



Diffacted Multiple Removal

NZ 3D Processing

21 April 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

- **Objective:**

To attenuate diffracted multiple energy.

- **Procedure:**

- The process is based on the difference in frequency content between primaries and multiples.
- Attenuation is tested with designed time window ($WBT^2 - 100 \sim 9500\text{ms}$).

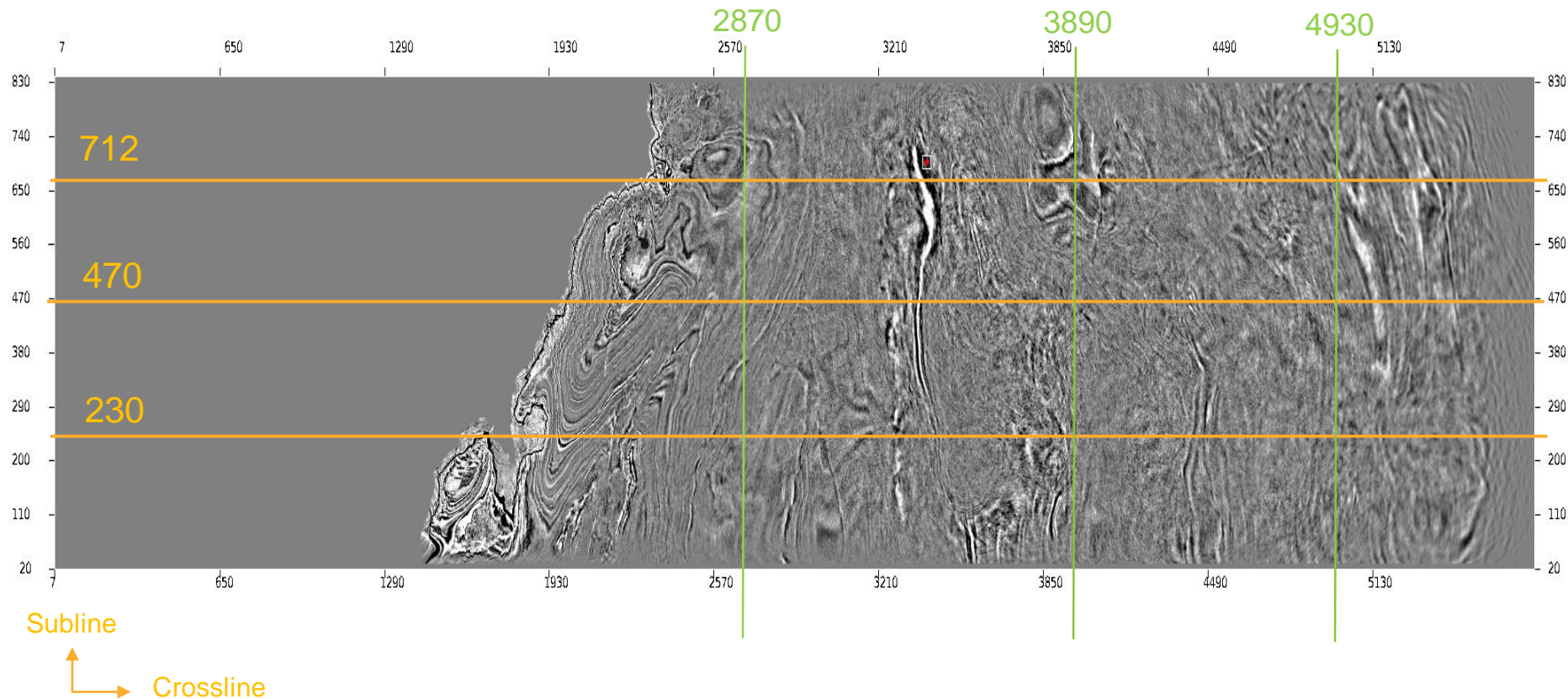
Multiple attenuation is tested common offset (near 250m, middle 1750m, far 4050m).

- **Display:**

Stack, common offset (subline, crossline).

- **Observation & Recommendation:**

Diffracted multiple energy is attenuated and primaries are untouched. It's recommended to apply for production.

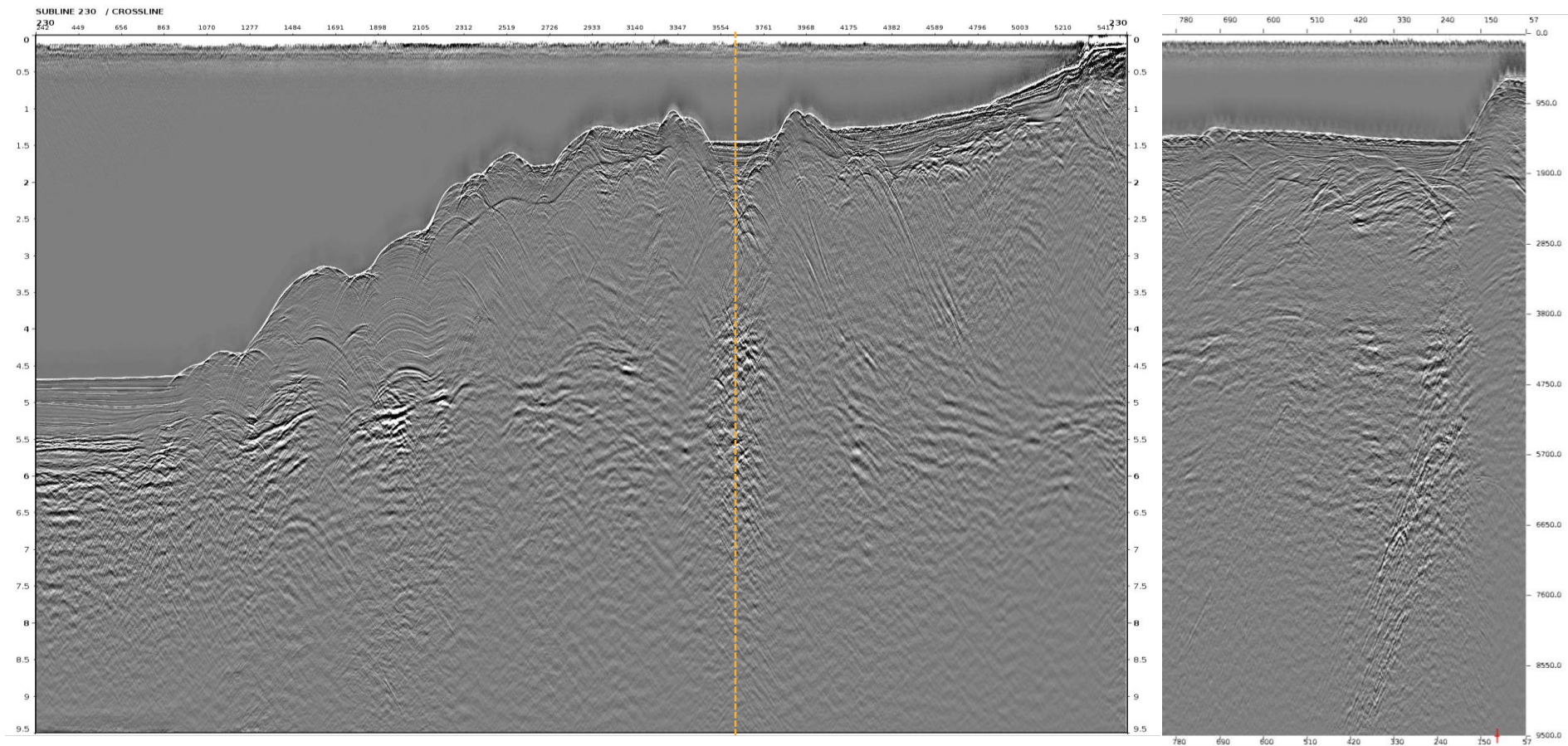


Stack

- subline 230
- subline 470
- subline 712

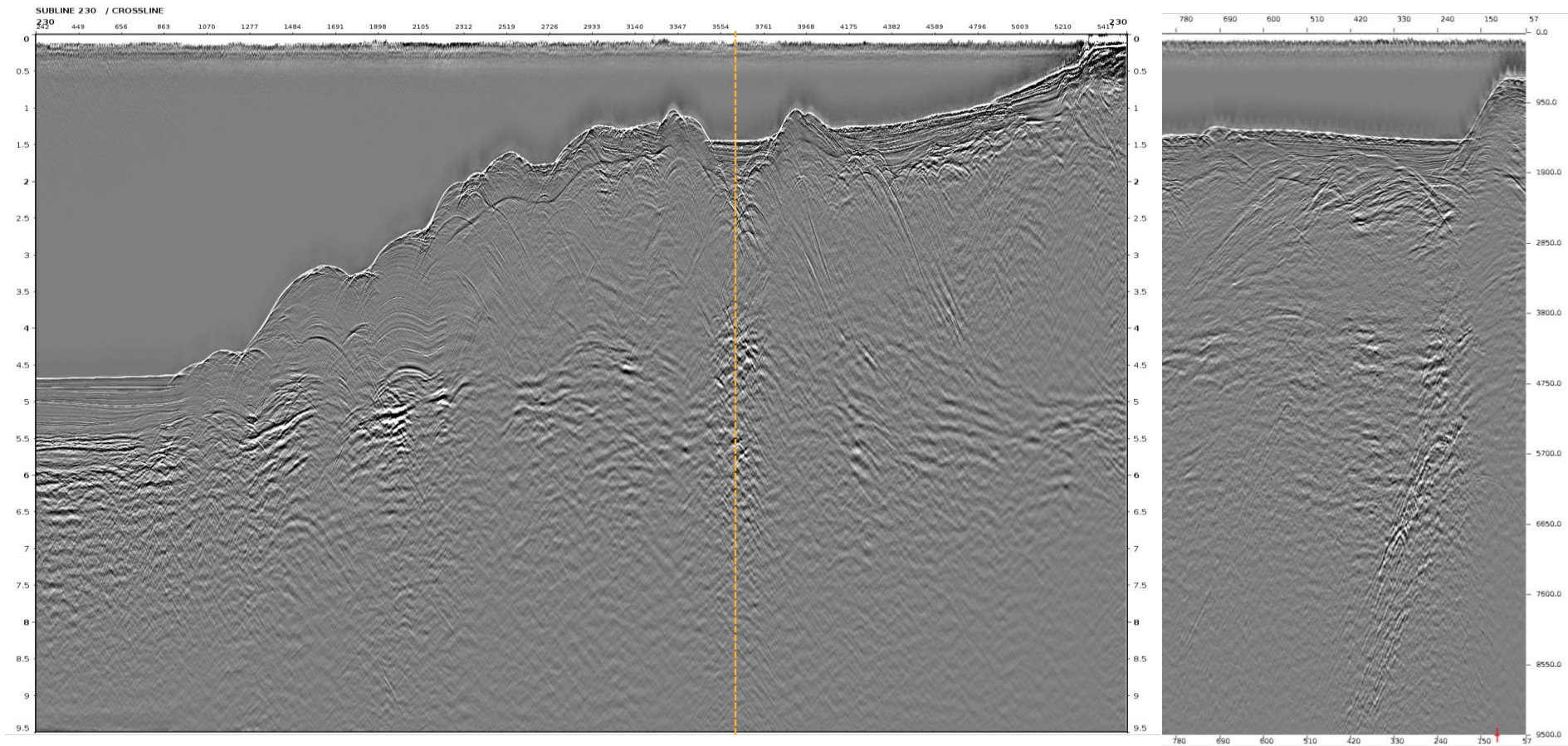
Stack before Diffracted Multiple Removal

6



Stack after Diffracted Multiple Removal

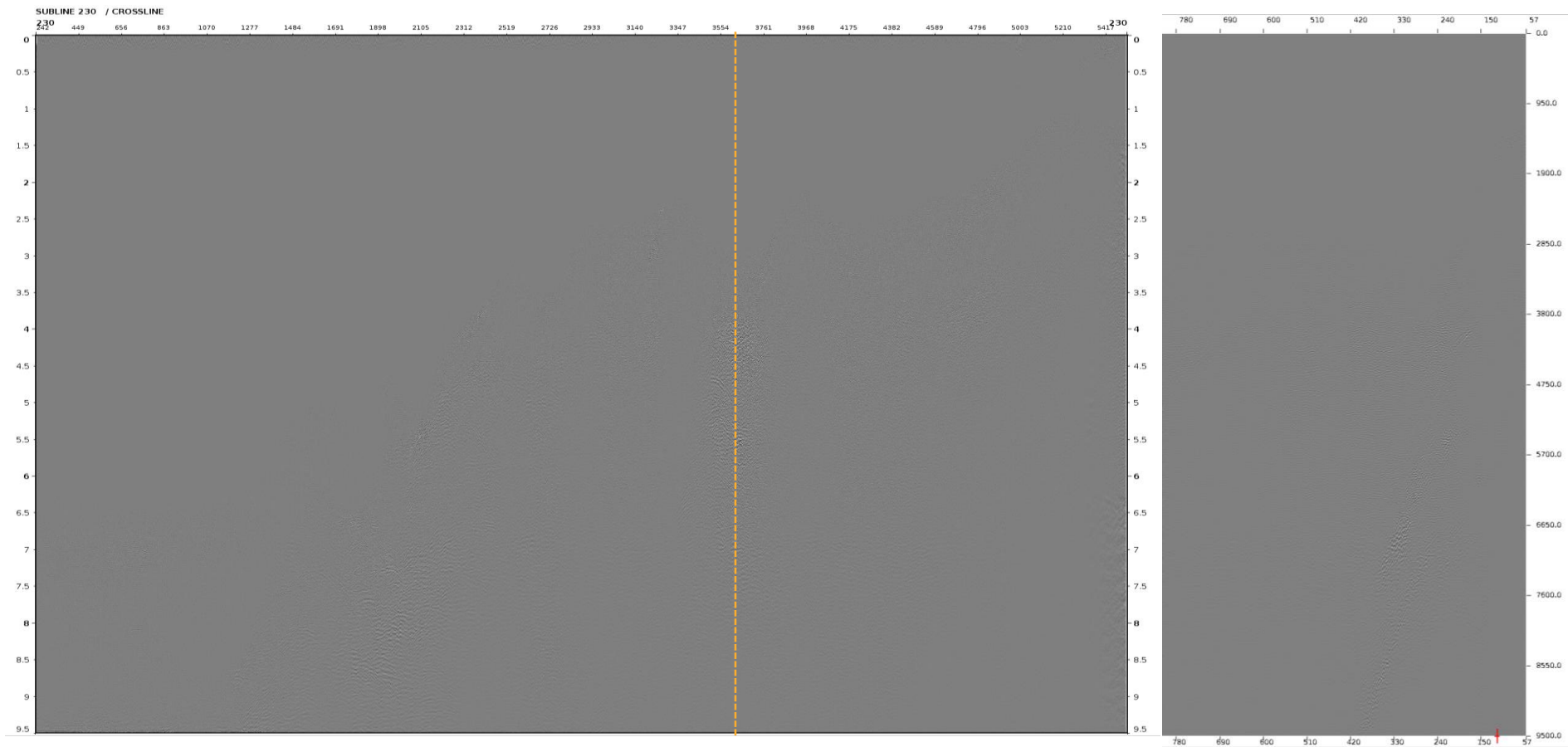
7





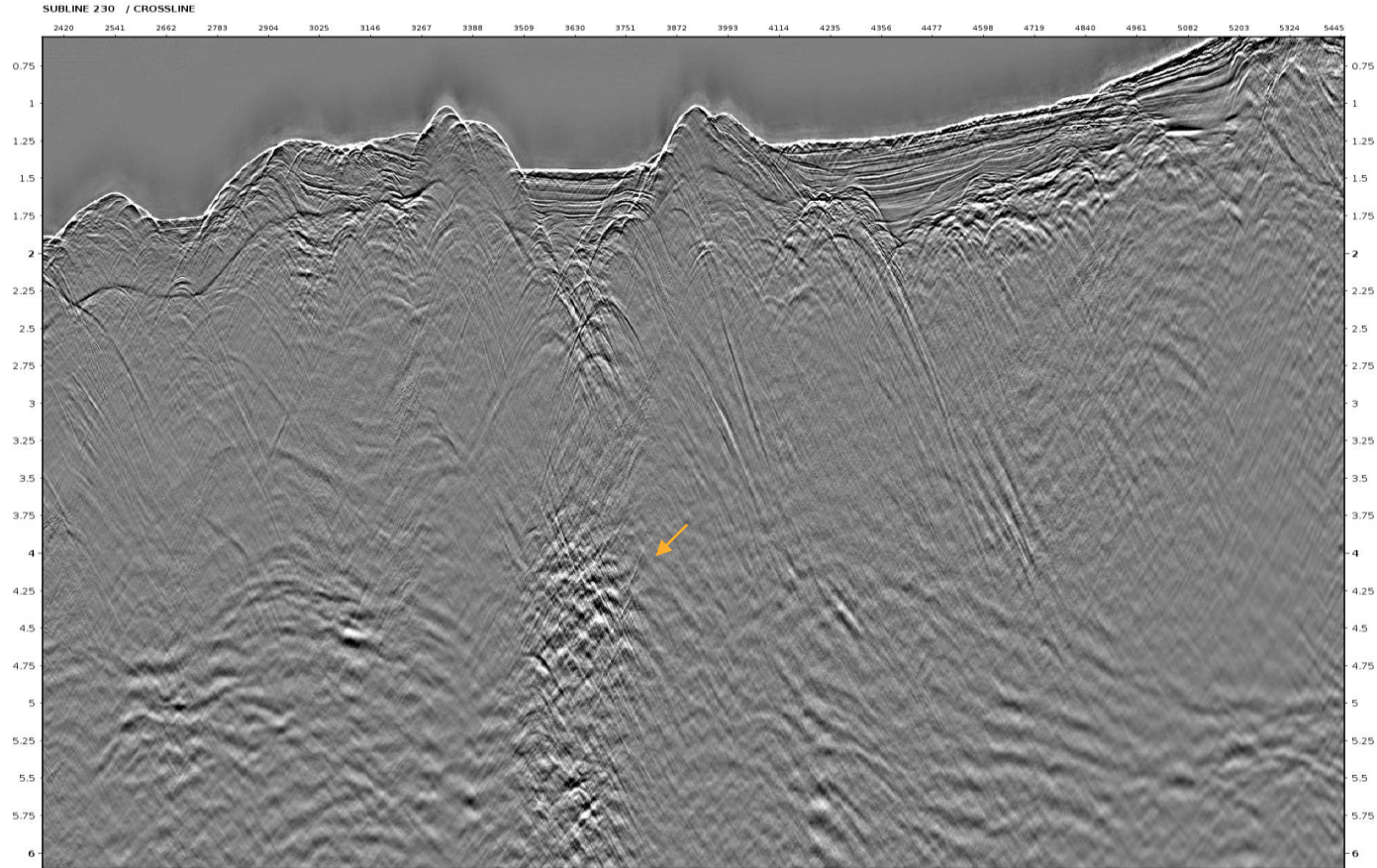
Difference before - after

8





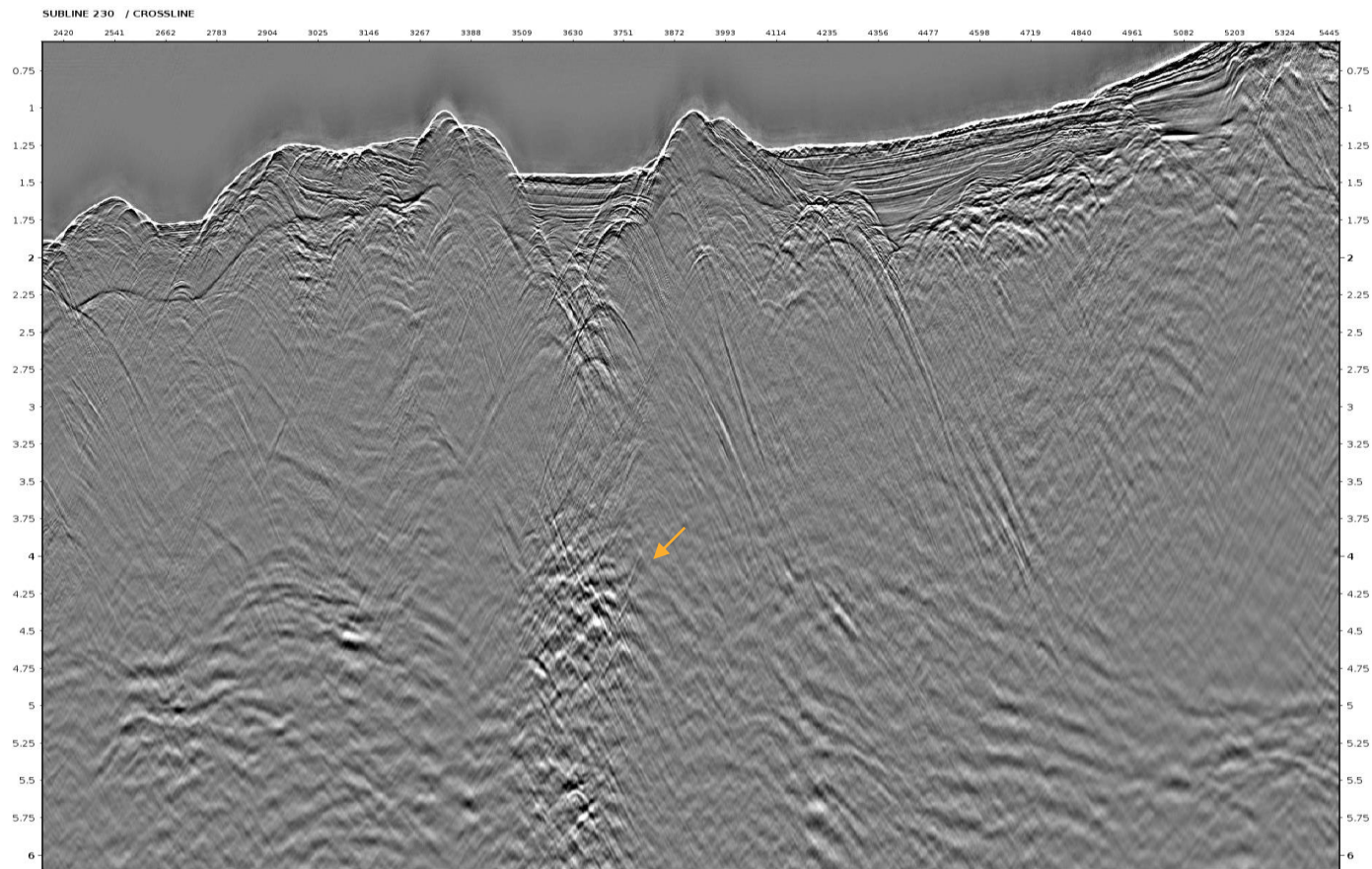
Zoom in Stack before Diffracted Multiple Removal





