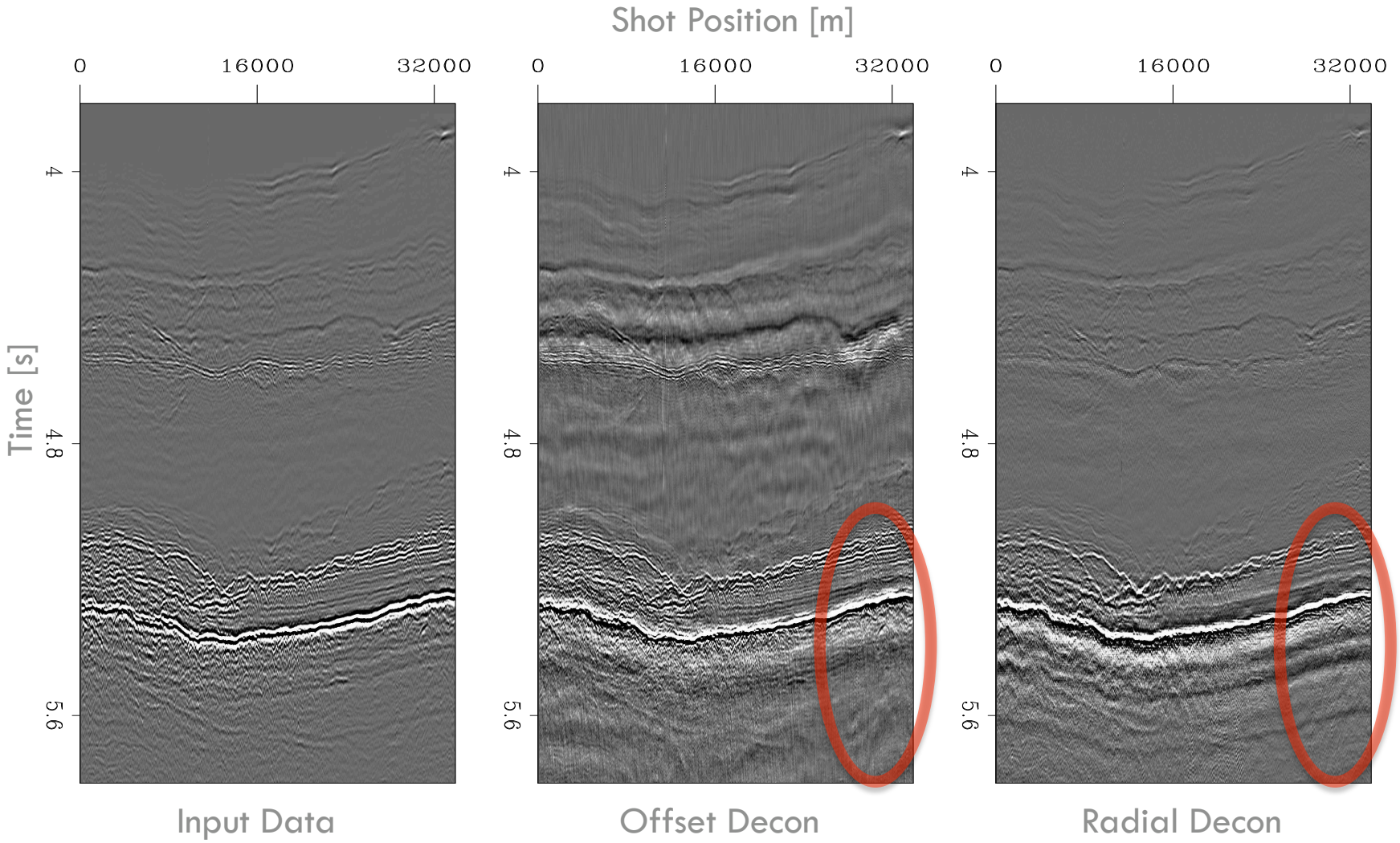
