

UOBR017-SCAN018 Post Migration Processing Report

GTO-19-C031-02 SCAN Acquisition Seismic Processing Order #2

4 FEBRUARY 2021

Energie Beheer Nederland B.V.

2D Seismic PreSTM Processing, Onshore Netherlands

- Initially the same post migration processing was applied as was used for the previous set of SCAN lines (EBN project: GTO-19-C031-01, DUGRef: sCAnPr_005).
- After testing, a milder Radon was shown to be more appropriate as shown in the following presentation on line UGOU021 and was also applied to this line:
 - (sCAnPr_007_UGOU021_PostMigRadonTesting_210113.pdf).
- The original post-stack dip filter was applied:
 - Original dip filter: 0.5 ms/trace in the shallow, 3 ms/trace in the mid, 1 ms/trace in the deep.
- Note that 'shallow' refers to the top 300 ms and 'deep' to the area below a smooth horizon near the Lower Triassic.

Processing sequence

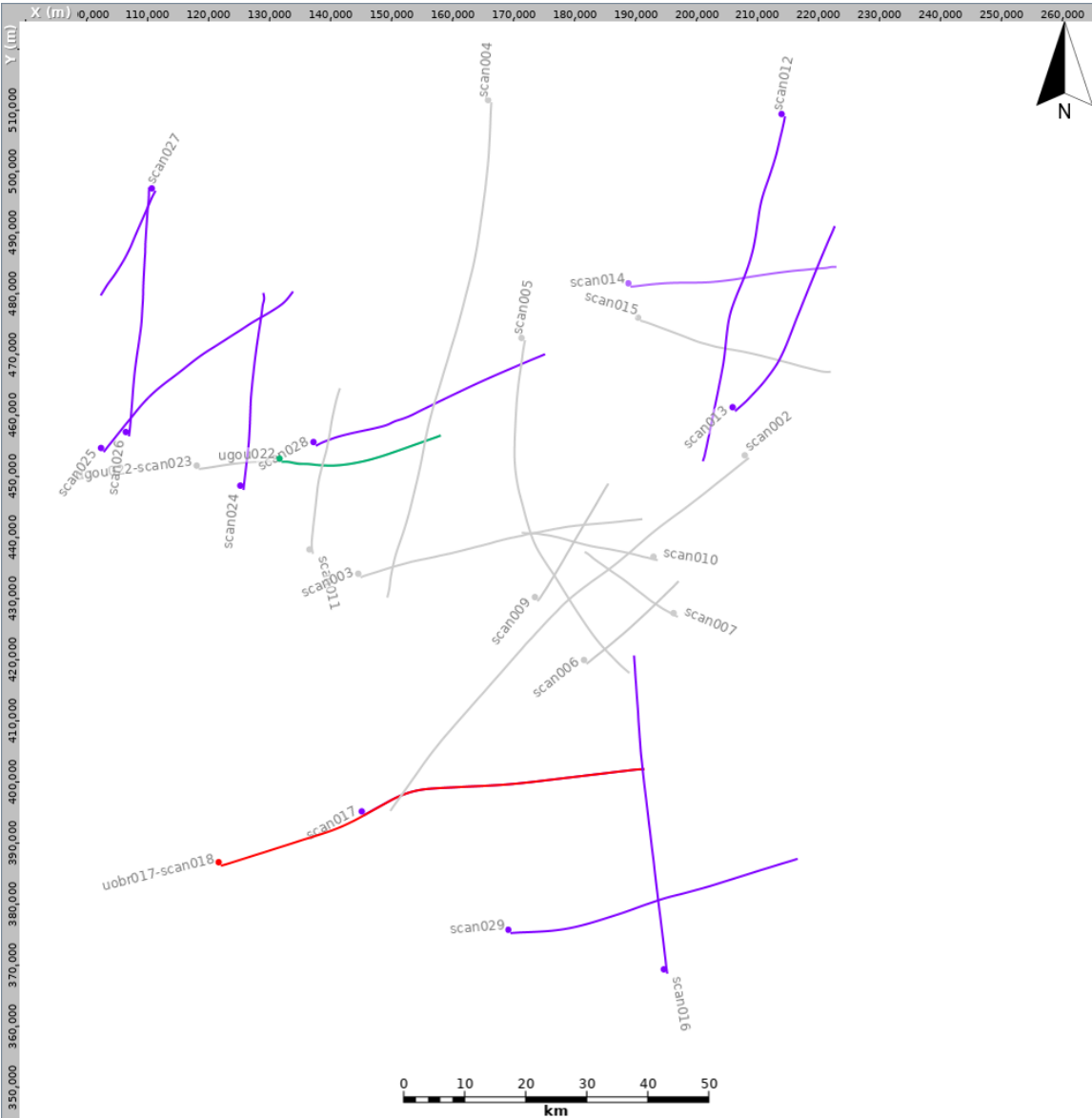
- Data reformat: SEGY to internal format
- Geometry: Crooked line with 2.5 m CDP interval
- Weak shots: 0-500 m offsets only
- Spherical divergence correction: T
- Geophone response correction:
- Refraction statics: Delay-time using $V_0 = 1000$ m/s $V_R = 1700$ m/s SRD = NAP
- Noise attenuation: +/-1250 m/s Weiner dip filter
- Edits: Kill invalid shots and receivers
- Noise attenuation: Despike
- Noise attenuation: Wavelet (D20) transform filter (muting the largest 10% of coefficients by 90% in scales 6-10)
- SCAC 1: Source and receiver designed on NMO corrected gathers over 200-2200 ms
- Noise attenuation: TFDN
- Inverse Q: $Q = 100$ phase and amplitude using 40 Hz reference frequency and 12 dB gain stabilisation
- DBS: Surface consistent with 160 ms operator length with 16 ms predictive gap
0.1% white noise stabilisation - Design window: 200-3000 ms
- Velocity analysis: 1 km interval
- Noise attenuation: 1.75 ms/tr (2857 m/s) dip filter and wavelet transform filter on shots
- Additional noise attenuation: Wavelet transform filter and TFDN on shots
- Residual statics: Surface consistent using MASTT
- Velocity analysis: 1 km interval
- Residual statics: Surface consistent using MASTT

Processing sequence (continued)

- SCAC 2: Source and receiver designed on NMO corrected gathers over 200-2200 ms
- Remove spherical divergence: T
- Low cut filter: 2.5 Hz low cut filter
- Migration (PreSTM 1): Isotropic 4th order curved ray Kirchhoff using smoothed (5000-300-3) stacking velocities
- Velocity analysis: Remove PreSTM 1 velocities and pick 2nd order velocities at 1 km intervals and 500 m where required - Effective Eta picked automatically every 250 m
- Migration (PreSTM 2): Kirchhoff VTI migration using smoothed (2000-200-2) 2nd order picked velocities and auto picked effective Eta
- Migration (PreSTM 3): Kirchhoff VTI migration using smoothed (500-100-2) 2nd order picked velocities and auto picked effective Eta
- Radon: Using polygon subtraction
- Noise attenuation: Dip filter on CDPs
- Trim statics: 12 ms correlation length
- Noise attenuation: Cadzow rank-reduction on CDP-offset (time-variant matrix)
- Noise attenuation: Common offset dip filter
- Zero phase filter: Statistical filter, trough polarity
- Trace drop: Limited to the offset range input to the migration (501 CDP smoother on fars, 51 CDP minimum and 10 CDP smoother for near offsets)
- Velocity analysis: 1 km interval
- Scaling: 2000 ms AGC on scaled stacks only
- Stack: $1/N$ ($1/\sqrt{N}$ for scaled stacks) with picked mute (45 degree mute used in testing)

Processing sequence (continued)

- Spectral broadening: Using True Amplitude Frequency Equalisation (TAFE) frequency gain pairs
- Noise attenuation: 0.5 ms/trace dip filter in shallow, 3 ms/trace in mid and 1 ms/trace in deep
- Noise attenuation: Cadzow filter on stack
- Noise attenuation: Structurally Oriented Filter (SOF)
- Time-variant bandpass filter: 6-8-100-190 Hz at 0 s
6-12-90-110 Hz at 2 s
6-12-35-55 Hz at 3 s
- Post-stack cosmetic mute:
- Output to SEG-Y:

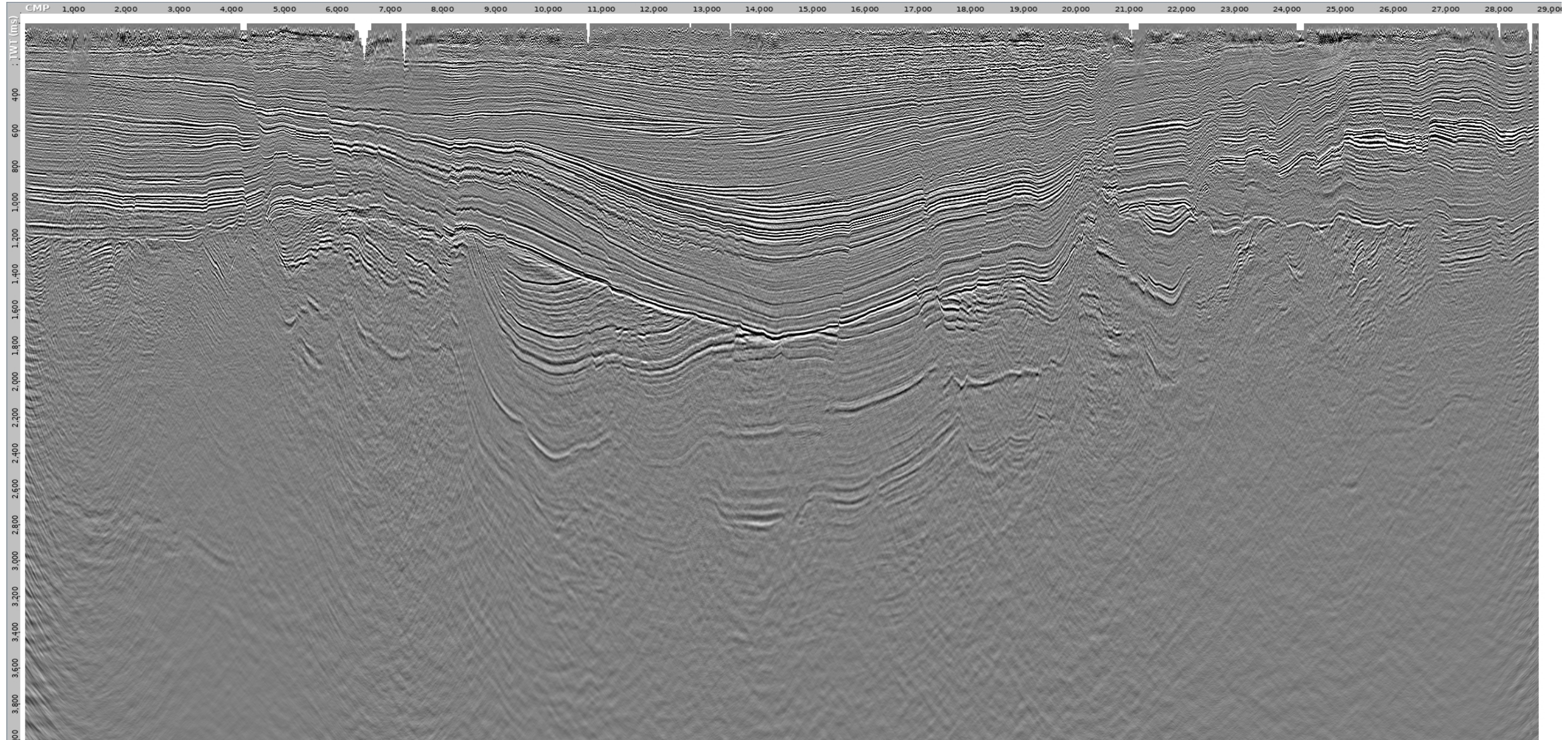


UOBR017-SCAN018 stack before Radon and dip filter

At floating datum



W



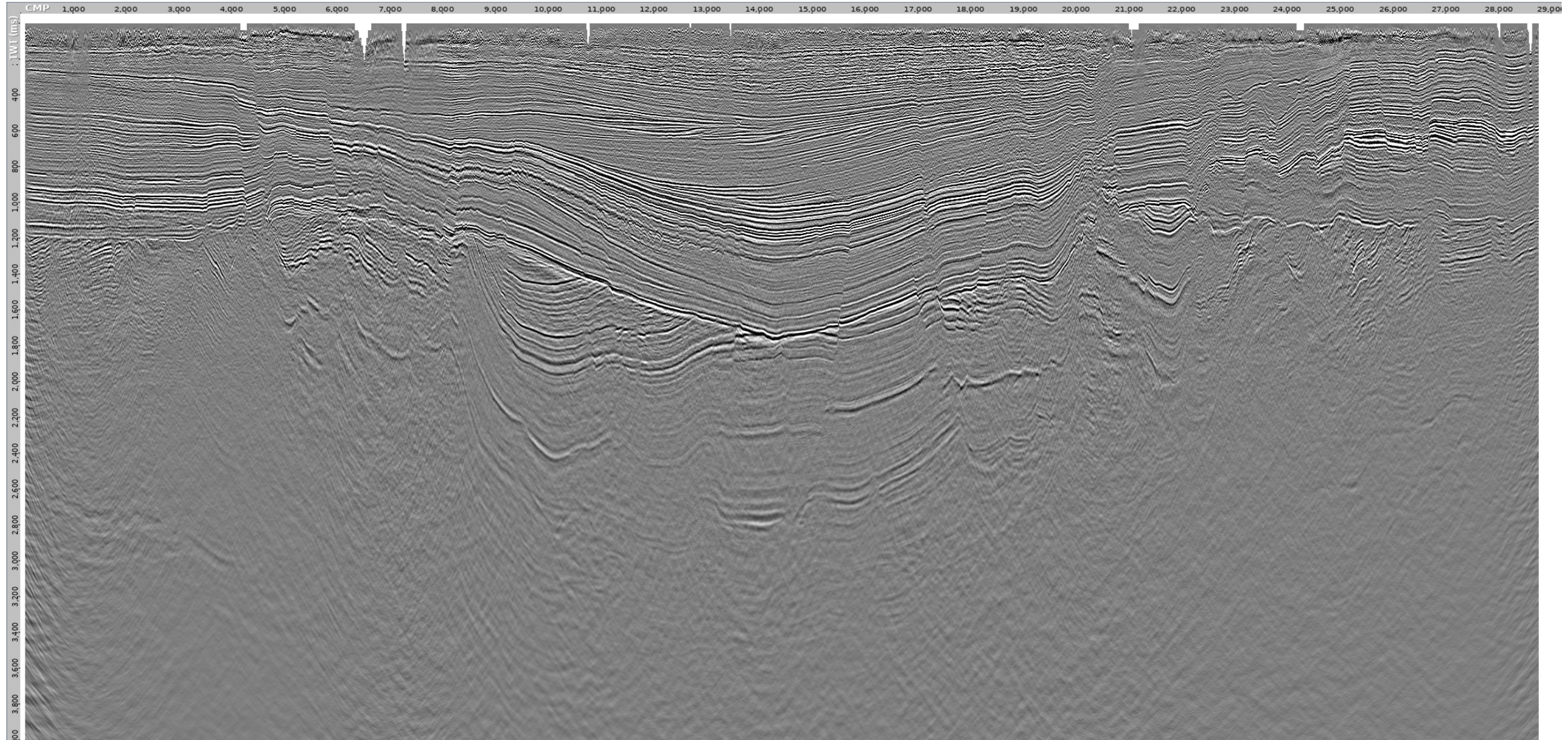
E

UOBR017-SCAN018 stack with Radon and dip filter on CDPs

At floating datum



W



E

UOBR017-SCAN018 stack with Radon and dip filter on CDPs difference

At floating datum



W



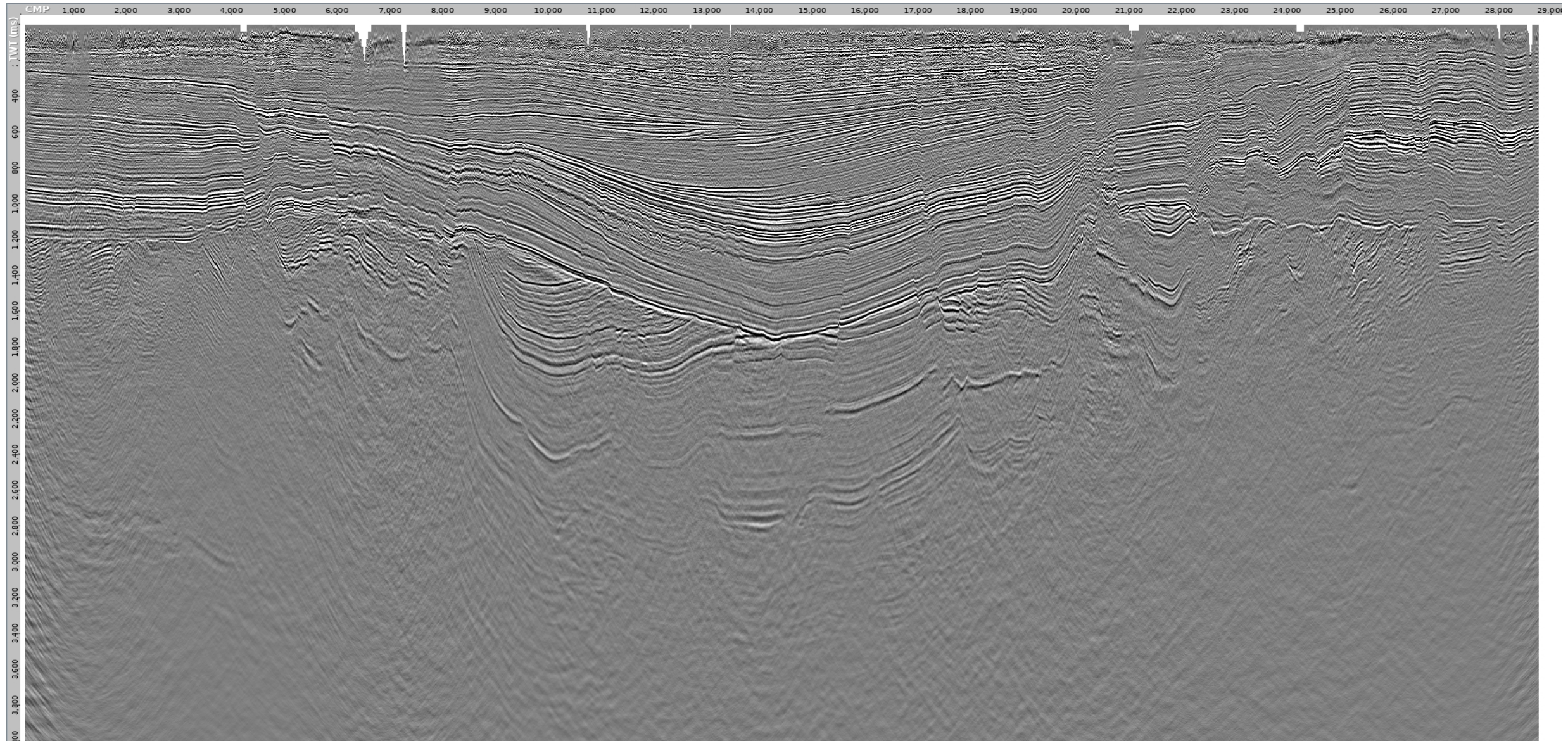
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UOBR017-SCAN018 stack with Radon and dip filter on CDPs (REPEAT SLIDE)

At floating datum



W



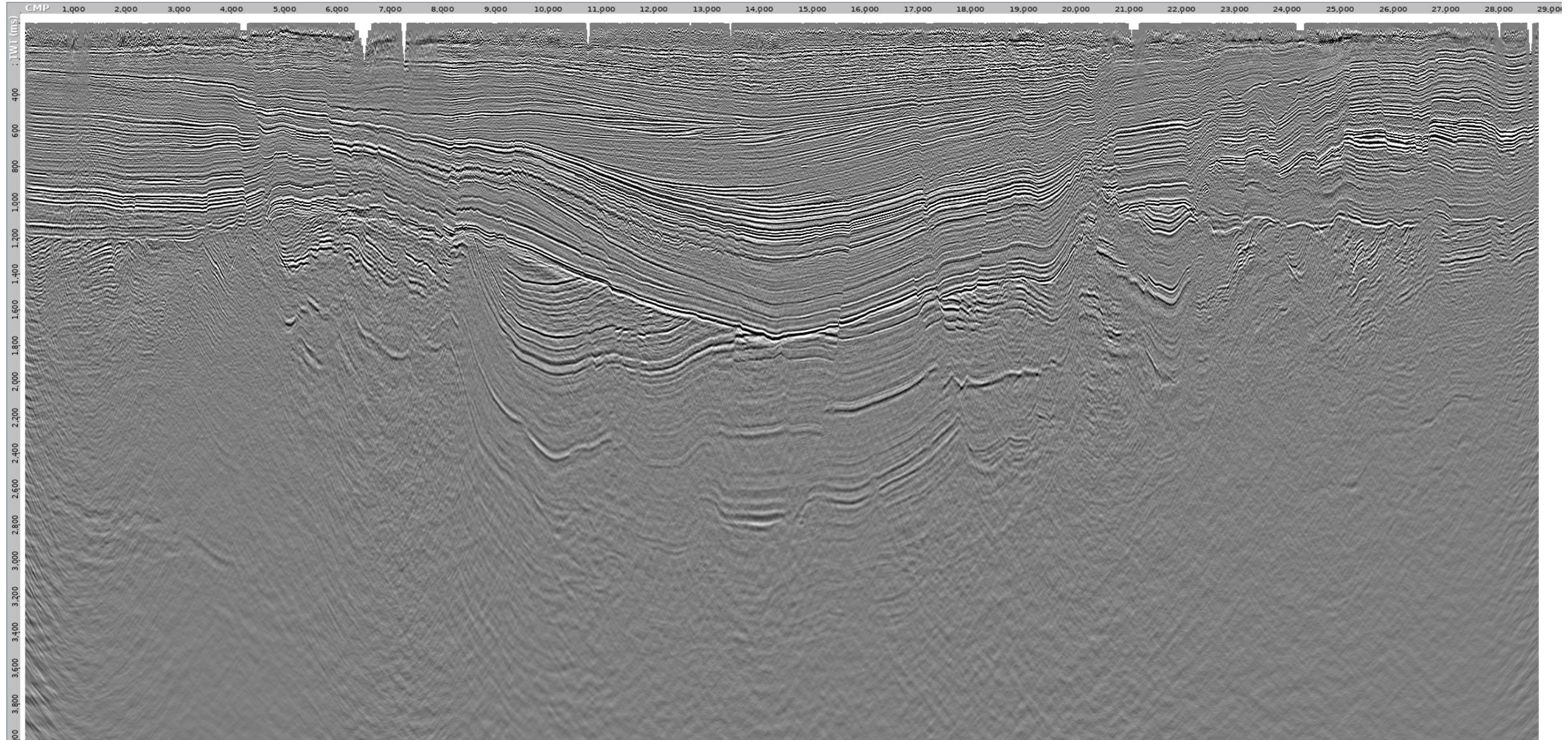
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UOBR017-SCAN018 stack with trim statics