Zoom in Stack after Diffracted Multiple Removal

10





Difference before - after

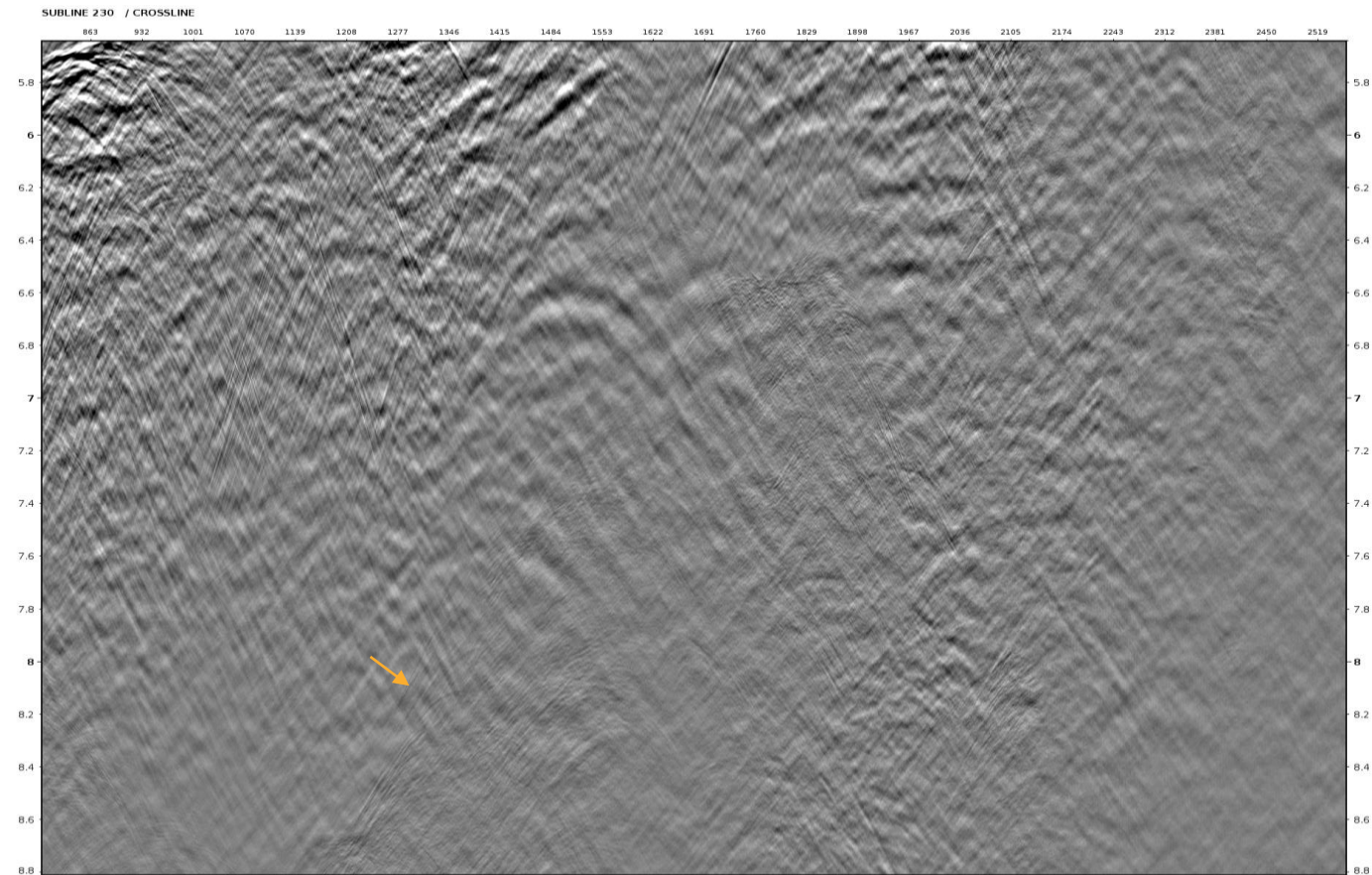
11





Zoom in Stack before Diffracted Multiple Removal

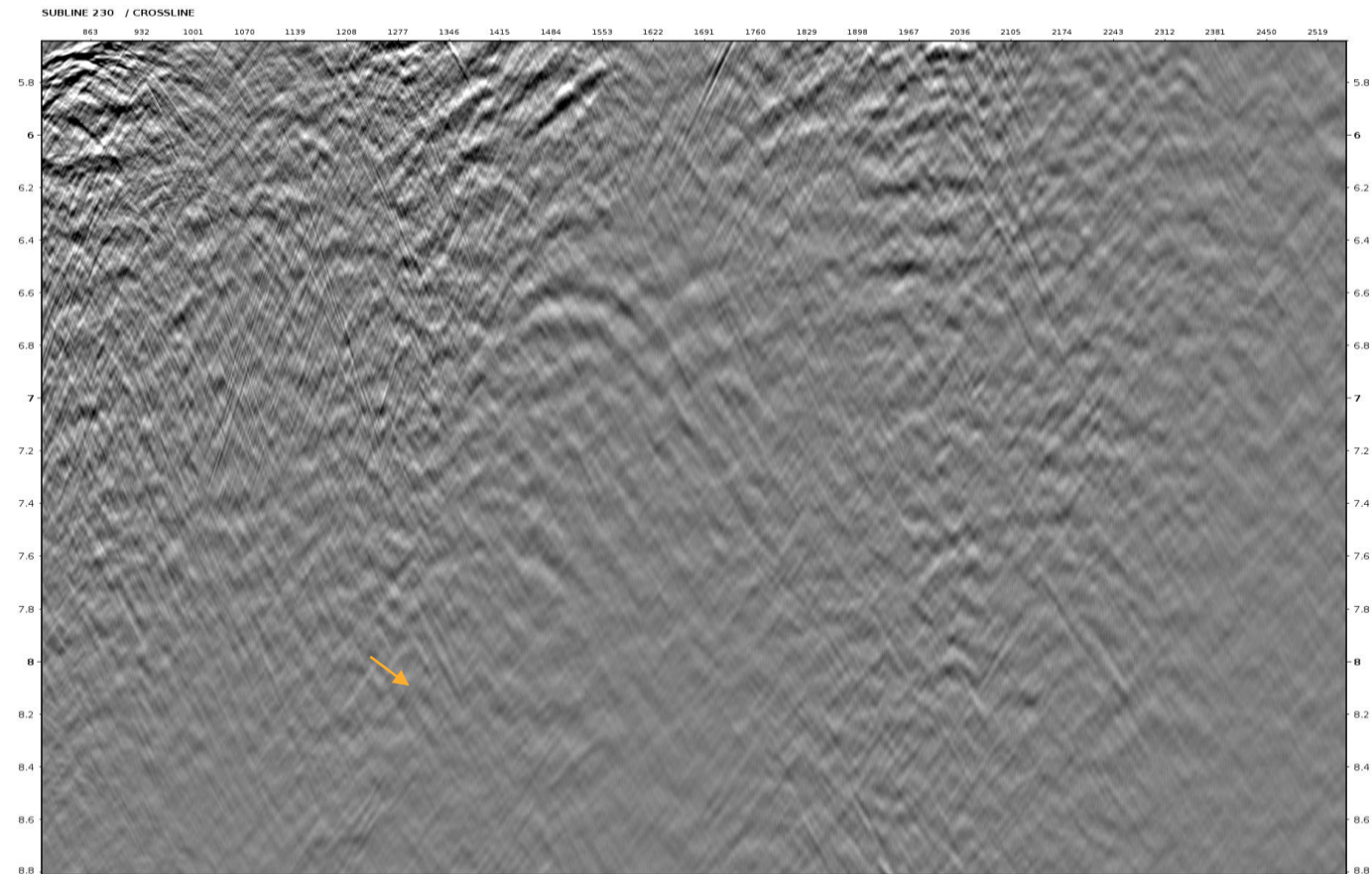
12





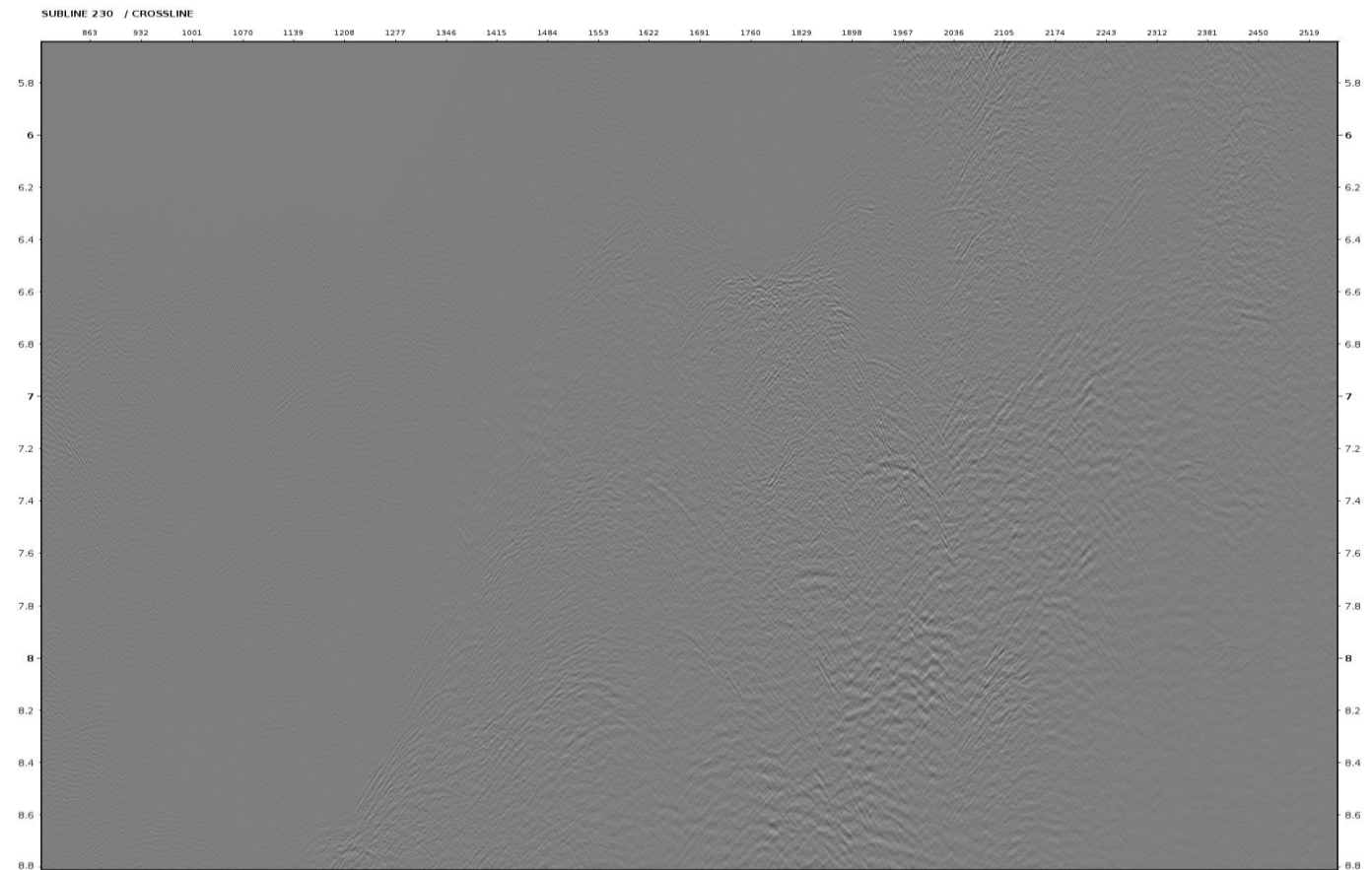
Zoom in Stack after Diffracted Multiple Removal

13





Difference before - after



Common Offset Subline 230

- offset 350m
- offset 1750m
- offset 4050m

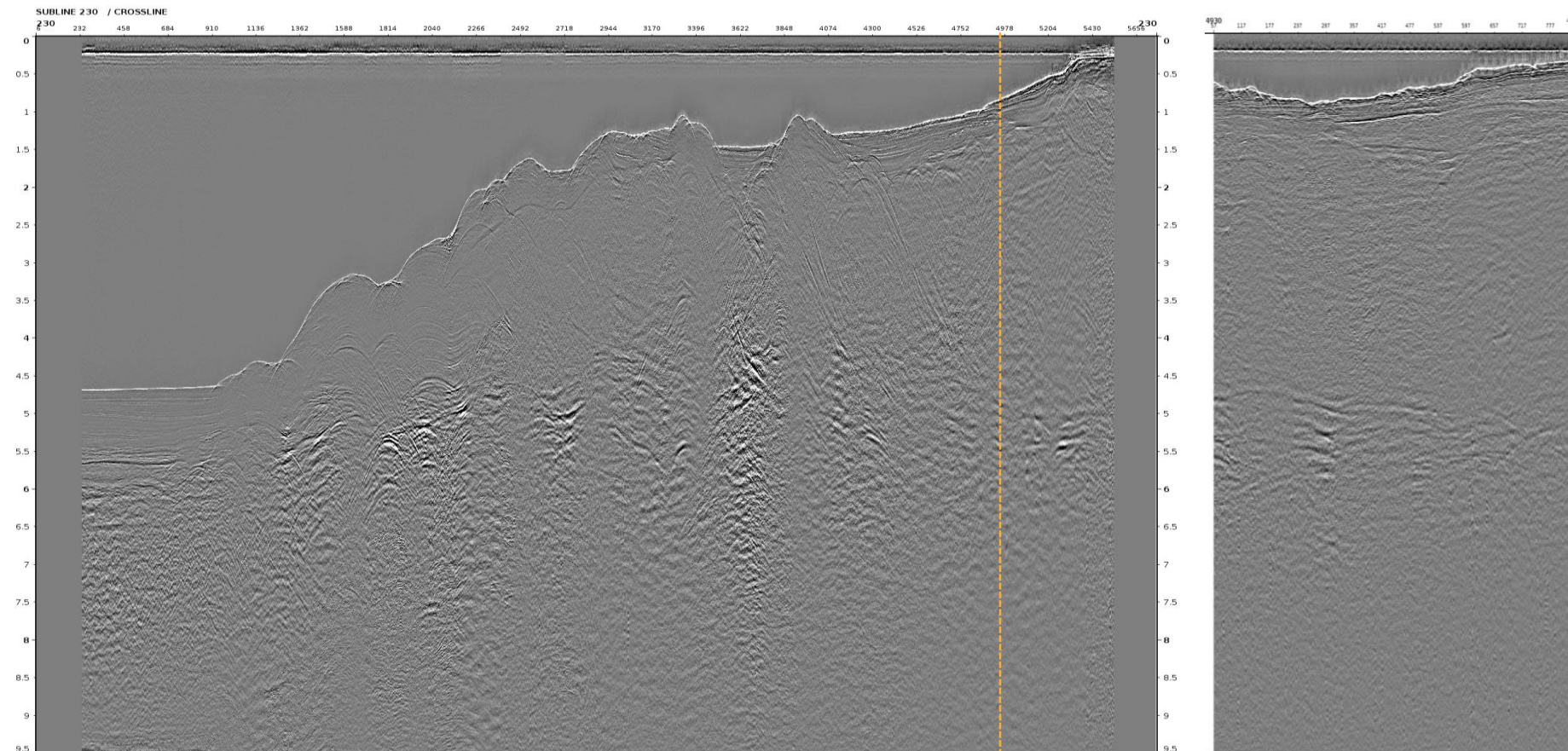


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Common Offset 350m before Diffracted Multiple Removal

