



Bandwidth Enhancement

NZ 3D Processing

27 July 2021

cgg.com



INSTITUTE FOR GEOPHYSICS



Passion for Geoscience

1. Convert to CGG Internal Format
2. Nav merge / trace edit
3. Low Cut Filter
4. Time Variant Scaling (TVS) & Resample to 4ms
5. Swell Noise Attenuation (SNA)
6. Debubble
7. Linear Noise Attenuation (LNA)
8. Tidal Statics Correction
9. Water Column Statics Correction
10. Shot & Channel Scaling
11. Receiver Motion Correction (RMC)
12. Joint Deghost & Designature
13. Residual Bubble Removal
14. Source Sensor Datum Correction
15. Shallow Water Demultiple
16. Surface Related Multiple Elimination (3D SRME)
17. Simultaneous Subtraction of MWD & SRME
18. Residual Linear Noise Attenuation (residual LNA)
19. Trace Regularization & Interpolation
20. Velocity Analysis
21. Radon Demultiple
22. Footprint Removal
23. Diffracted Multiple Removal
24. Common Offset Denoise
25. Q Analysis and Compensation
26. Final TTI Kirchhoff Migration
27. Convert from Depth to Time Domain
28. High Density Automatically Velocity Analysis
29. Radon Demultiple
30. Trim Static Correction
31. Post Migration Denoise
32. Q Compensation (Amplitude)
33. Spectra Offset Balancing
34. Angle Mute & Full Stack
35. Residual Noise Attenuation
36. Frequency Dependent Amplitude Correction for Spatial Amplitude
37. [Bandwidth Enhancement](#)

- **Objective:**

To extend the bandwidth of full stack data.

- **Procedure:**

- Input data is full stack in time domain.
- Bandwidth enhancement in curvelet domain is a spectrum whitening technology, which can better enhance signal while depressing noise.

- **Display:**

- Selected subline and crossline in time domain.
- Spectrum.

- **Observation & Recommendation:**

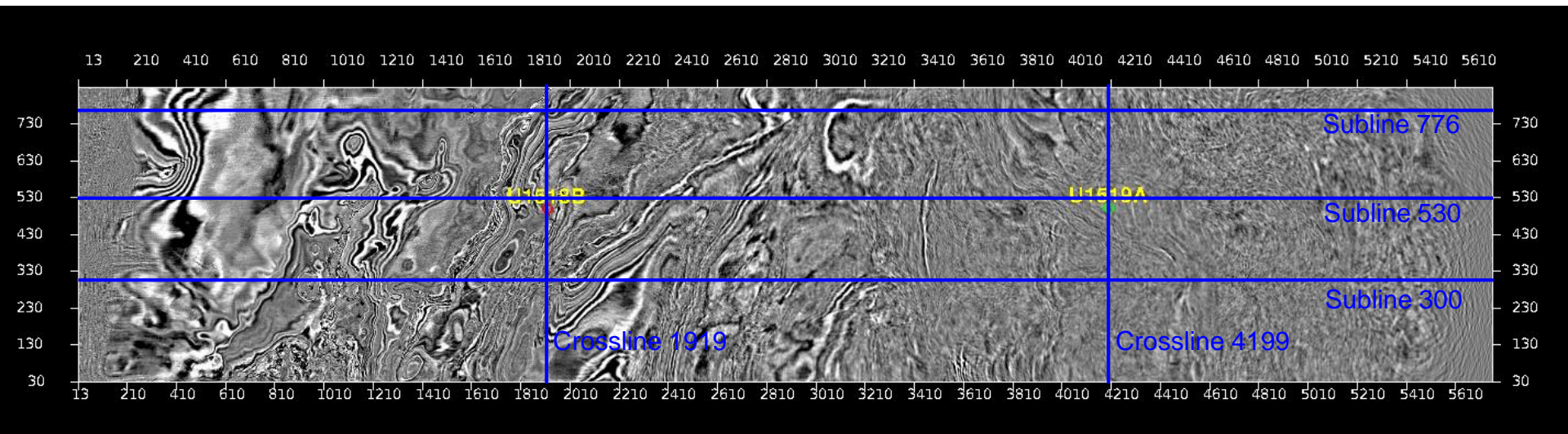
- Bandwidth enhancement broadens the frequency spectrum.
- Bandwidth enhancement is recommended for production.



Test Lines location

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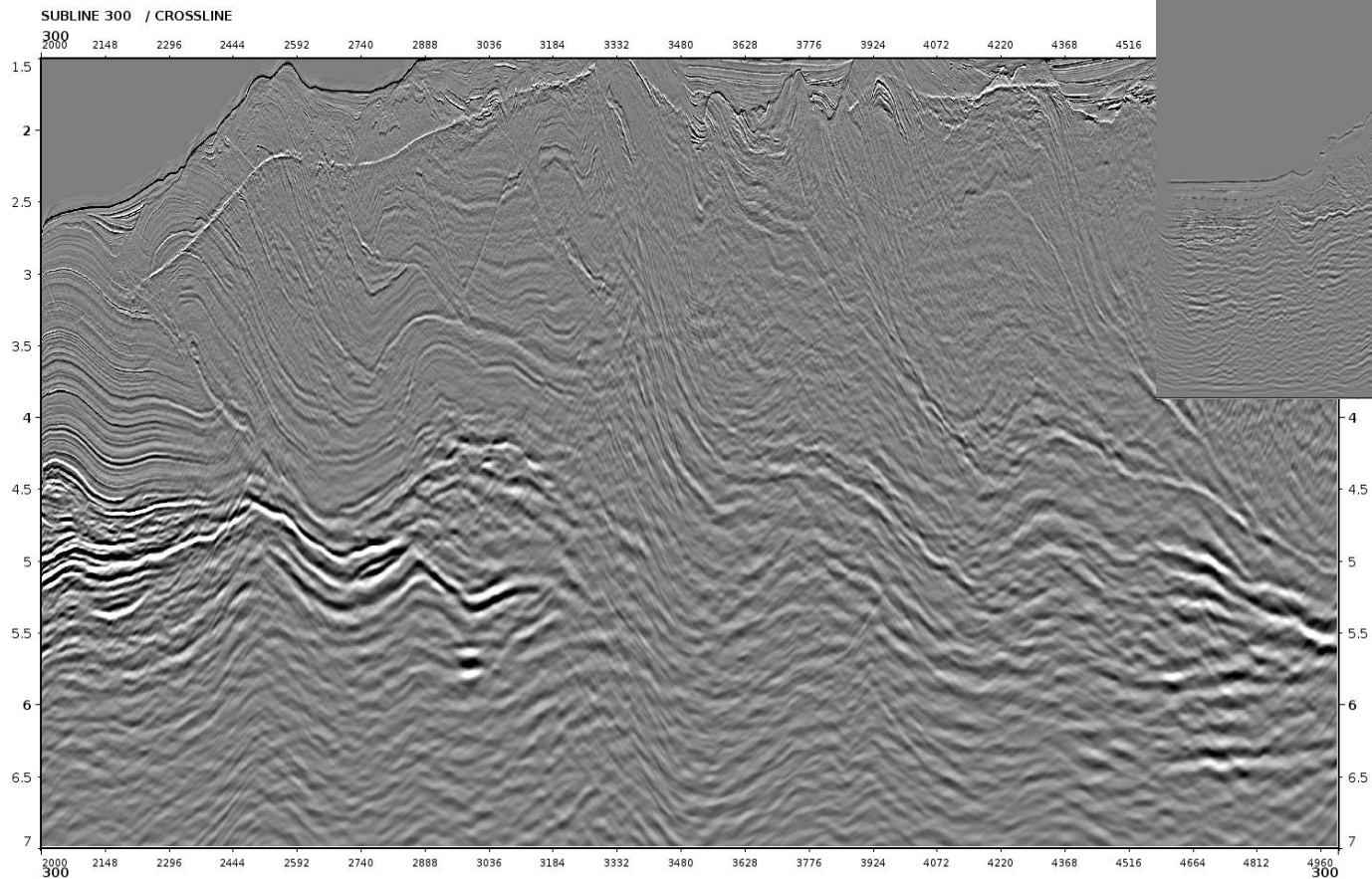
- Subline 300, 530 and 776
- Crossline 1919 and 4199