At floating datum



W



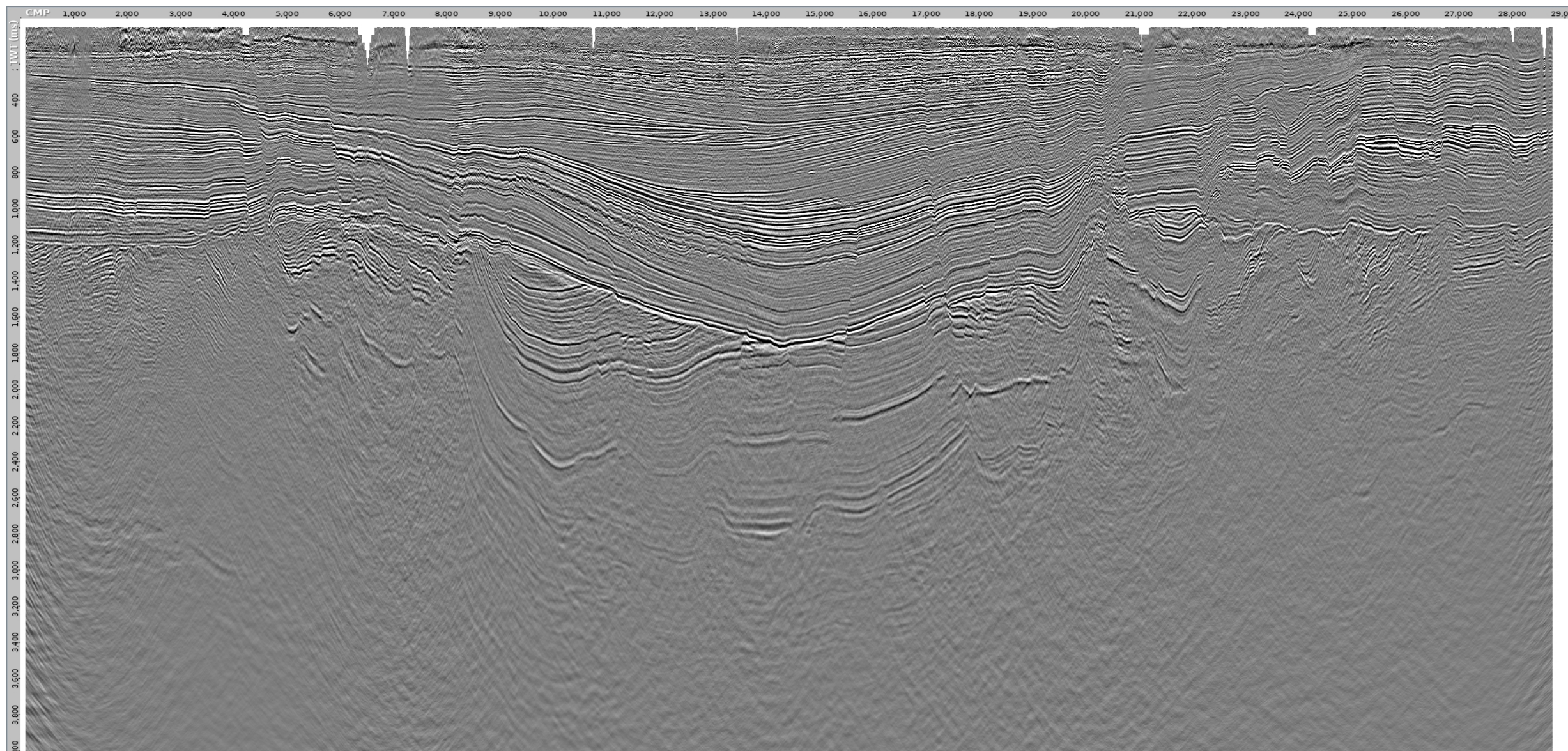
E

UOBR017-SCAN018 stack with CDP Cadzow noise attenuation, dip filter

At floating datum



W



E

UOBR017-SCAN018 stack with CDP Cadzow noise attenuation and dip filter difference

At floating datum



W



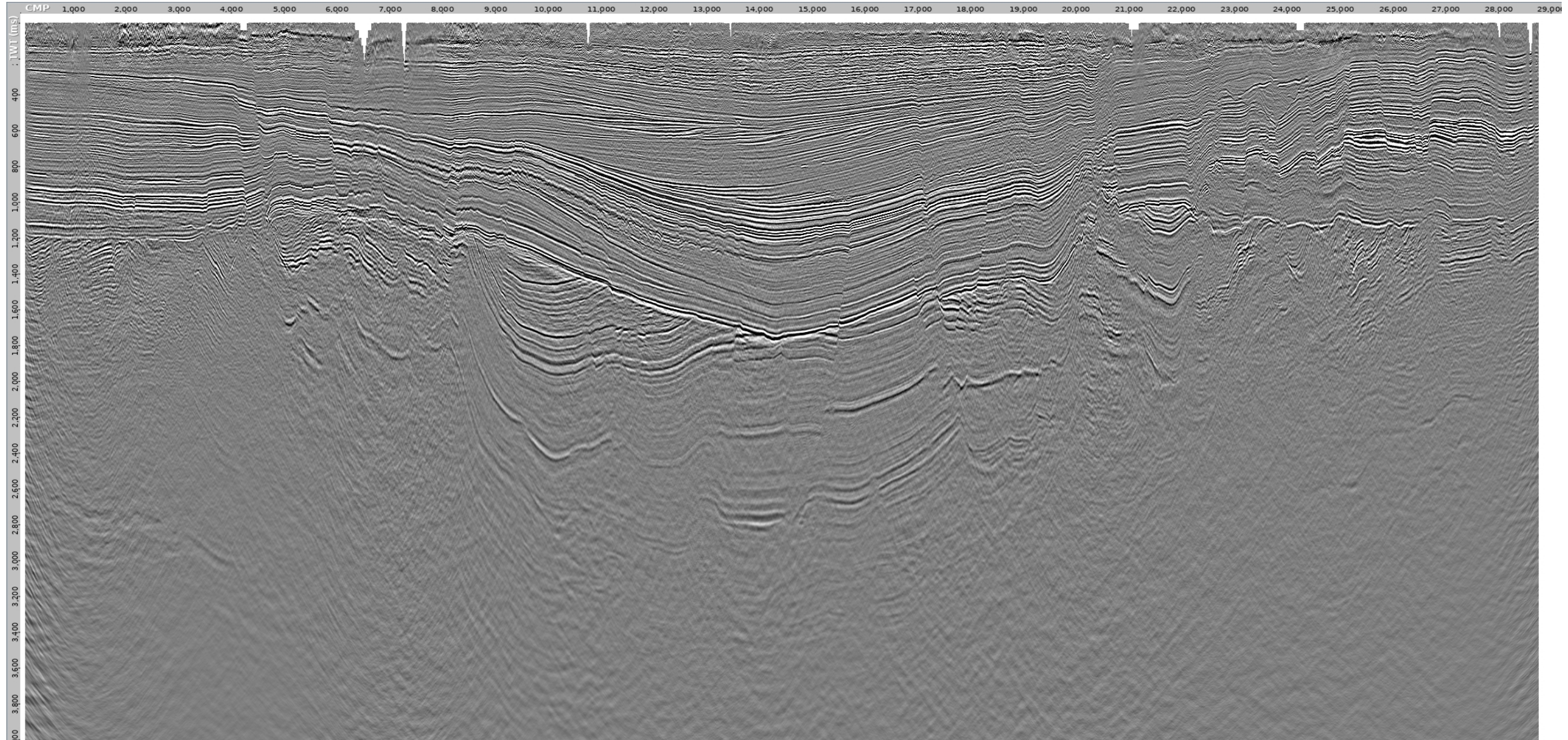
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UOBR017-SCAN018 stack with CDP Cadzow noise attenuation, dip filter (REPEAT SLIDE)

At floating datum



W



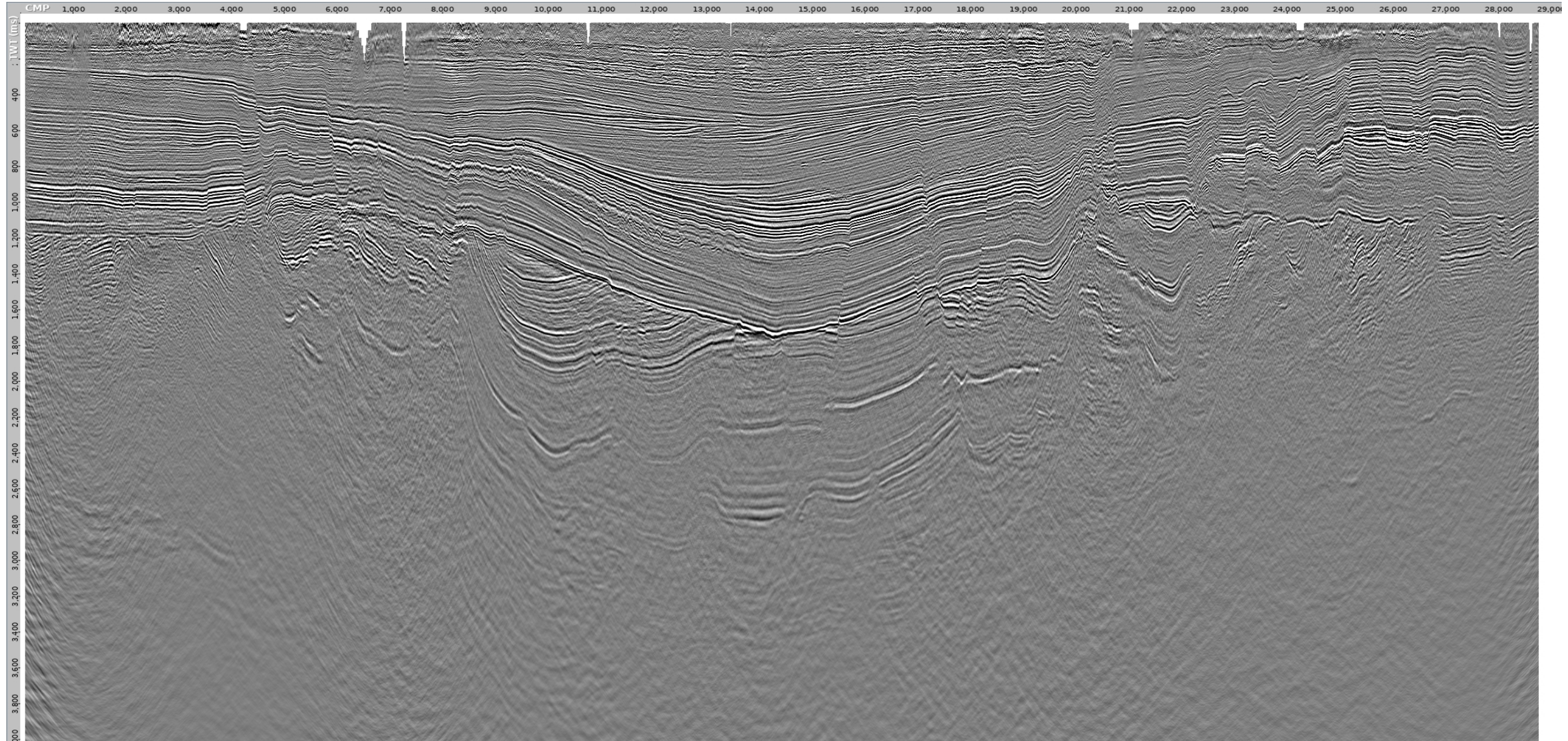
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UOBR017-SCAN018 stack with CDP Cadzow noise attenuation, dip filter and zero phasing filter