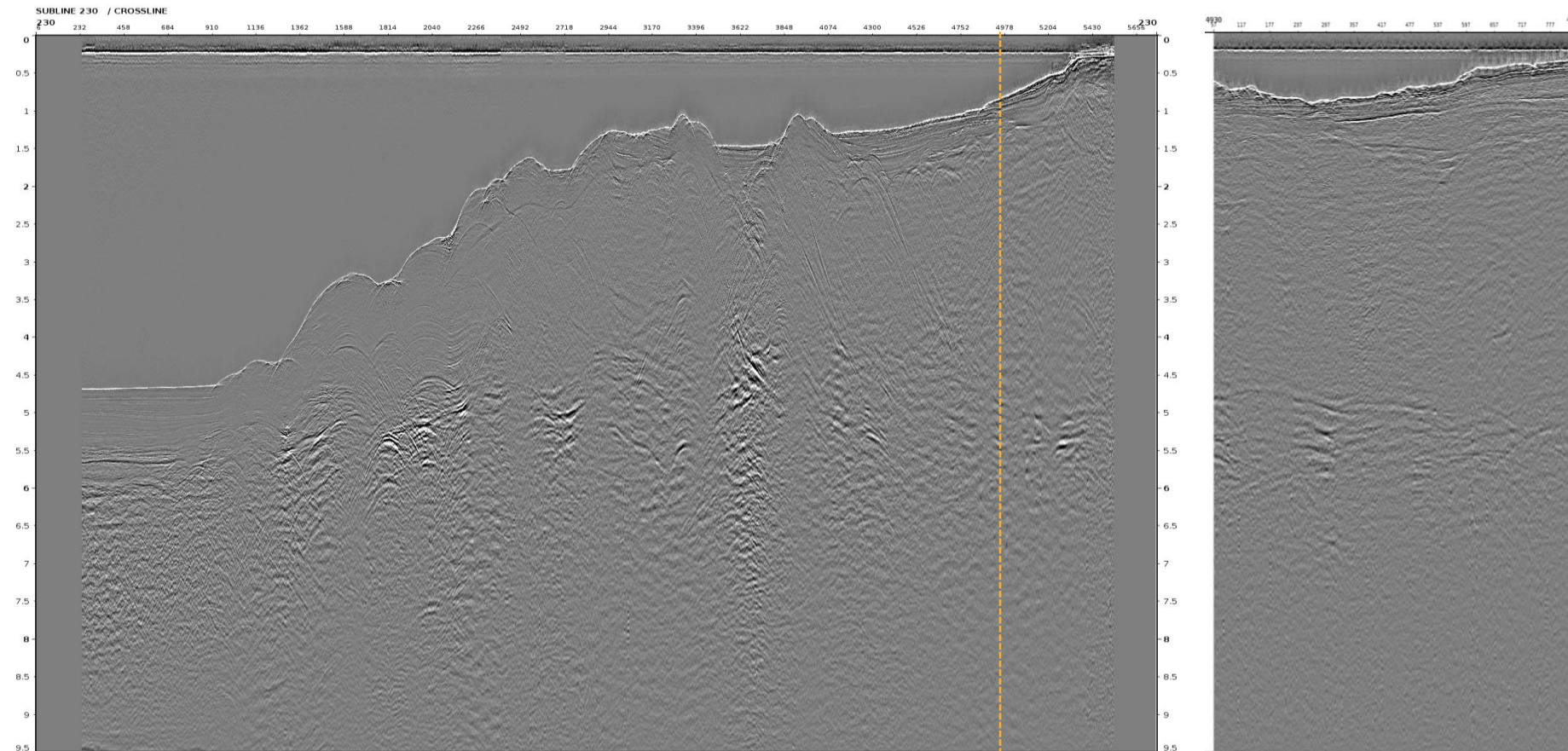
16





Common Offset 350m **after** Diffracted Multiple Removal

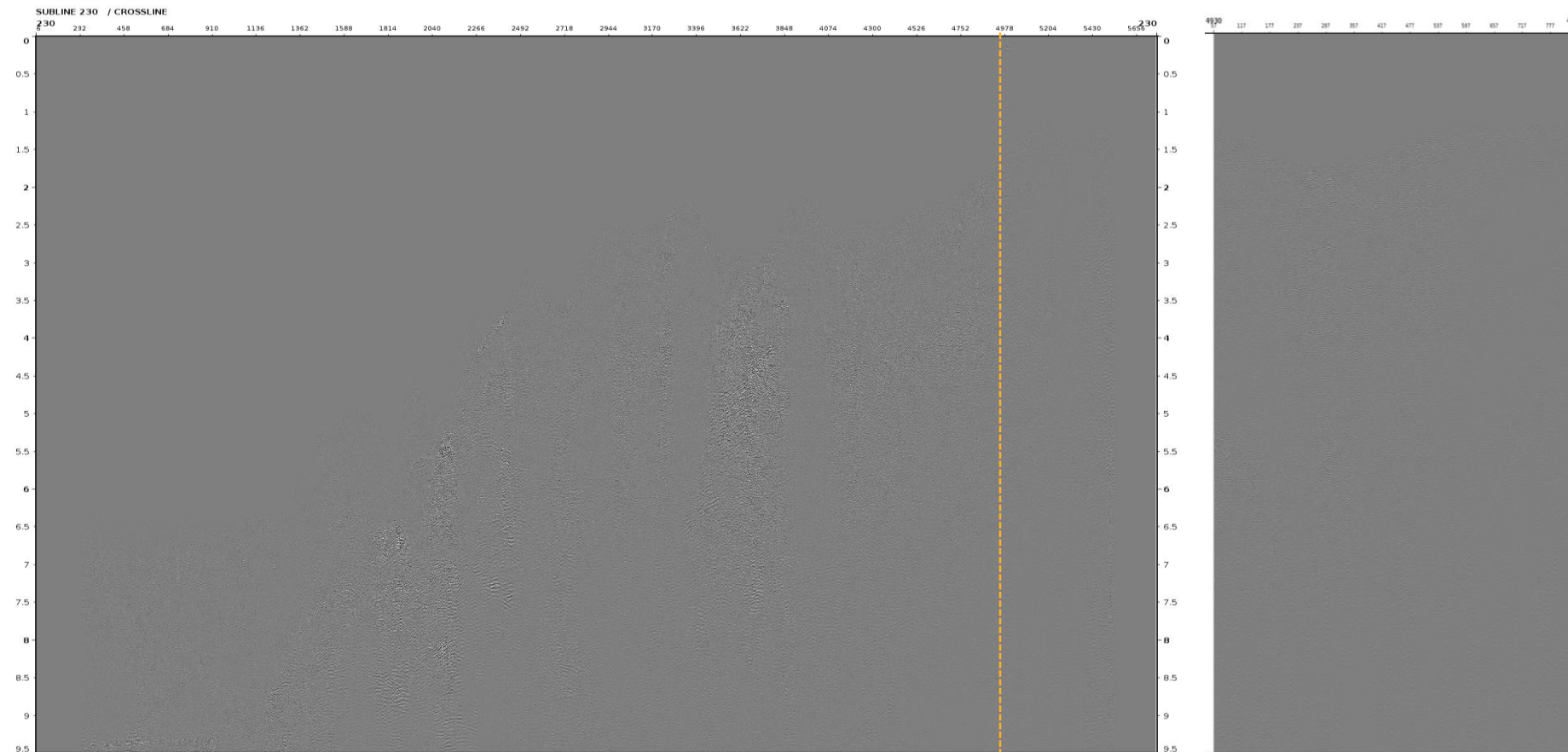
17





Difference before - after

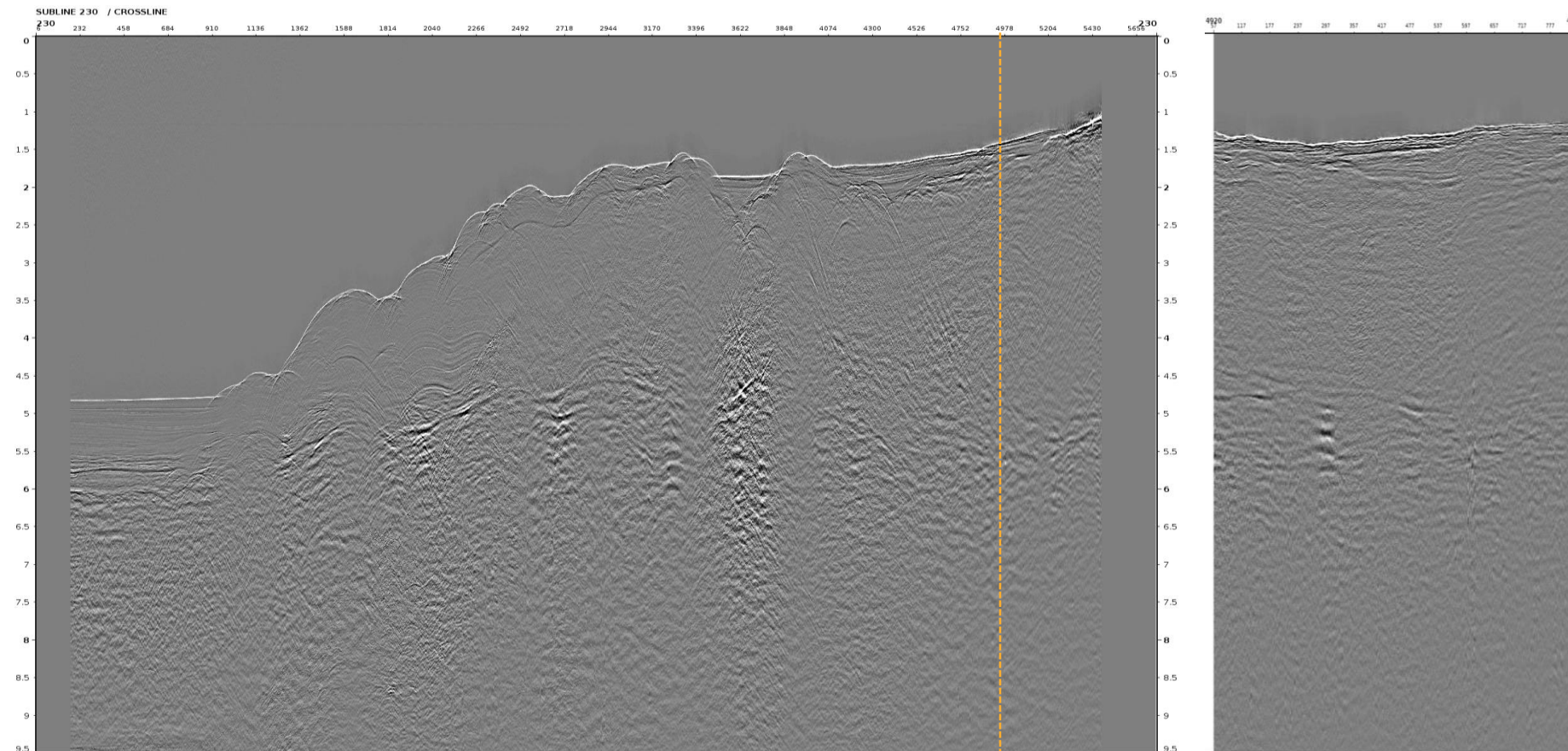
18





Common Offset 1750m before Diffracted Multiple Removal

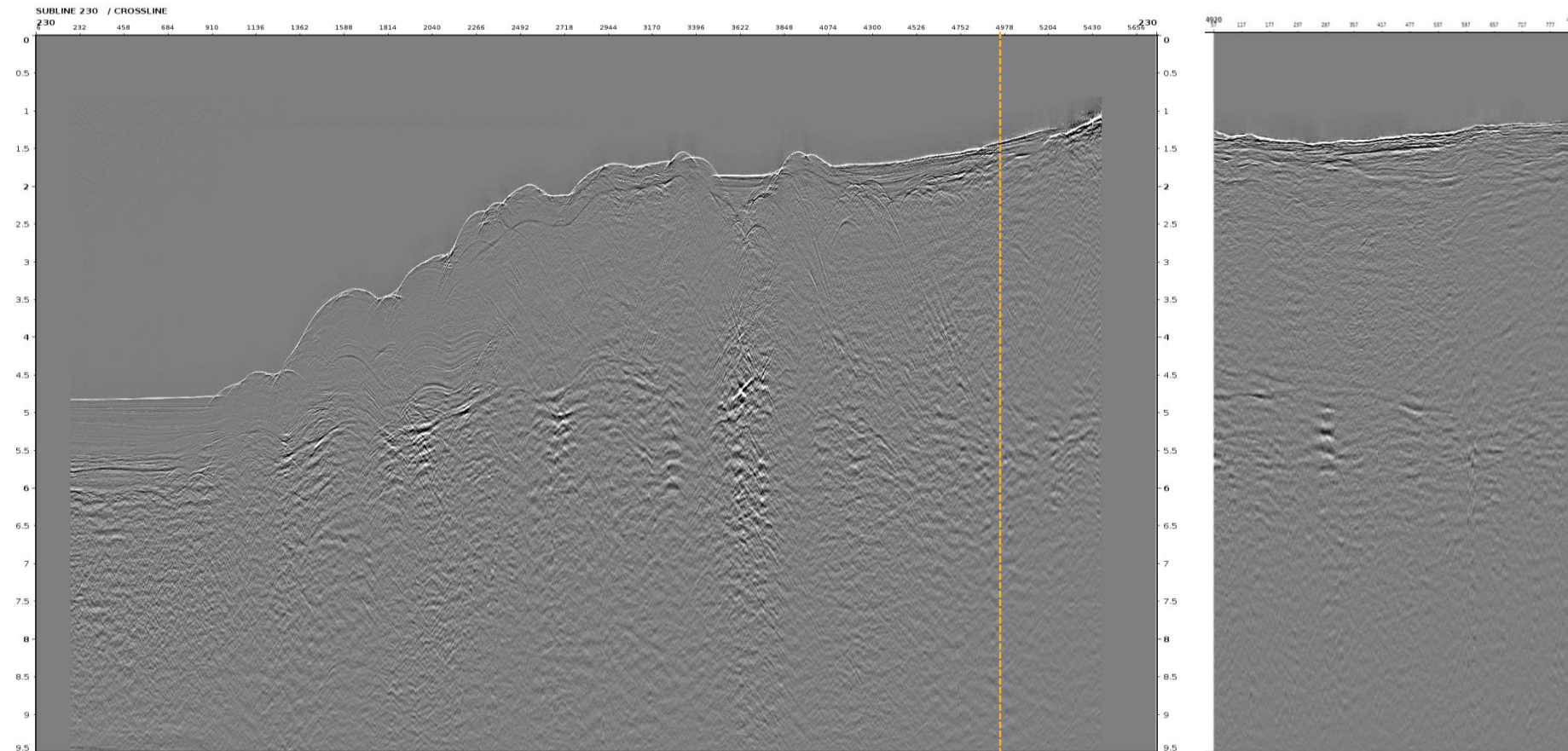
19





Common Offset 1750m **after** Diffracted Multiple Removal

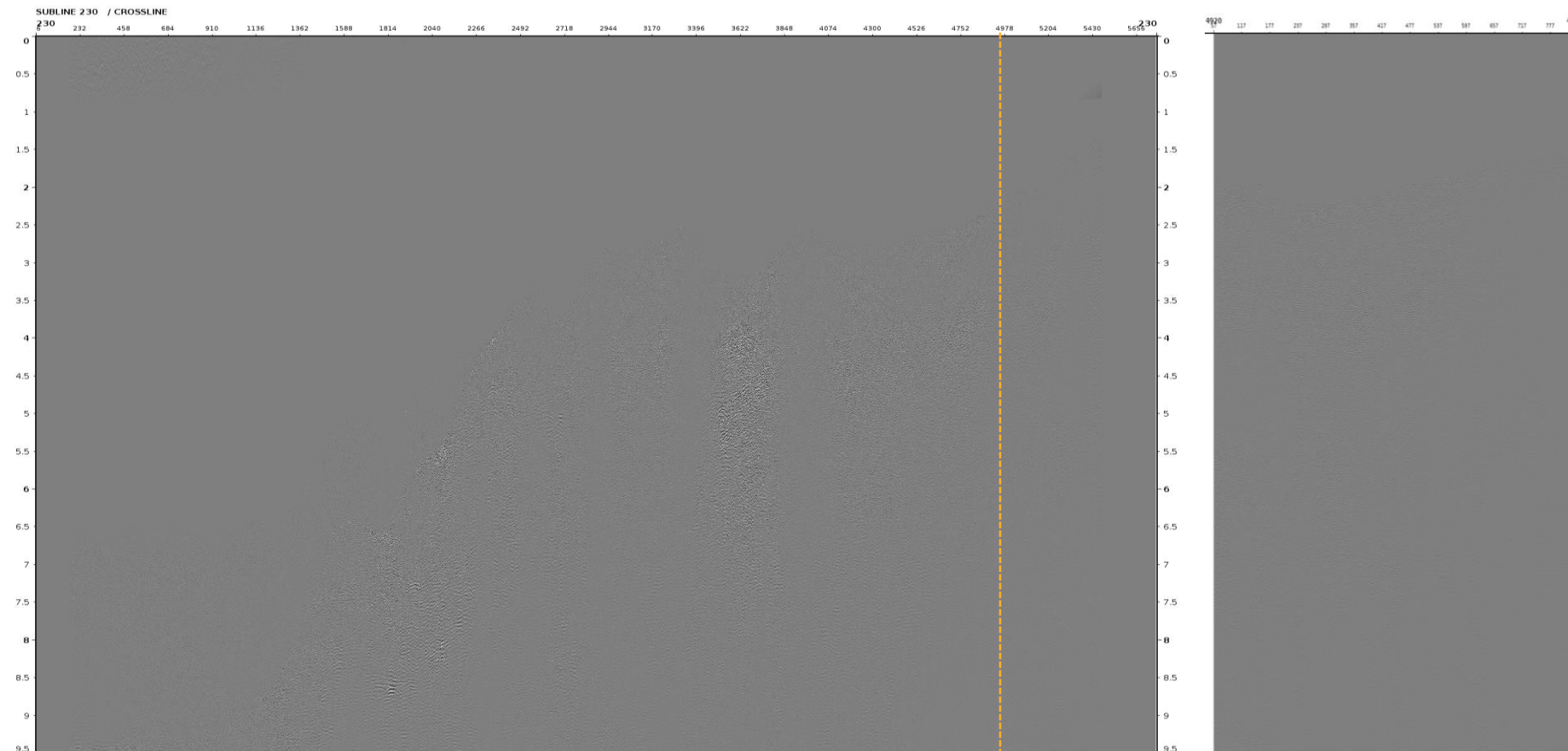
20





Difference before - after

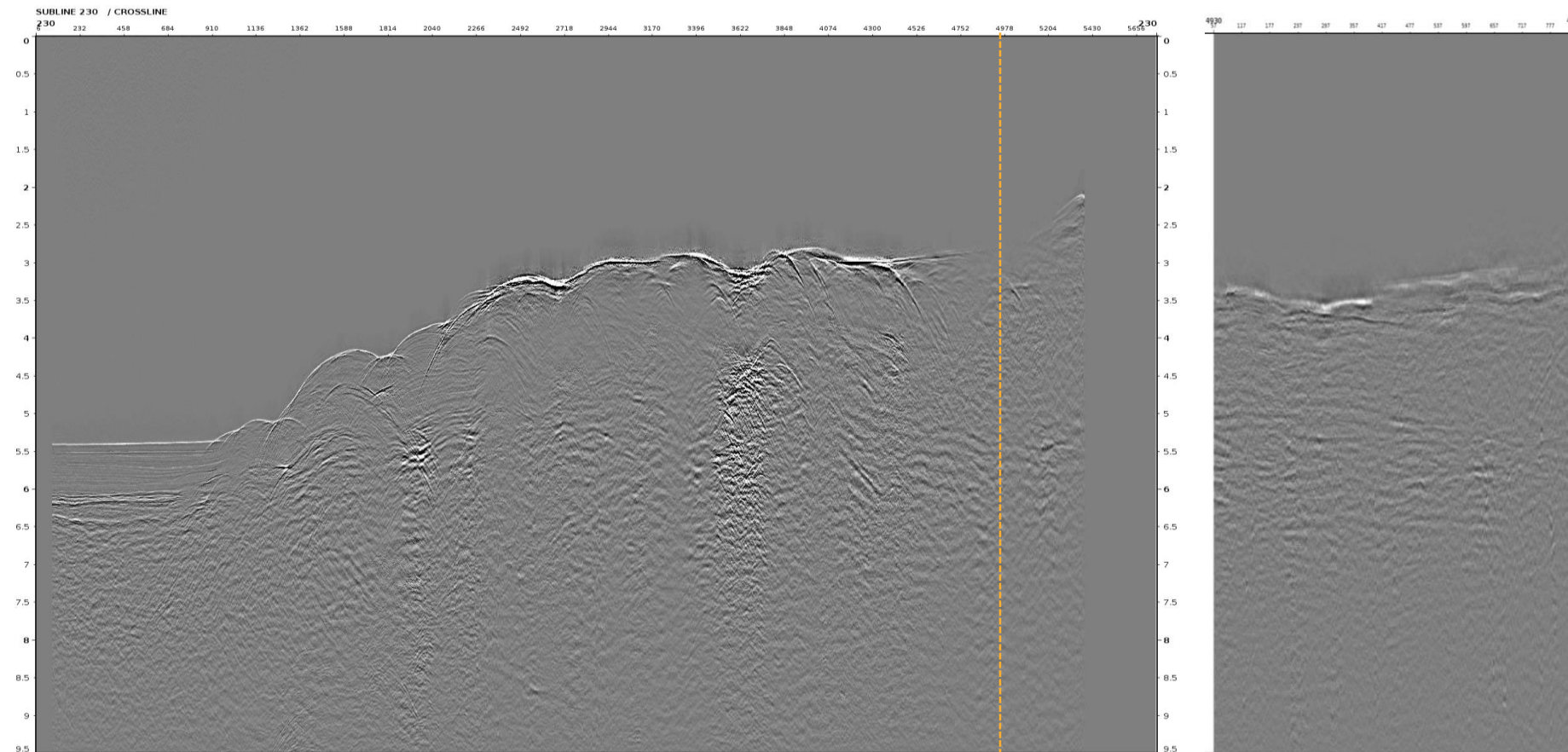
21





Common Offset 4050m before Diffracted Multiple Removal

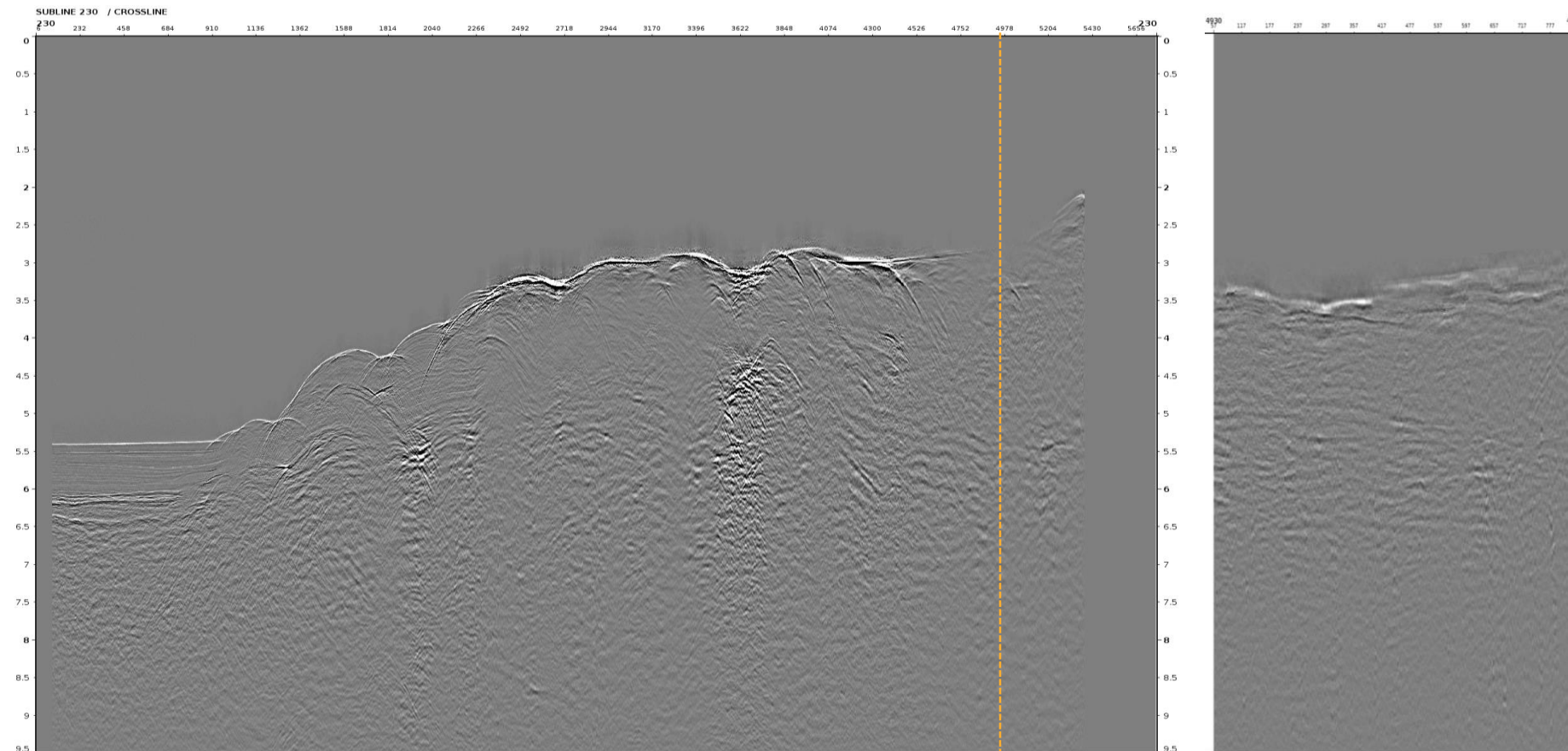
22





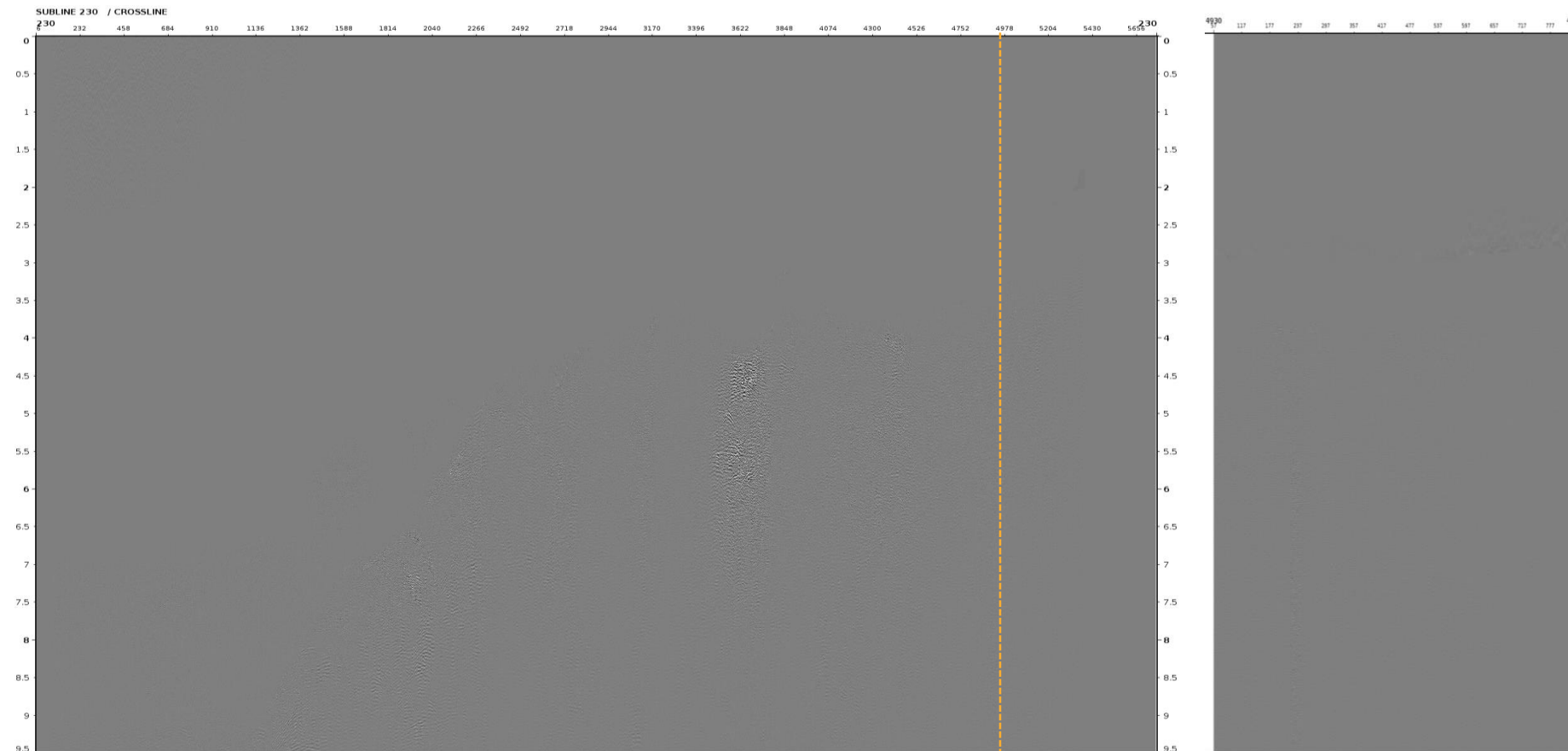
Common Offset 4050m **after** Diffracted Multiple Removal

23





Difference before - after

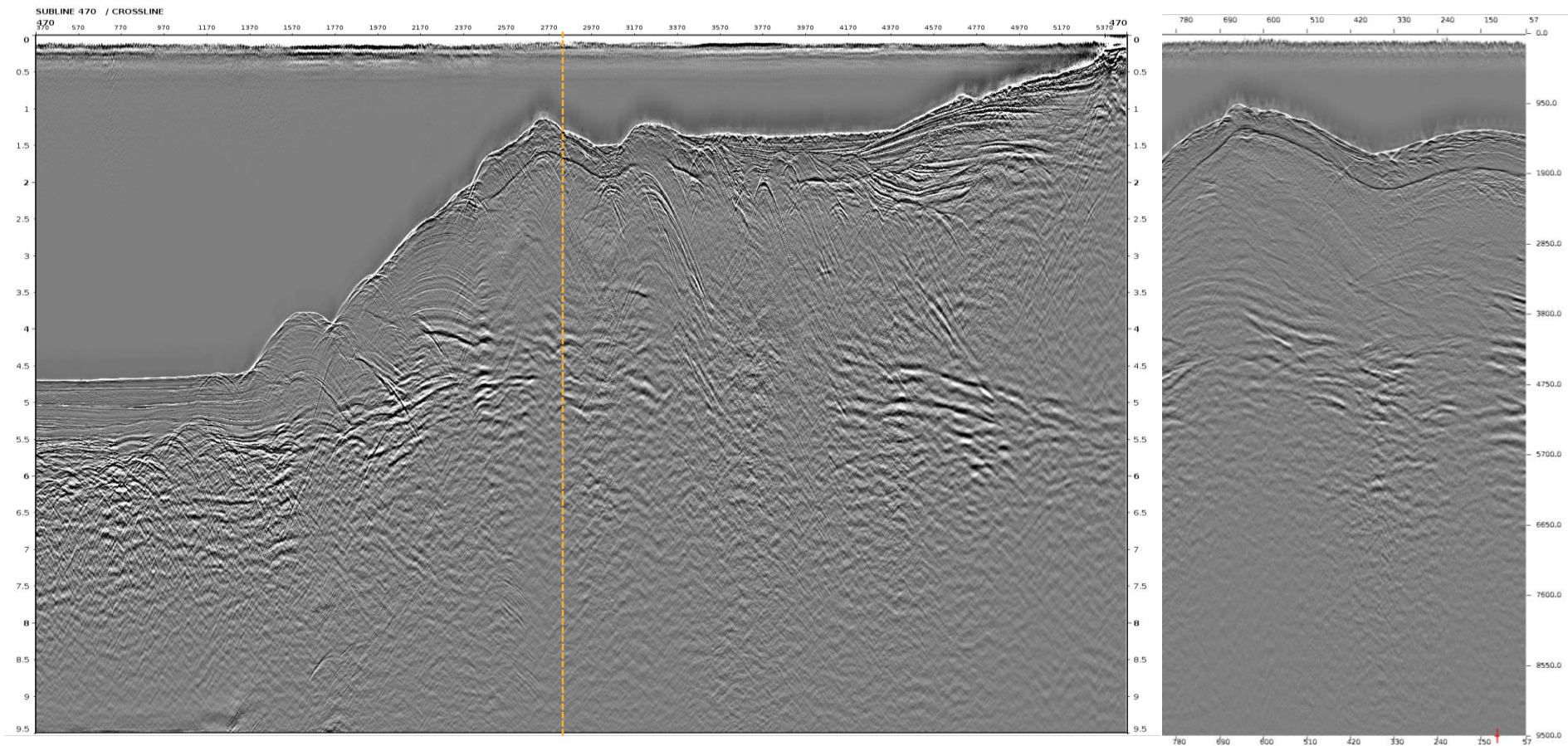


Stack

- subline 230
- **subline 470**
- subline 712

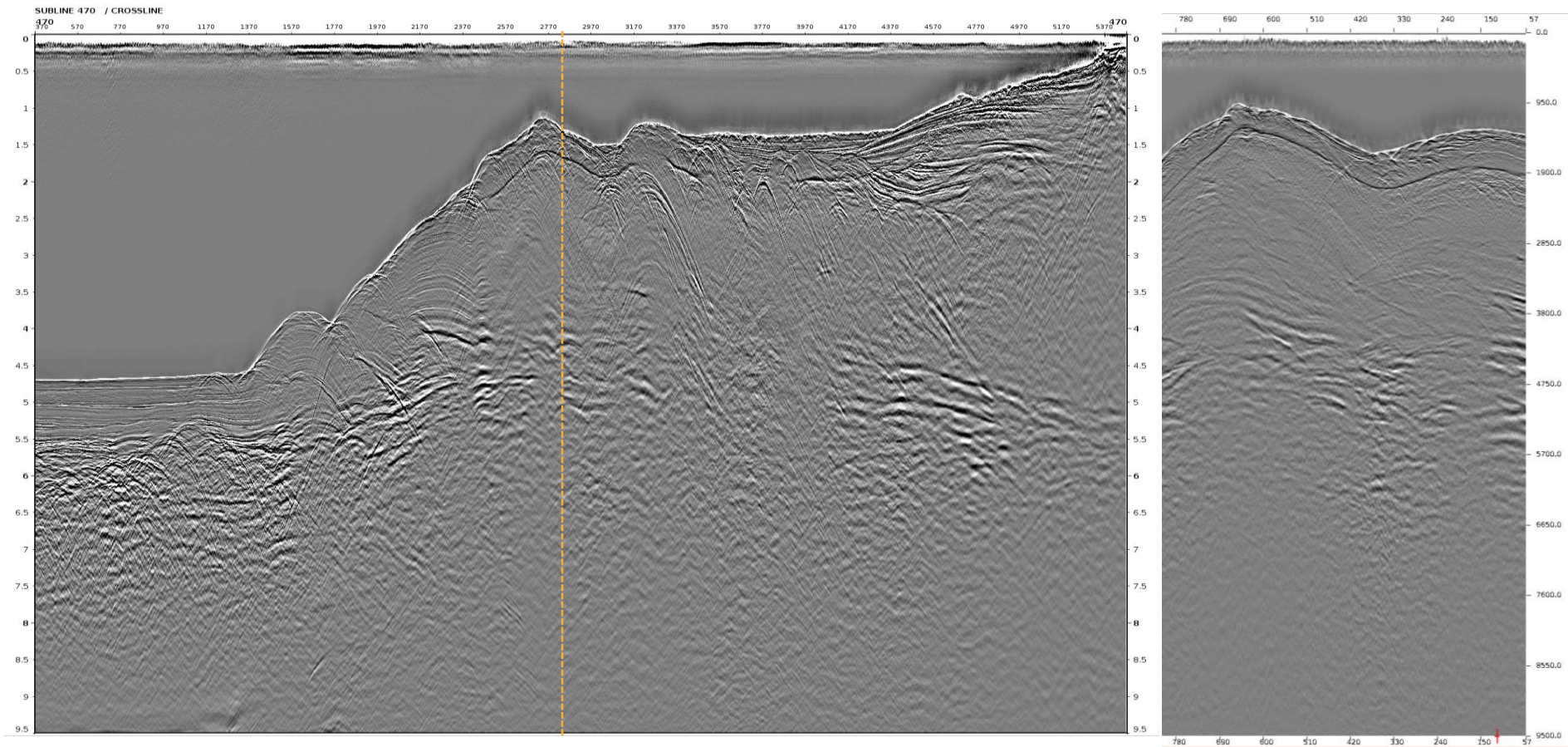
Stack before Diffracted Multiple Removal