Subline 300: before bandwidth enhancement

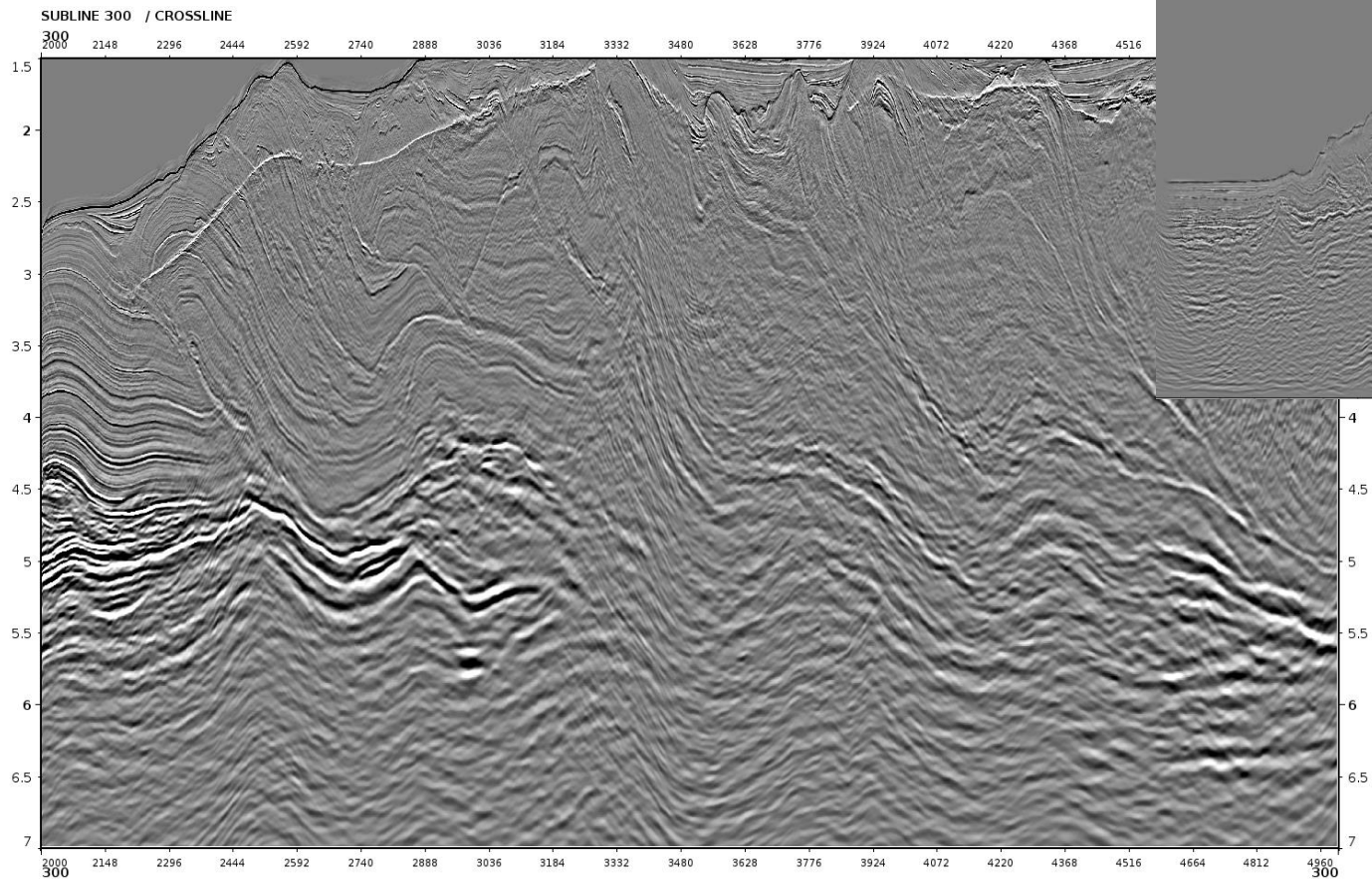
5





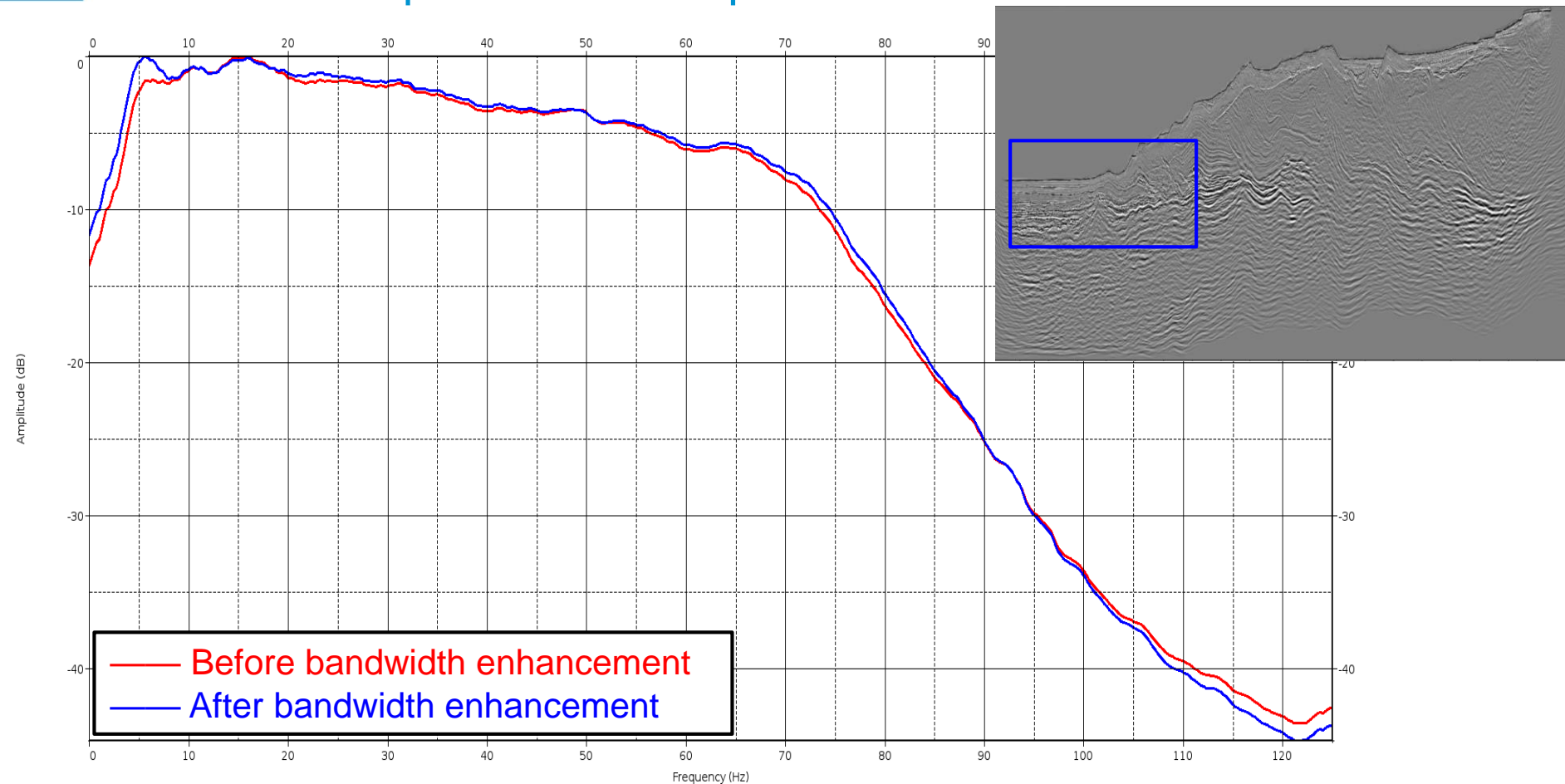
Subline 300: after bandwidth enhancement

