



High Density Automatically Velocity Analysis

NZ 3D Processing

19 May 2021

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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

Objective:

To correct residual moveout (RMO) after migration.

Procedure:

- Input gathers are from TTI Kirchhoff migration converted to time domain.
- Precondition of gathers is done to minimize the possibility of multiple interference via mild Radon-demultiple.
- Moveout velocity (2nd* order term) is estimated by H.W. Swan's* AVO analysis approach
- 4th* order term is estimated with 2nd* order term.
- Both items are used for NMO.

Display:

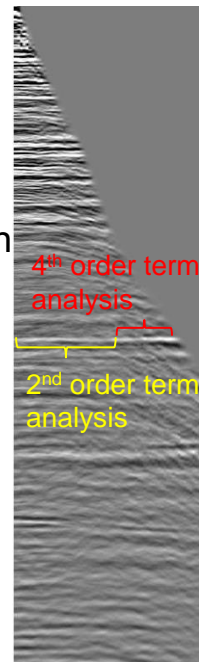
Full depth stack (0-35deg), ultra far stack (35-45deg), time CDP gathers.

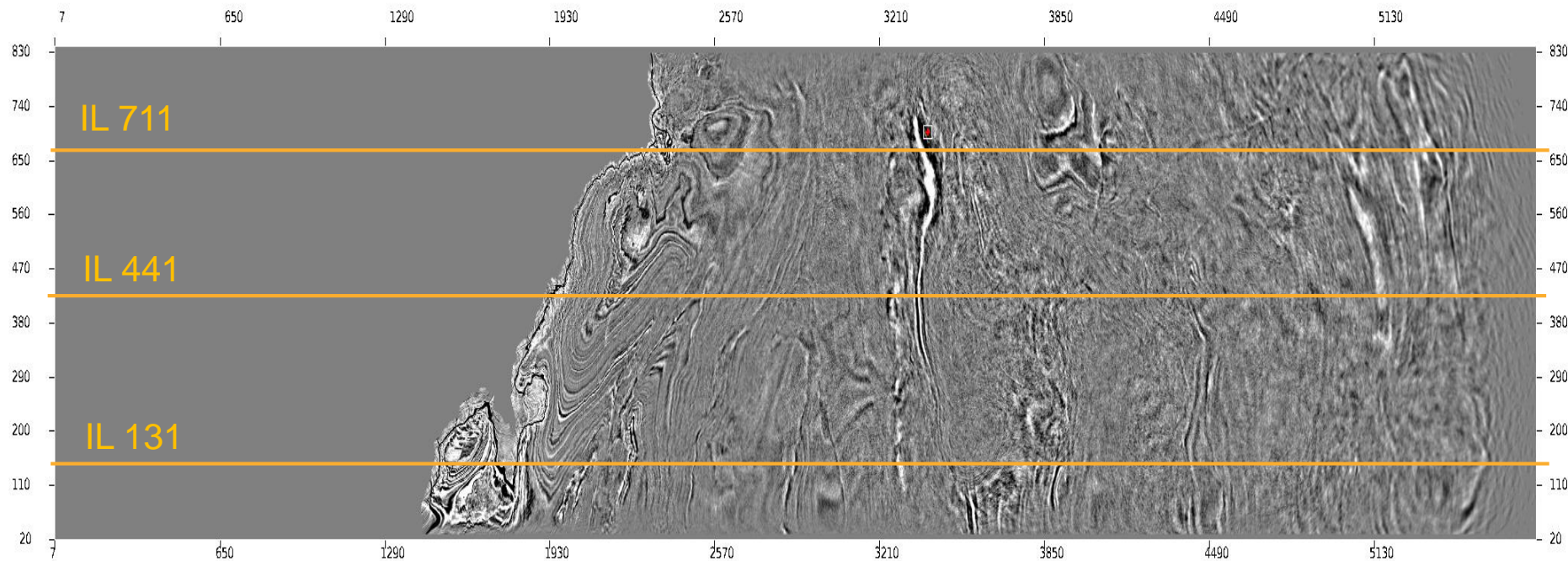
Observation & Recommendation:

Gathers are flatter and residual curvature is smaller. Primaries are more focused on stack.

* Herbert W. Swan. *Seismic velocities from amplitude variations with offset* SEG **2000** Expanded Abstracts.

$$* \quad t^2 = t_0^2 + \frac{x^2}{v_{NMO}^2} - \frac{2\eta x^4}{v_{NMO}^2 v_0^2 [t_0^2 v_{NMO}^2 + (1 + 2\eta)x^2]}$$





Subline



Crossline

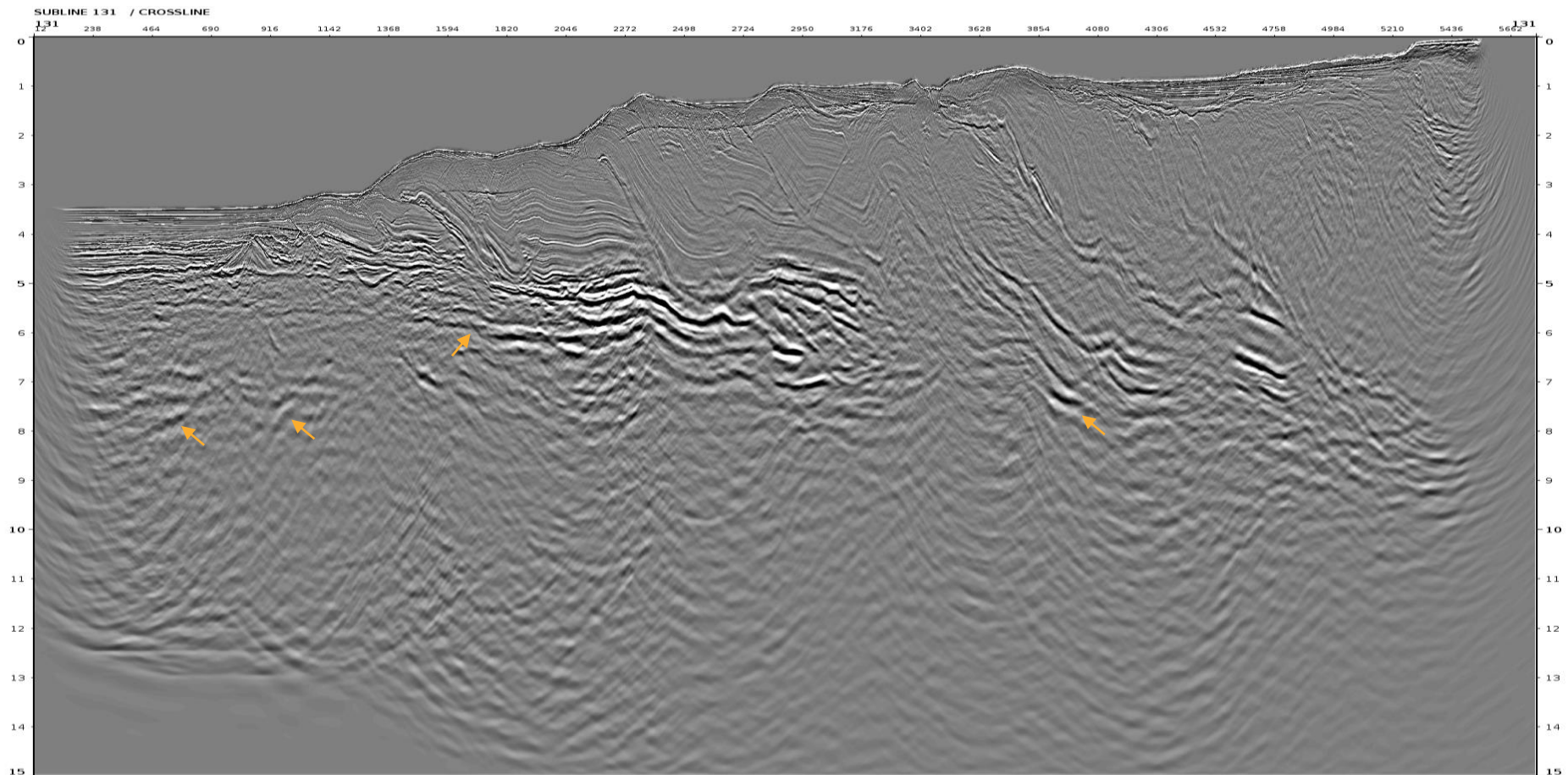
IL 131

- Full depth stack (0-35deg)
- Ultra Far Depth Stack (35-45deg)
- Selected time CDP gathers