At floating datum



W



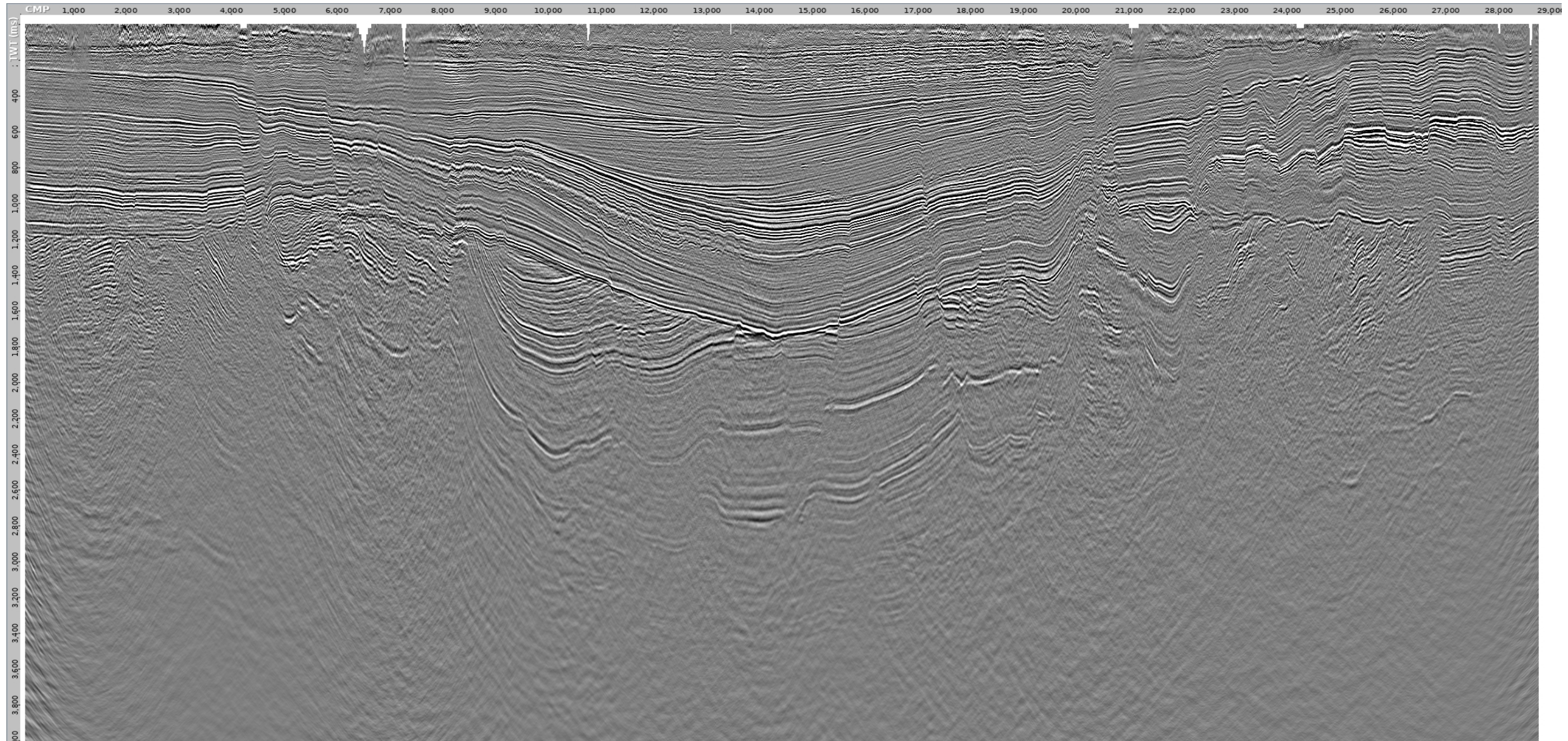
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UOBR017-SCAN018 stack with picked mute

At floating datum



W



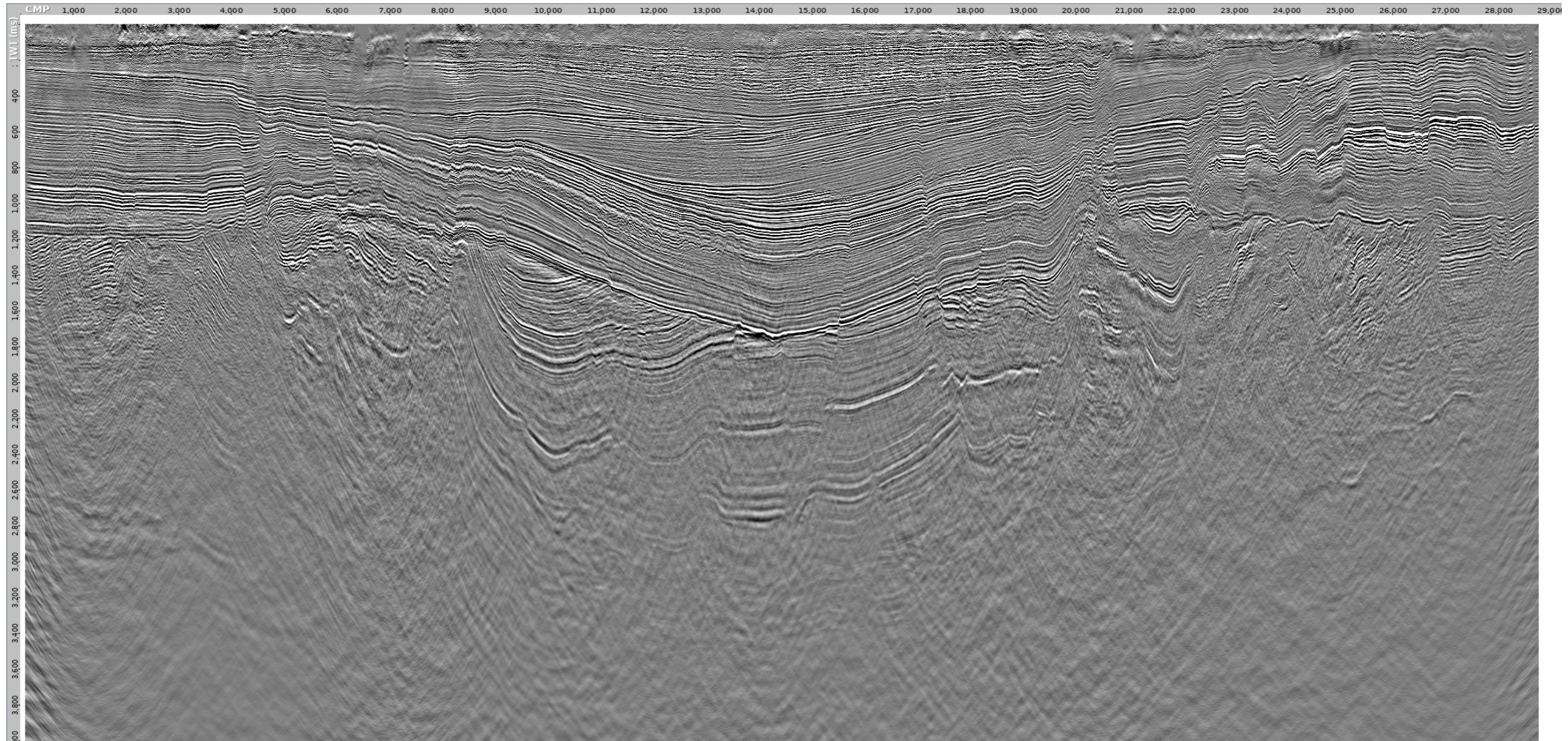
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UOBR017-SCAN018 stack with spectral broadening and dip filter