6



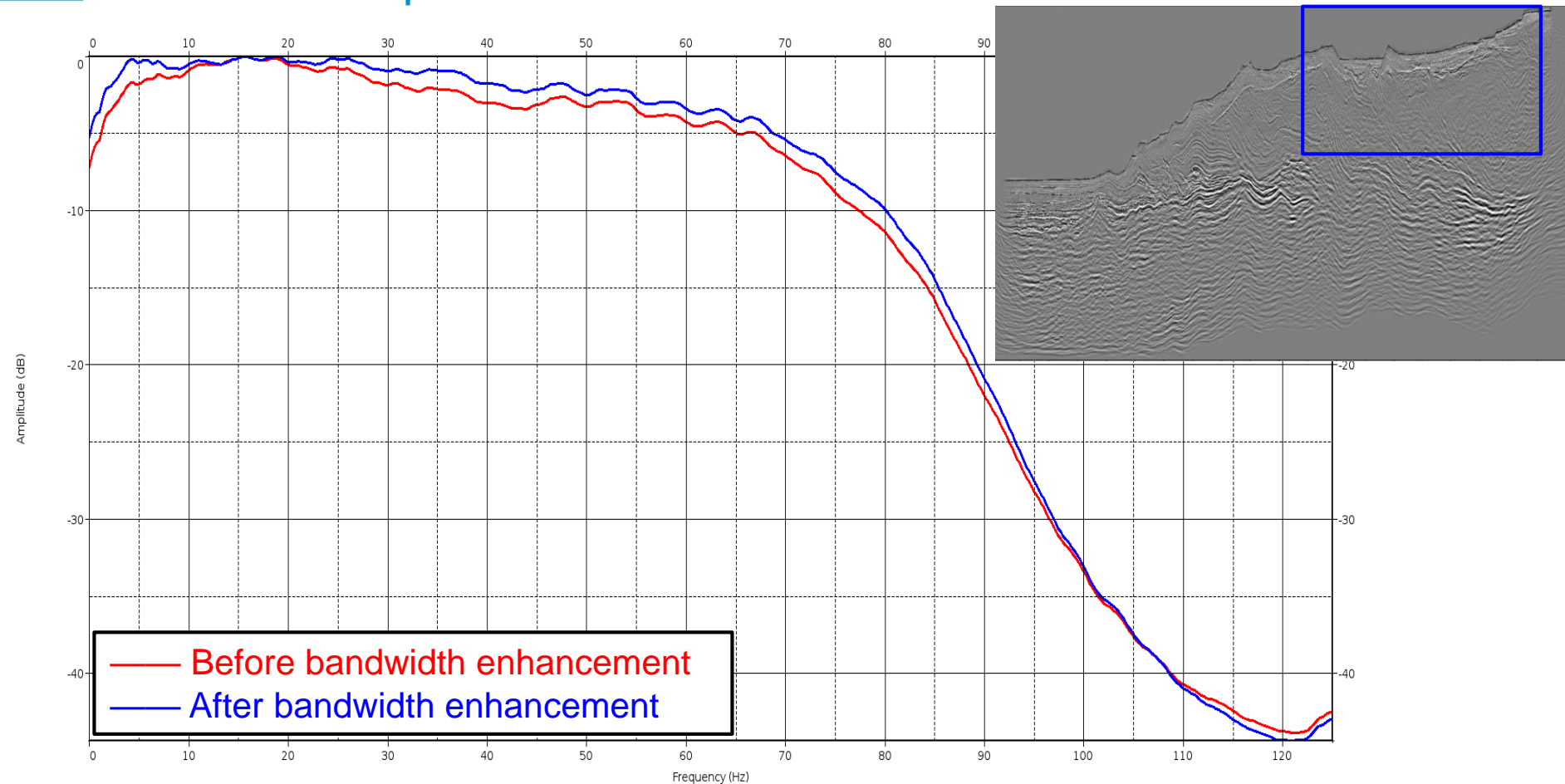
Subline 300: spectrum at deep water

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Subline 300: spectrum at shallow water