Full Depth Stack (0-35deg) IL131 before RMO Correction

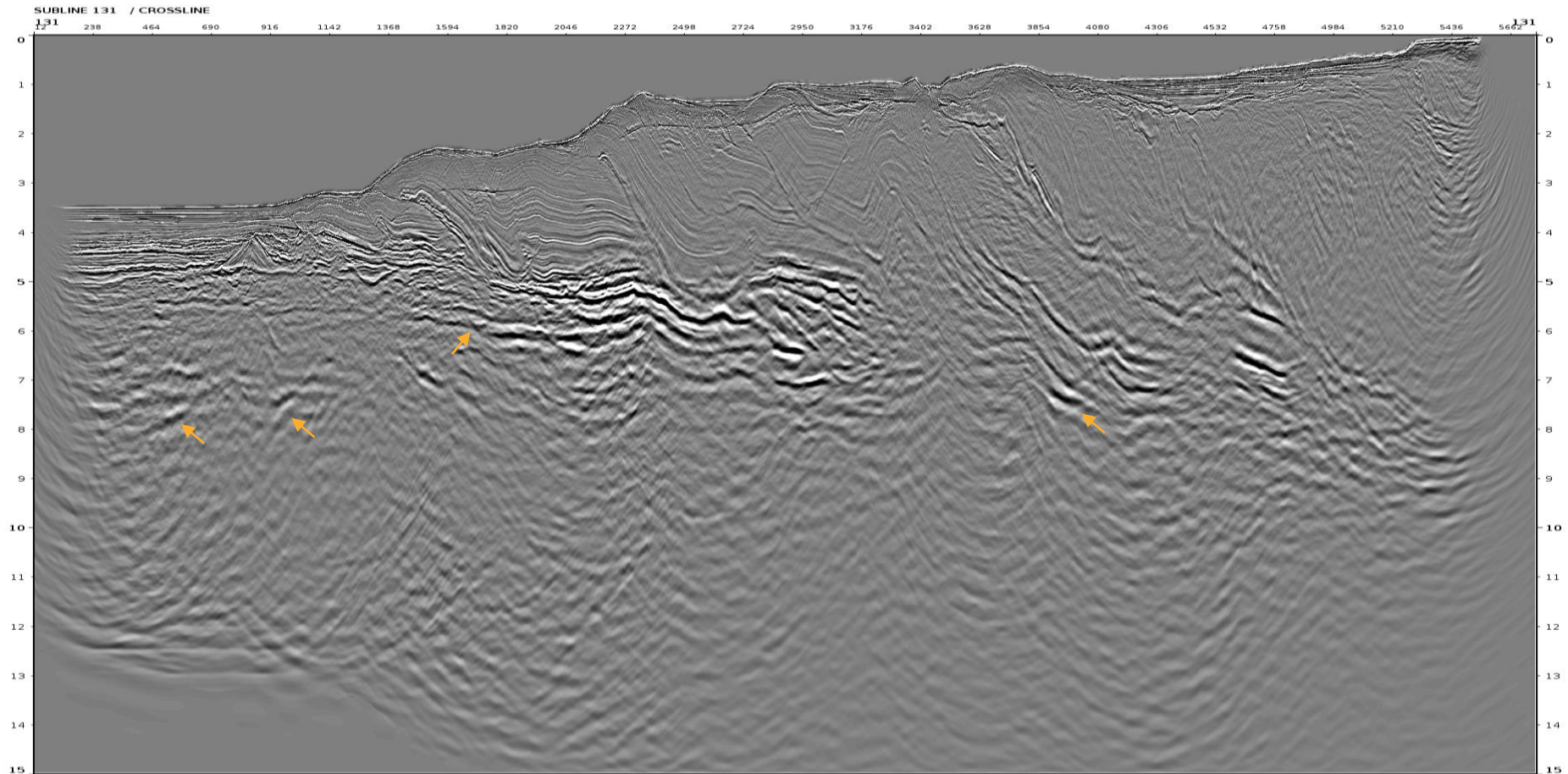
6





Full Depth Stack (0-35deg) IL131 **after** RMO Correction

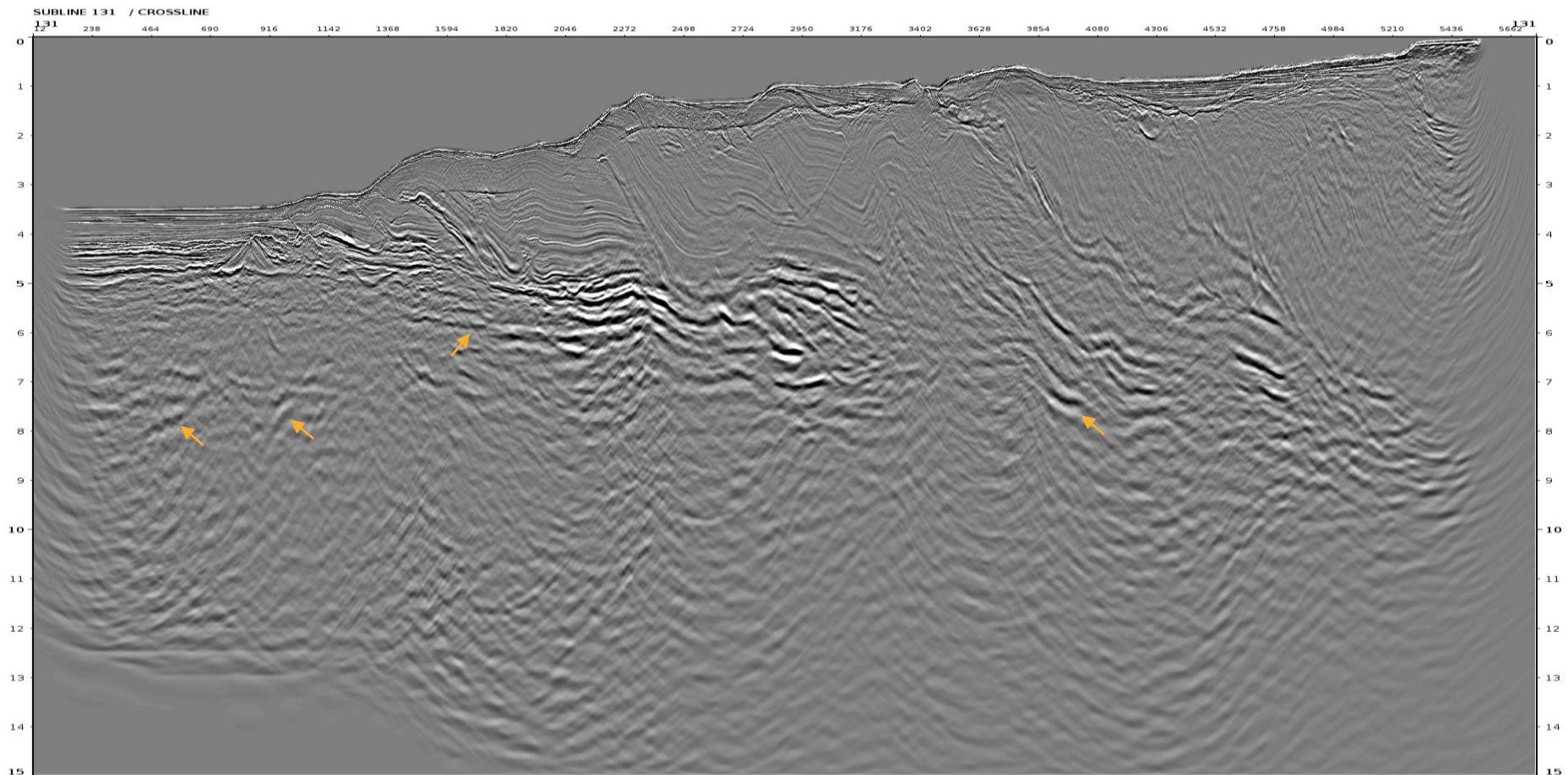
7





Ultra Far Depth Stack (35-45deg) IL131 before RMO Correction

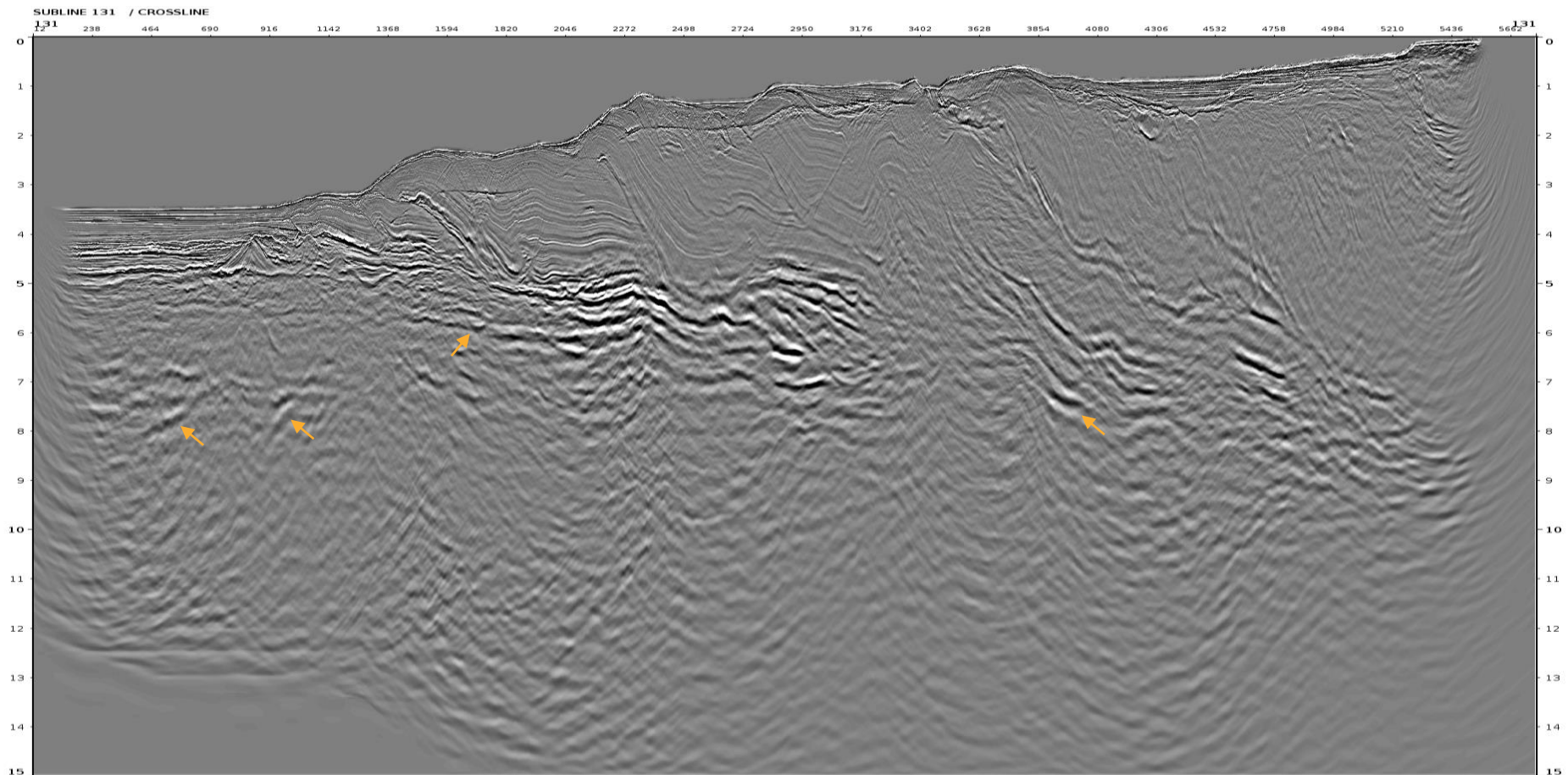
8





Ultra Far Depth Stack (35-45deg) IL131 after RMO Correction