At floating datum



W



E

UOBR017-SCAN018 stack difference with dip filter relative to no dip filter

At floating datum



W



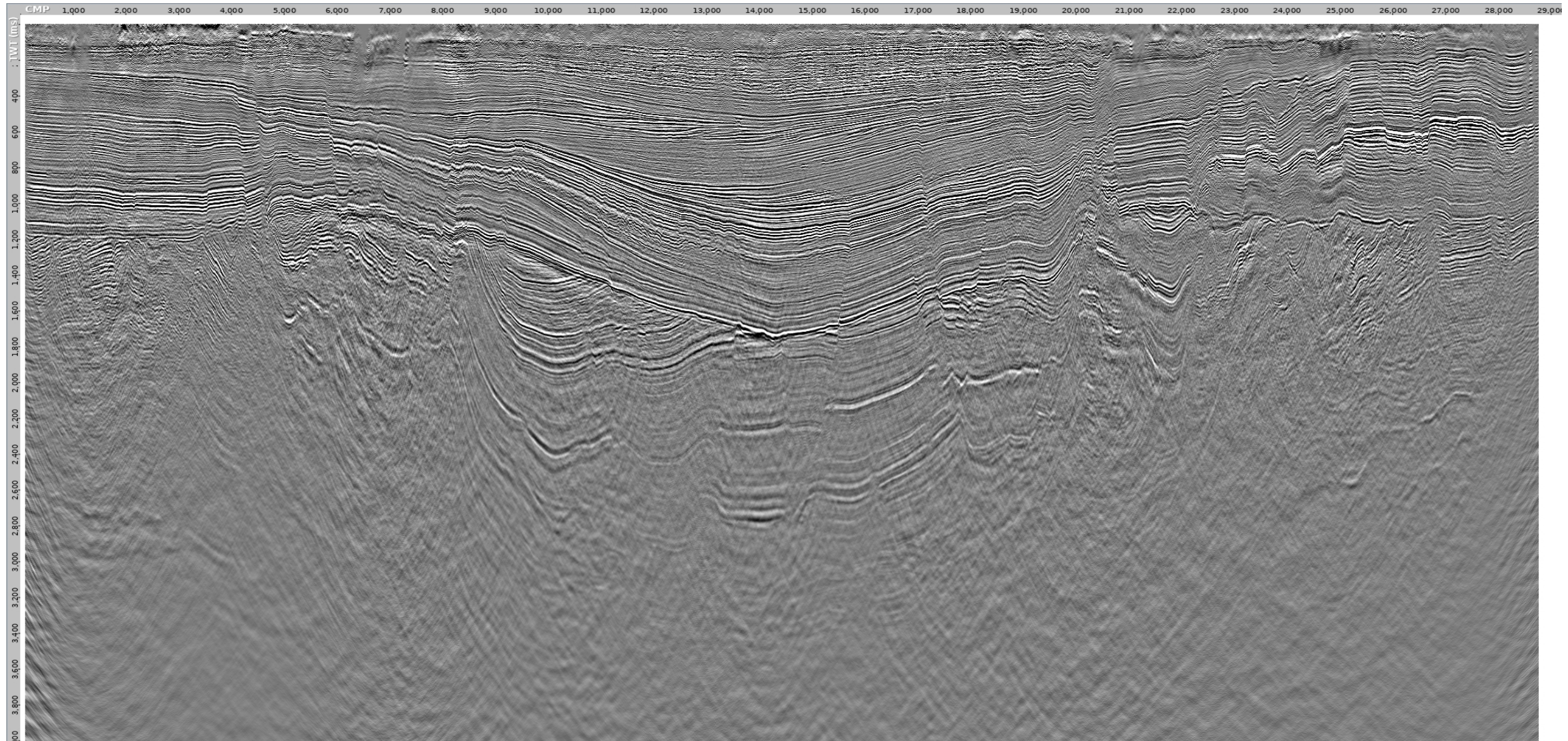
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UOBR017-SCAN018 stack with spectral broadening and dip filter (REPEATED)

At floating datum



W



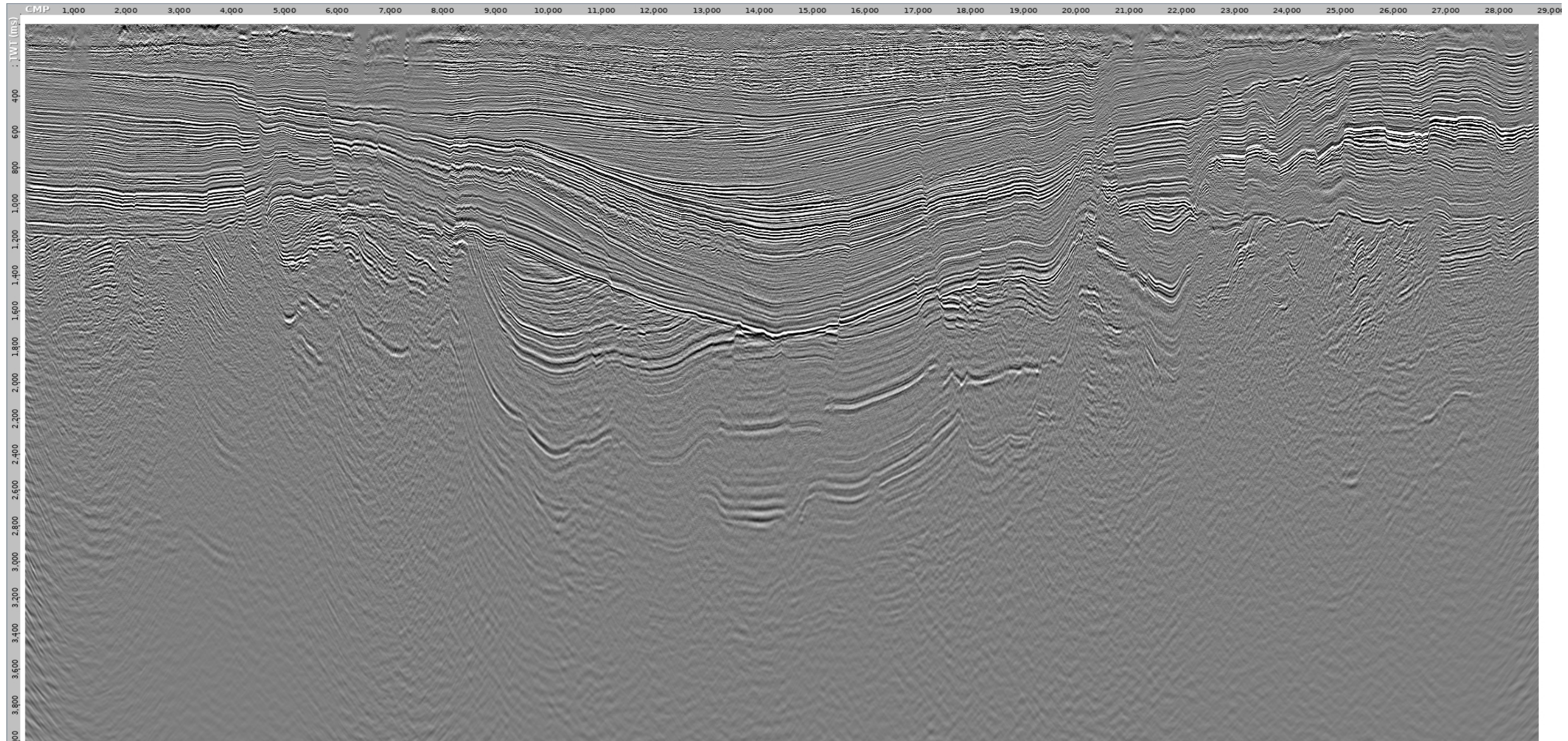
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UOBR017-SCAN018 stack with original dip filter, SOF and time-variant bandpass filter stack

At floating datum



W



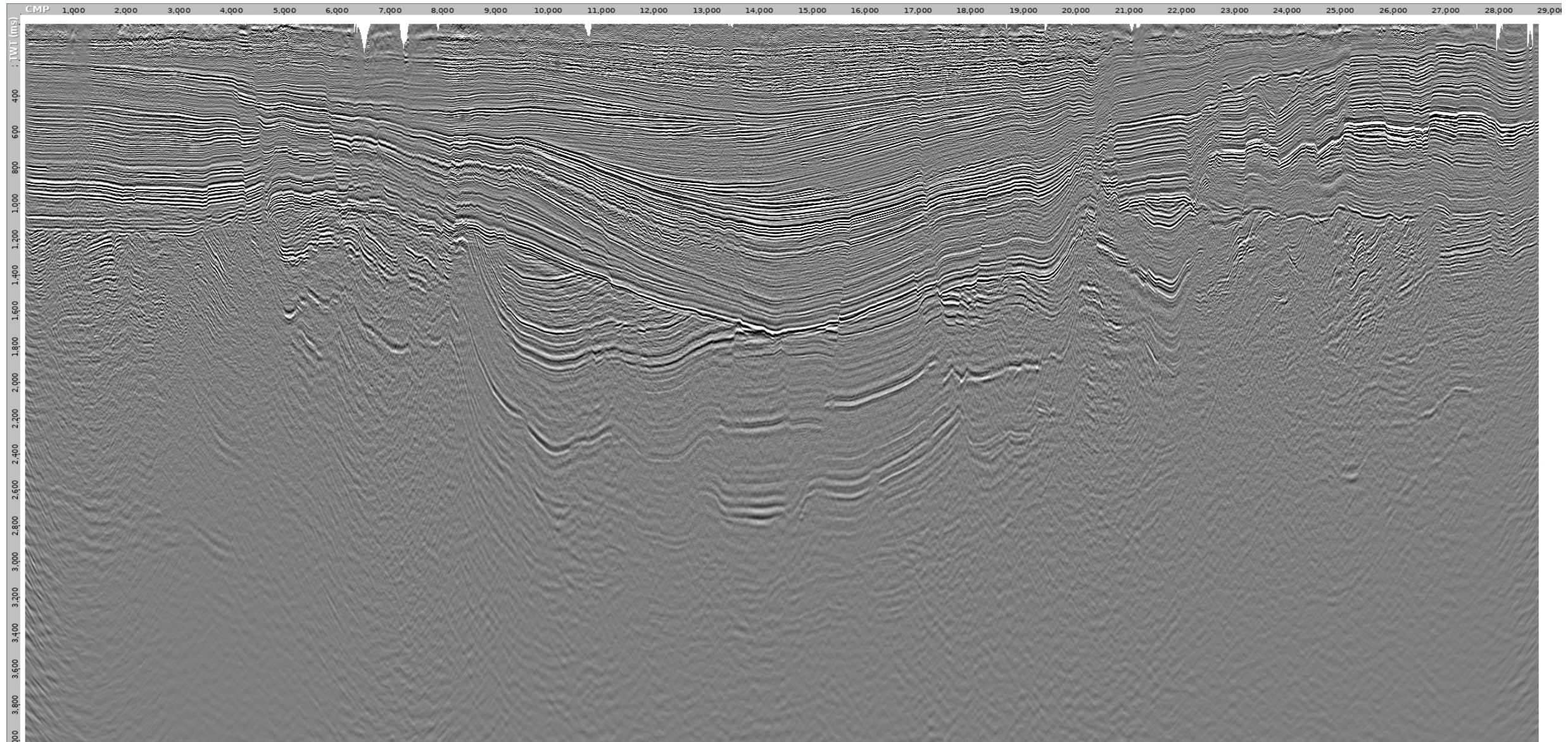
E

UOBR017-SCAN018 stack with original dip filter, SOF and time-variant bandpass filter stack on flat datum with post-stack mute