26



Stack after Diffracted Multiple Removal

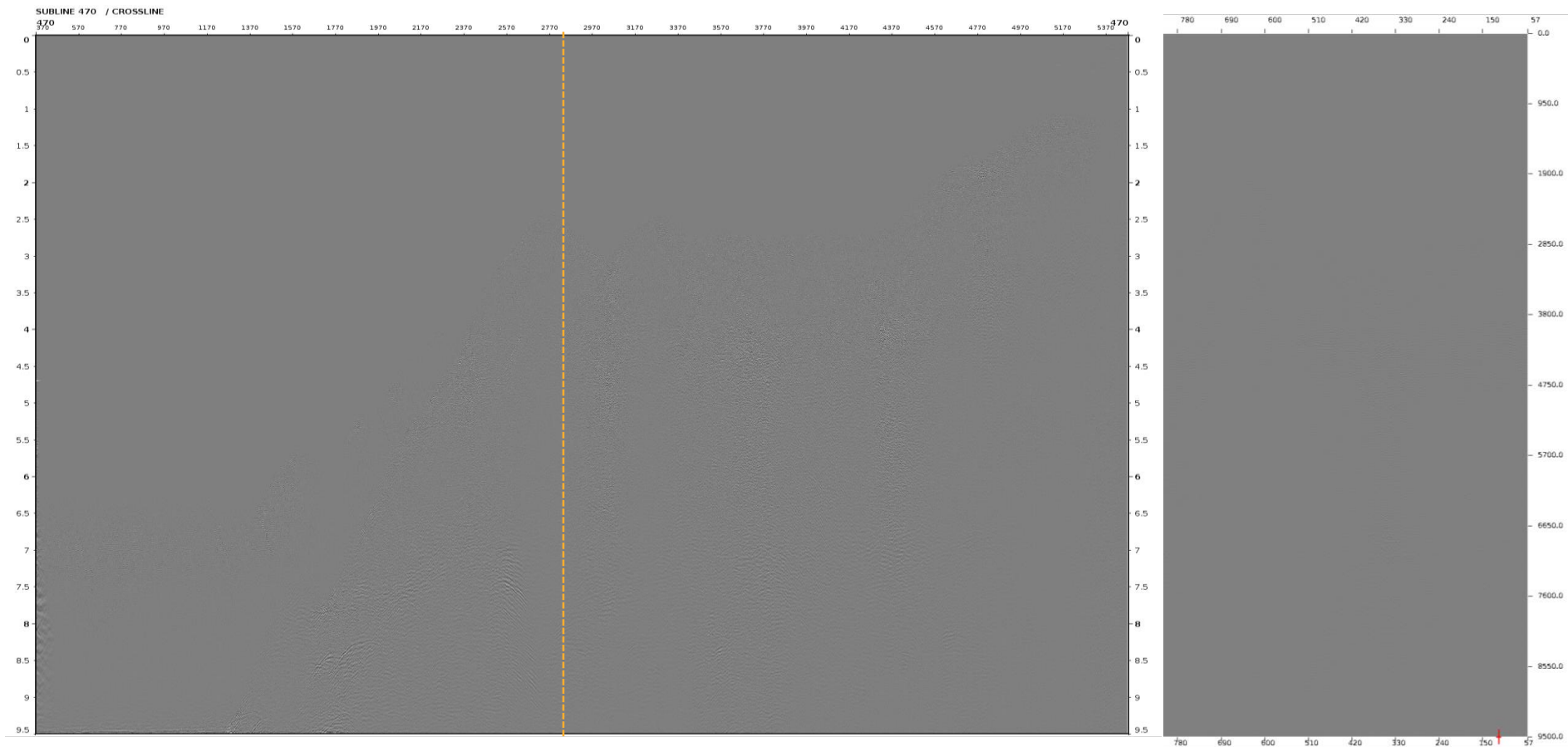
27





Difference before - after

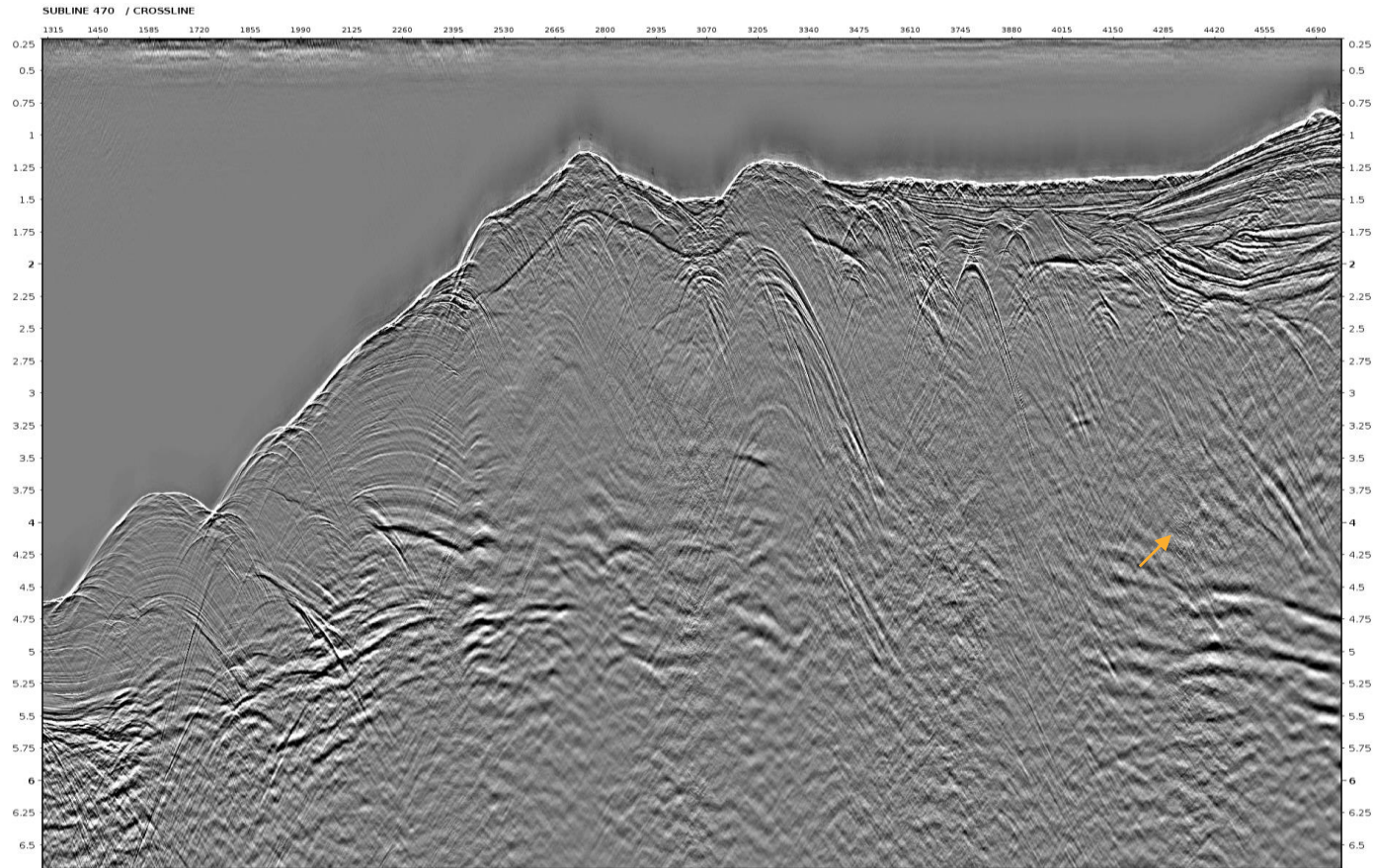
28





Zoom in Stack before Diffracted Multiple Removal

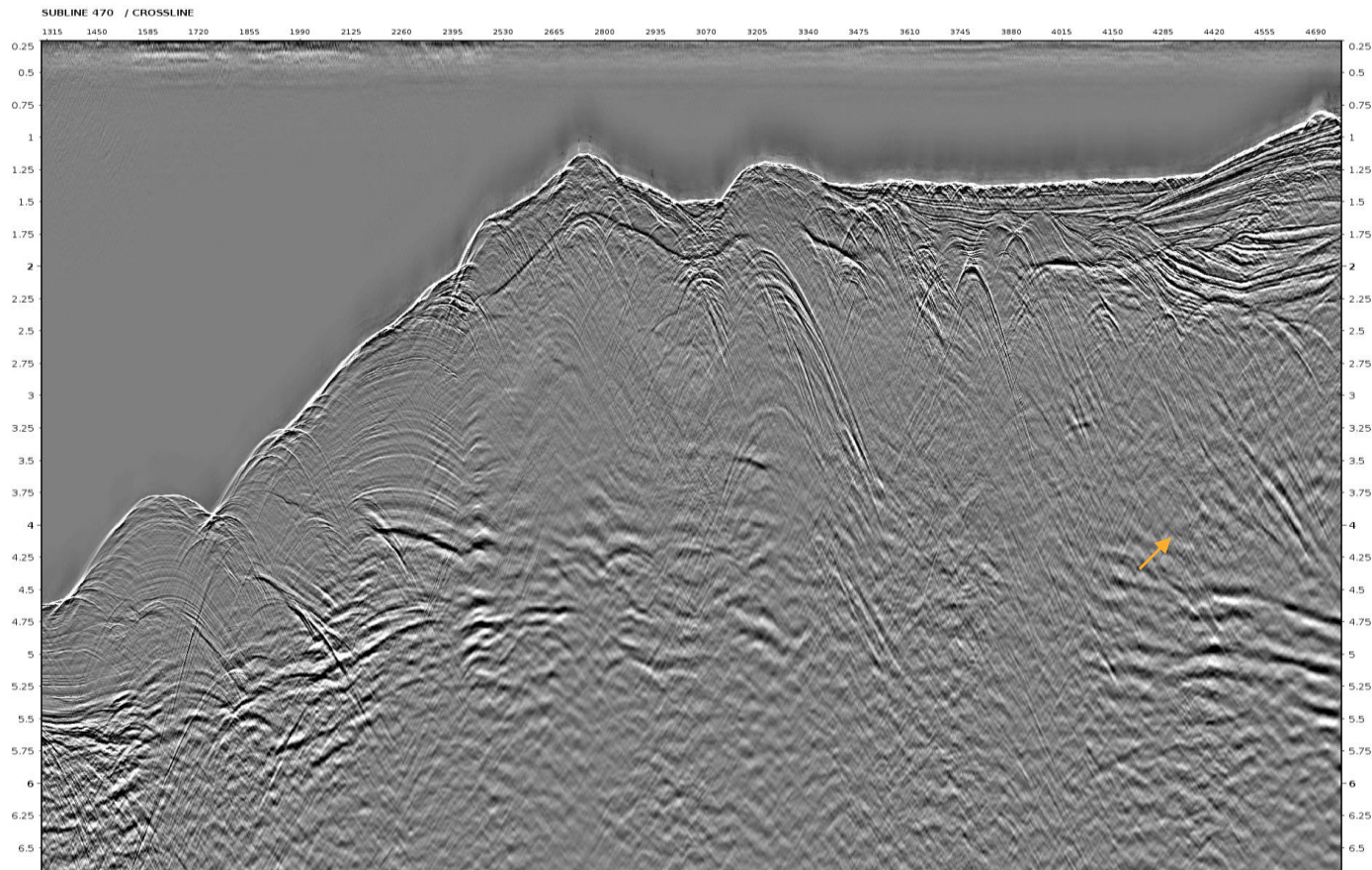
29





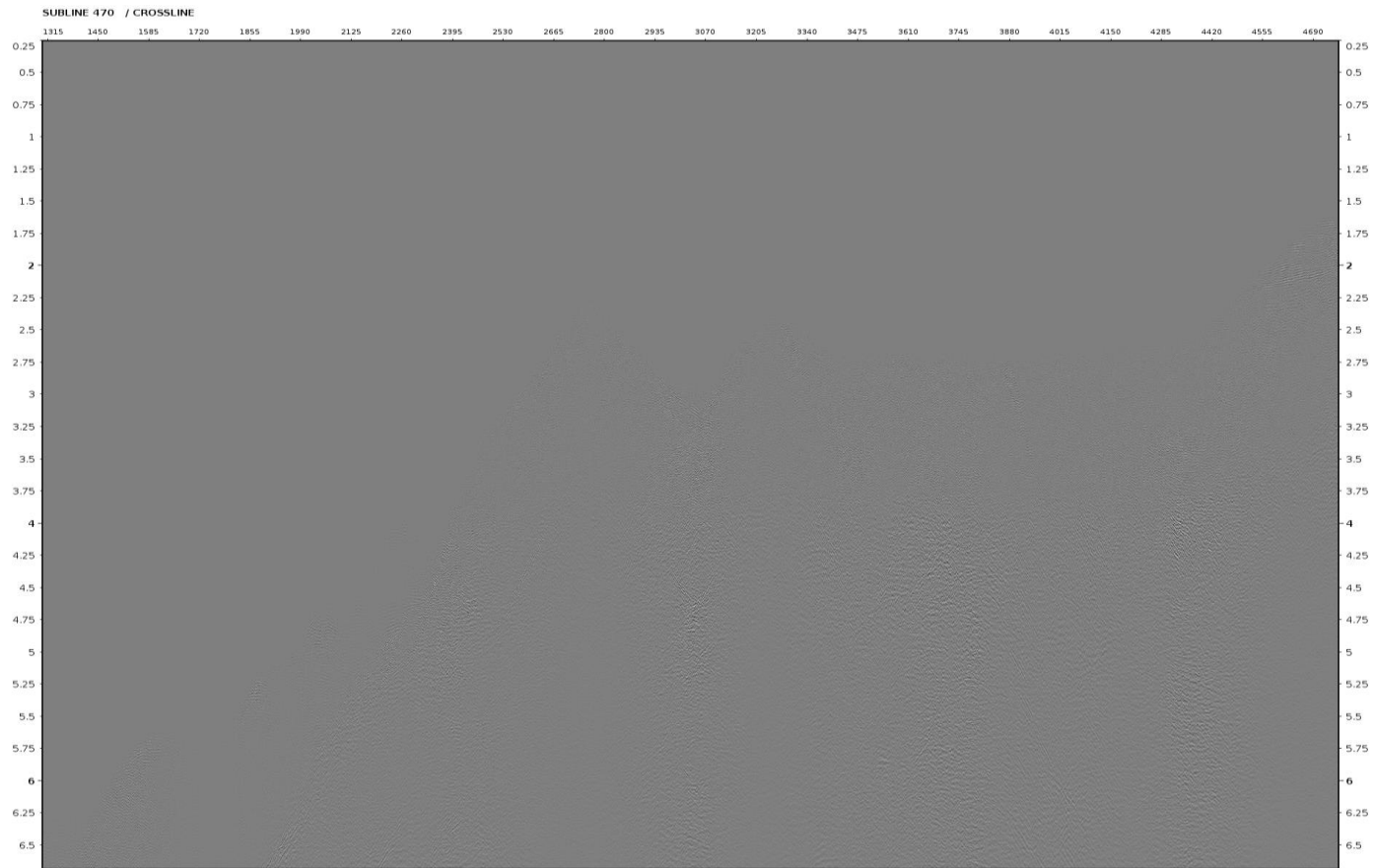
Zoom in Stack after Diffracted Multiple Removal