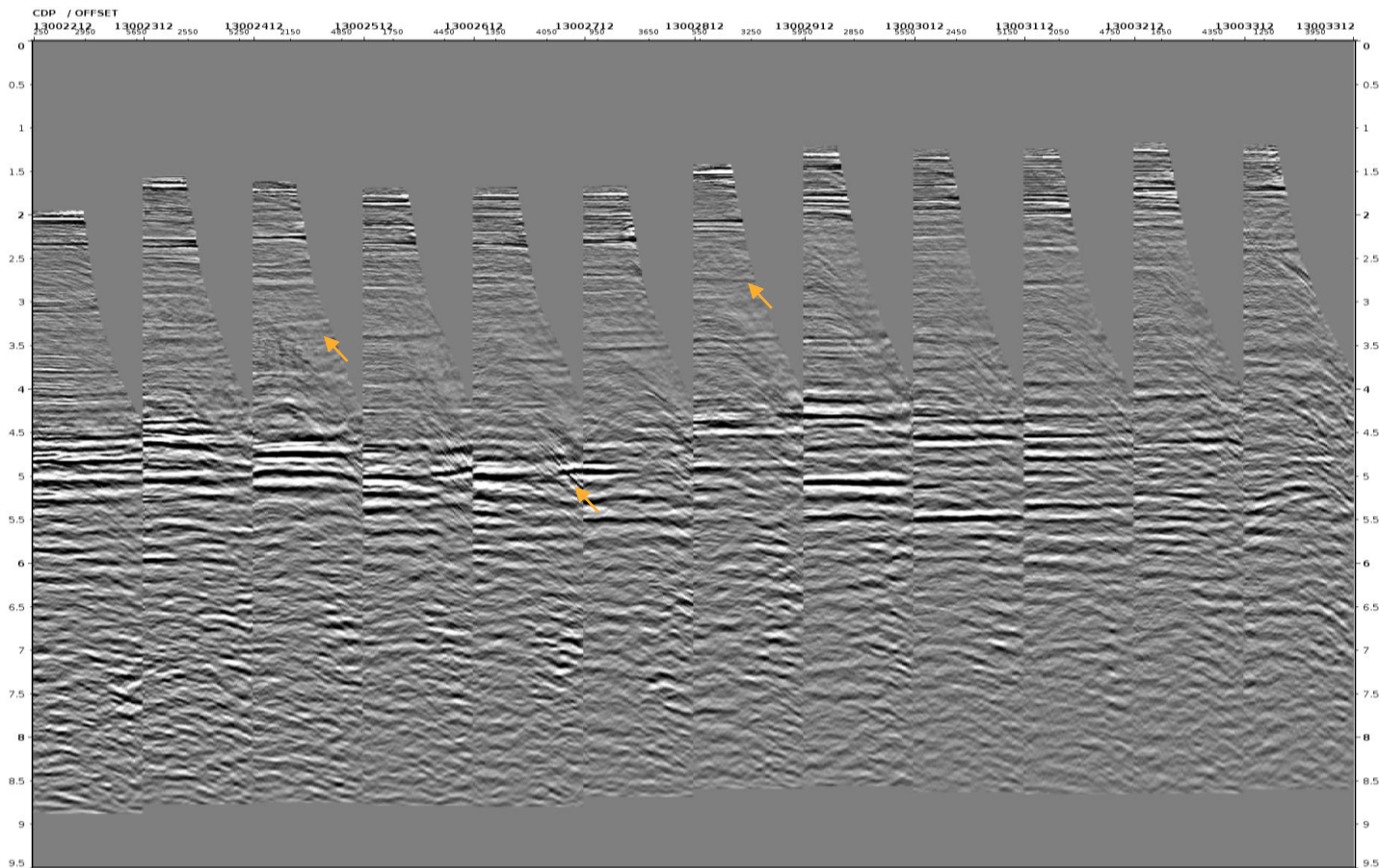
9





Selected Time CDP Gathers (0-50deg) before RMO Correction

10

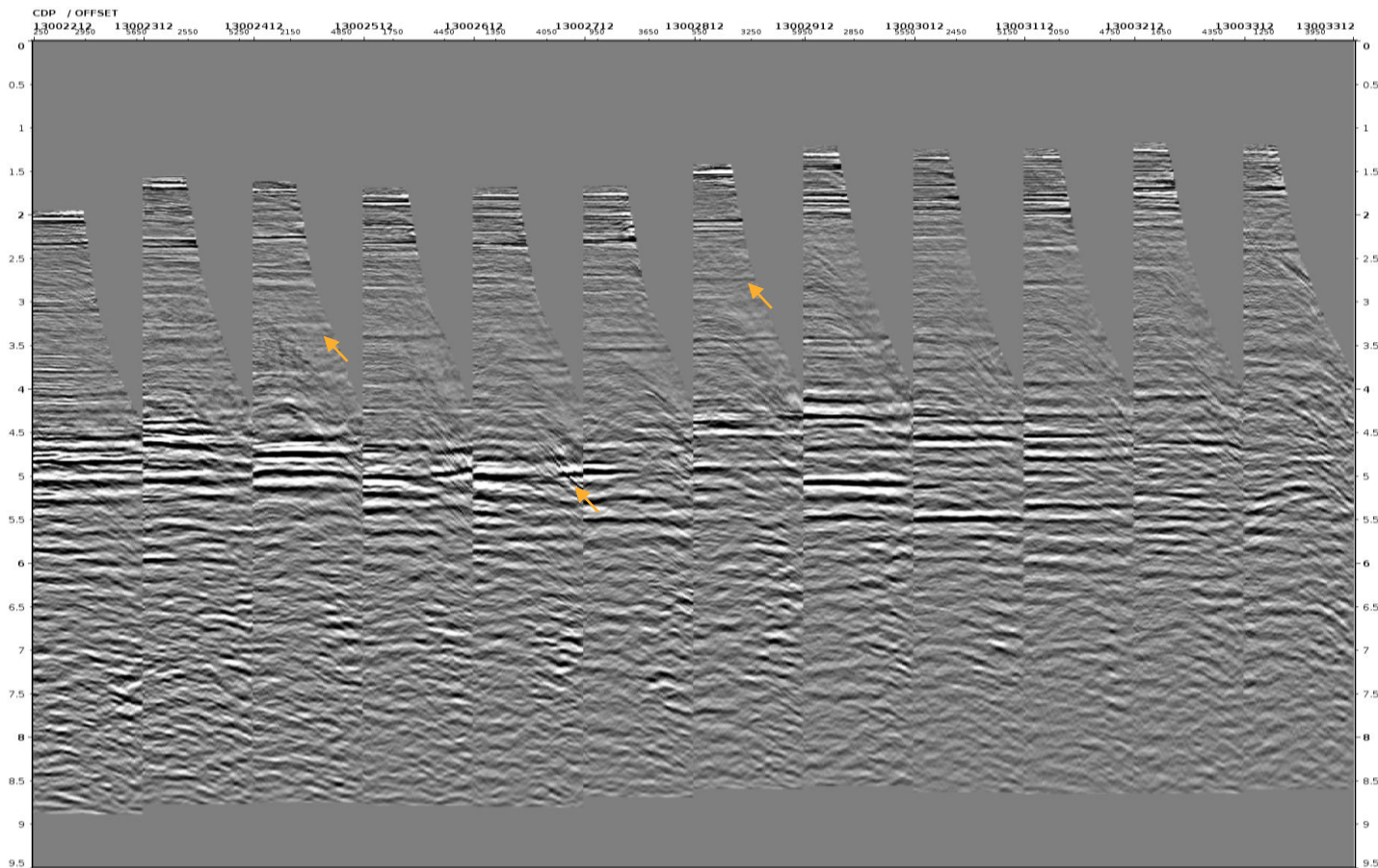


- Residual curvature is attenuated after RMO correction.



Selected Time CDP Gathers (0-50deg) after RMO Correction

11



- Residual curvature is attenuated after RMO correction.