At flat datum



W



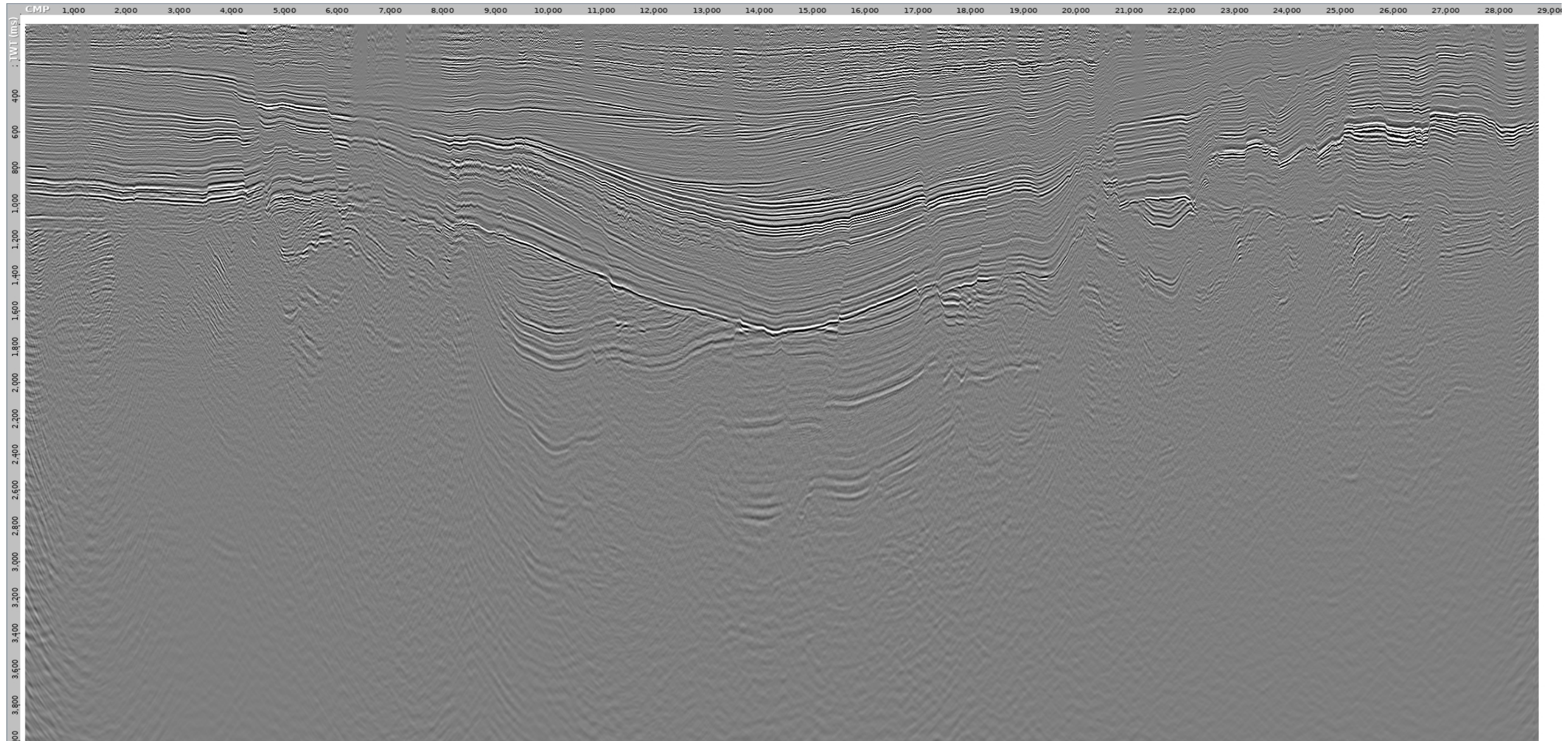
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UOBR017-SCAN018 fast-track true amplitude stack

At flat datum



W



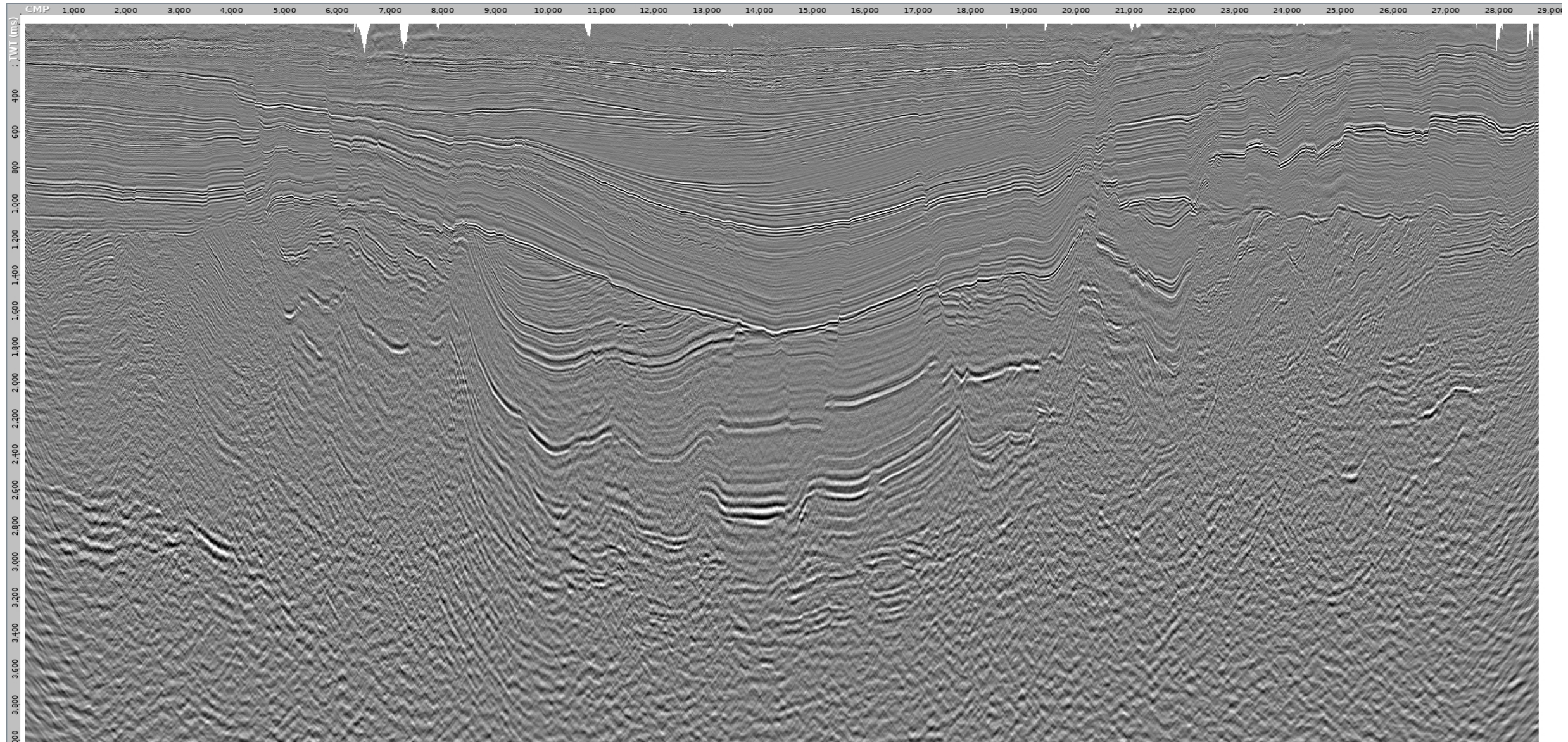
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UOBR017-SCAN018 final AGC stack on flat datum

At flat datum



W



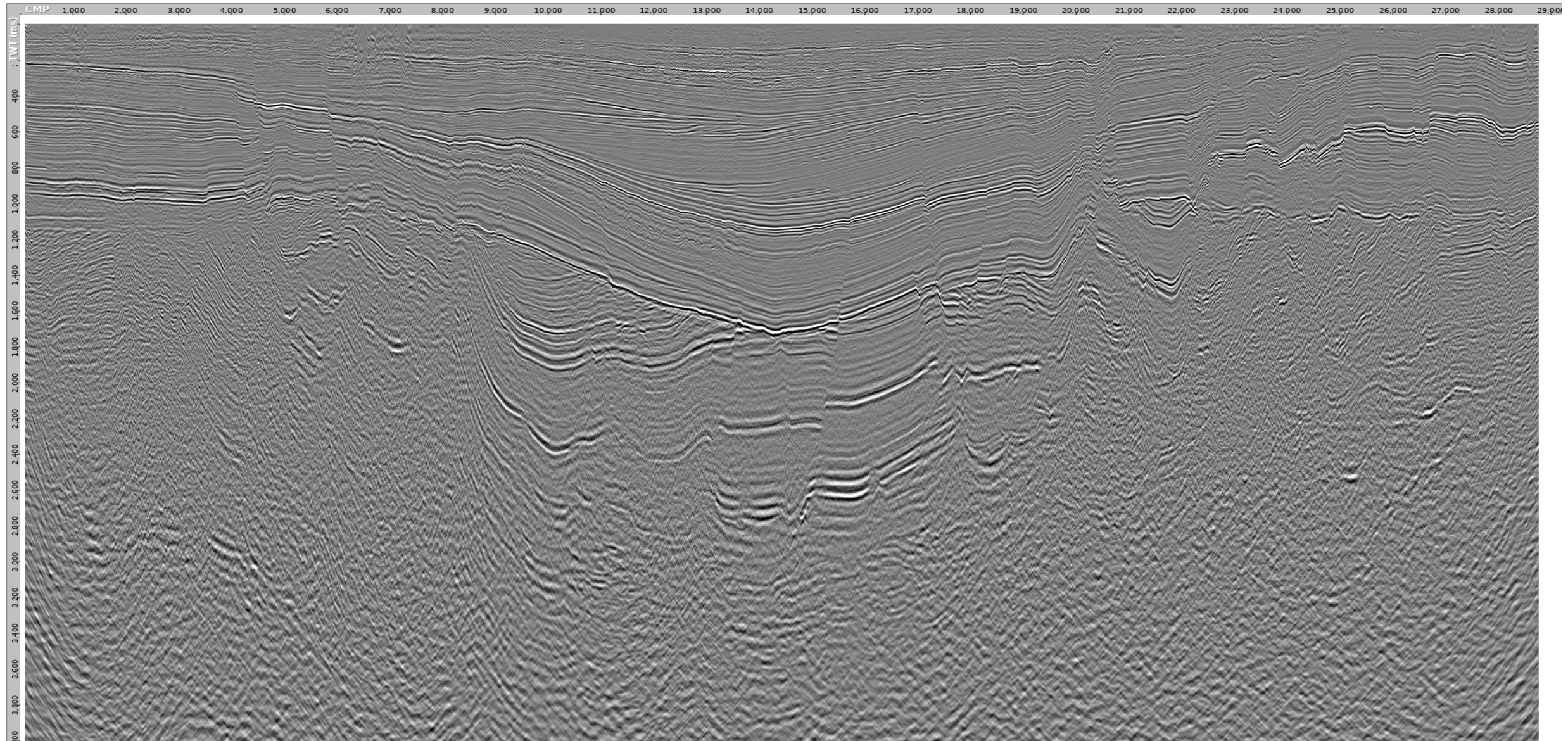
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UOBR017-SCAN018 fast-track AGC stack