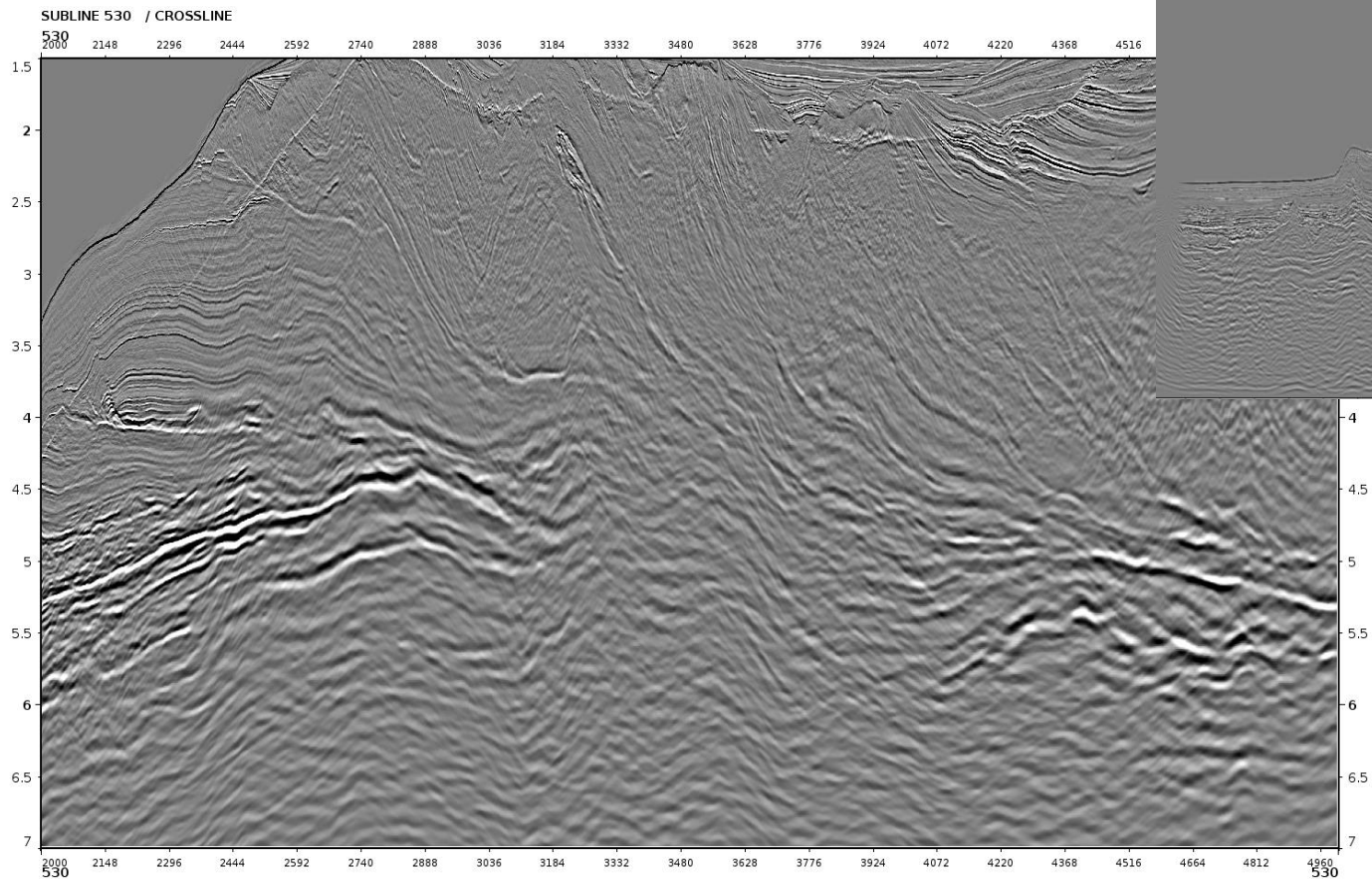
8





Subline 530: before bandwidth enhancement

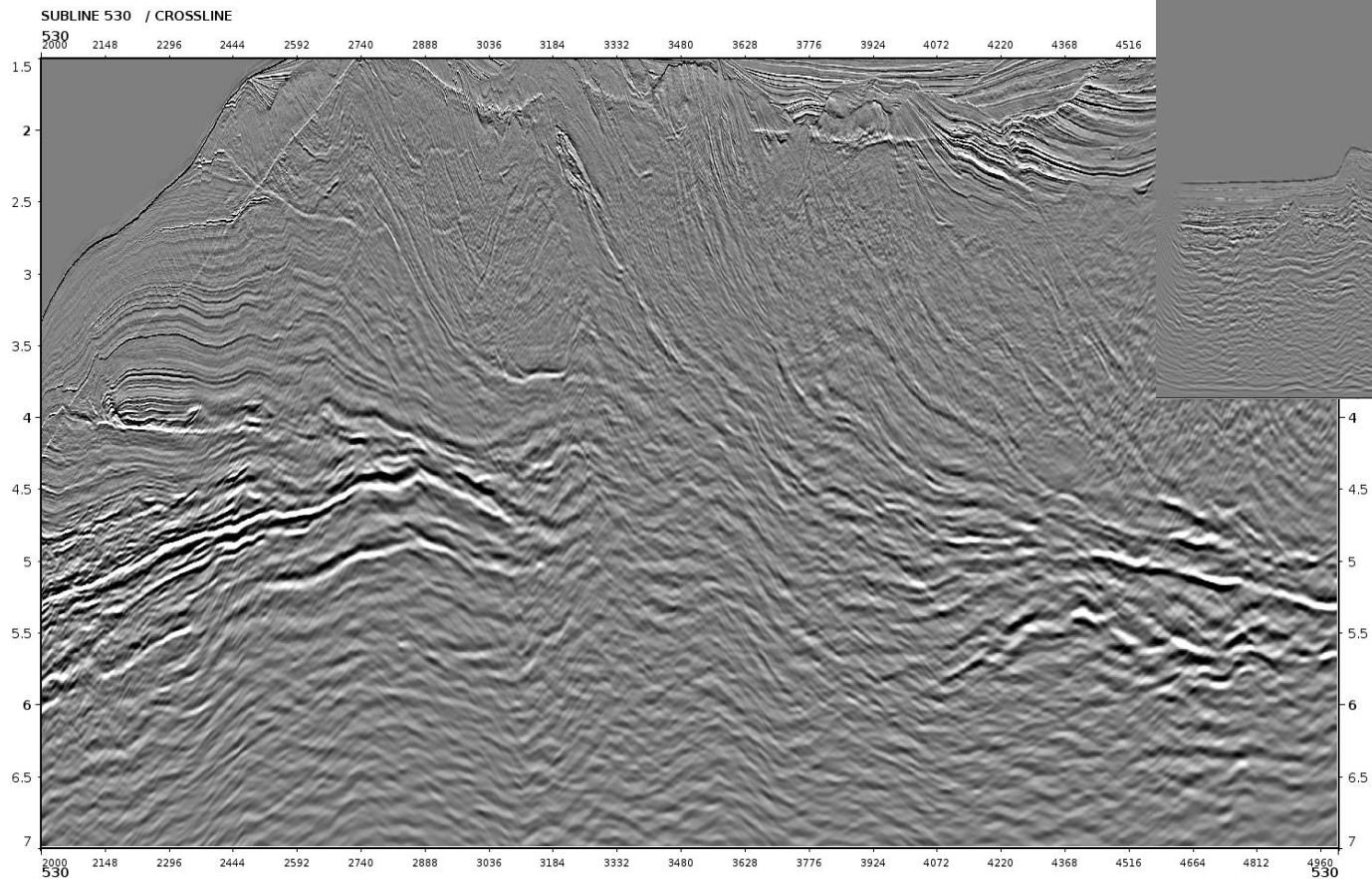
9





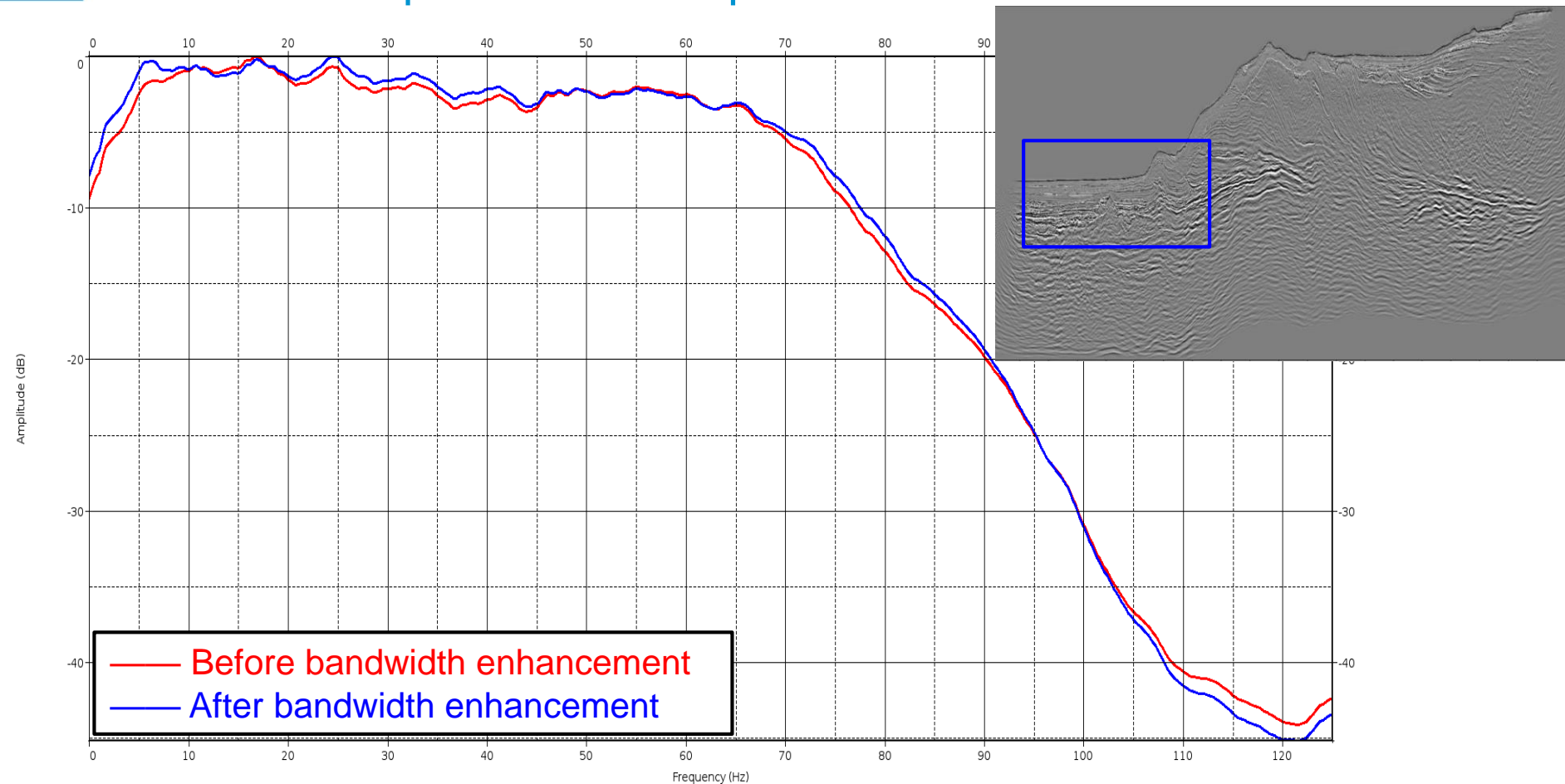
Subline 530: after bandwidth enhancement