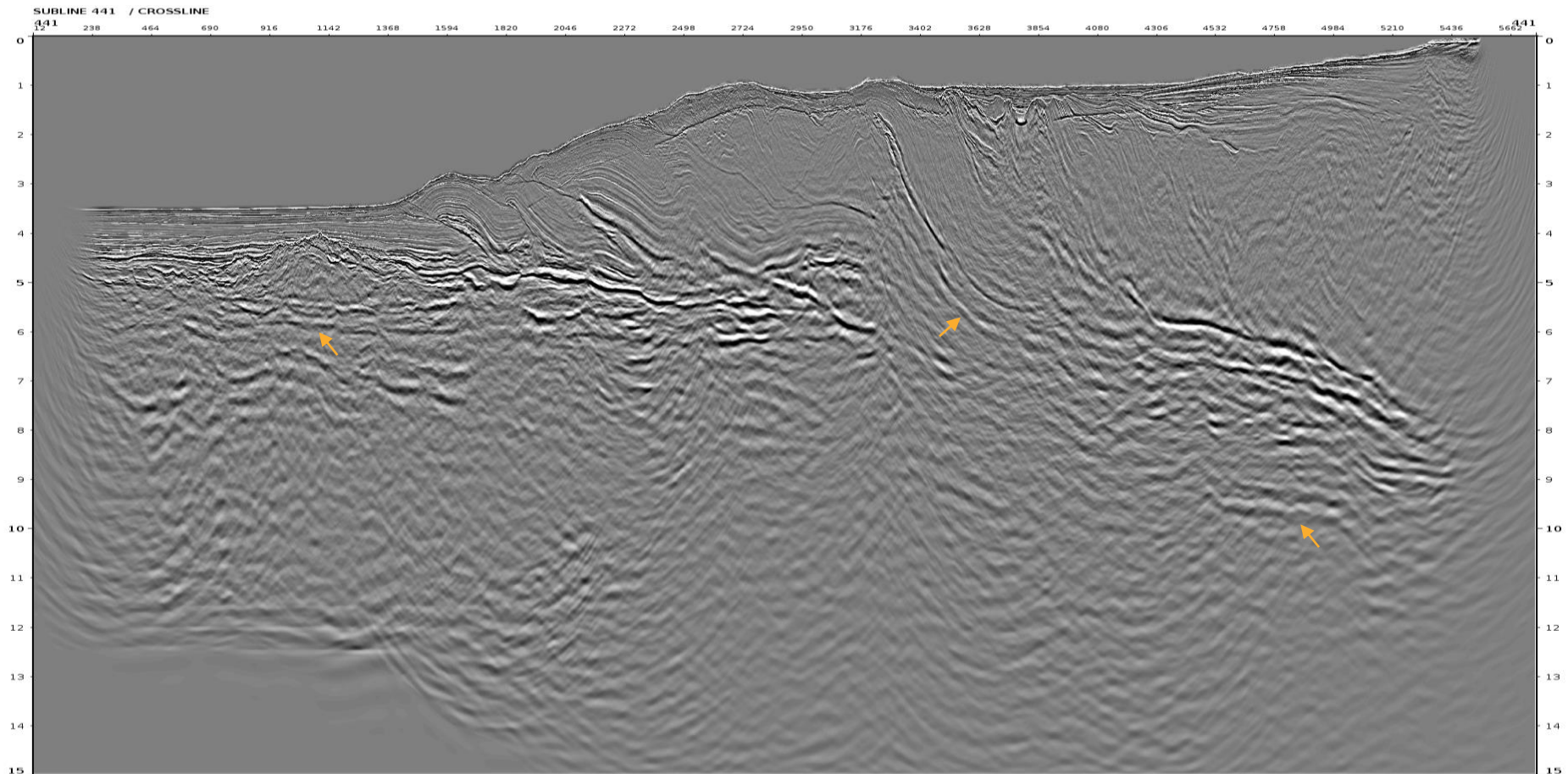
IL 441

- Full depth stack (0-35deg)
- Ultra Far Depth Stack (35-45deg)
- Selected time CDP gathers