30





Difference before - after

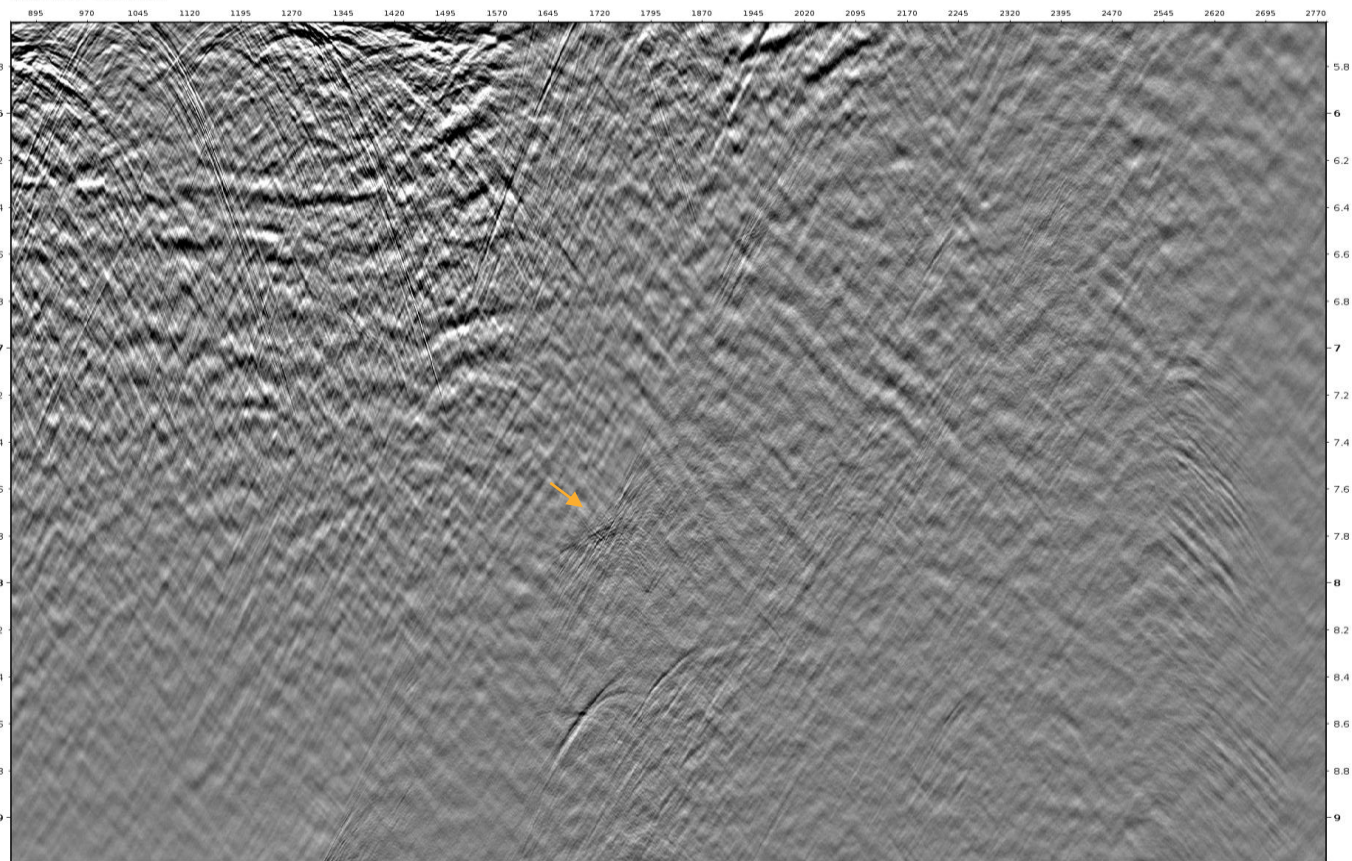




Zoom in Stack before Diffracted Multiple Removal

32

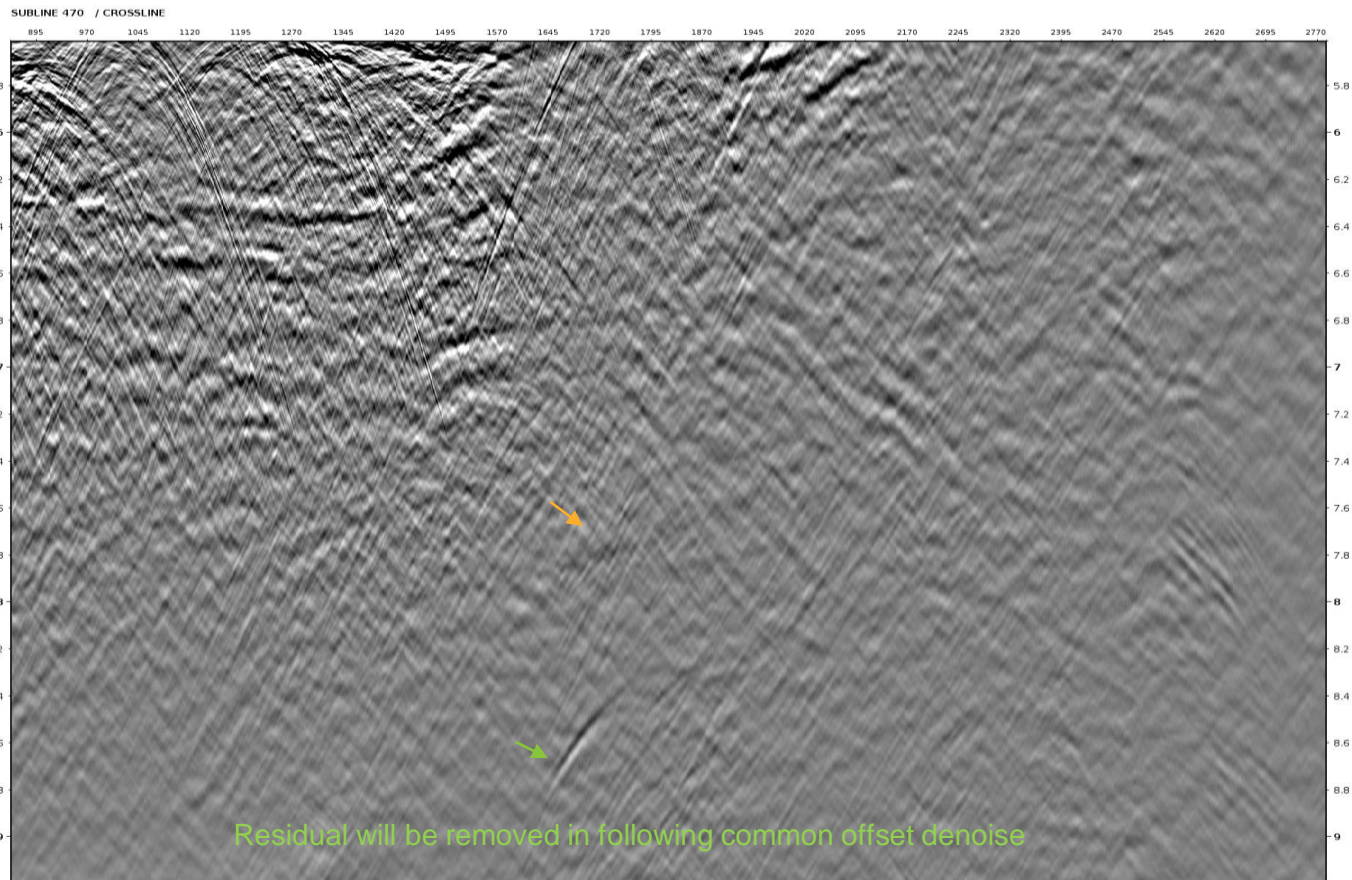
SUBLINE 470 / CROSSLINE





Zoom in Stack **after** Diffracted Multiple Removal

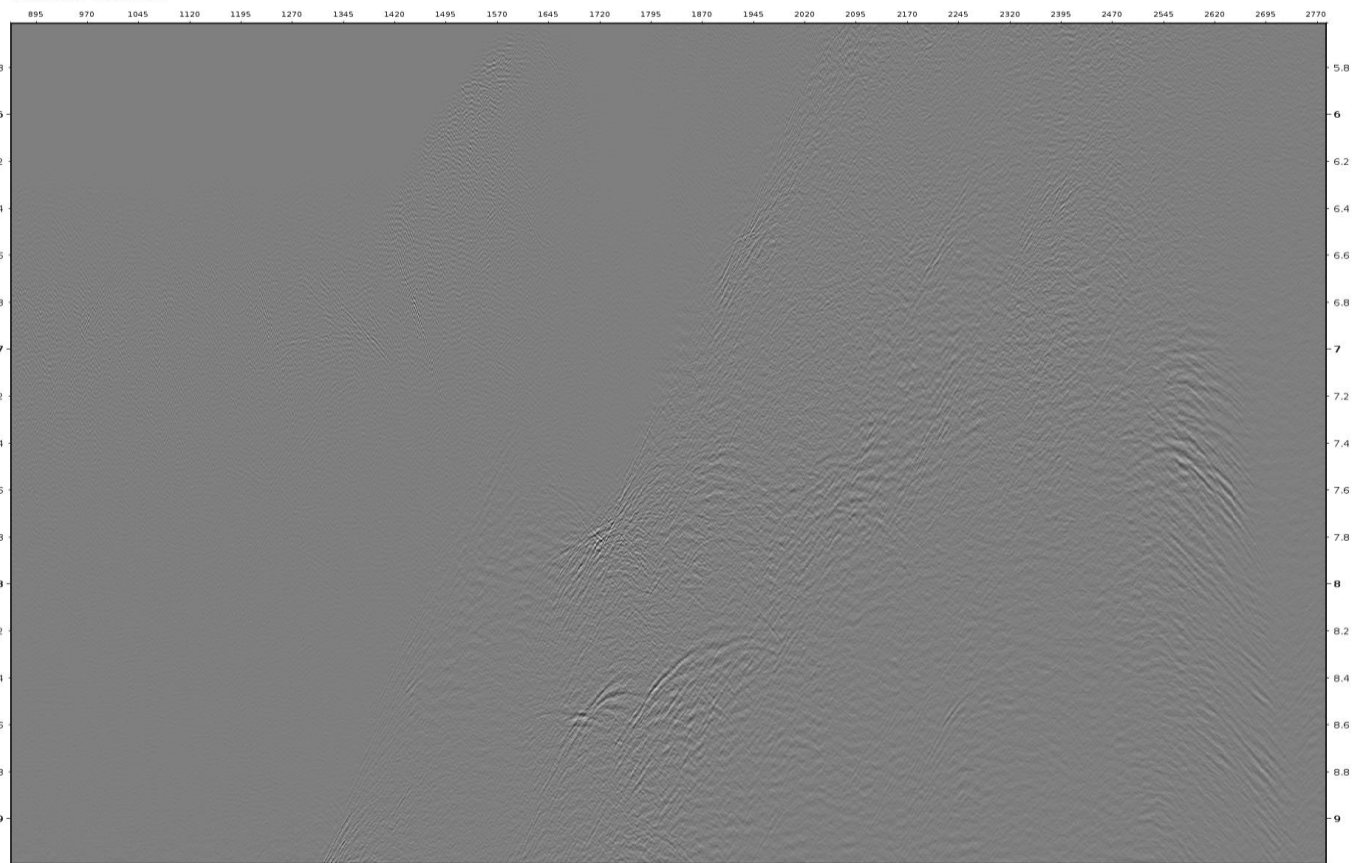
33





Difference before - after

SUBLINE 470 / CROSSLINE



Common Offset Subline 470

- offset 350m
- offset 1750m
- offset 4050m

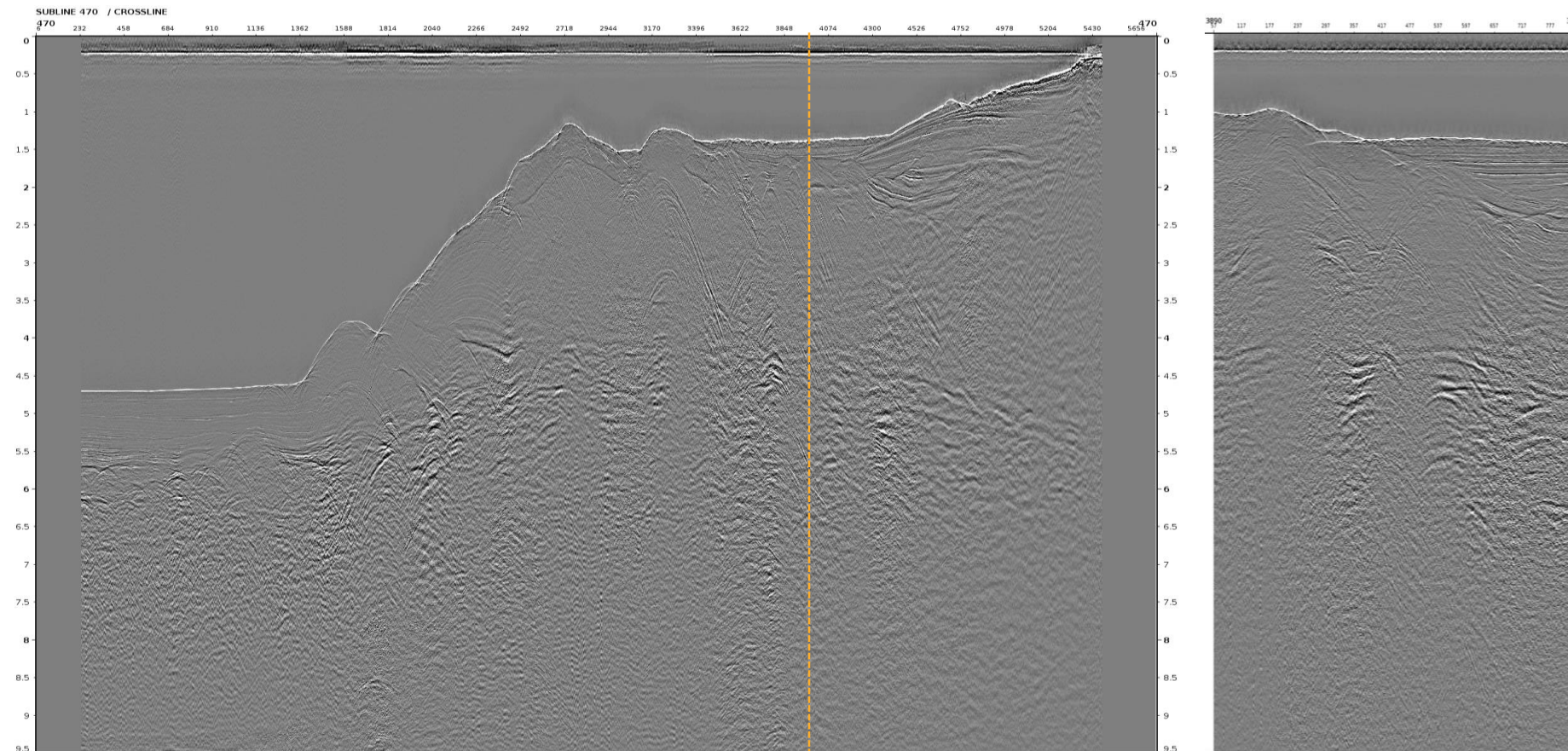


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Common Offset 350m before Diffracted Multiple Removal

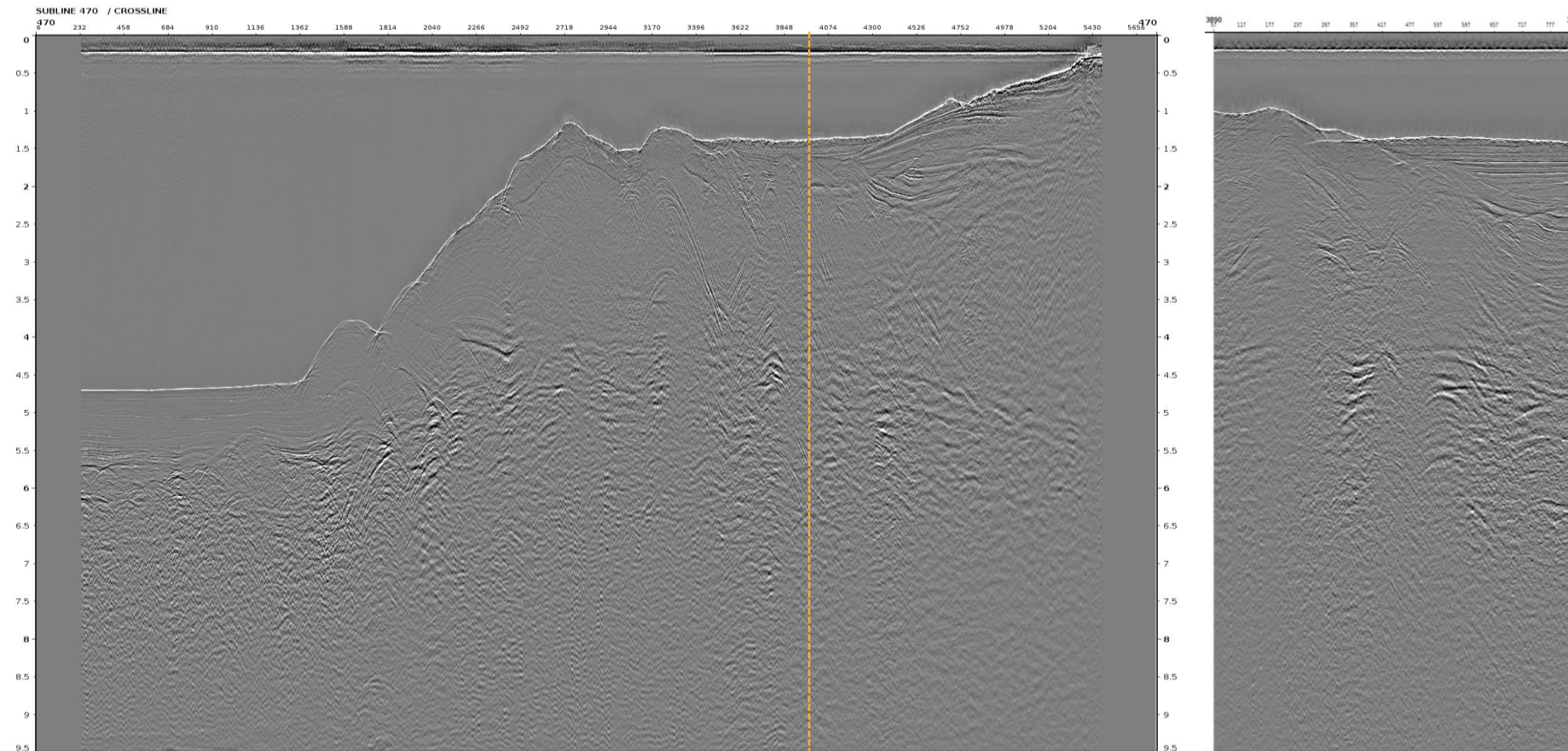
36





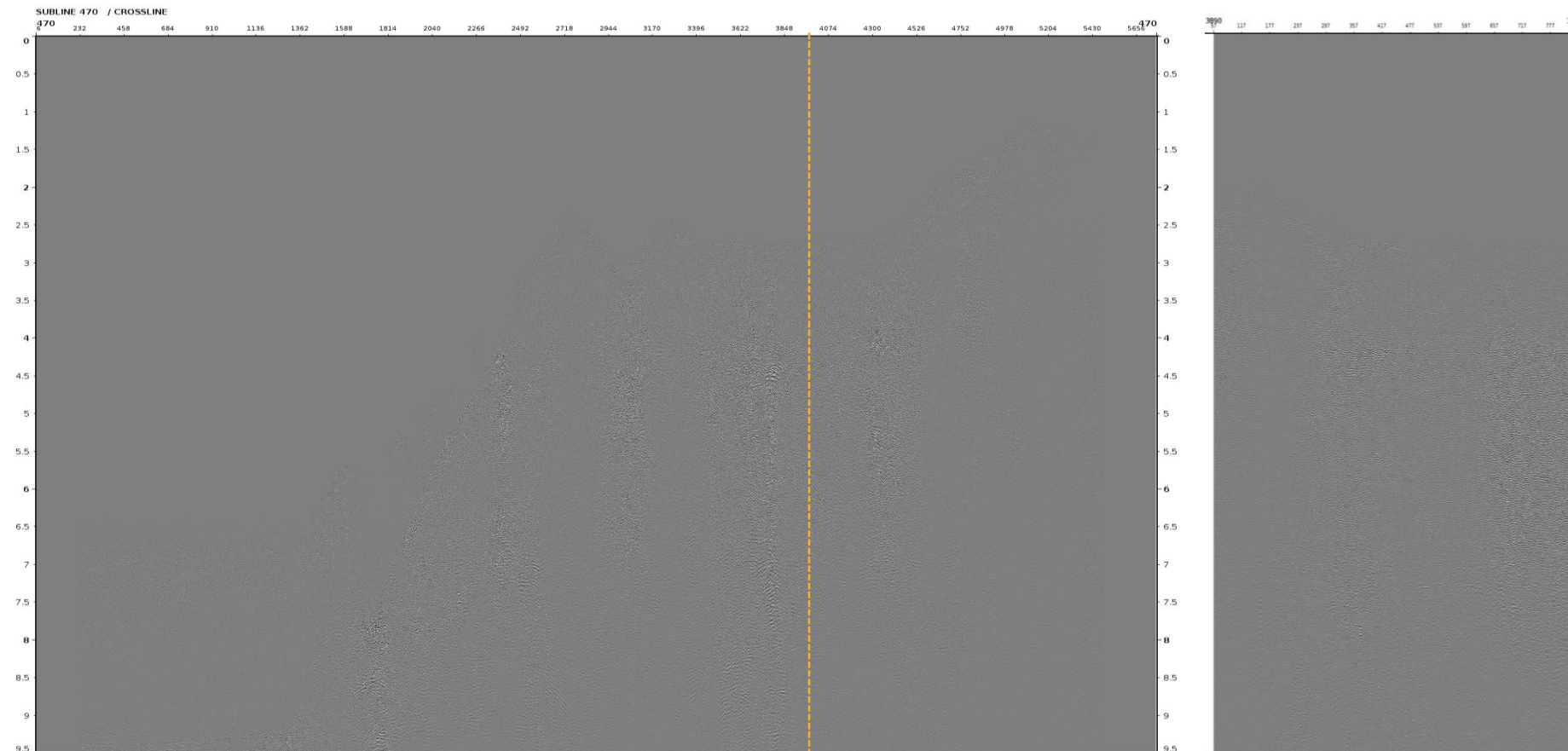
Common Offset 350m **after** Diffracted Multiple Removal