At flat datum



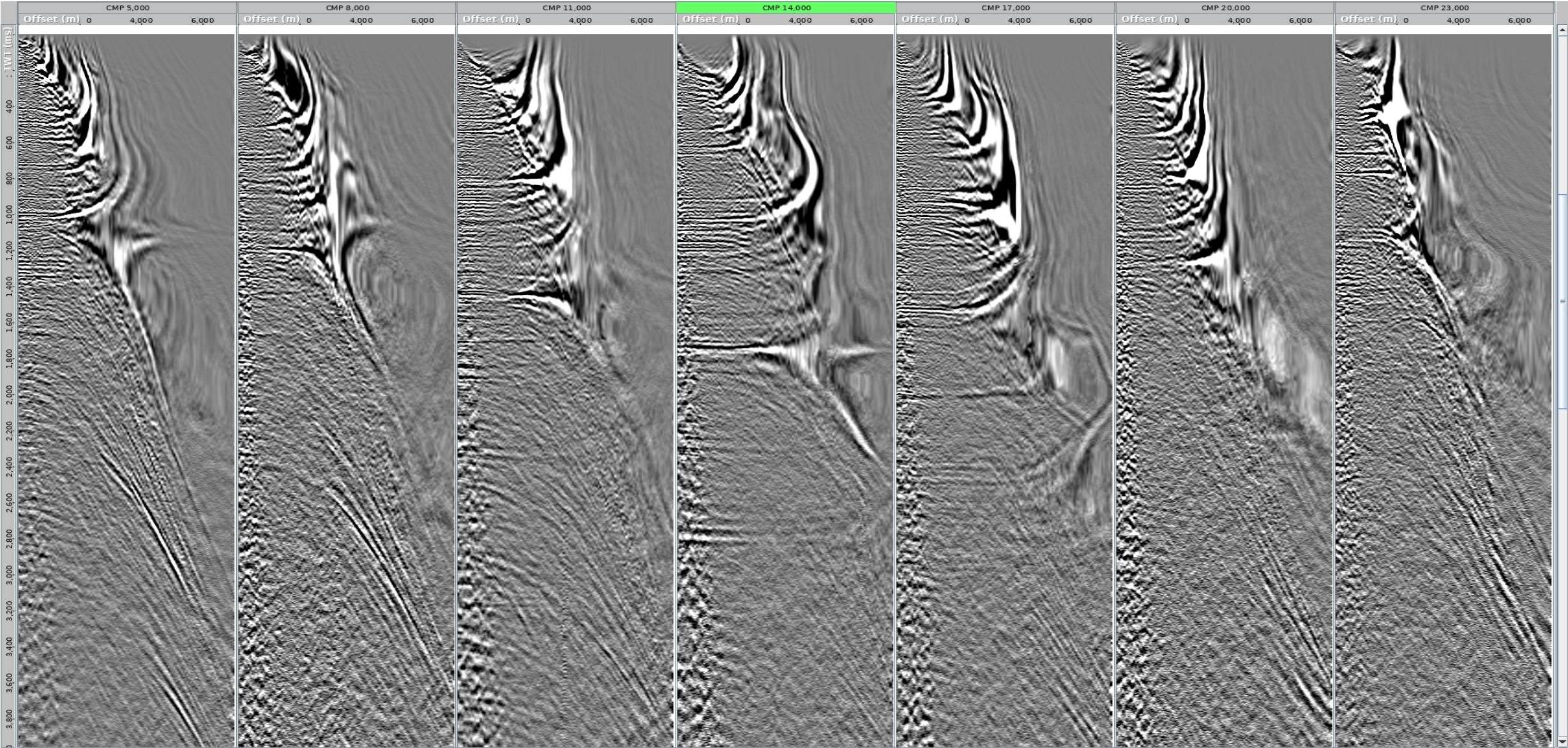
W



E



W



E

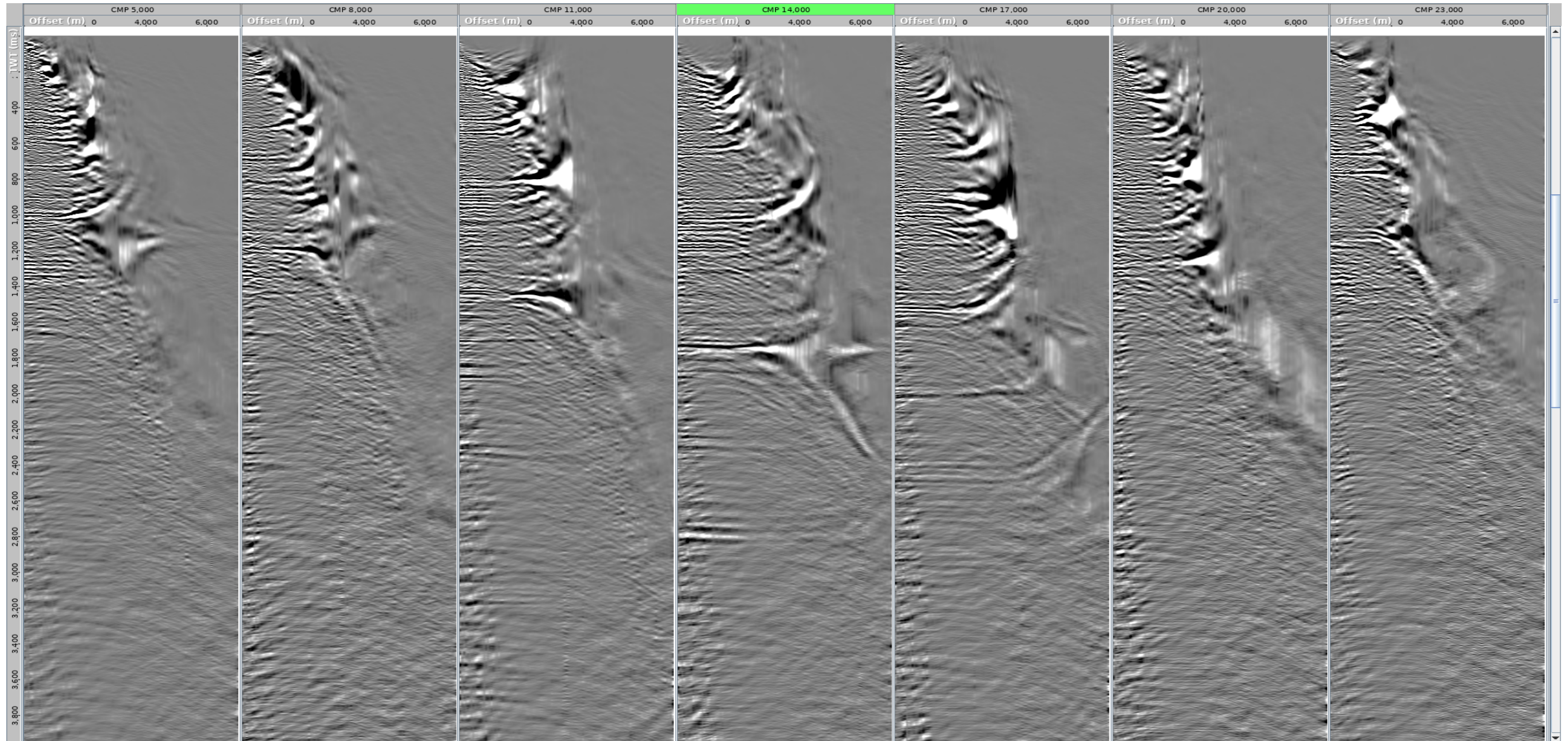


UOBR017-SCAN018 CDPs with Radon and dip filter

At floating datum



W



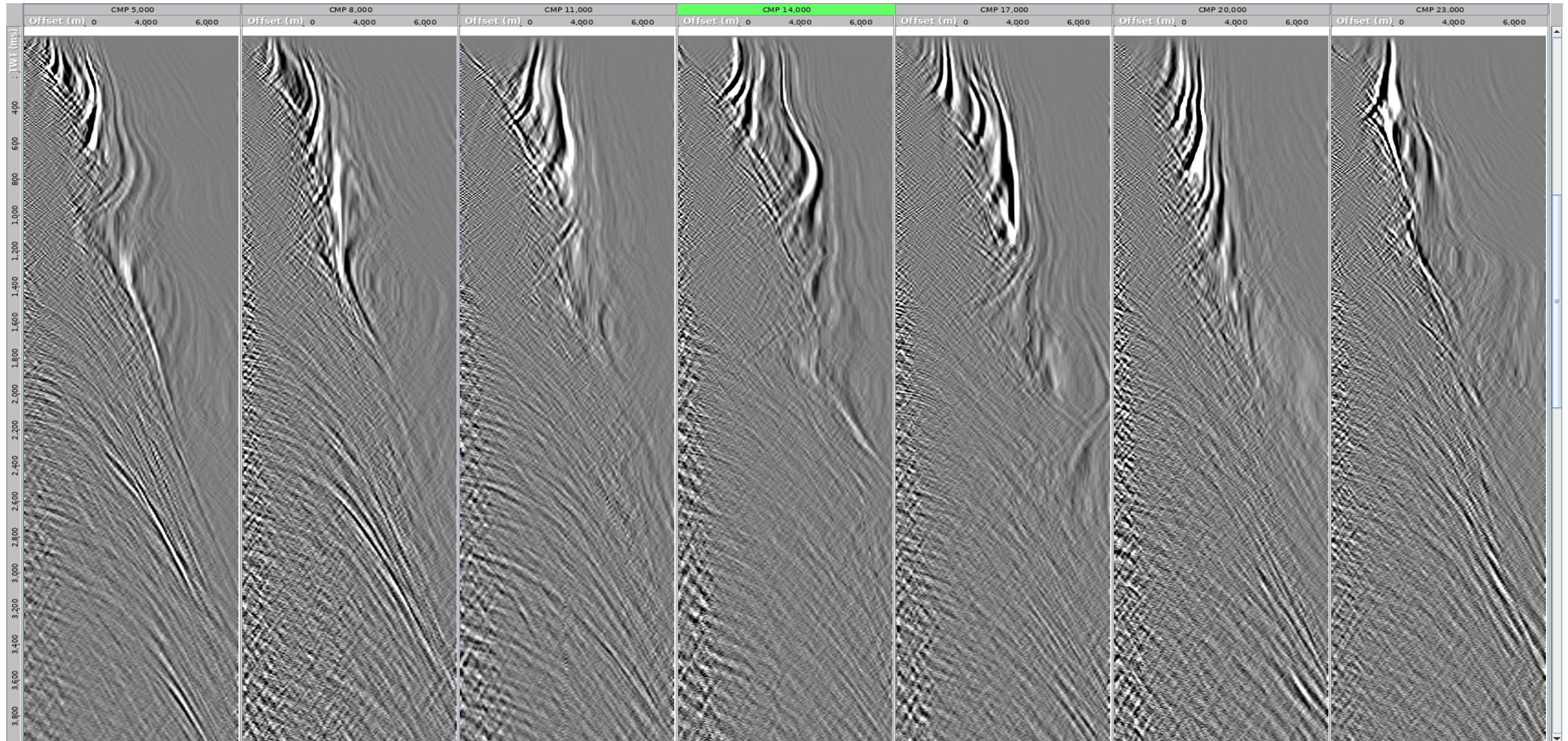
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UOBR017-SCAN018 CDPs with Radon and dip filter difference