Full Depth Stack (0-35deg) IL441 before RMO Correction

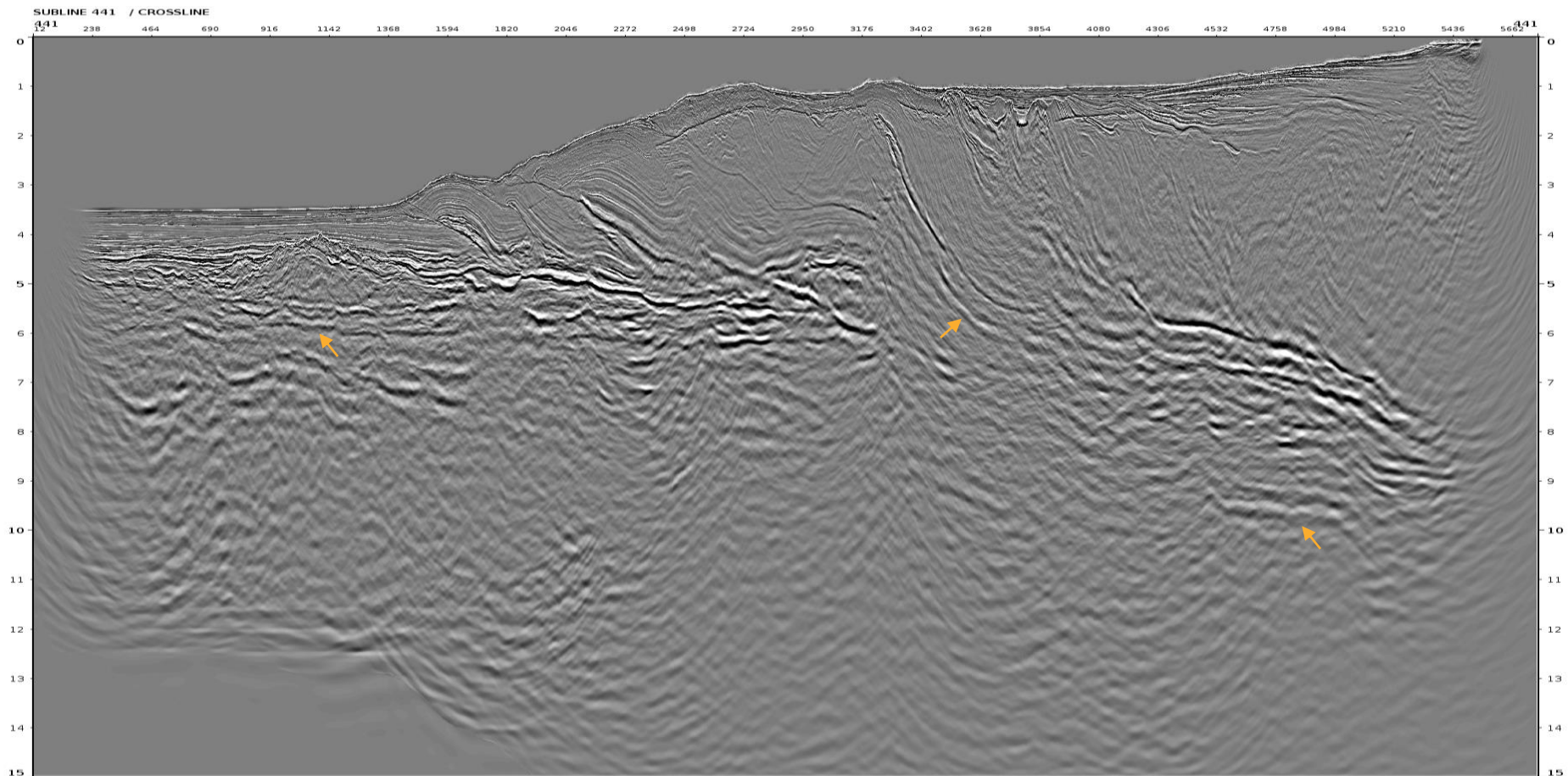
13





Full Depth Stack (0-35deg) IL441 **after** RMO Correction

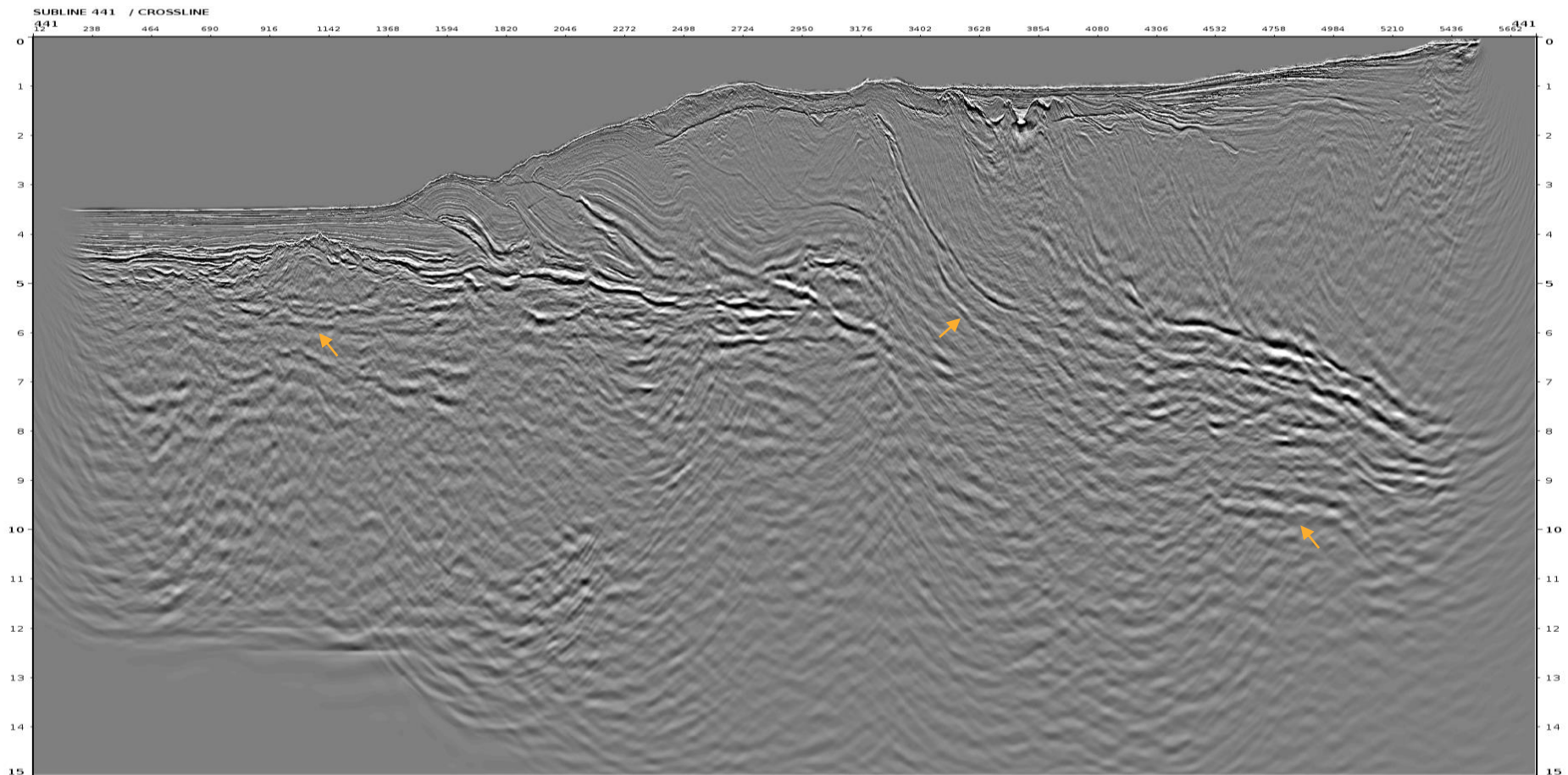
14





Ultra Far Depth Stack (35-45deg) IL441 before RMO Correction

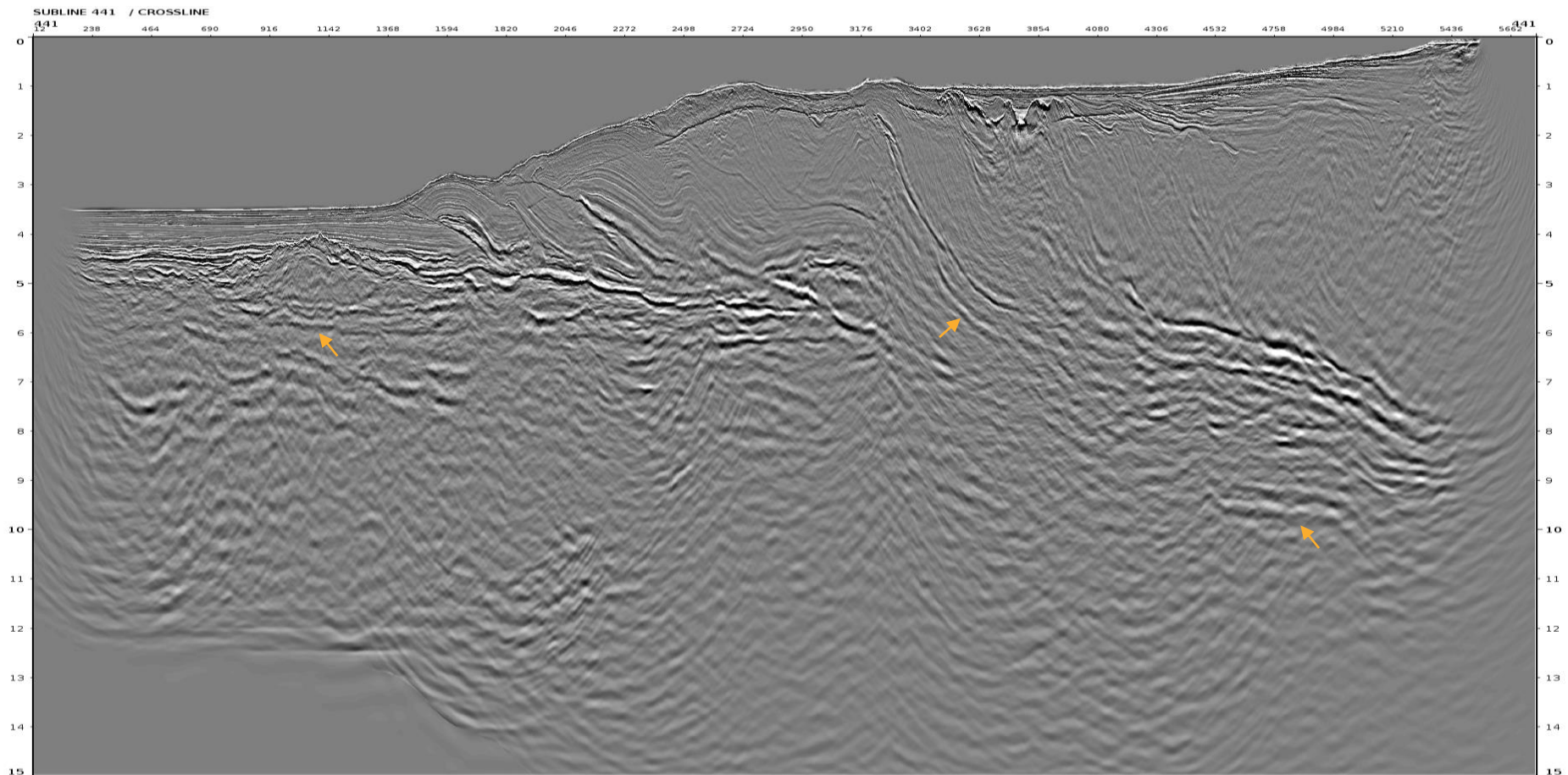
15





Ultra Far Depth Stack (35-45deg) IL441 after RMO Correction

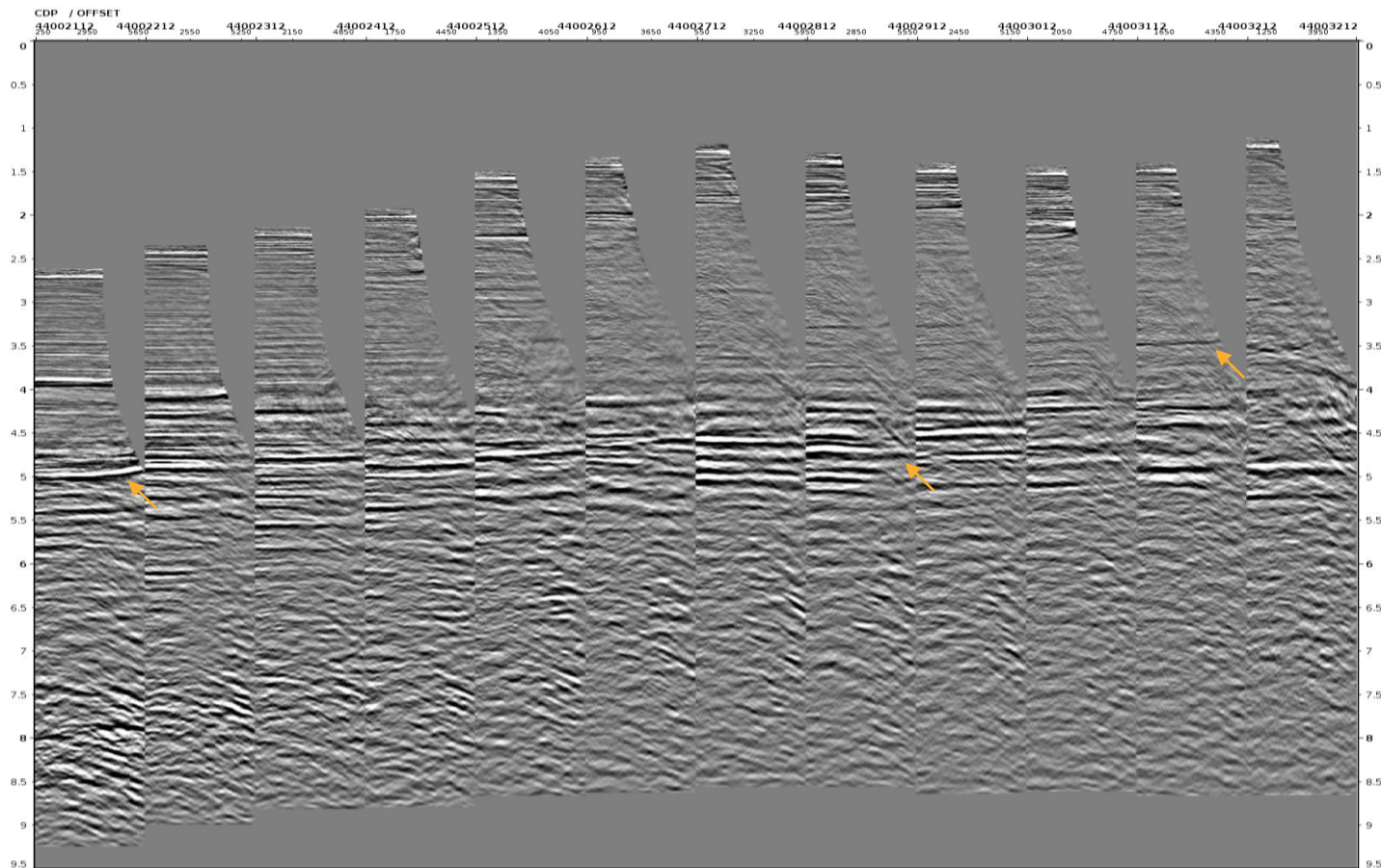
16