37





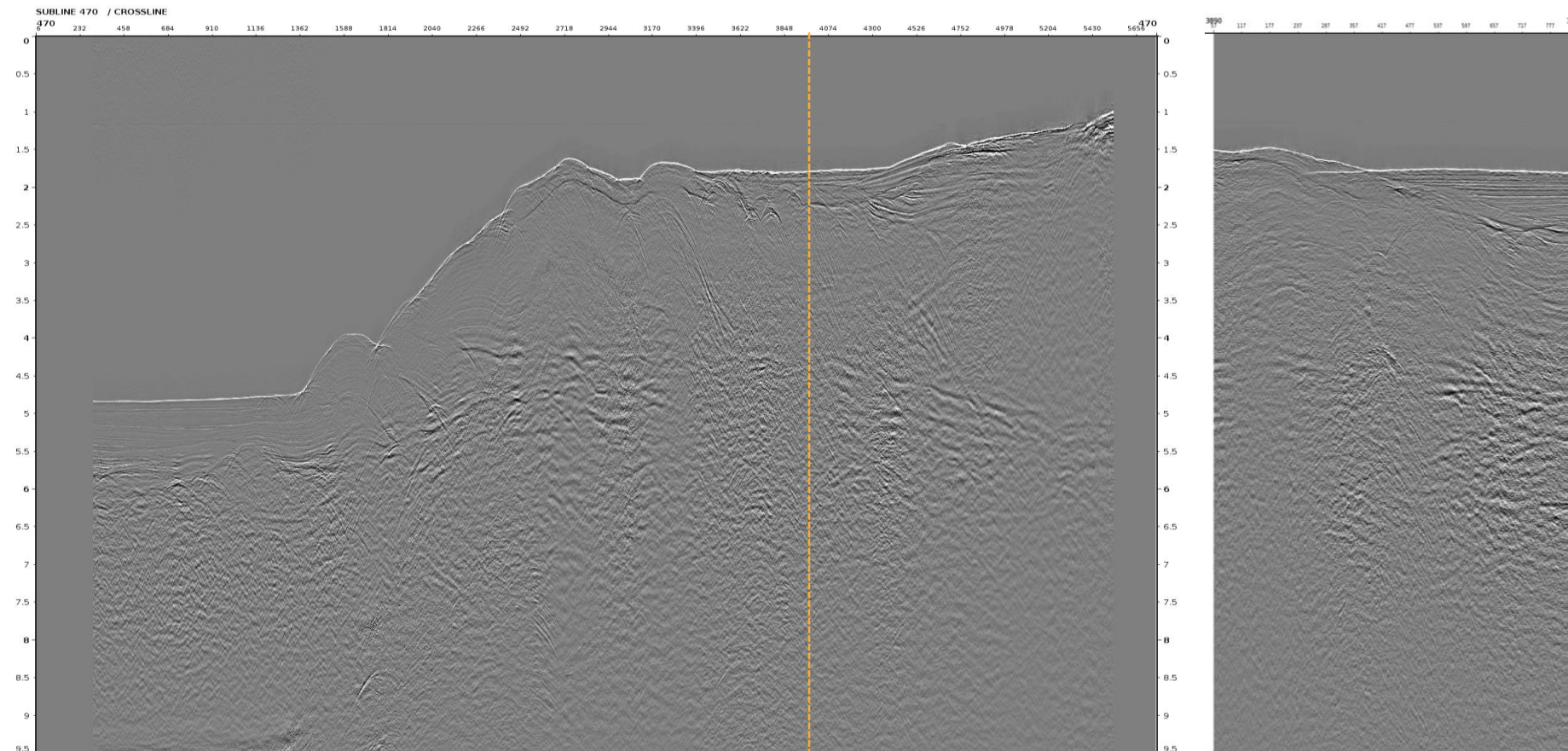
Difference before - after





Common Offset 1750m before Diffracted Multiple Removal

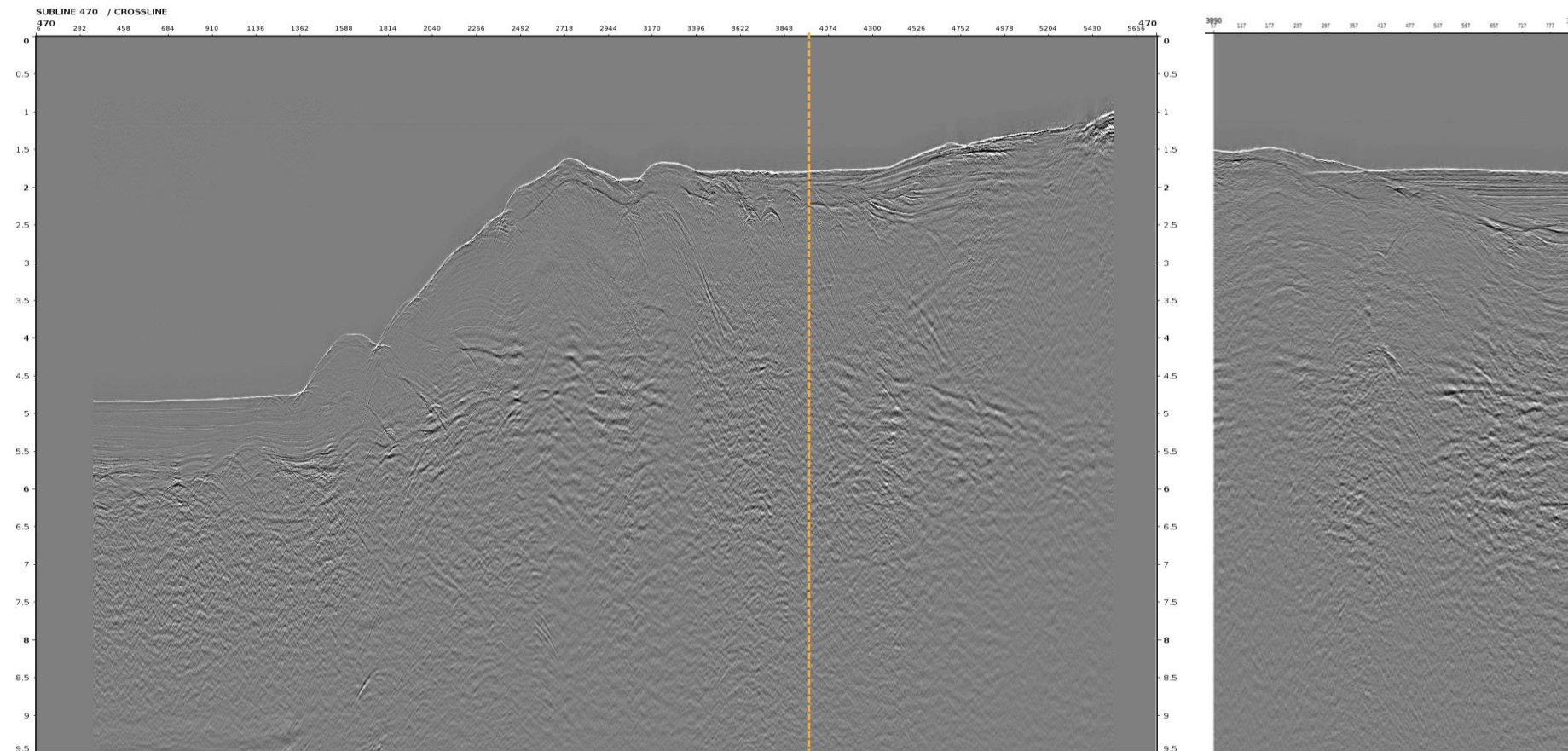
39





Common Offset 1750m **after** Diffracted Multiple Removal

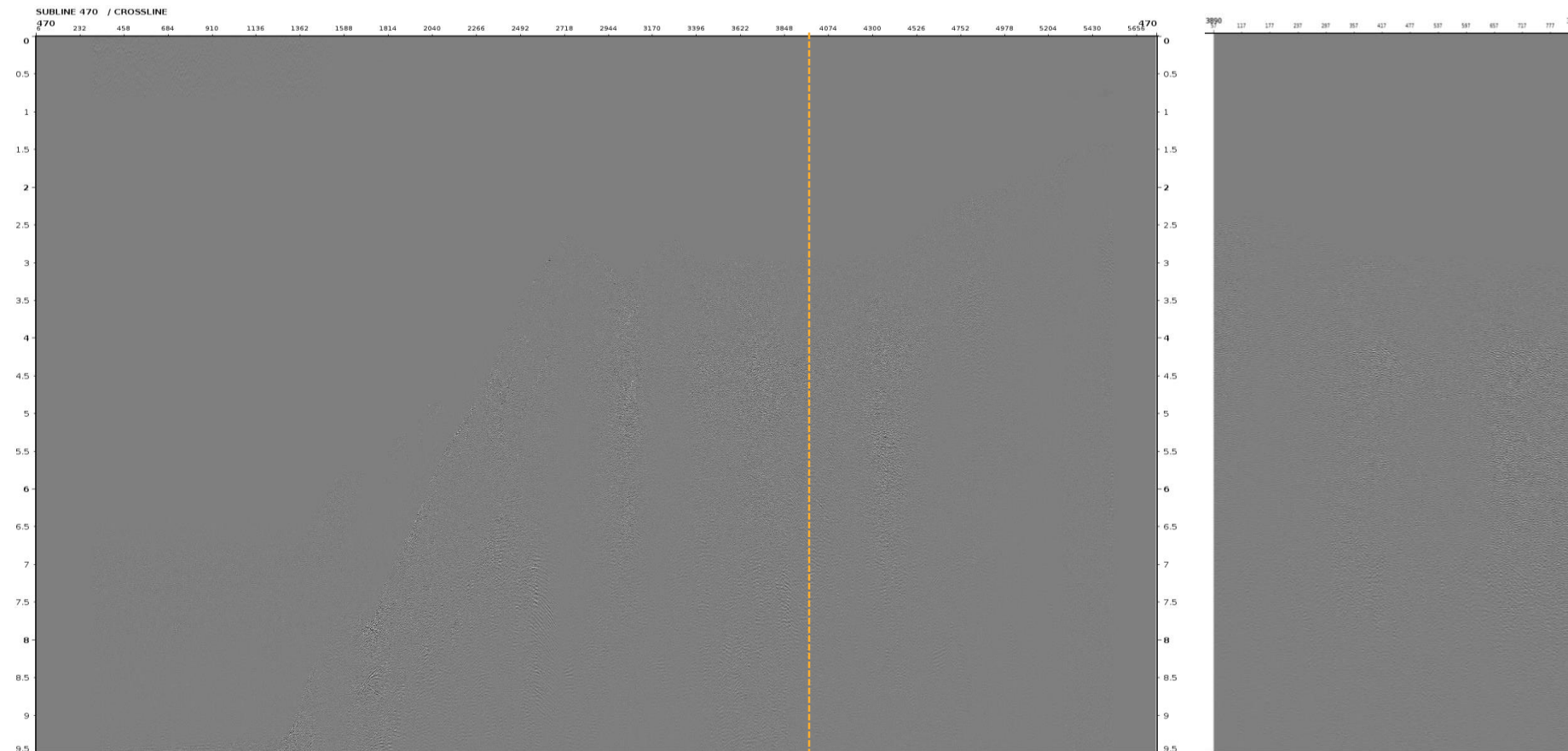
40





Difference before - after

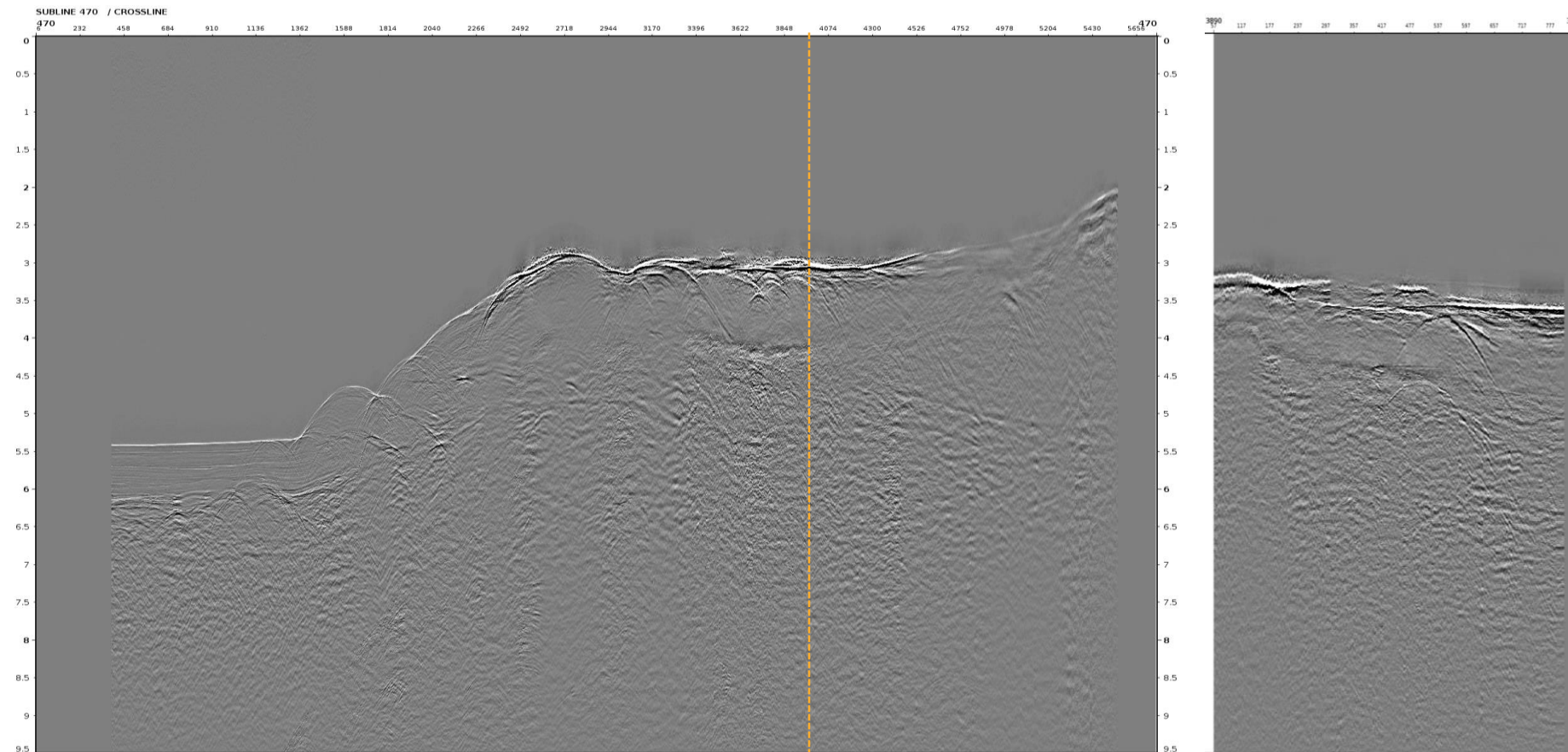
41





Common Offset 4050m before Diffracted Multiple Removal

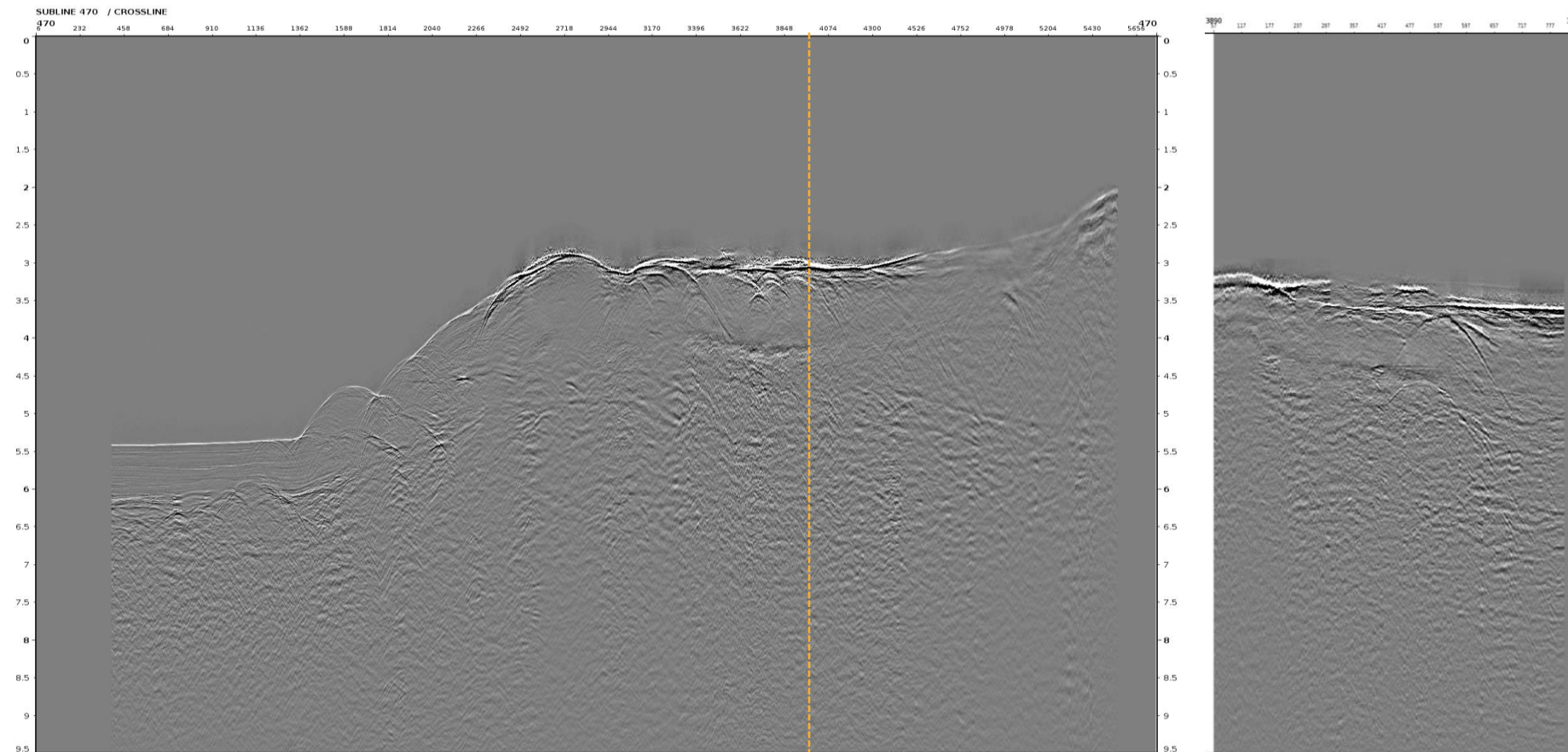
42





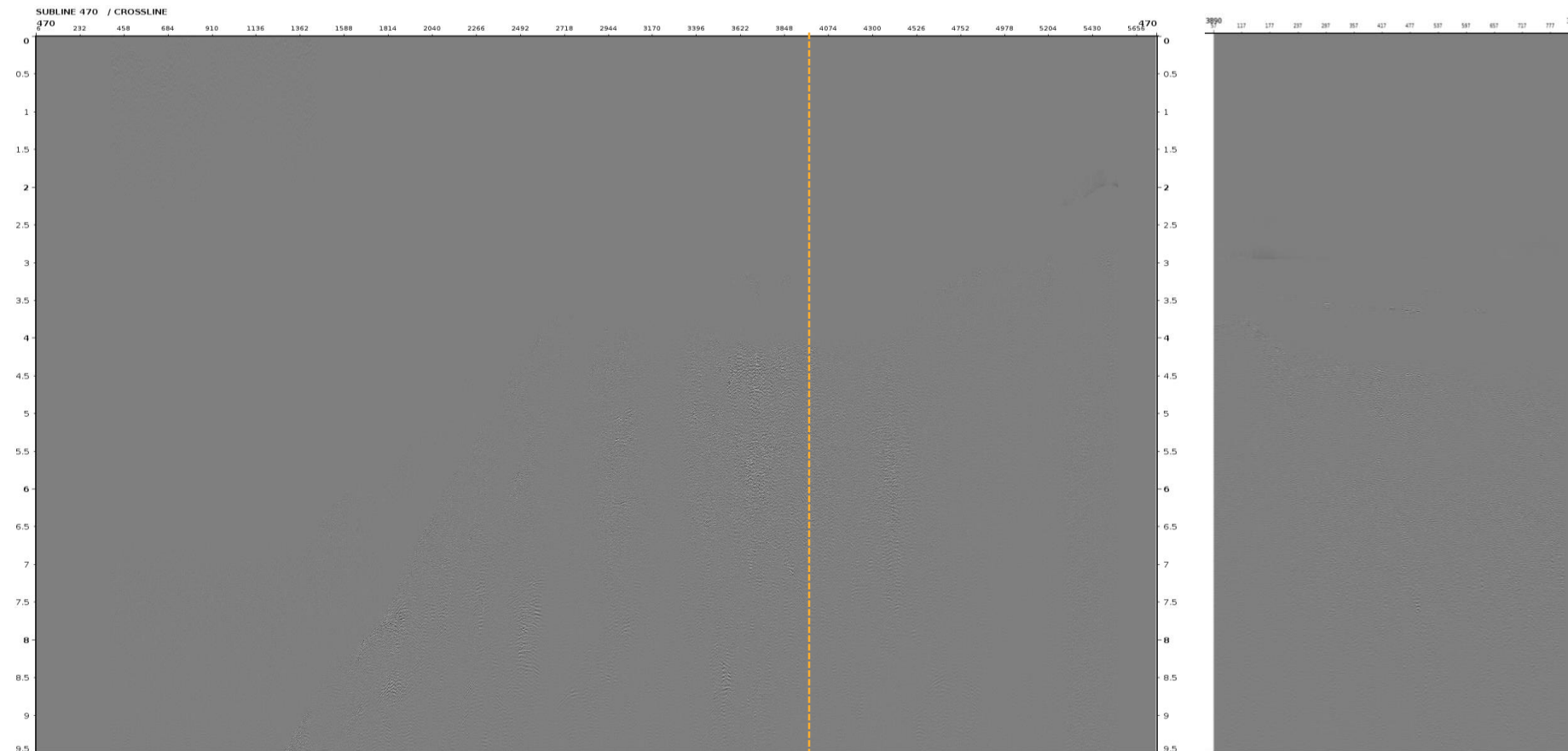
Common Offset 4050m **after** Diffracted Multiple Removal

43





Difference before - after

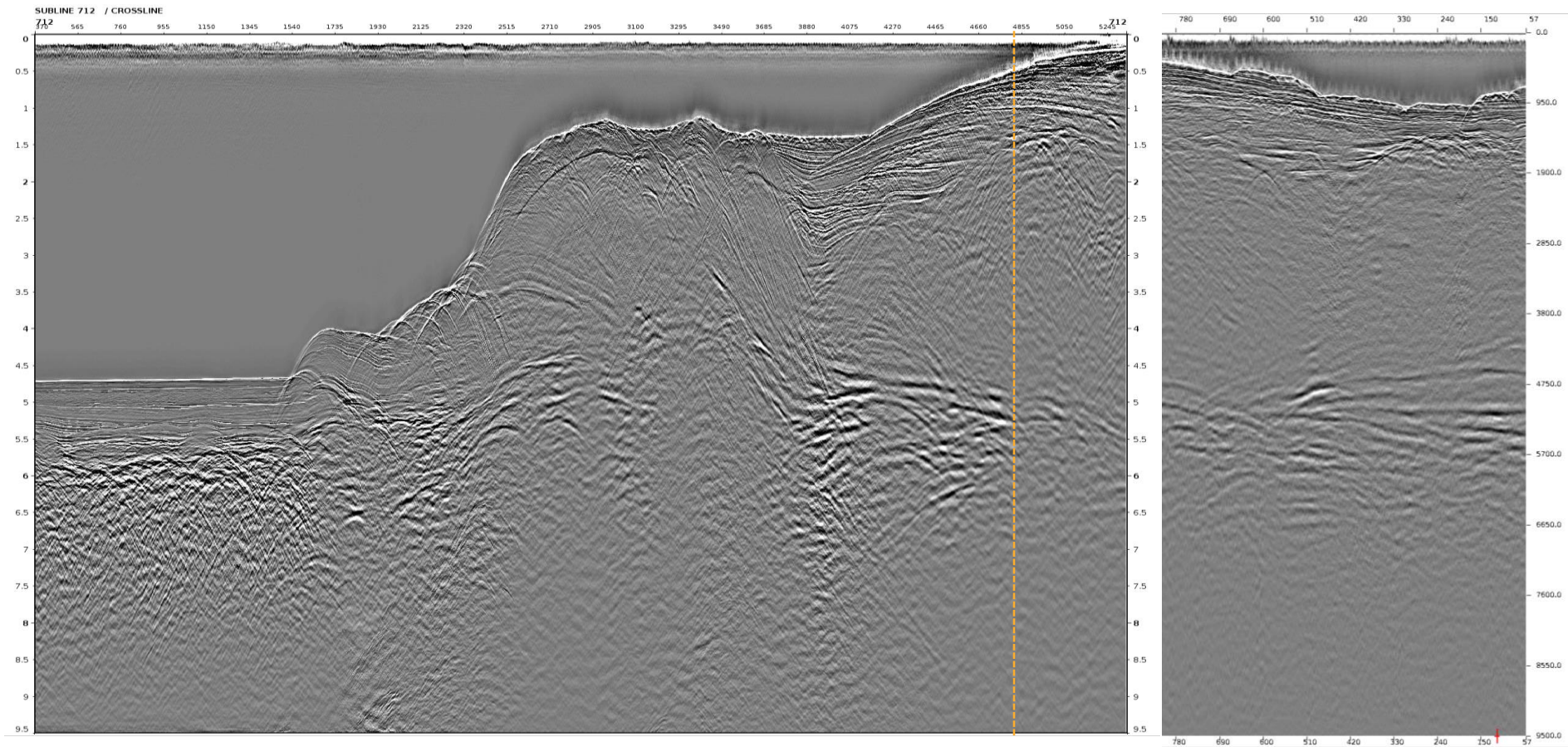


Stack

- subline 230
- subline 470
- subline 712

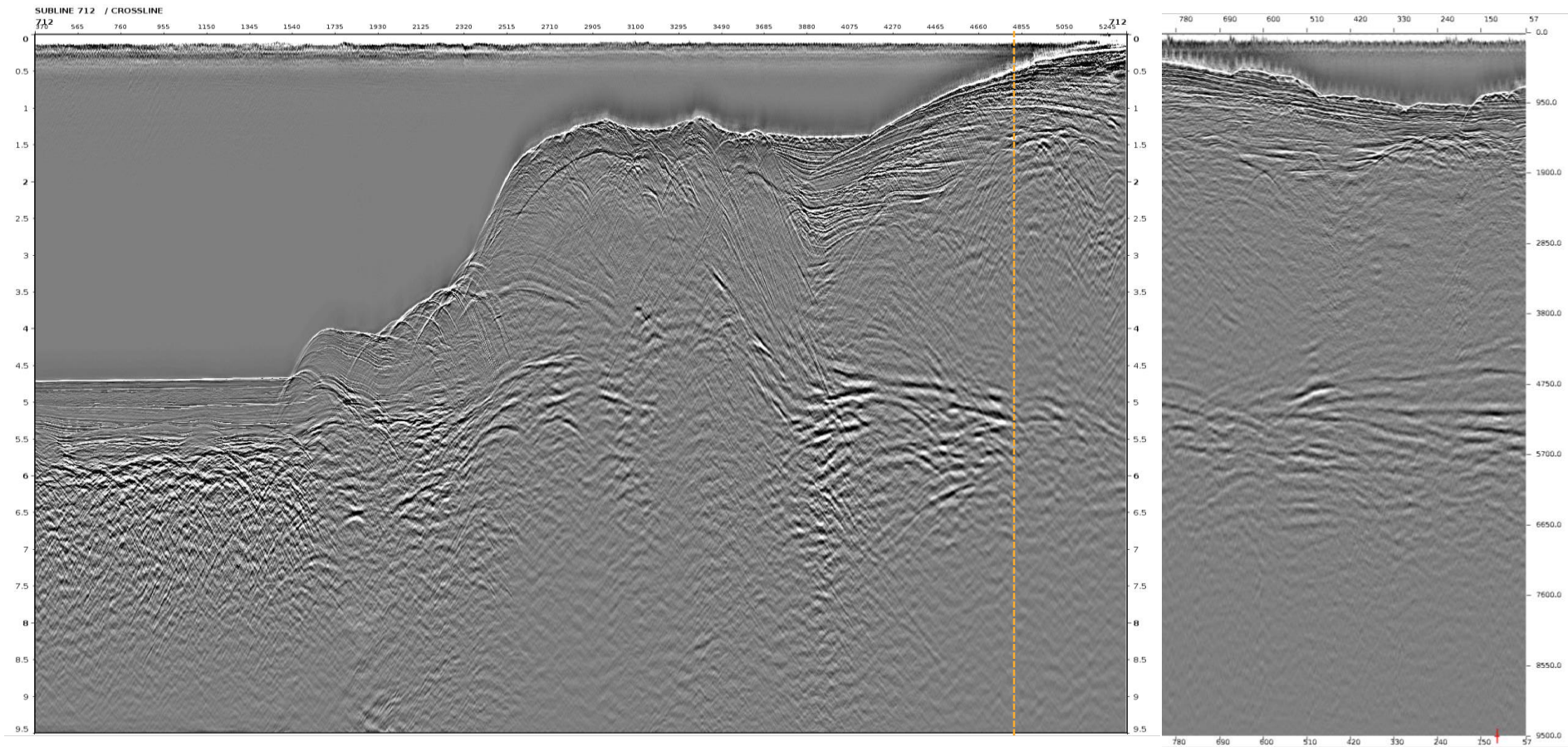
Stack before Diffracted Multiple Removal