10



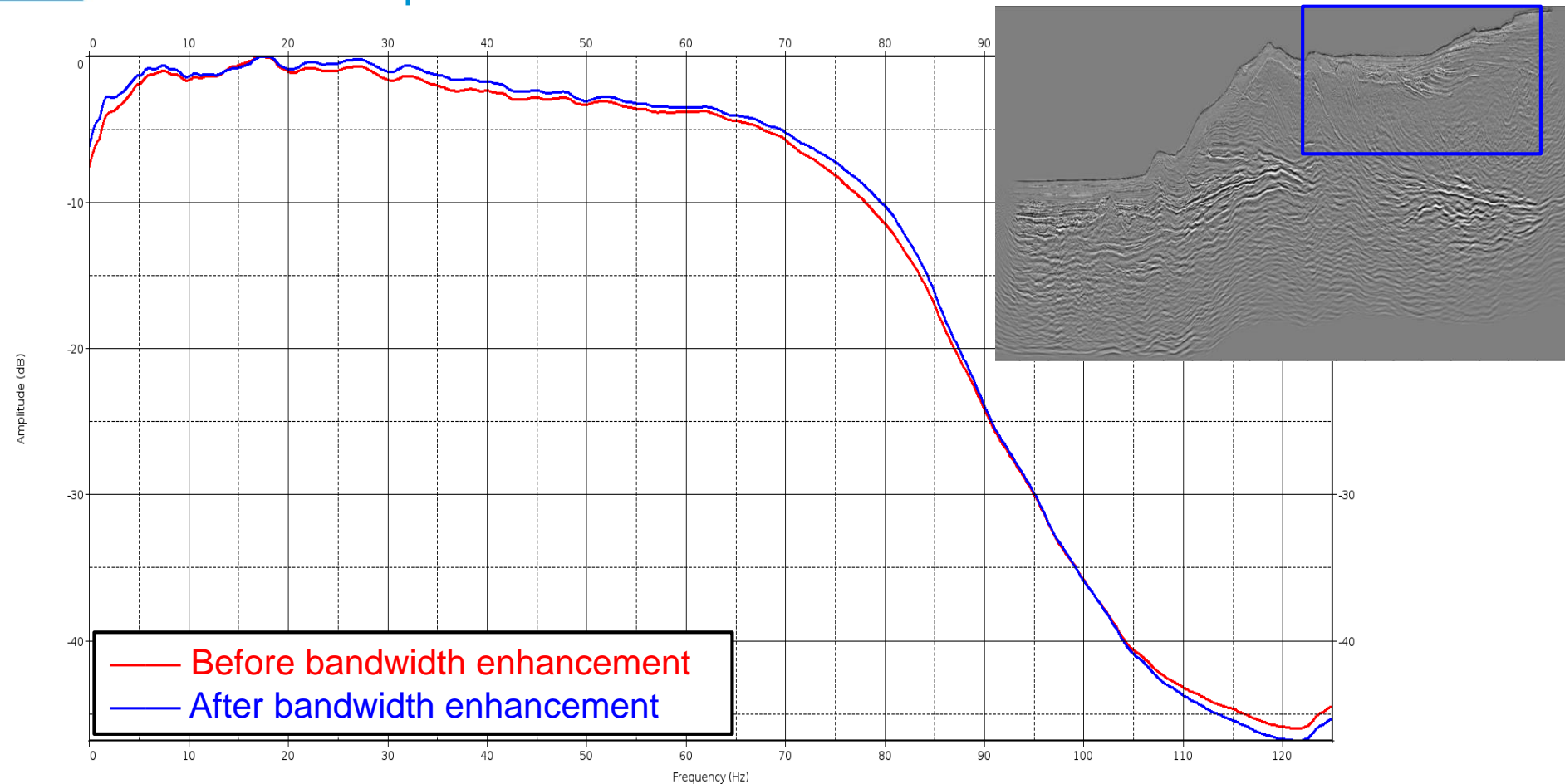
Subline 530: spectrum at deep water

11



Subline 530: spectrum at shallow water

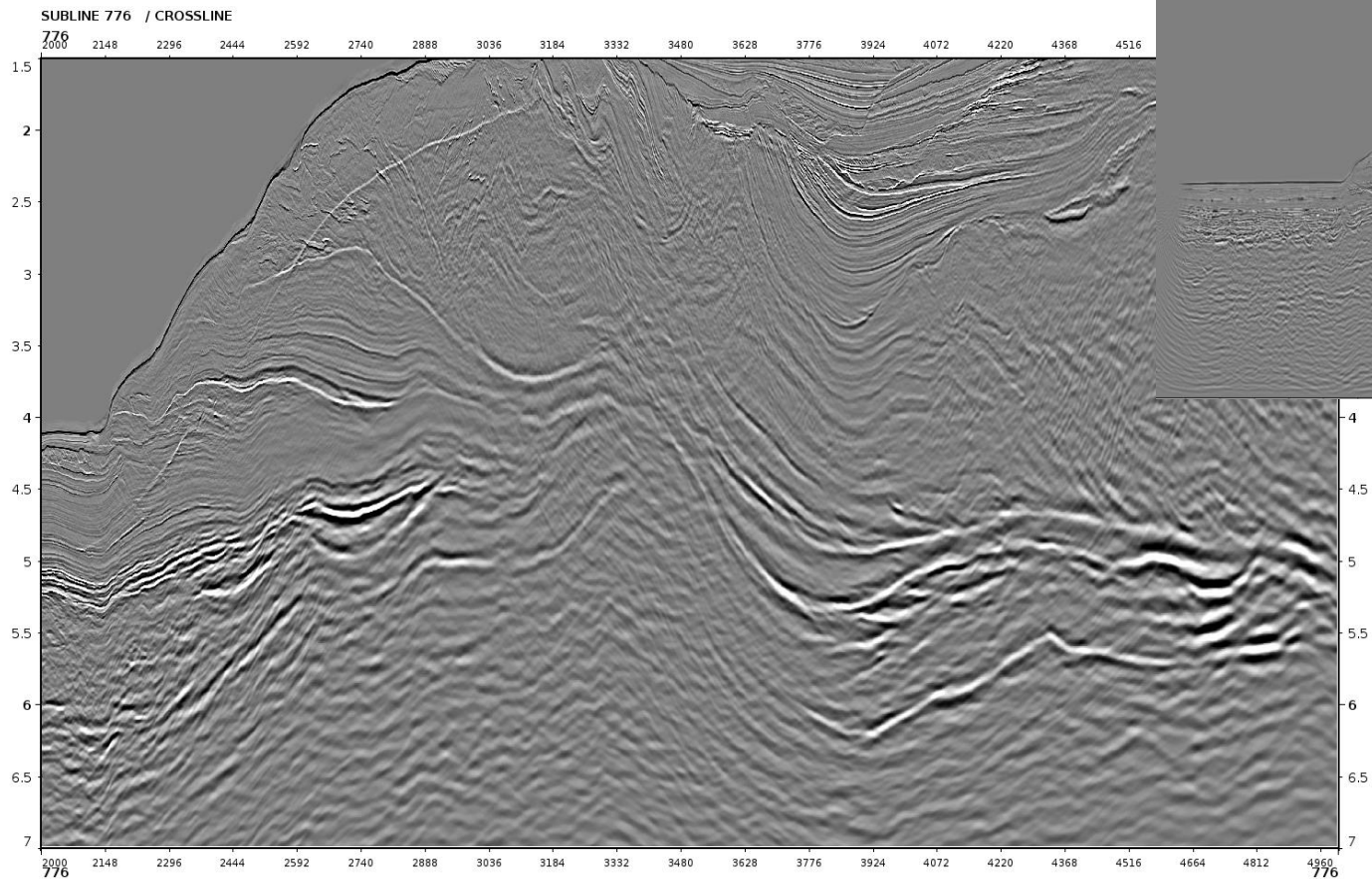
12