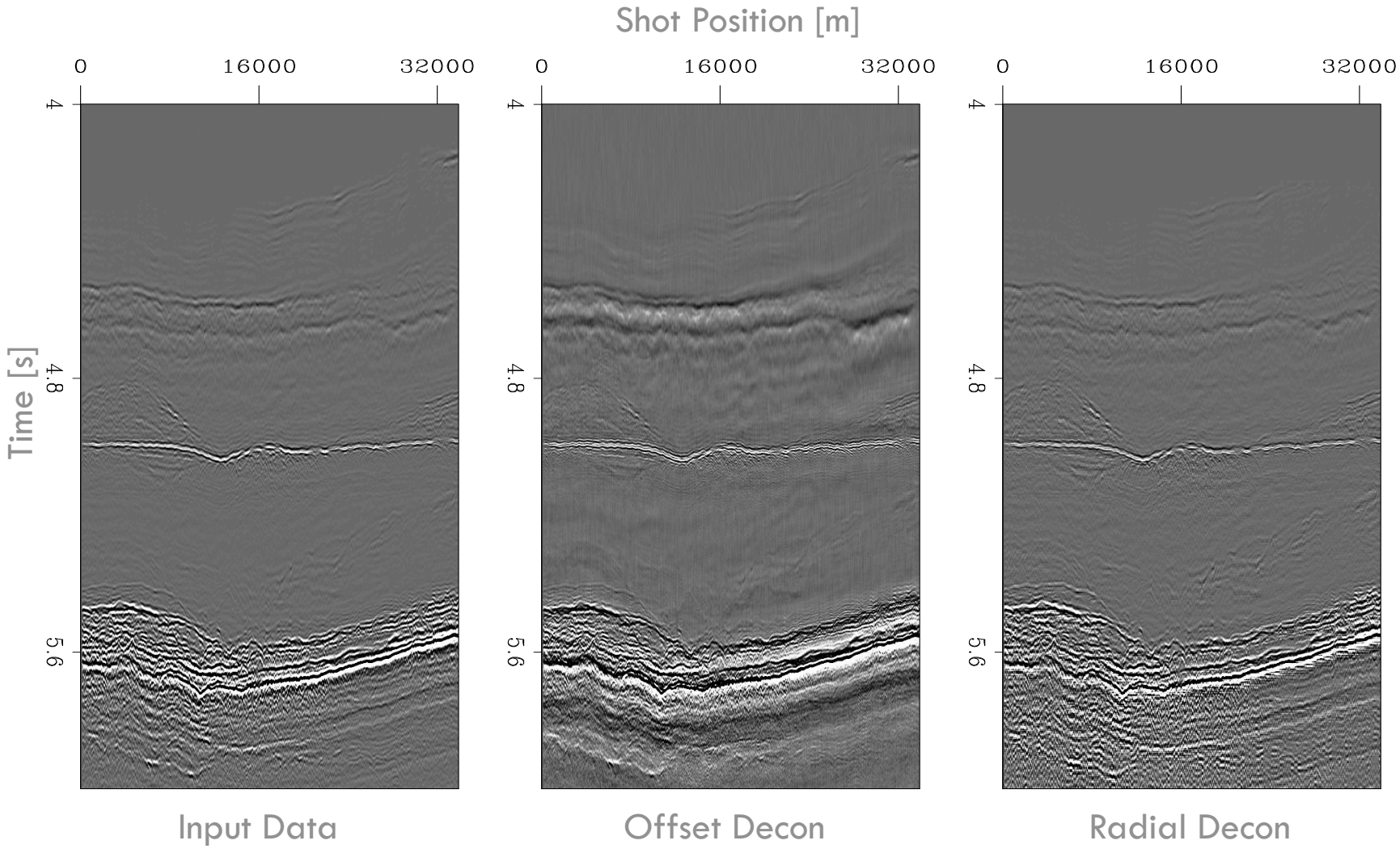