46



Stack after Diffracted Multiple Removal

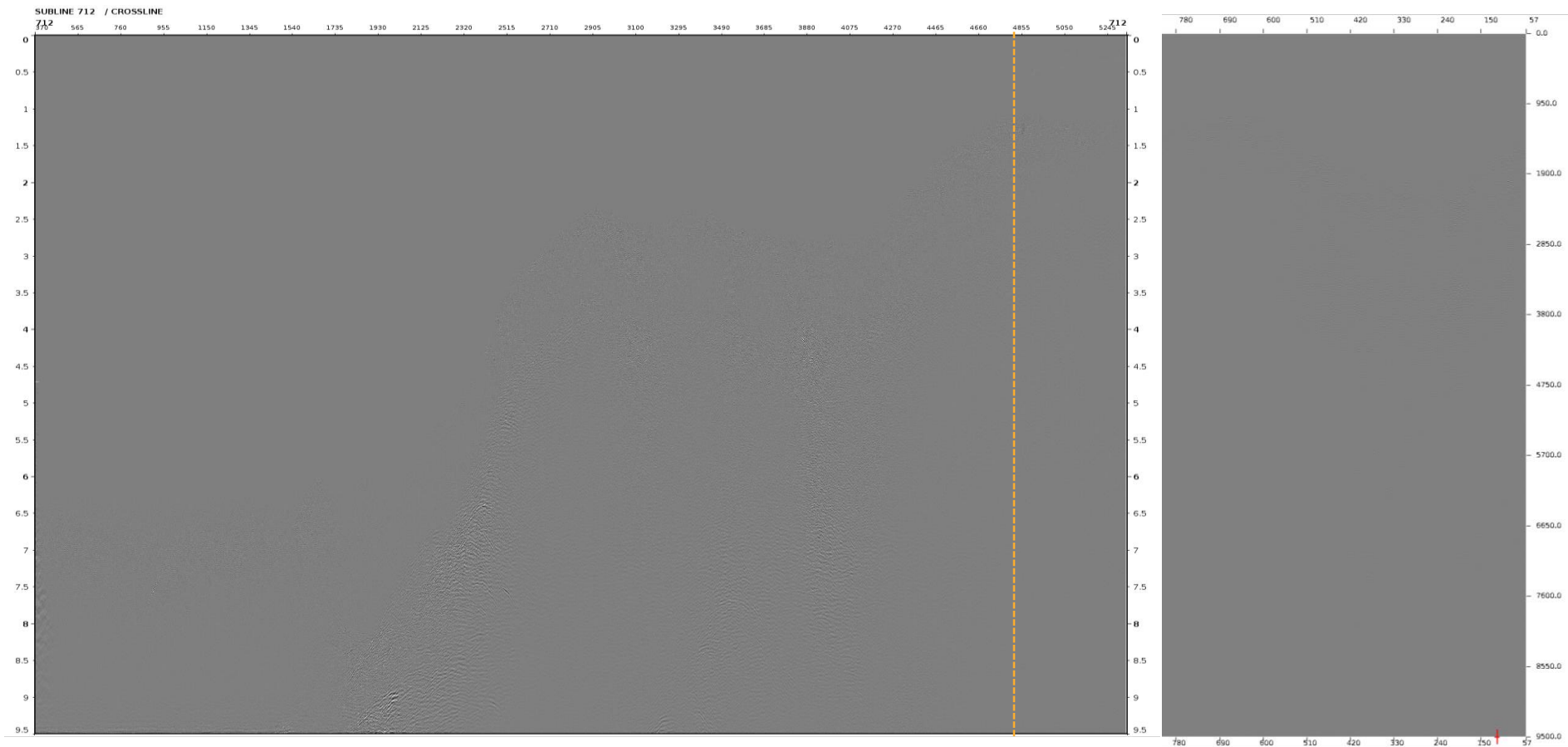
47





Difference before - after

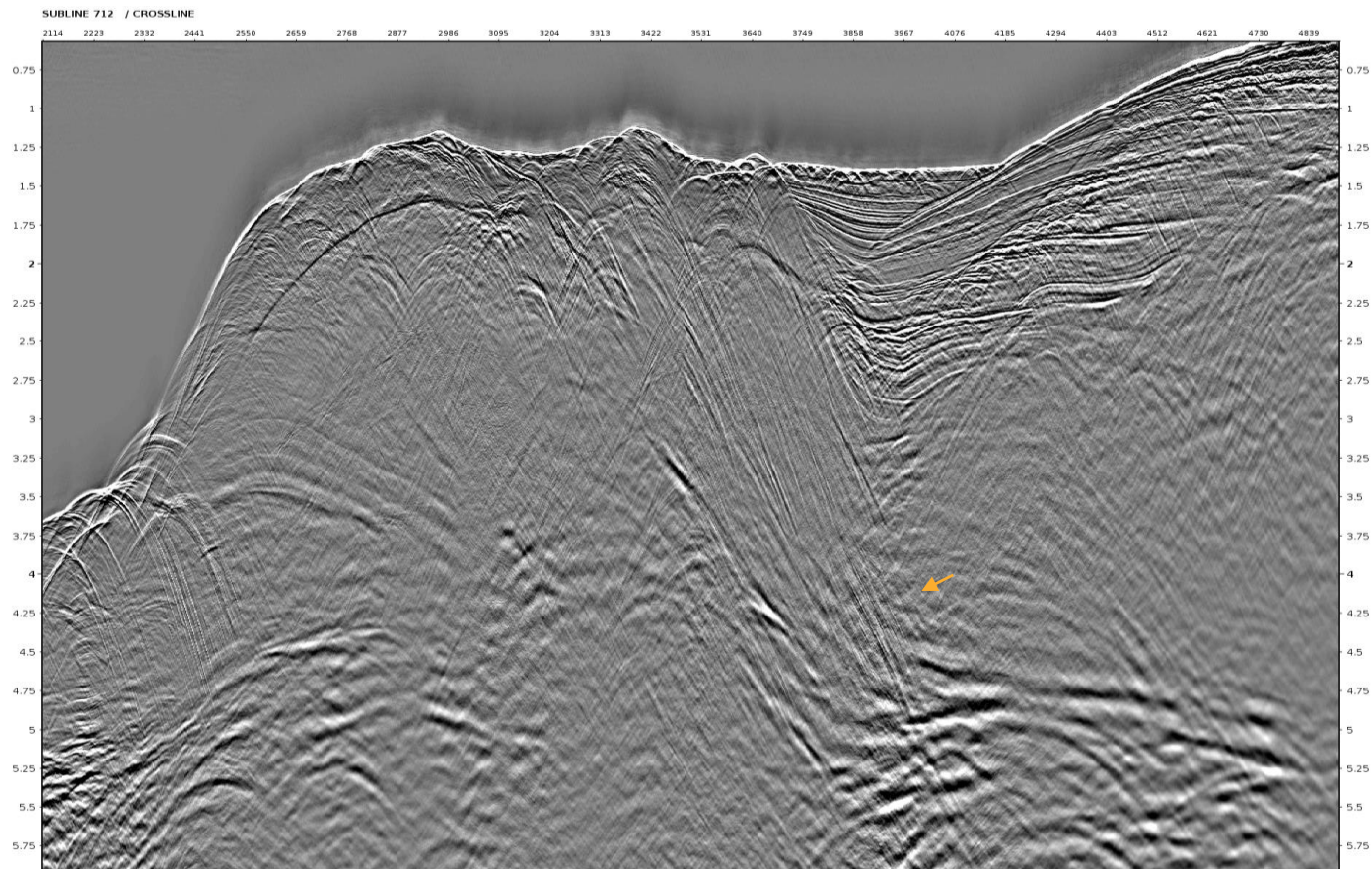
48





Zoom in Stack before Diffracted Multiple Removal

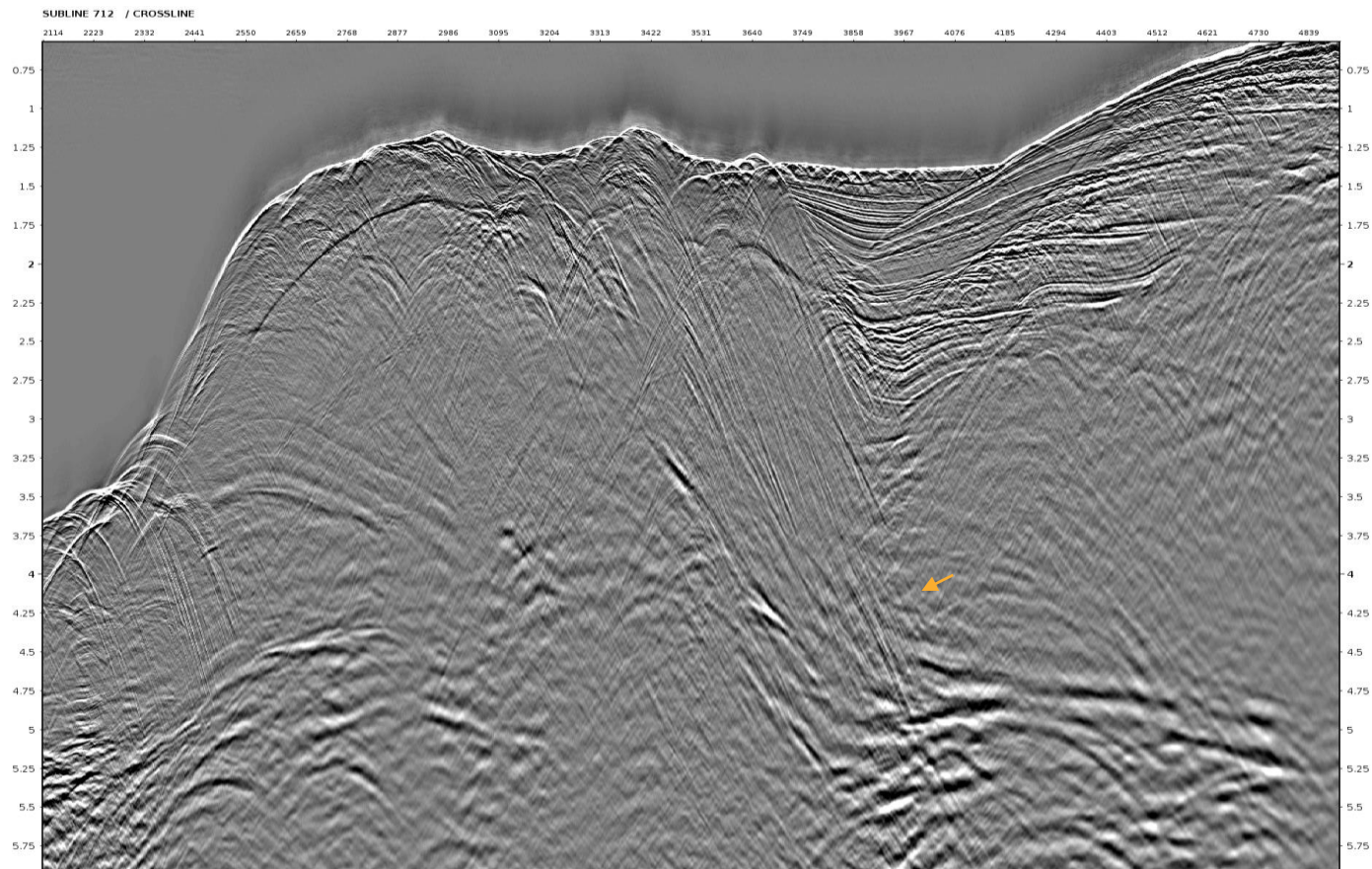
49





Zoom in Stack **after** Diffracted Multiple Removal

50





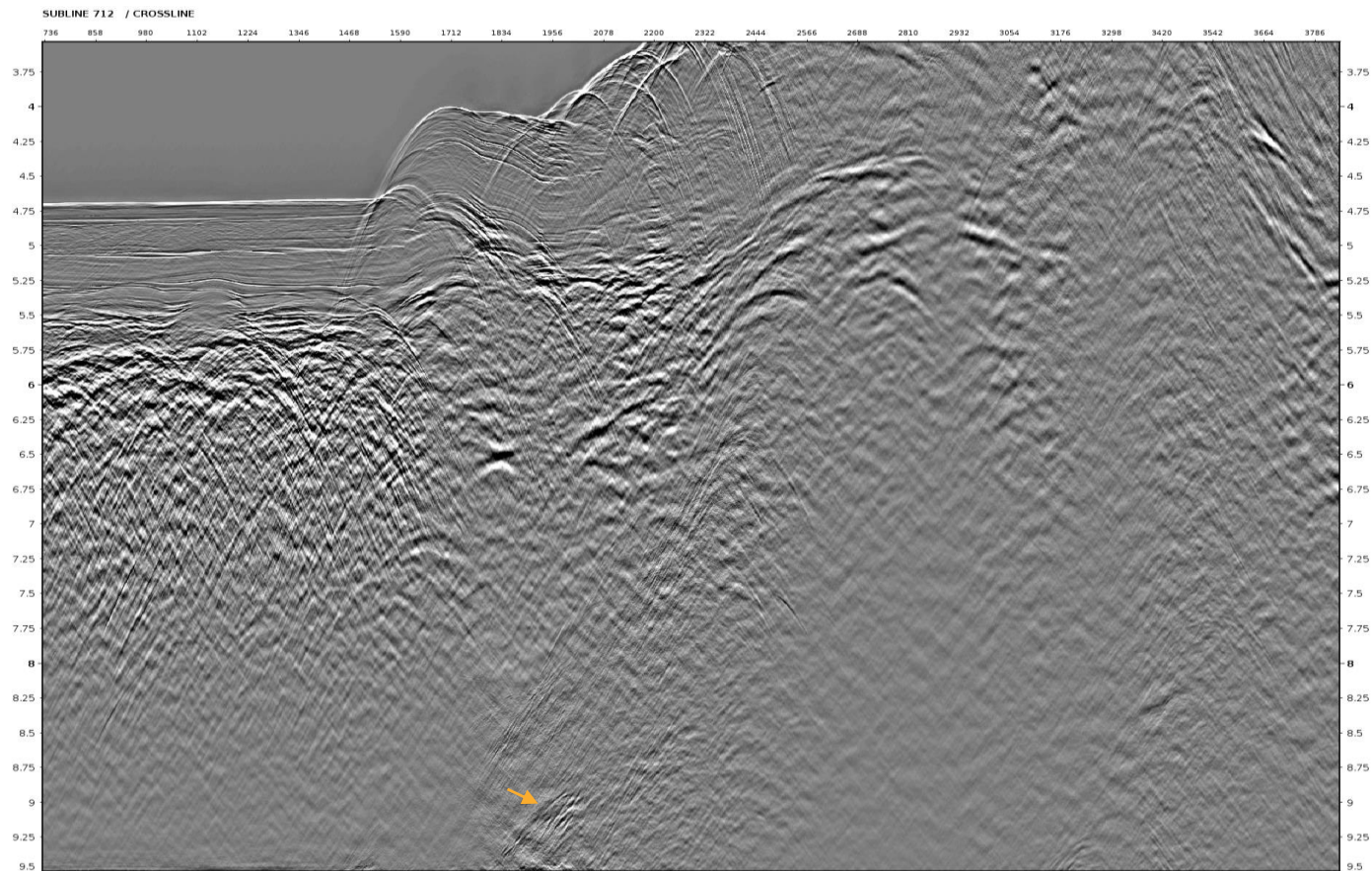
Difference before - after





Zoom in Stack before Diffracted Multiple Removal

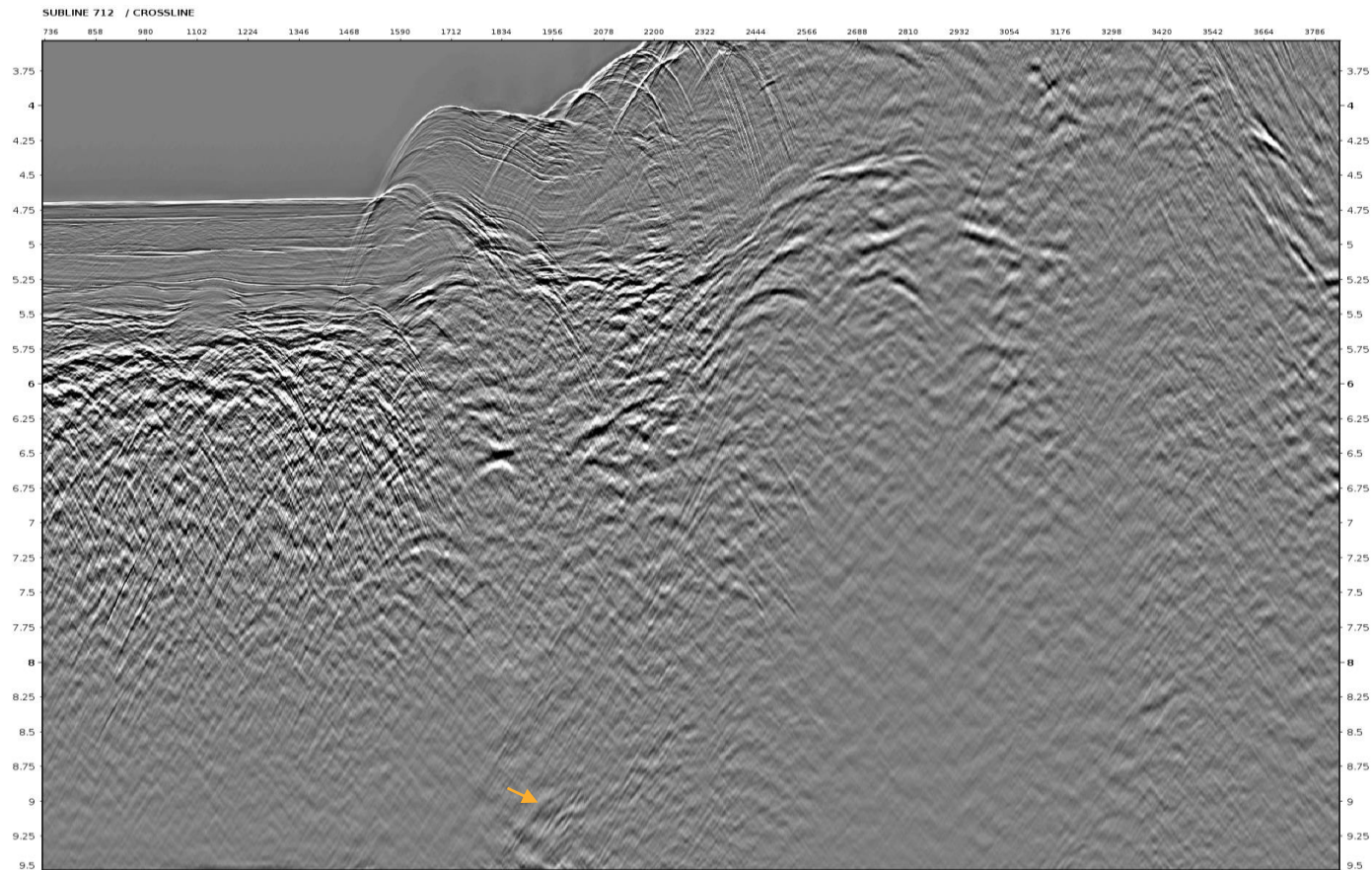
52





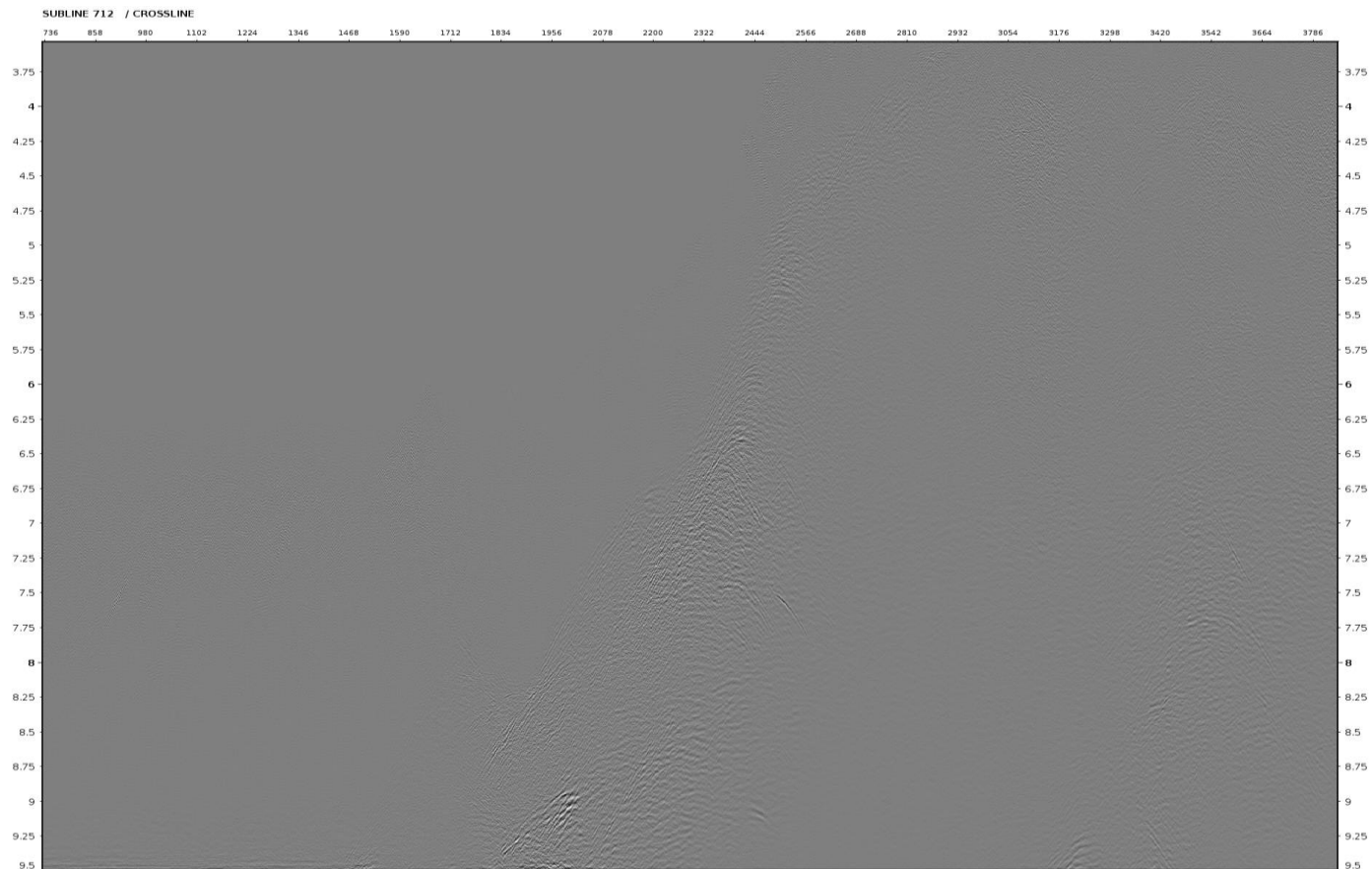
Zoom in Stack after Diffracted Multiple Removal

53





Difference before - after



Common Offset Subline 712

- offset 350m
- offset 1750m
- offset 4050m

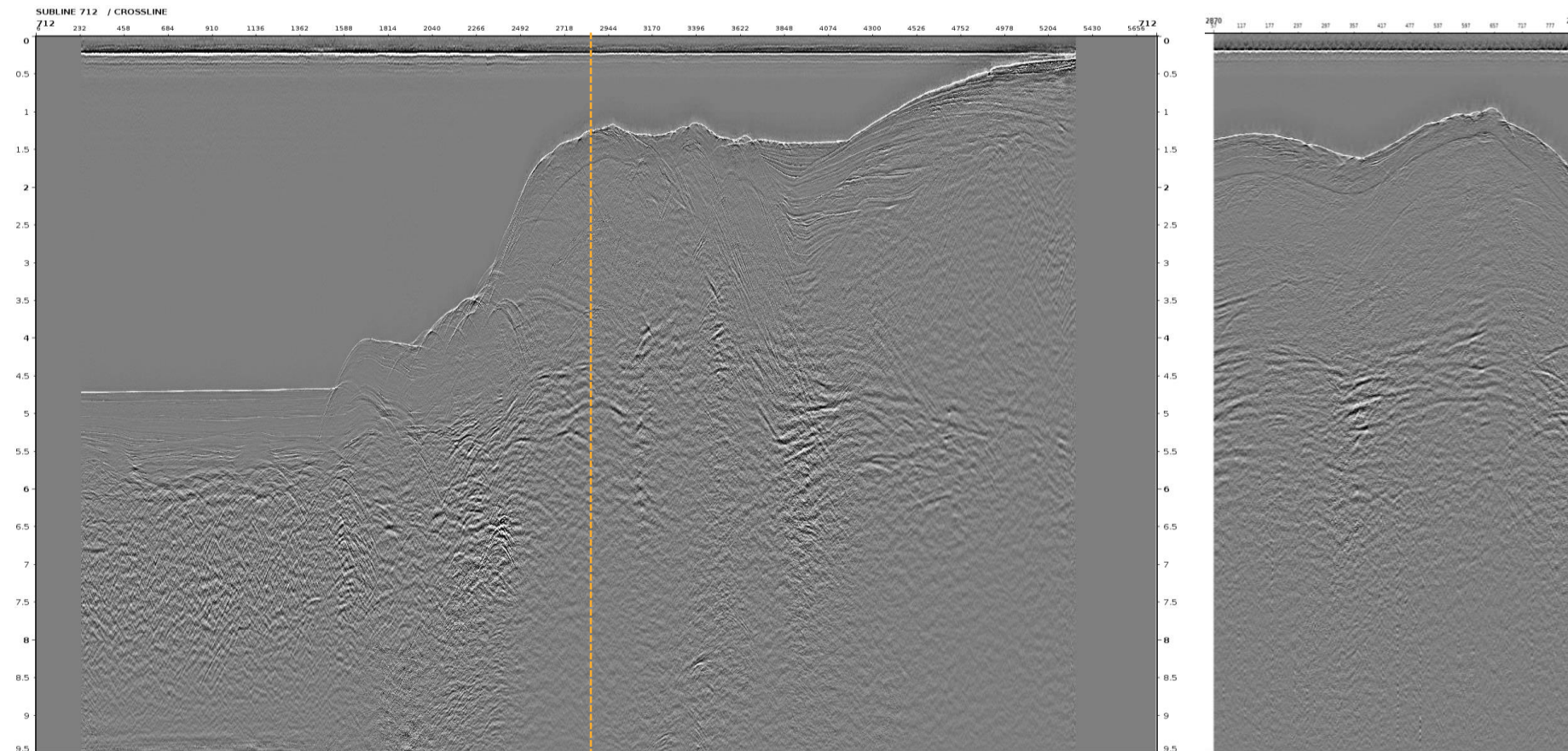


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Common Offset 350m before Diffracted Multiple Removal