Selected Time CDP Gathers (0-50deg) before RMO Correction

17

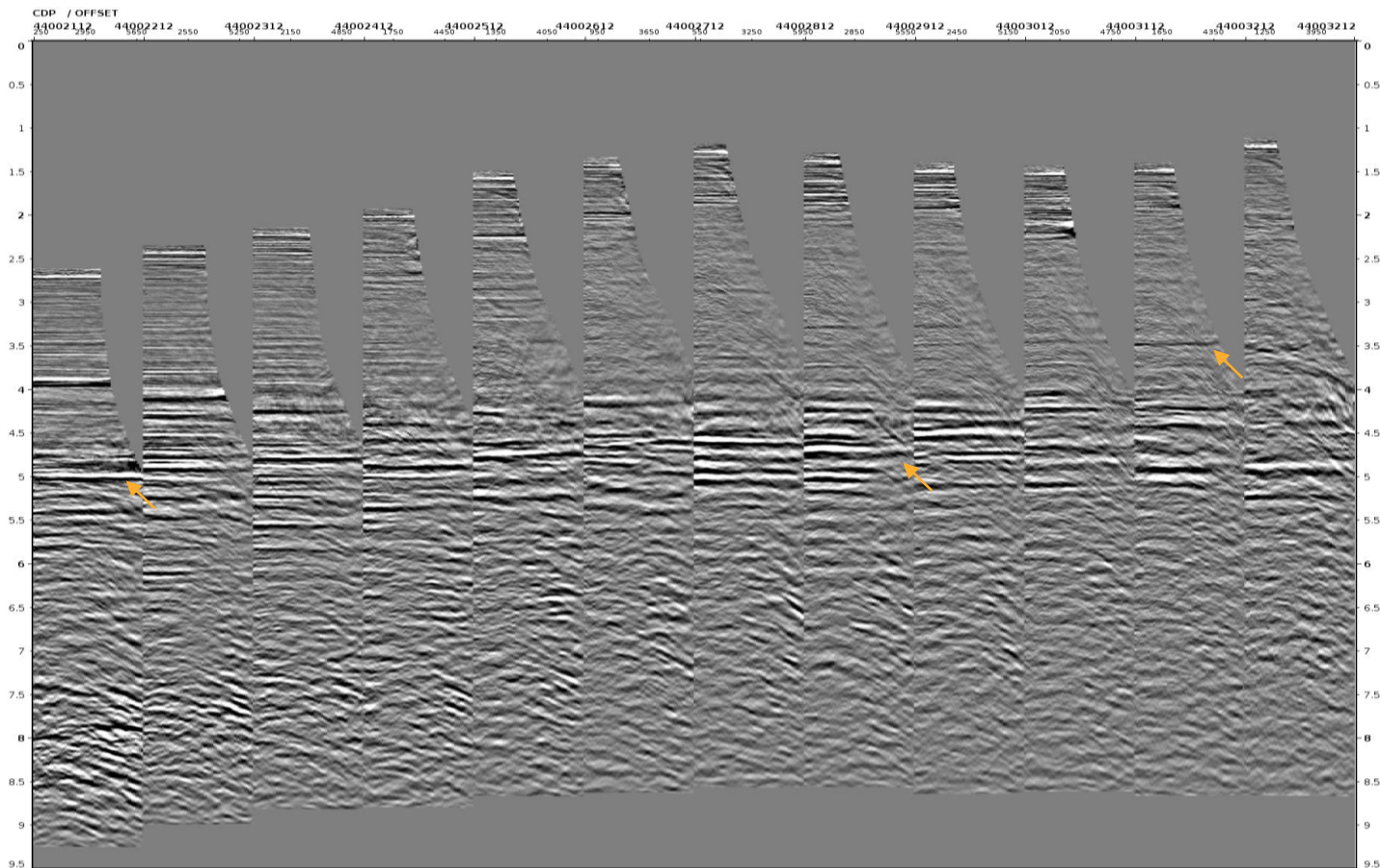


- Residual curvature is attenuated after RMO correction.



Selected Time CDP Gathers (0-50deg) after RMO Correction

18



- Residual curvature is attenuated after RMO correction.

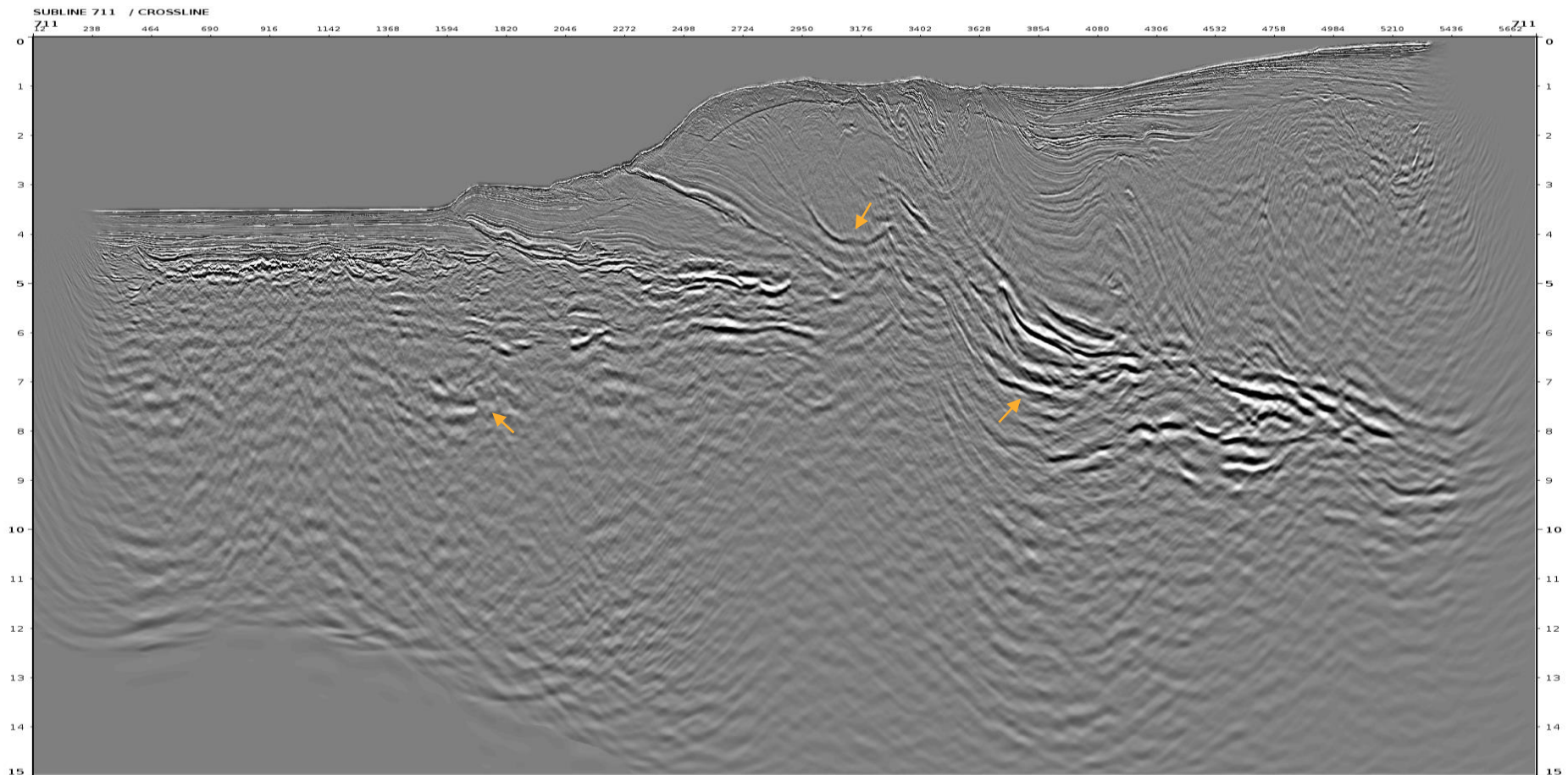
IL 711

- Full depth stack (0-35deg)
- Ultra Far Depth Stack (35-45deg)
- Selected time CDP gathers