Deconvolved Data: Offset=7200 [m]



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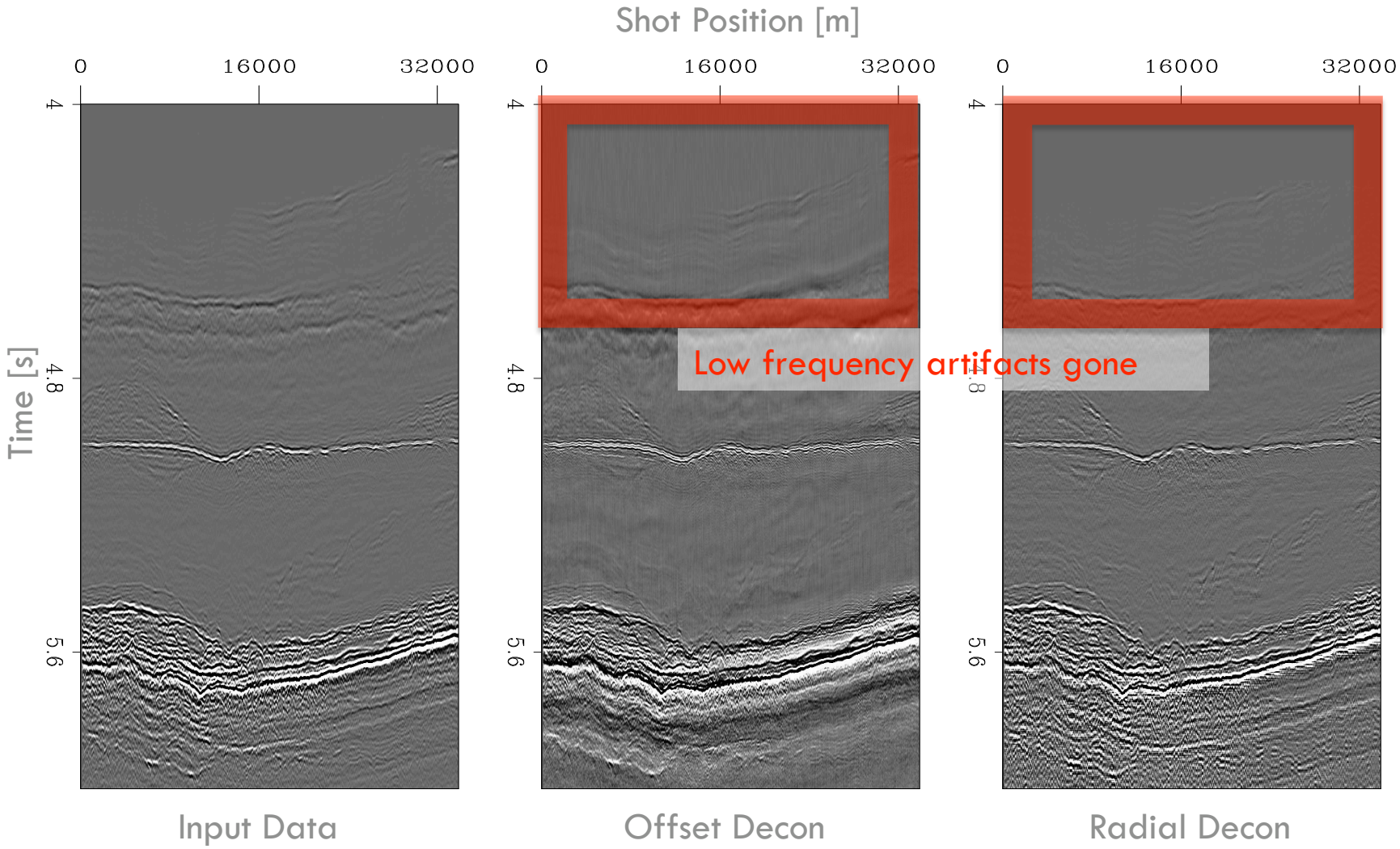

Conclusions

- Poorer results for earlier events at far offset due to trace

- Marginal improvement for further offset / late time events.

Acknowledgements

- Antoine Guitton
- Jon Claerbout
- Chevron
- SEP Sponsors