Subline 776: before bandwidth enhancement

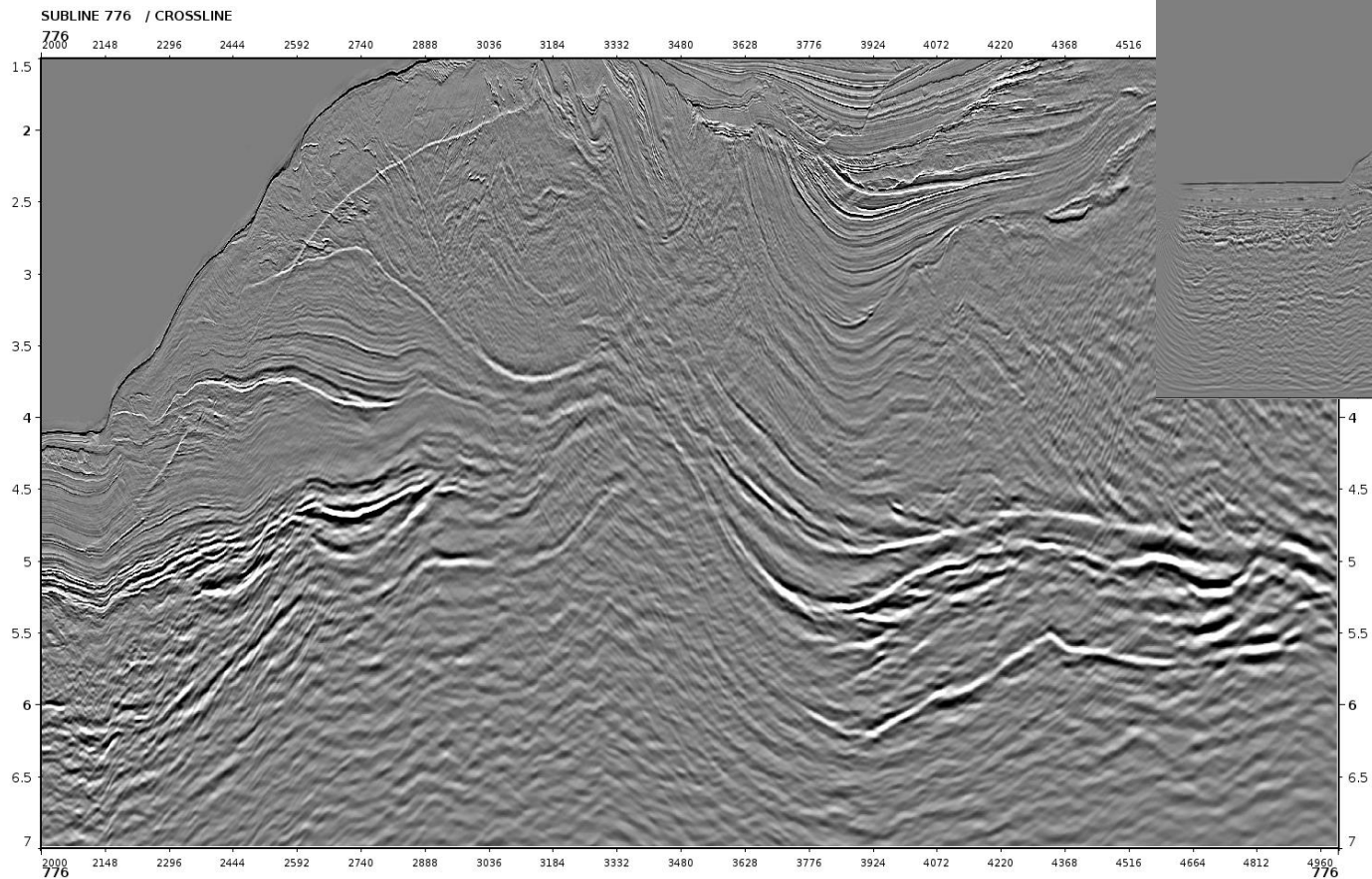
13





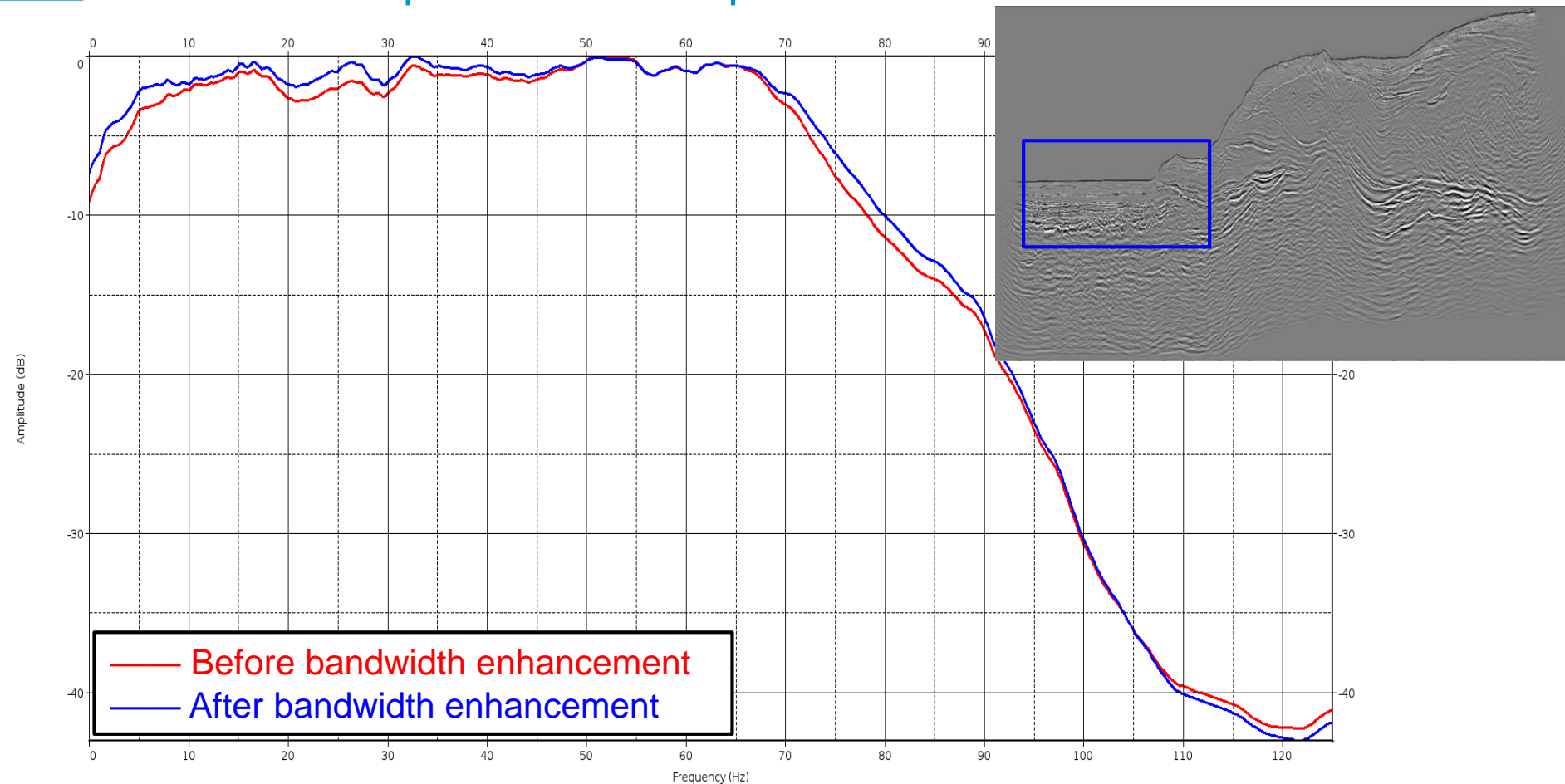
Subline 776: after bandwidth enhancement