Full Depth Stack (0-35deg) IL711 before RMO Correction

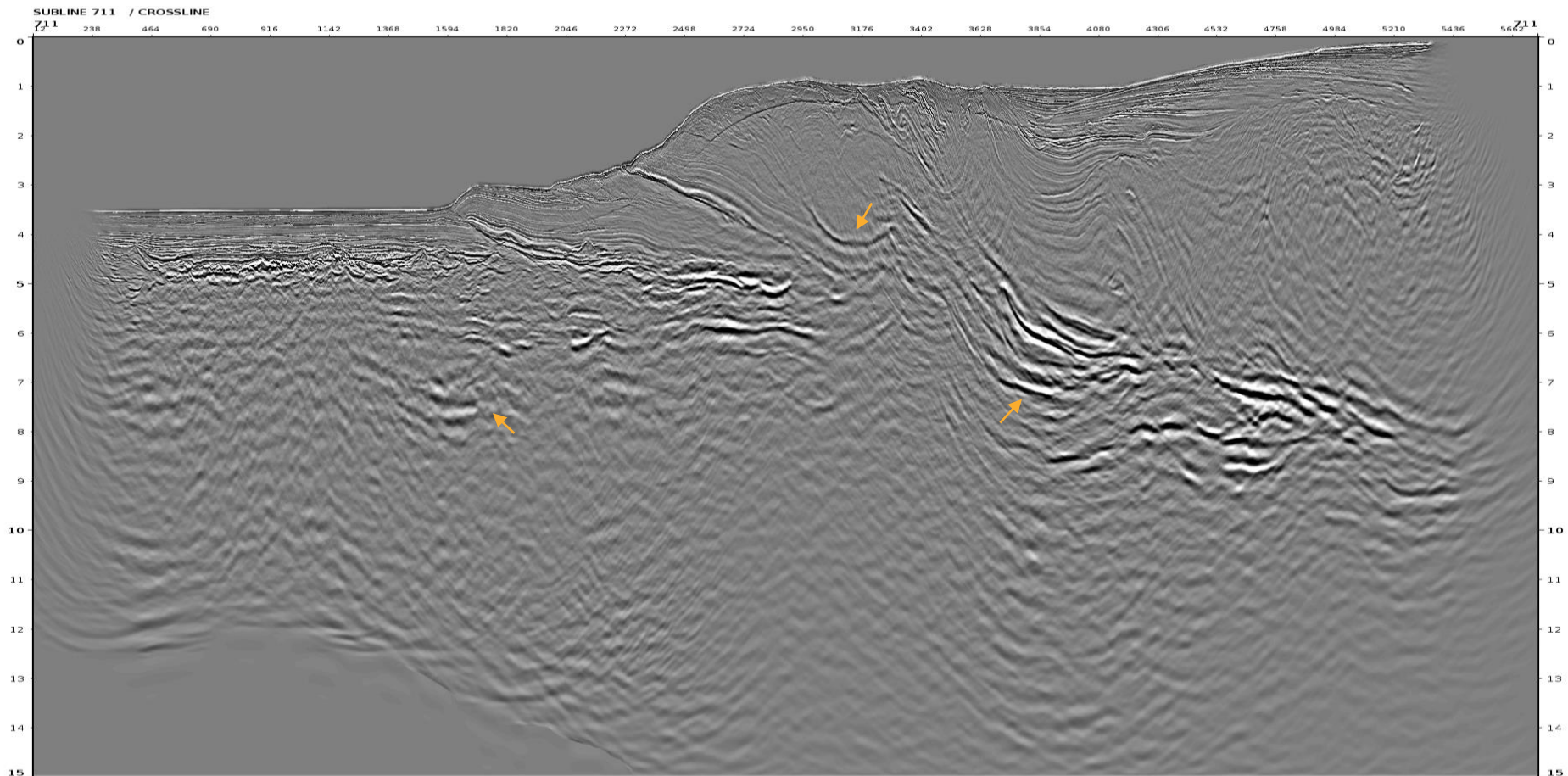
20





Full Depth Stack (0-35deg) IL711 after RMO Correction

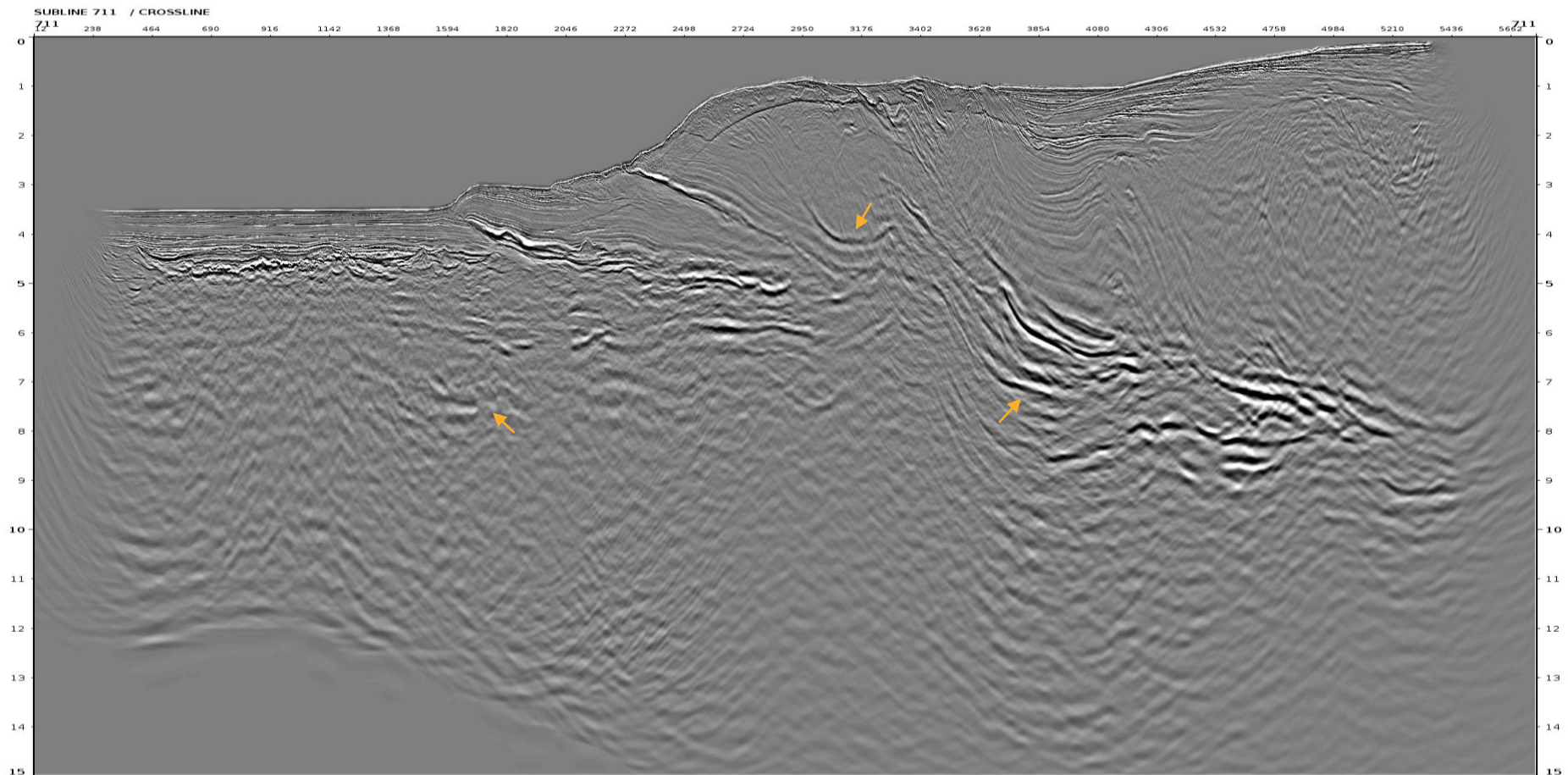
21





Ultra Far Depth Stack (35-45deg) IL711 before RMO Correction

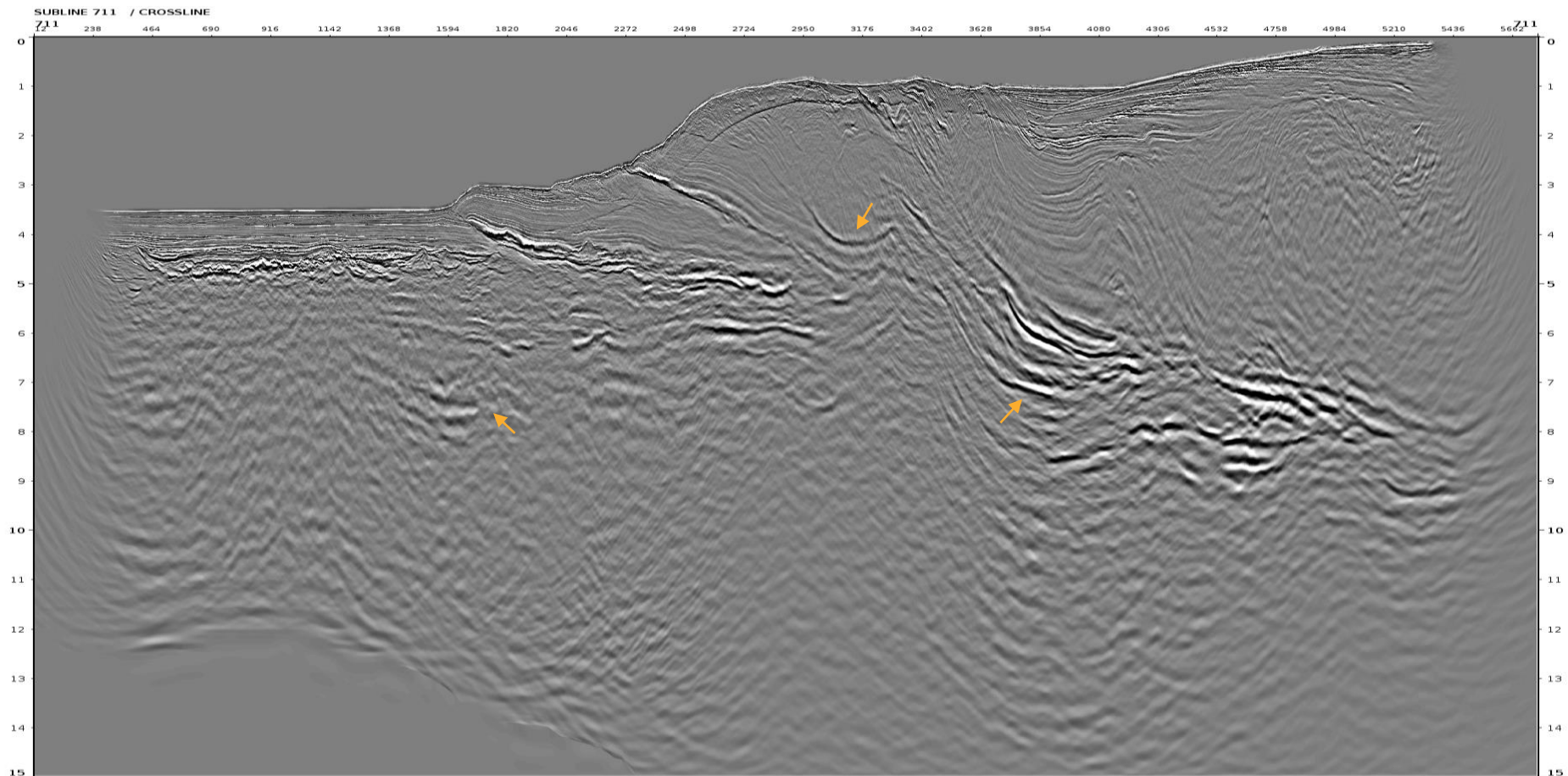
22





Ultra Far Depth Stack (35-45deg) IL711 after RMO Correction

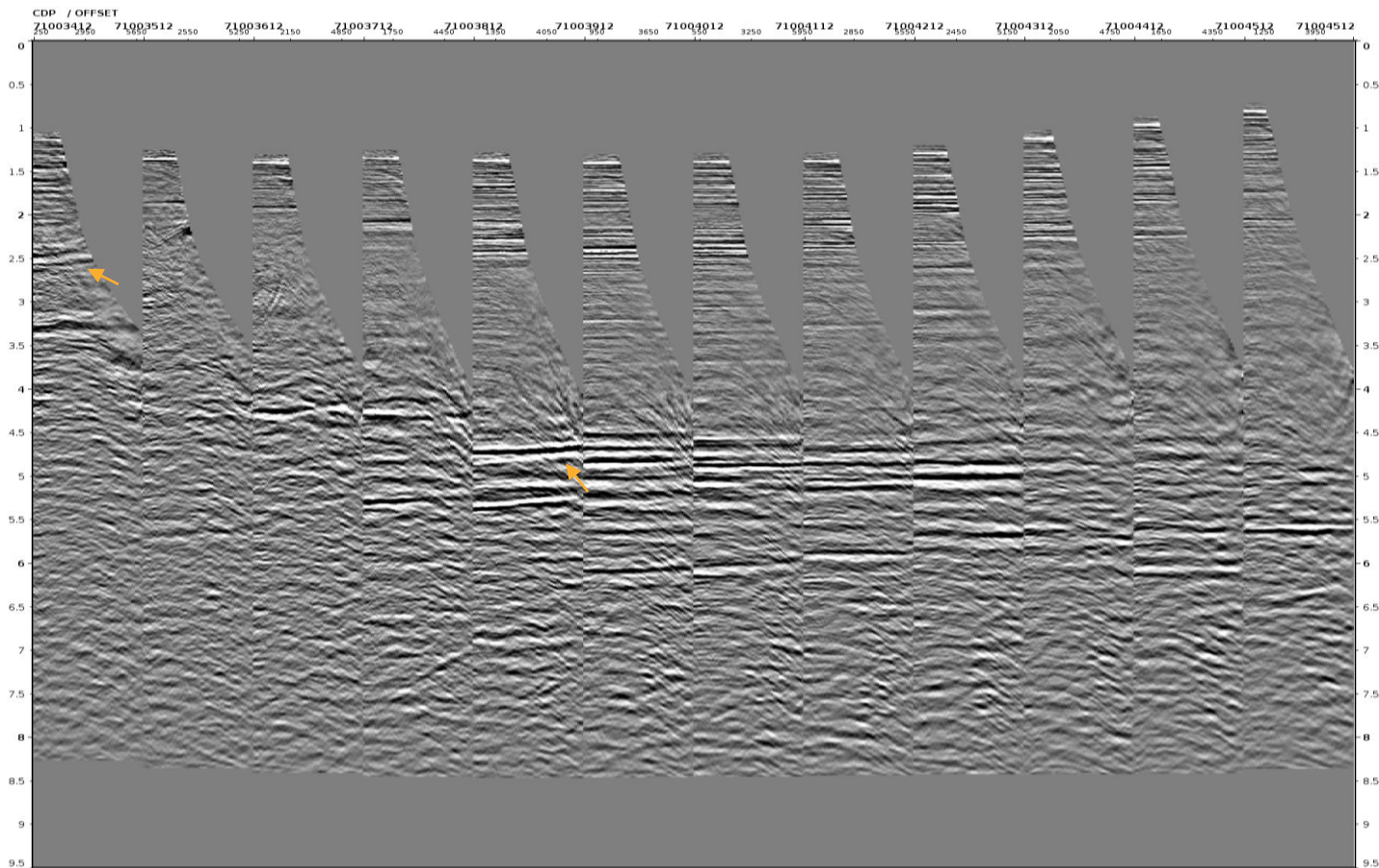
23