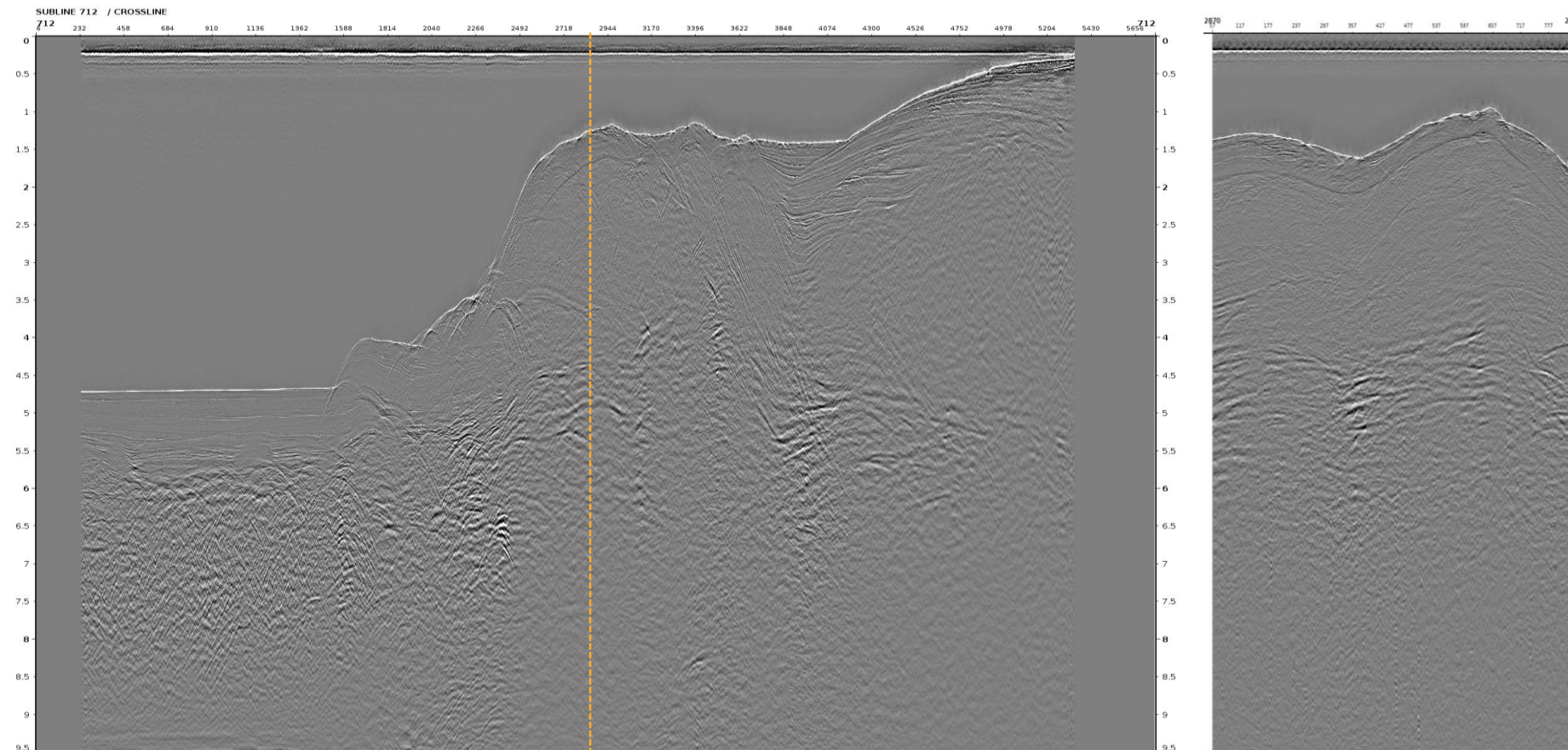
56





Common Offset 350m **after** Diffracted Multiple Removal

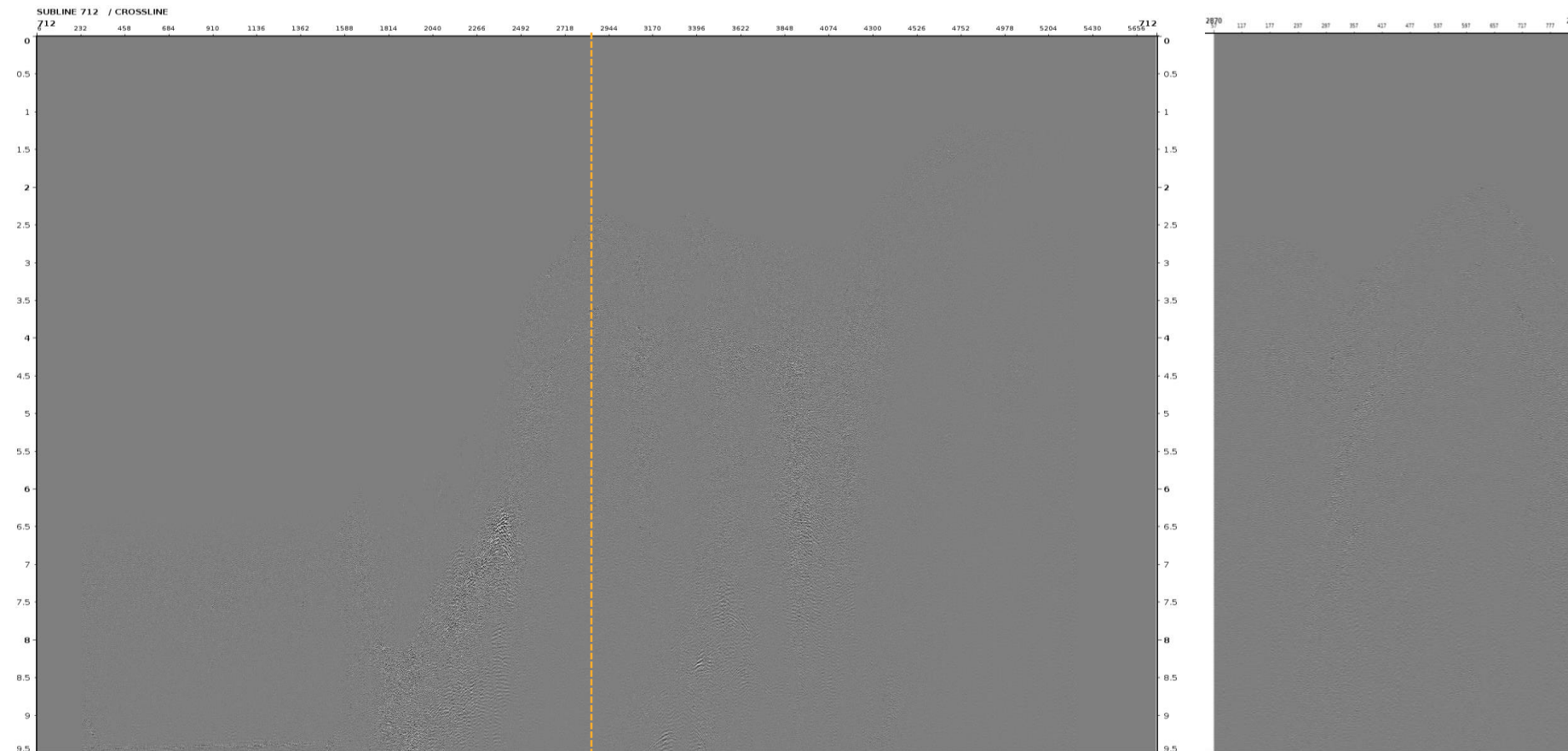
57





Difference before - after

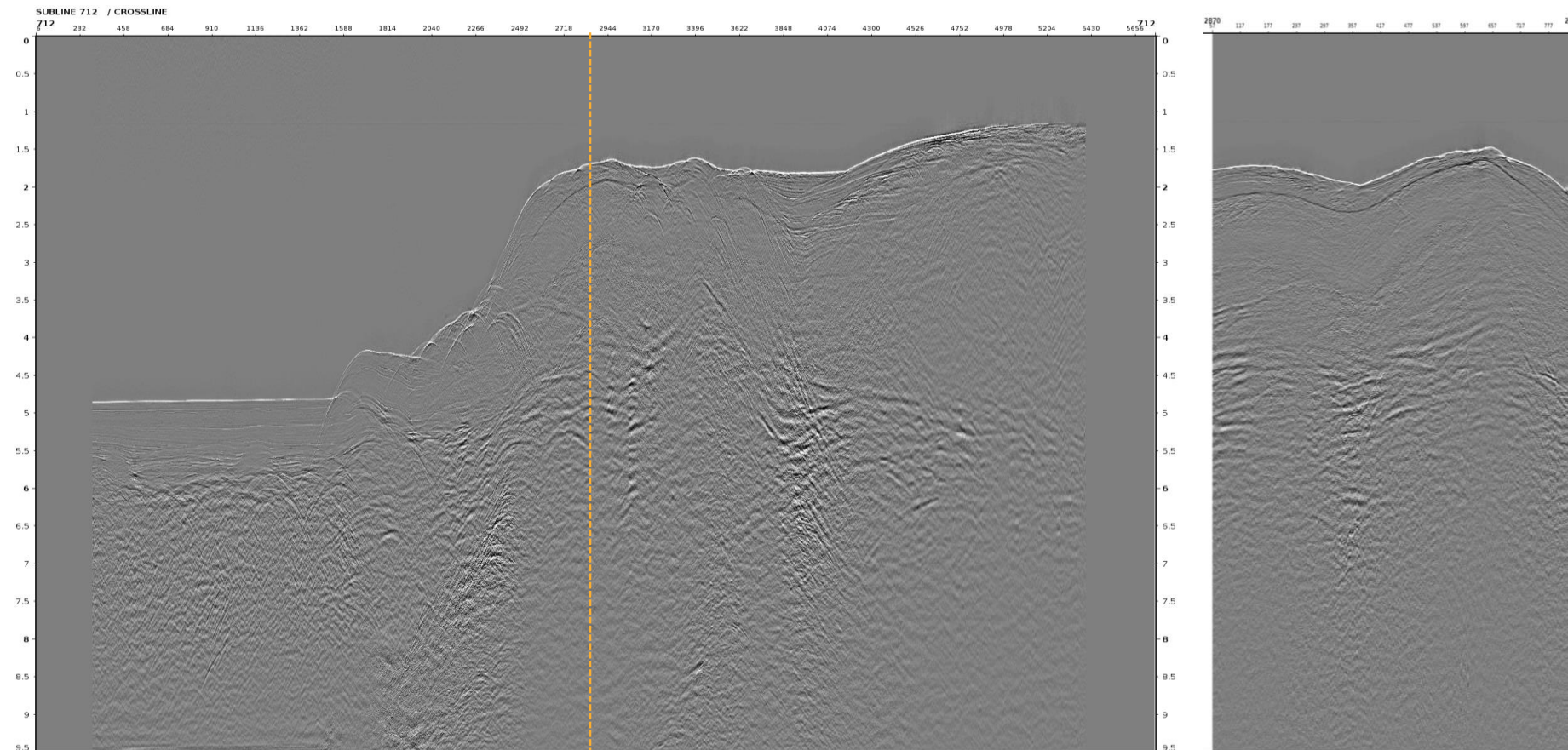
58





Common Offset 1750m before Diffracted Multiple Removal

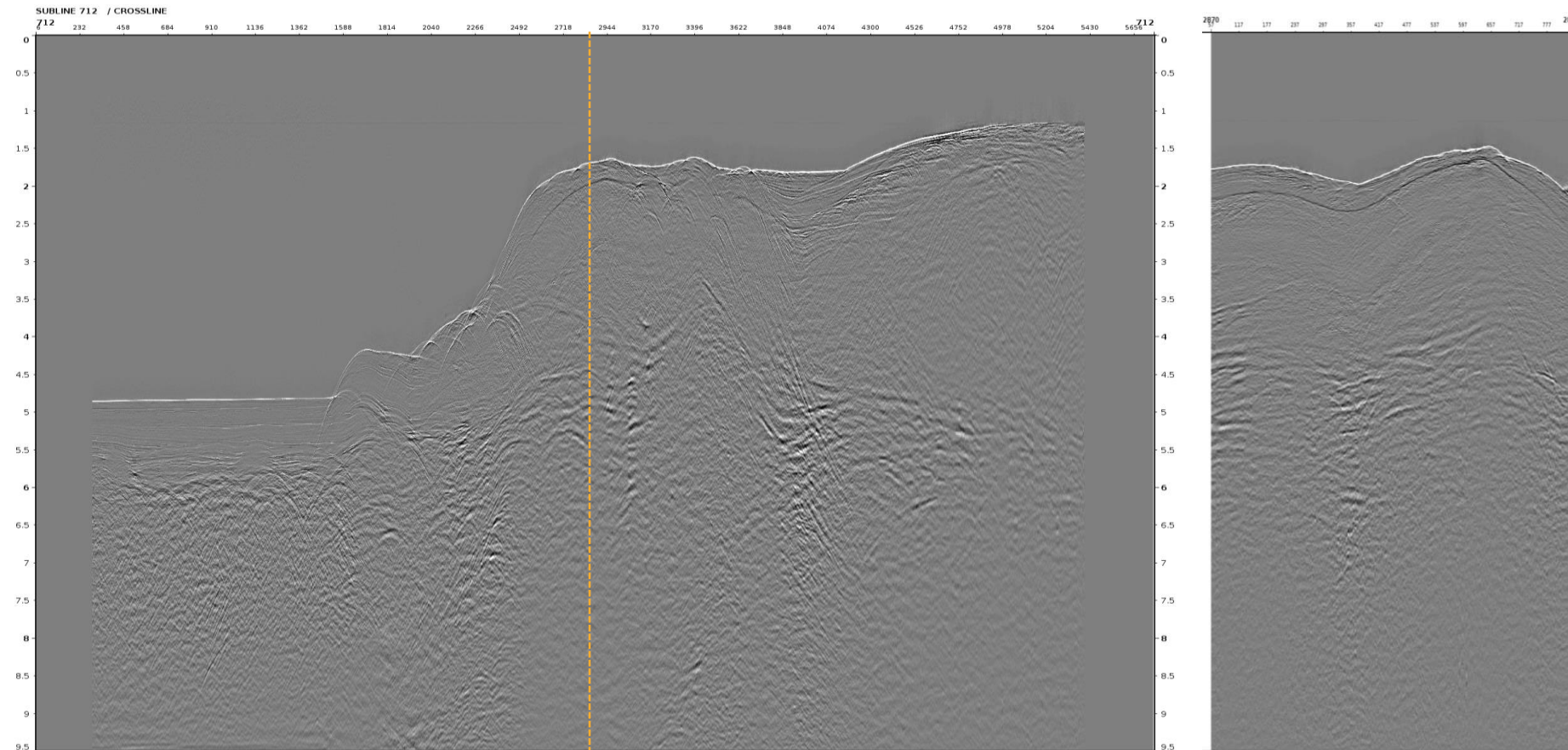
59





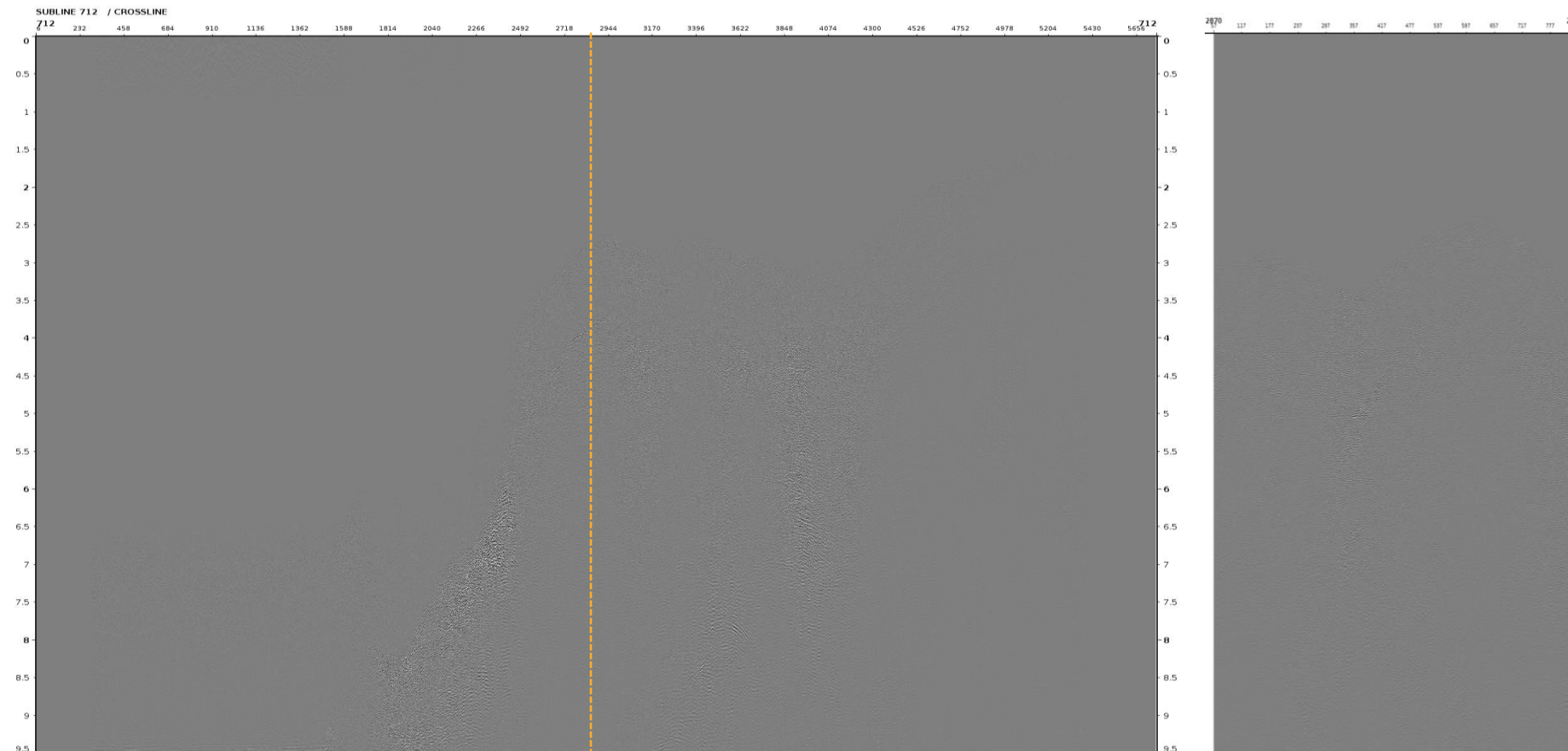
Common Offset 1750m **after** Diffracted Multiple Removal

60





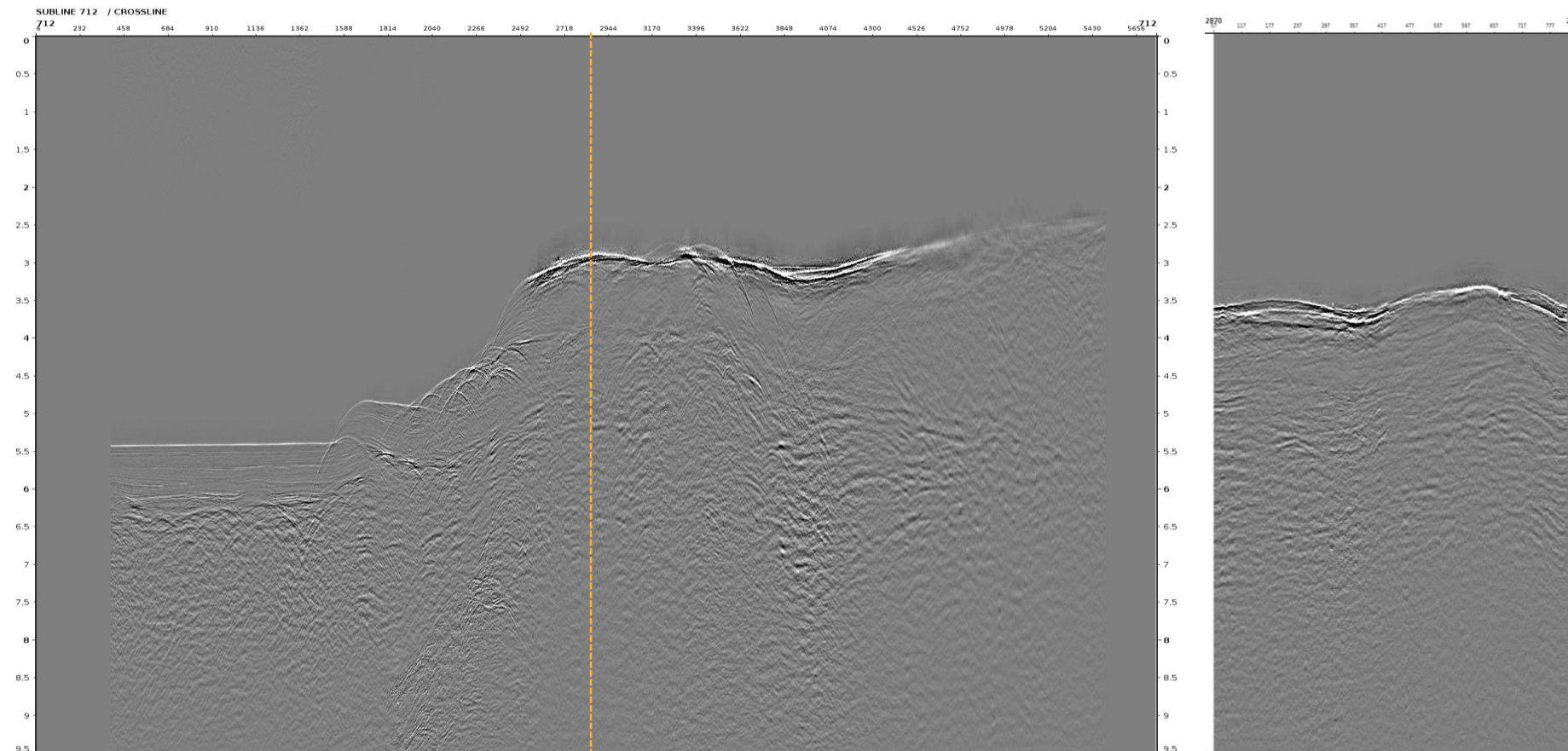
Difference before - after





Common Offset 4050m before Diffracted Multiple Removal

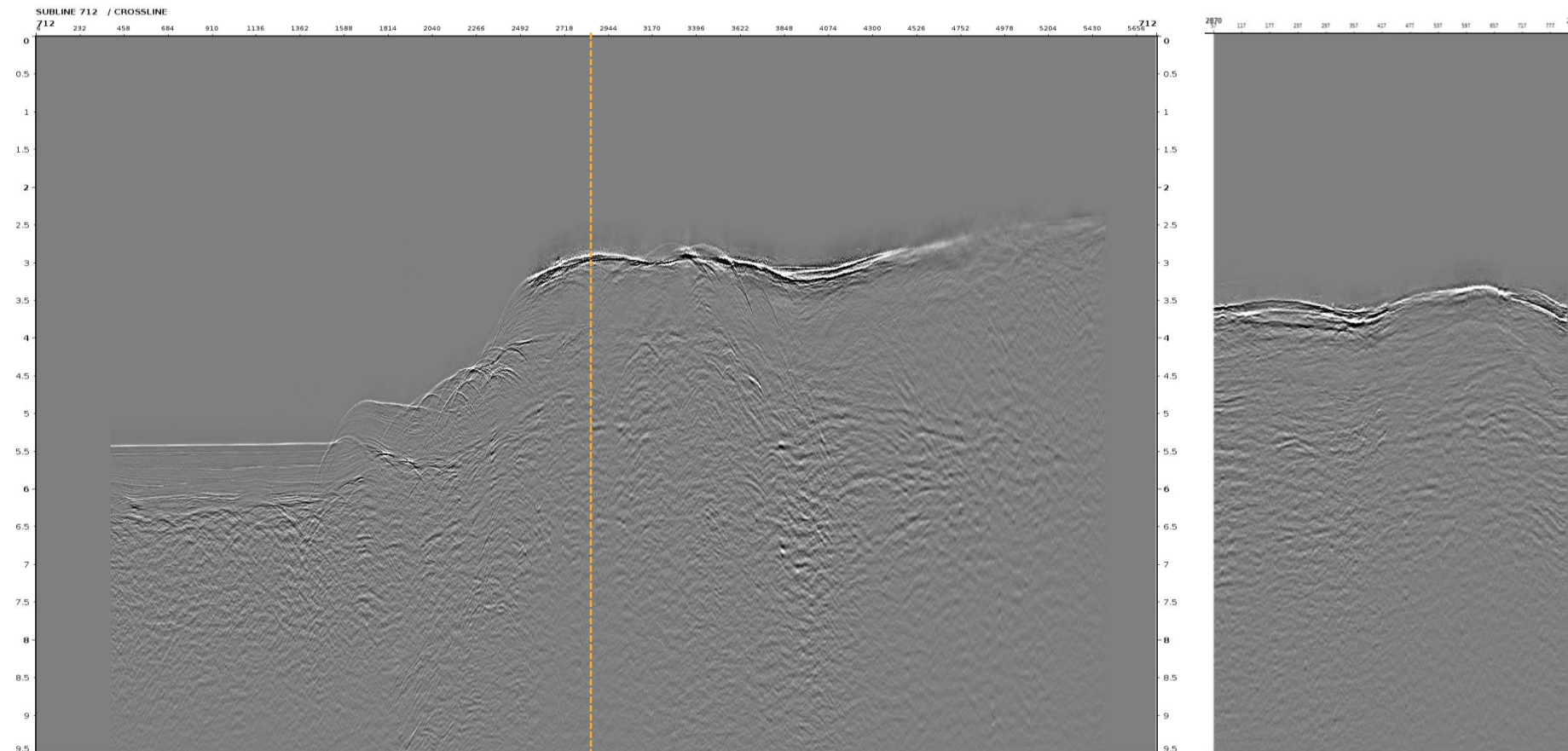
62





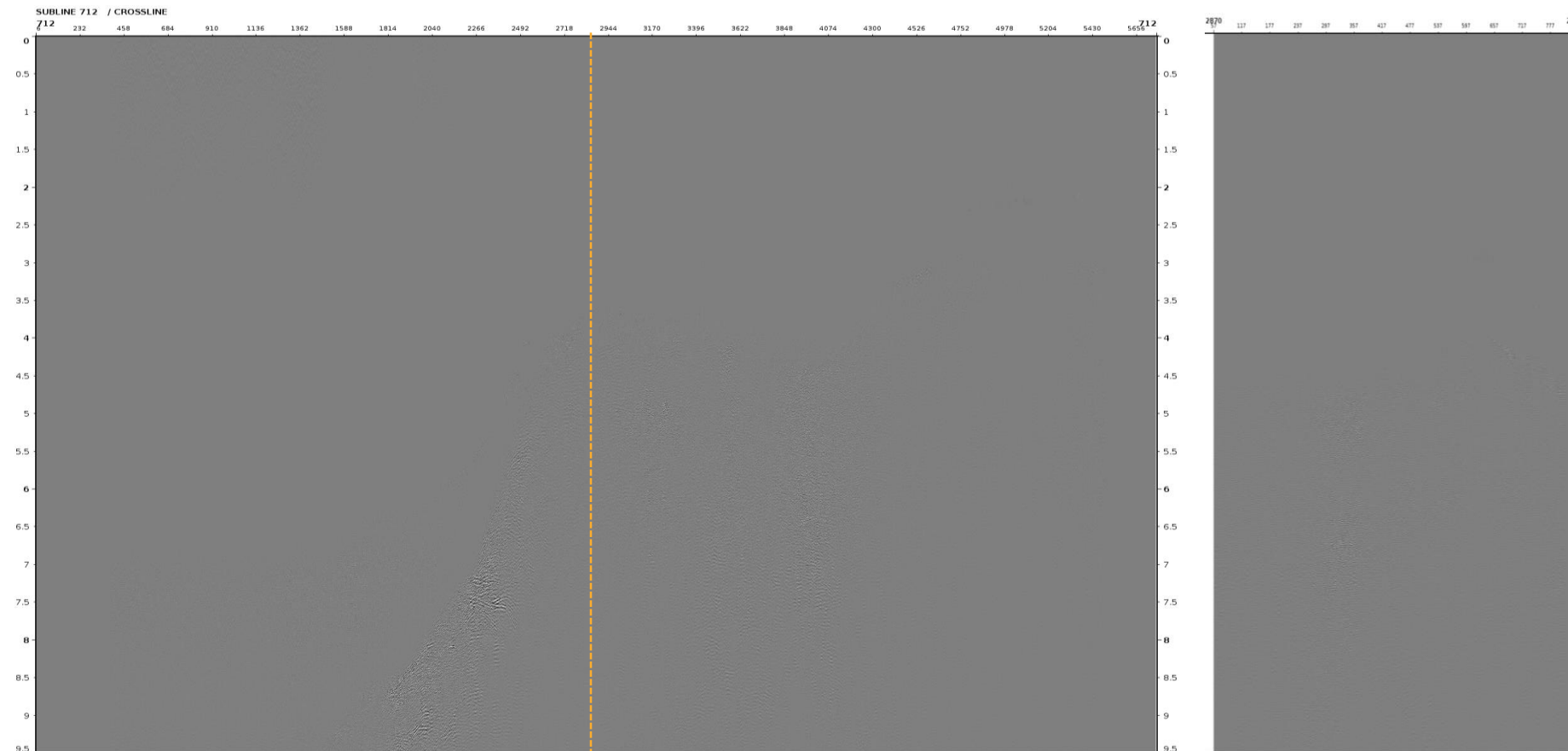
Common Offset 4050m **after** Diffracted Multiple Removal

63





Difference before - after



- Residual diffracted multiple energy is attenuated, it's recommended to apply for production.