14



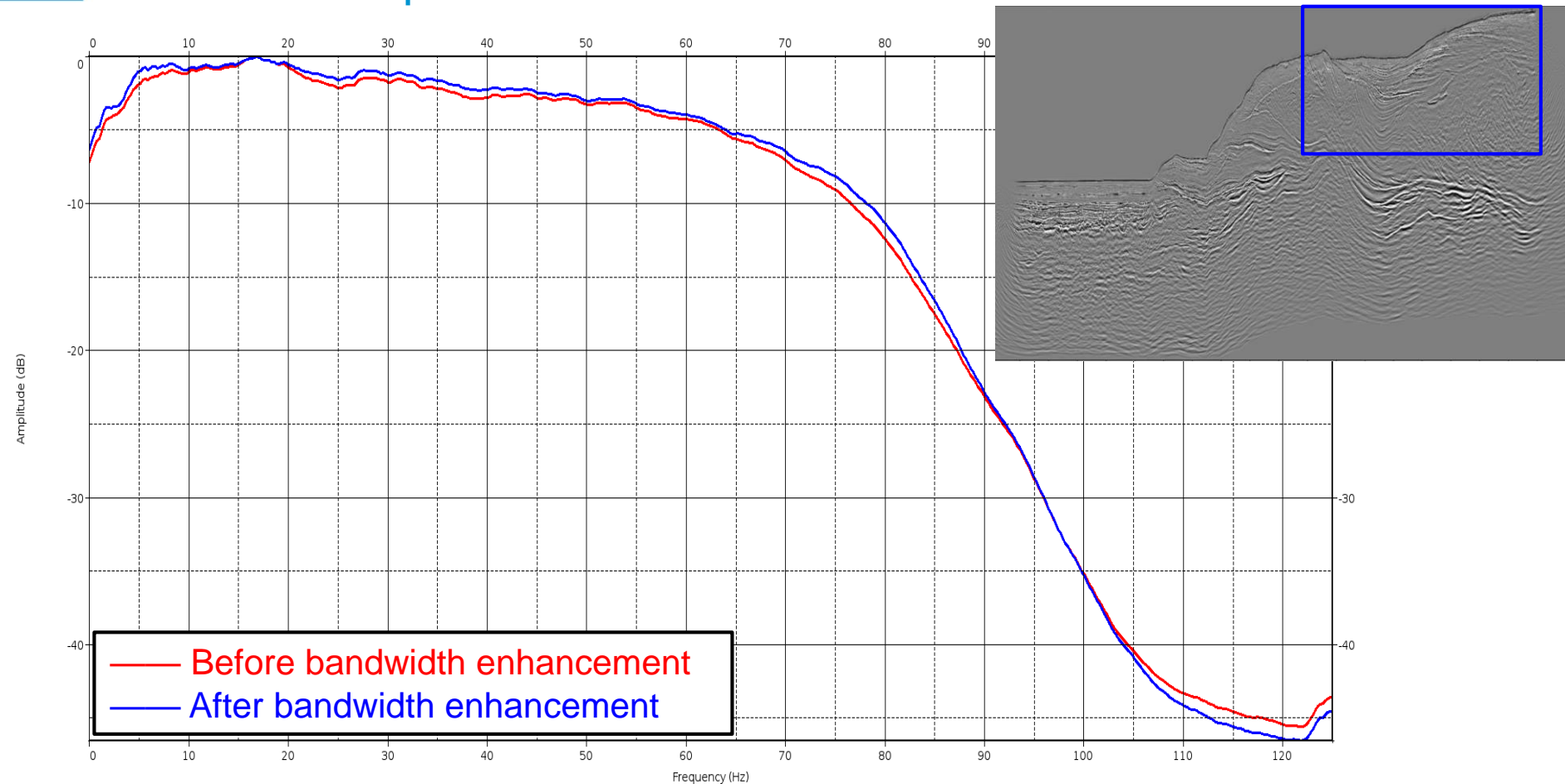
Subline 776: spectrum at deep water

15



Subline 776: spectrum at shallow water

16

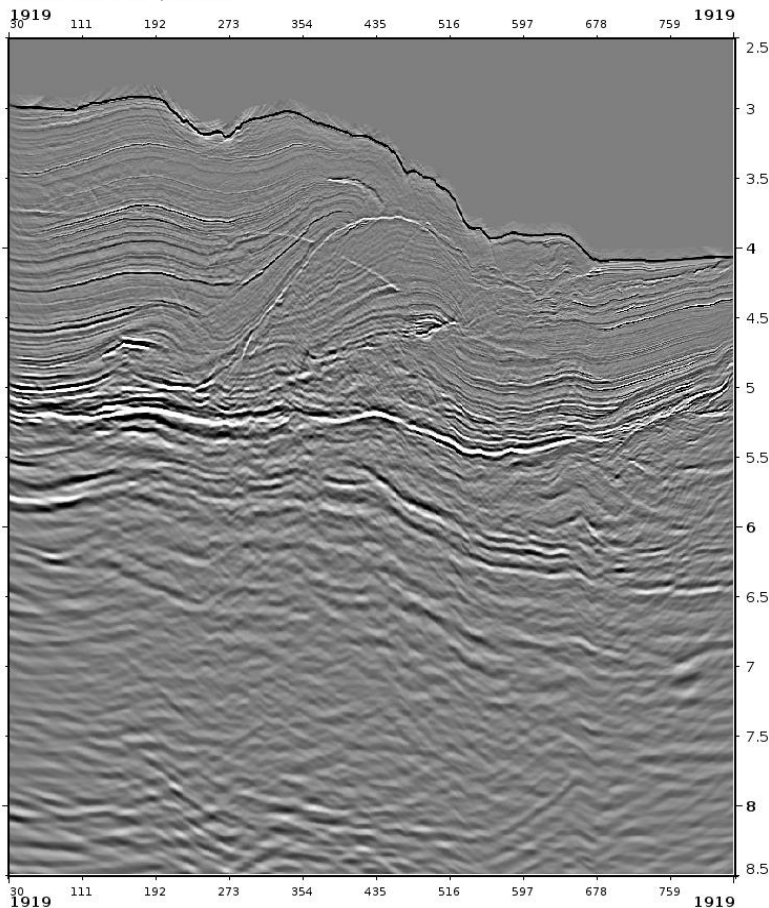




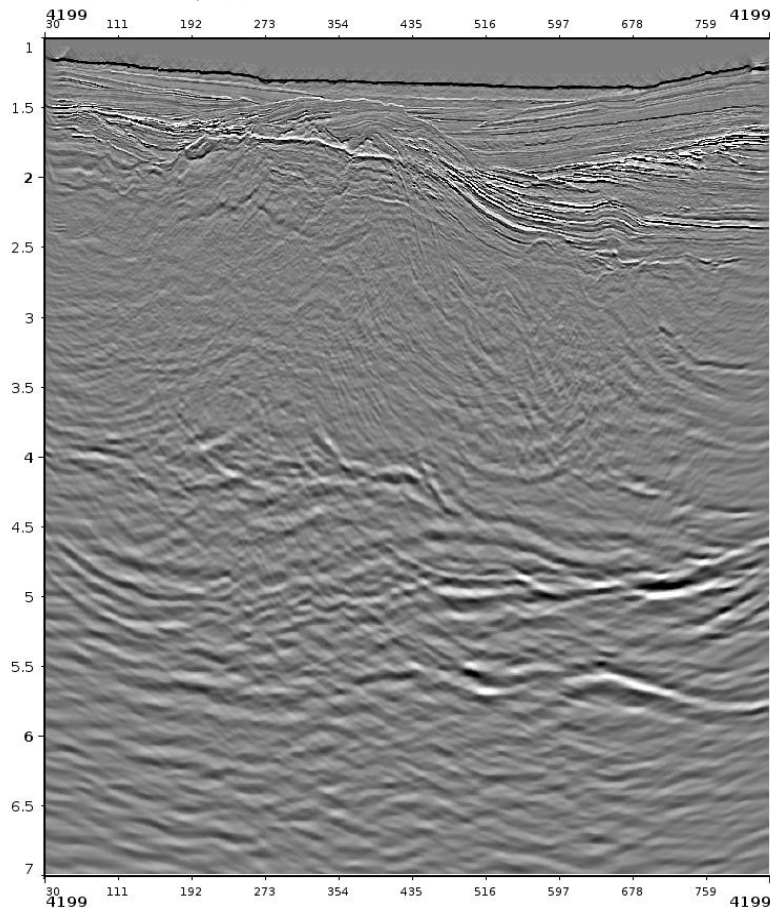
Crossline 1919 and 4199: before bandwidth enhancement