Selected Time CDP Gathers (0-50deg) before RMO Correction

24

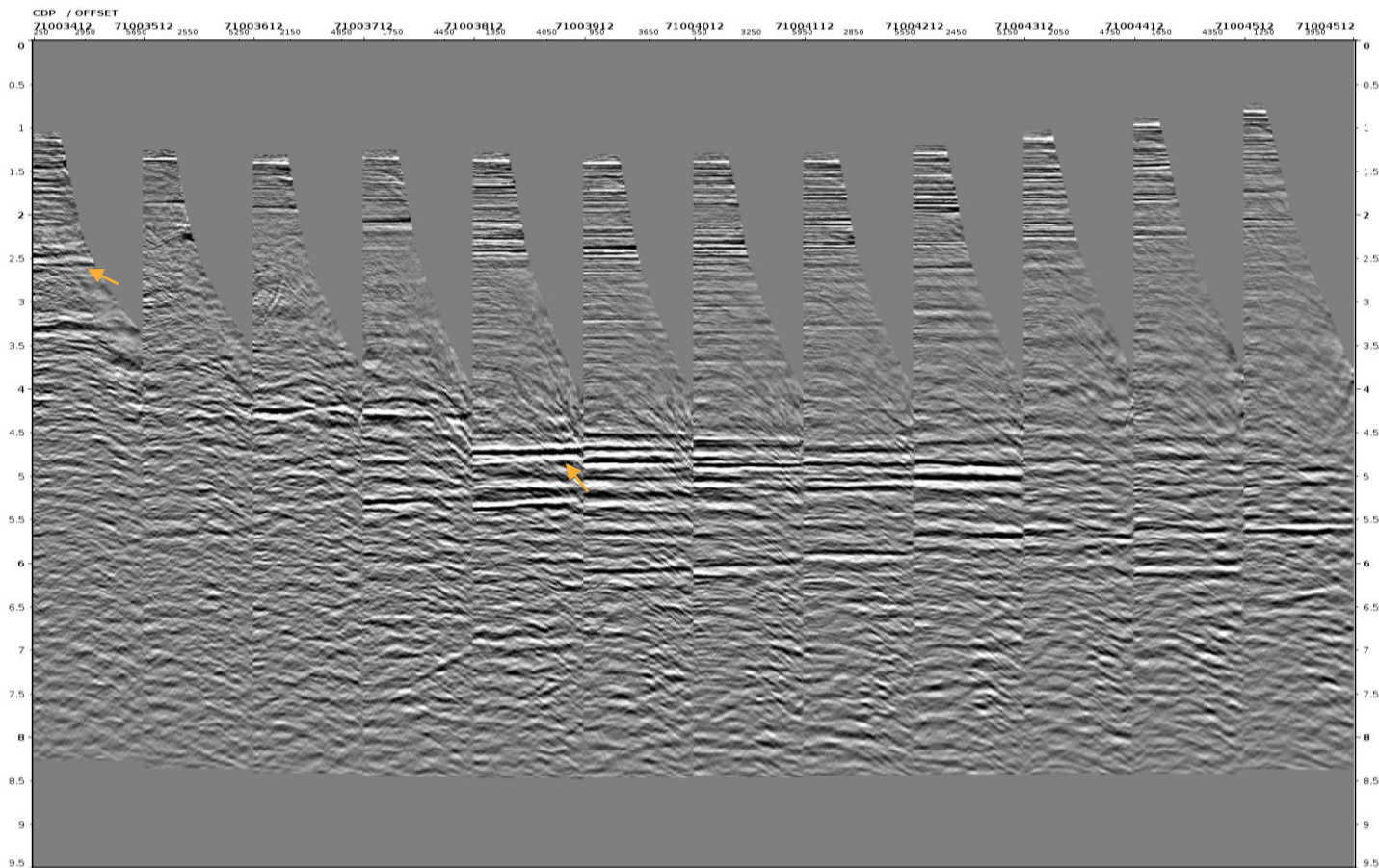


- Residual curvature is attenuated after RMO correction.



Selected Time CDP Gathers (0-50deg) after RMO Correction

25



- Residual curvature is attenuated after RMO correction.

- RMO correction flattens primaries on CDP gathers, as a result, primaries are more focused on stack.
- We recommend to proceed for production.