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CROSSLINE 1919 / SUBLINE



CROSSLINE 4199 / SUBLINE

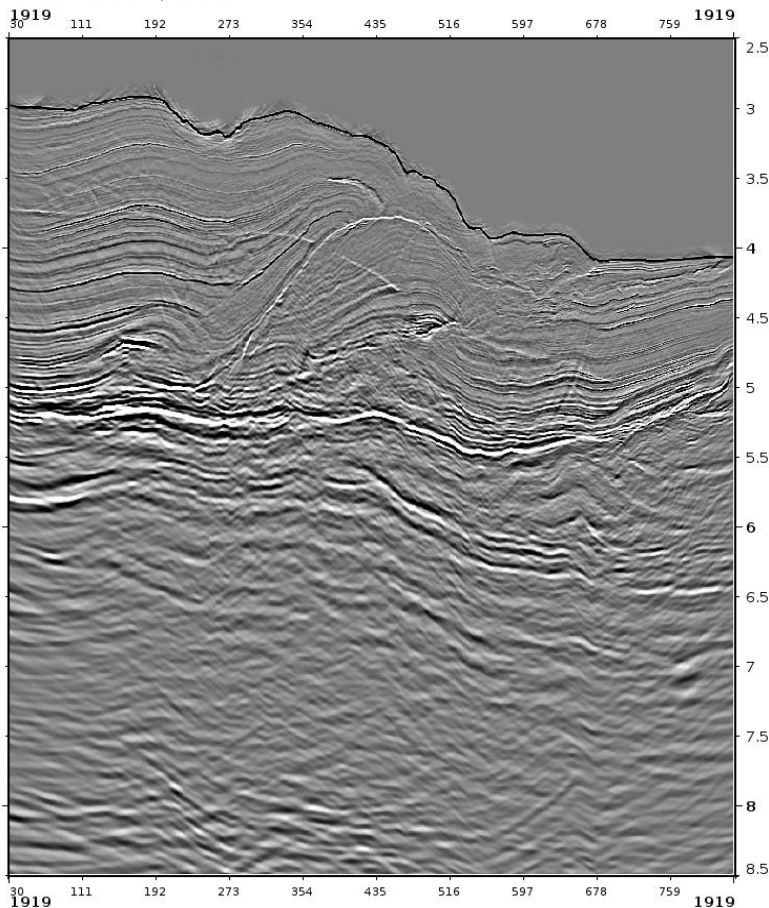




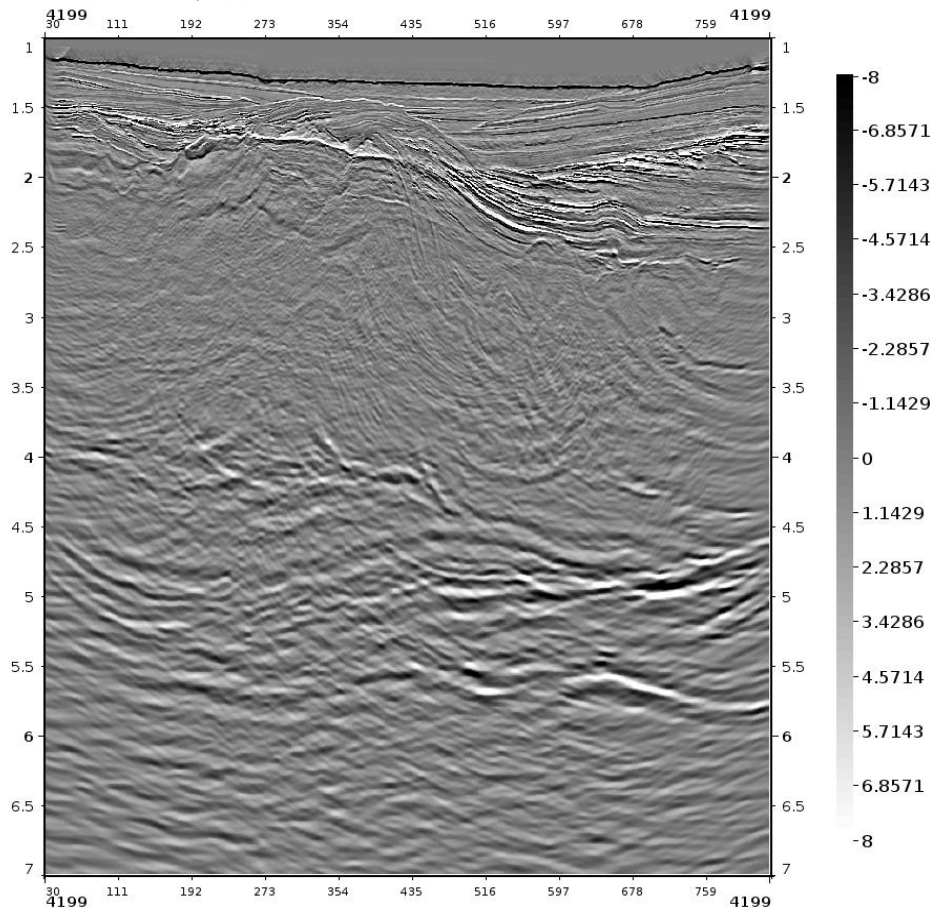
Crossline 1919 and 4199: **after** bandwidth enhancement

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CROSSLINE 1919 / SUBLINE



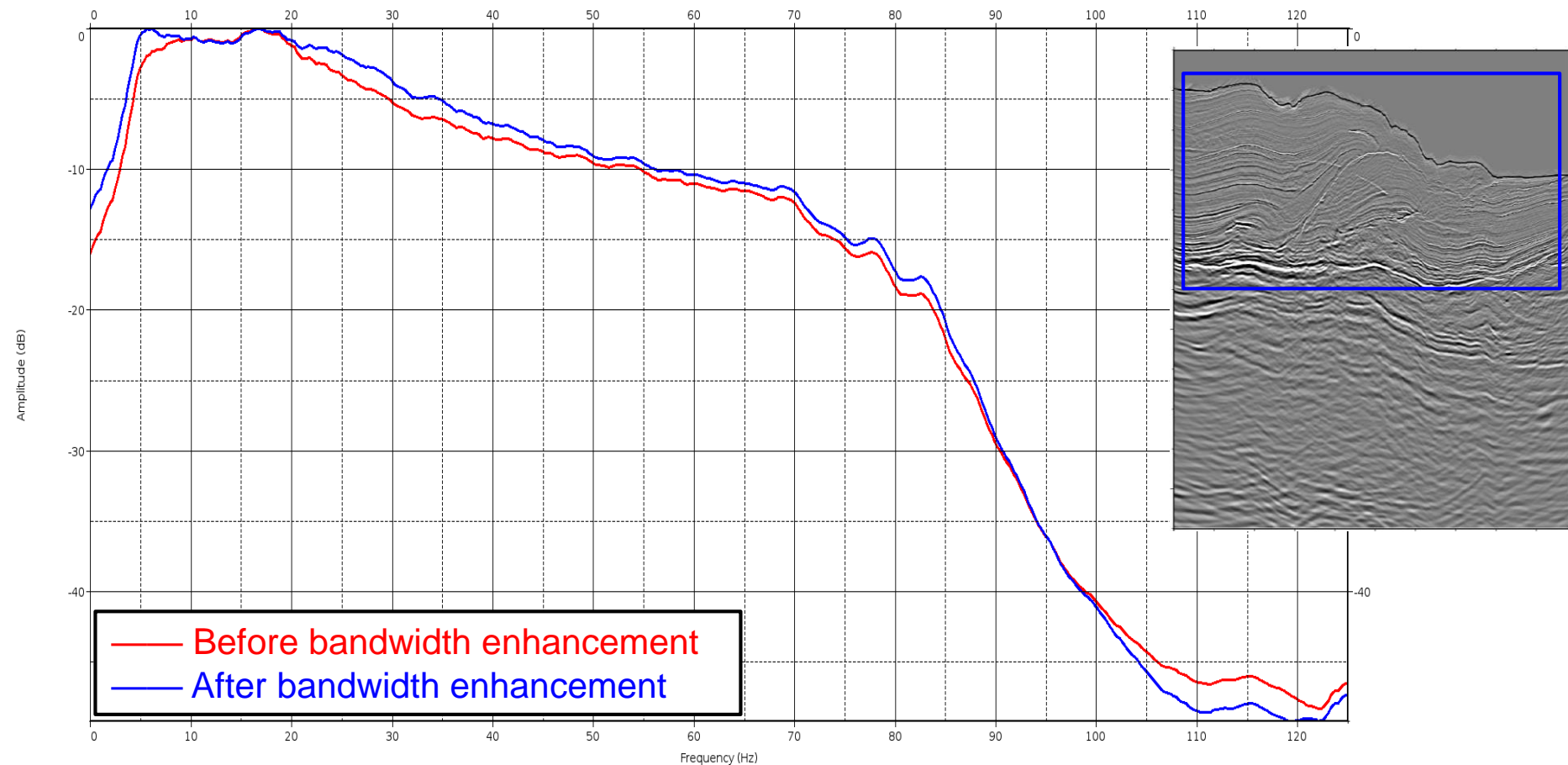
CROSSLINE 4199 / SUBLINE





Crossline 1919: spectrum

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Crossline 4199: spectrum

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