At floating datum



W



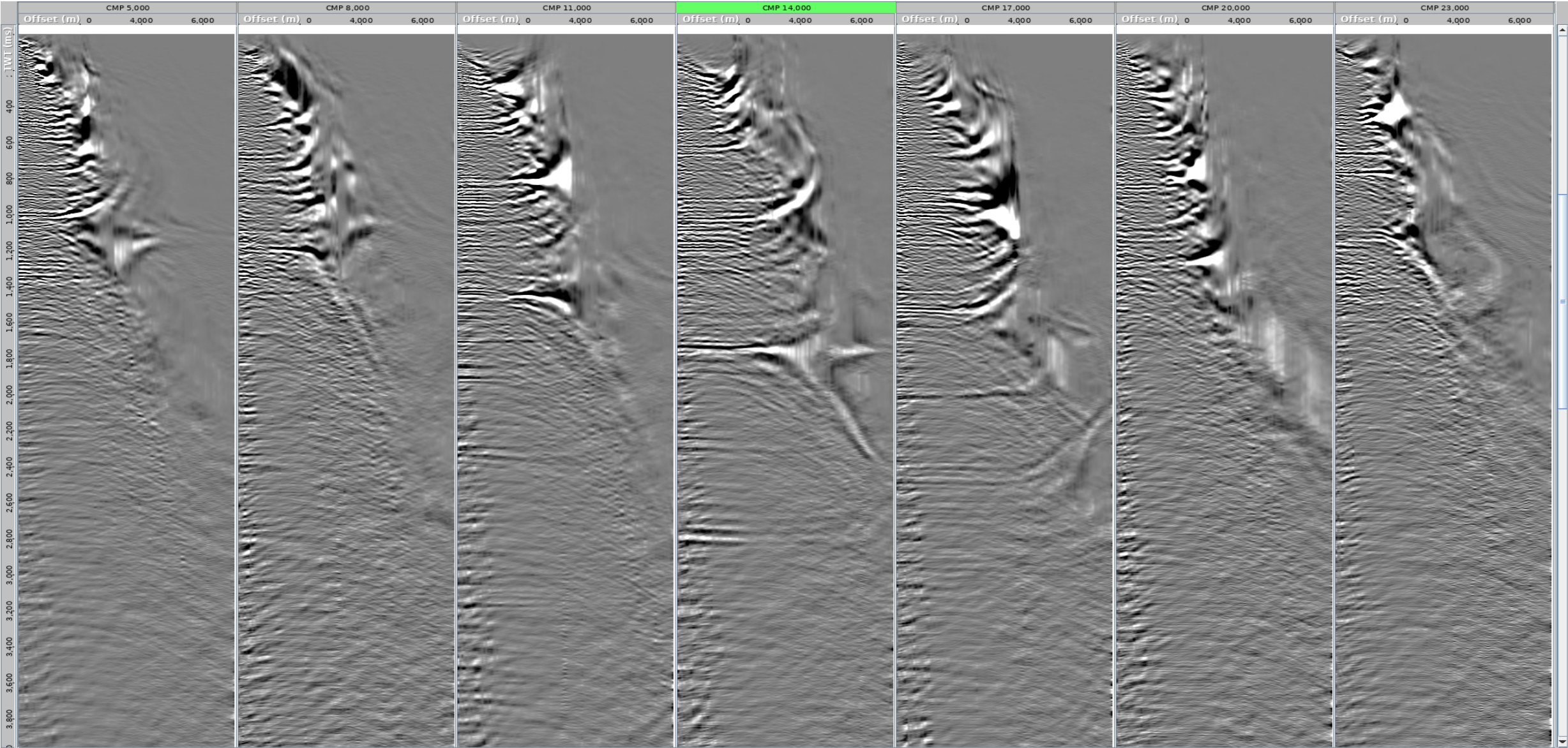
E

UOBR017-SCAN018 CDPs with Radon and dip filter (REPEAT SLIDE)

At floating datum



W



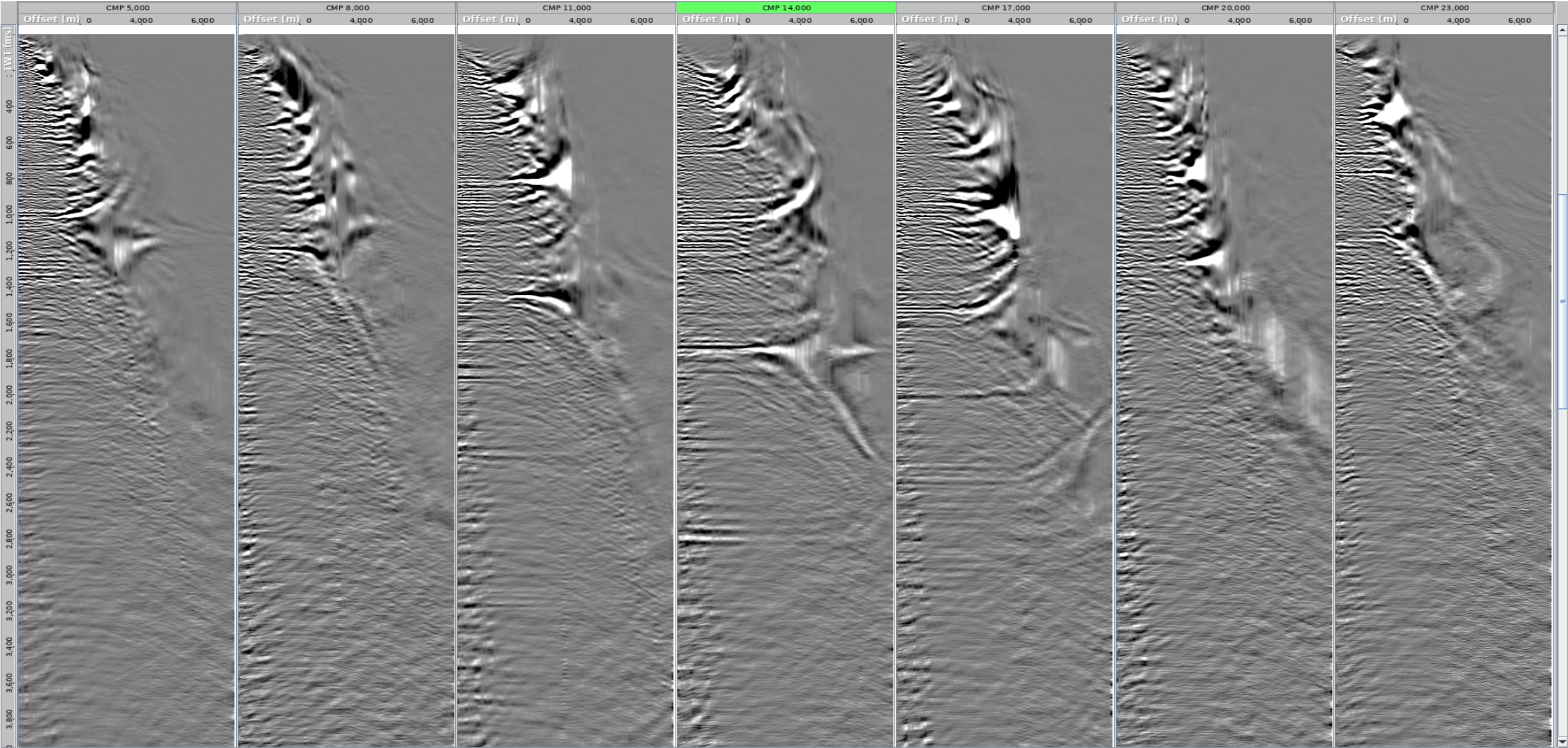
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UOBR017-SCAN018 CDPs with trim statics

At floating datum



W



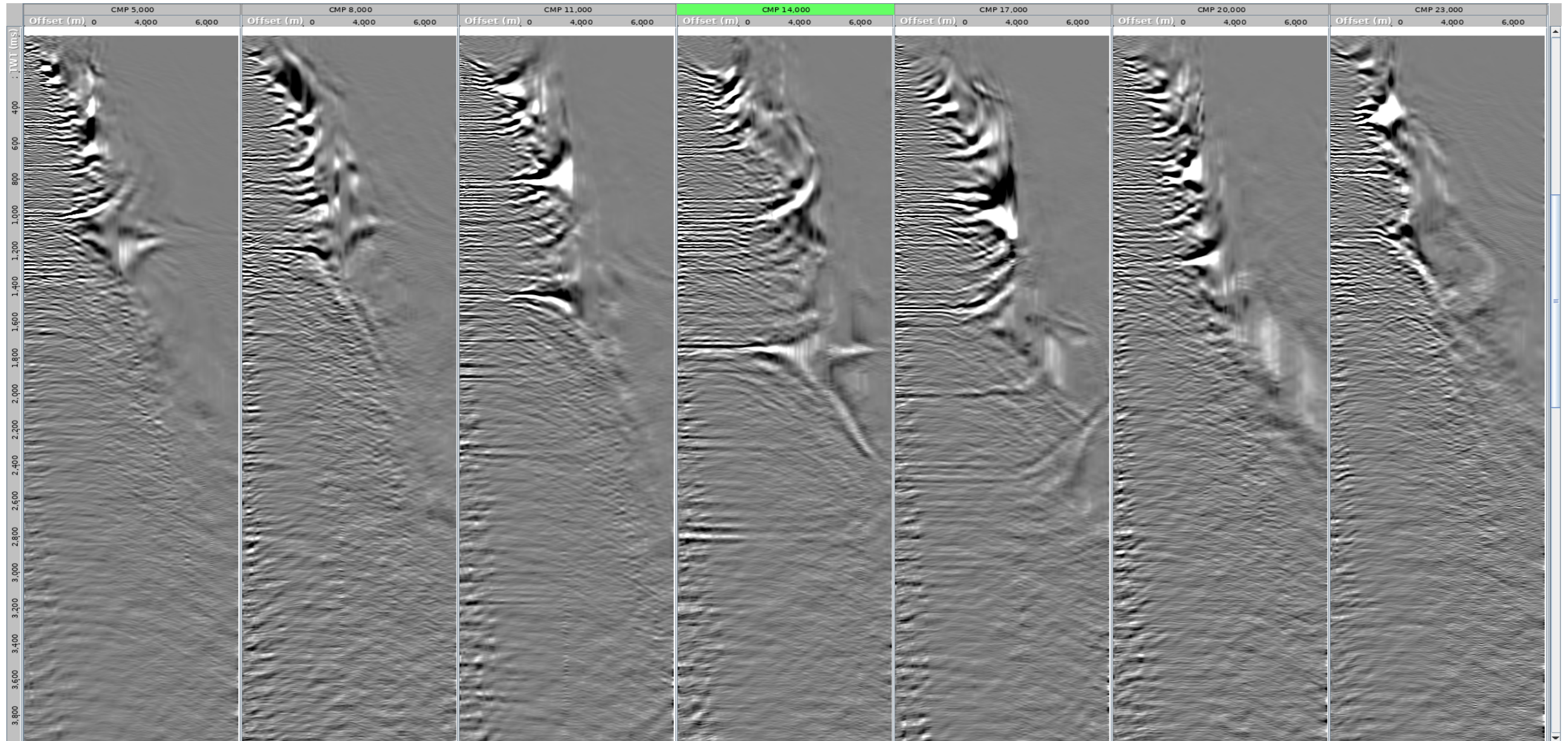
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UOBR017-SCAN018 CDPs with trim, Cadzow on CDP-offset and dip filter

At floating datum



W



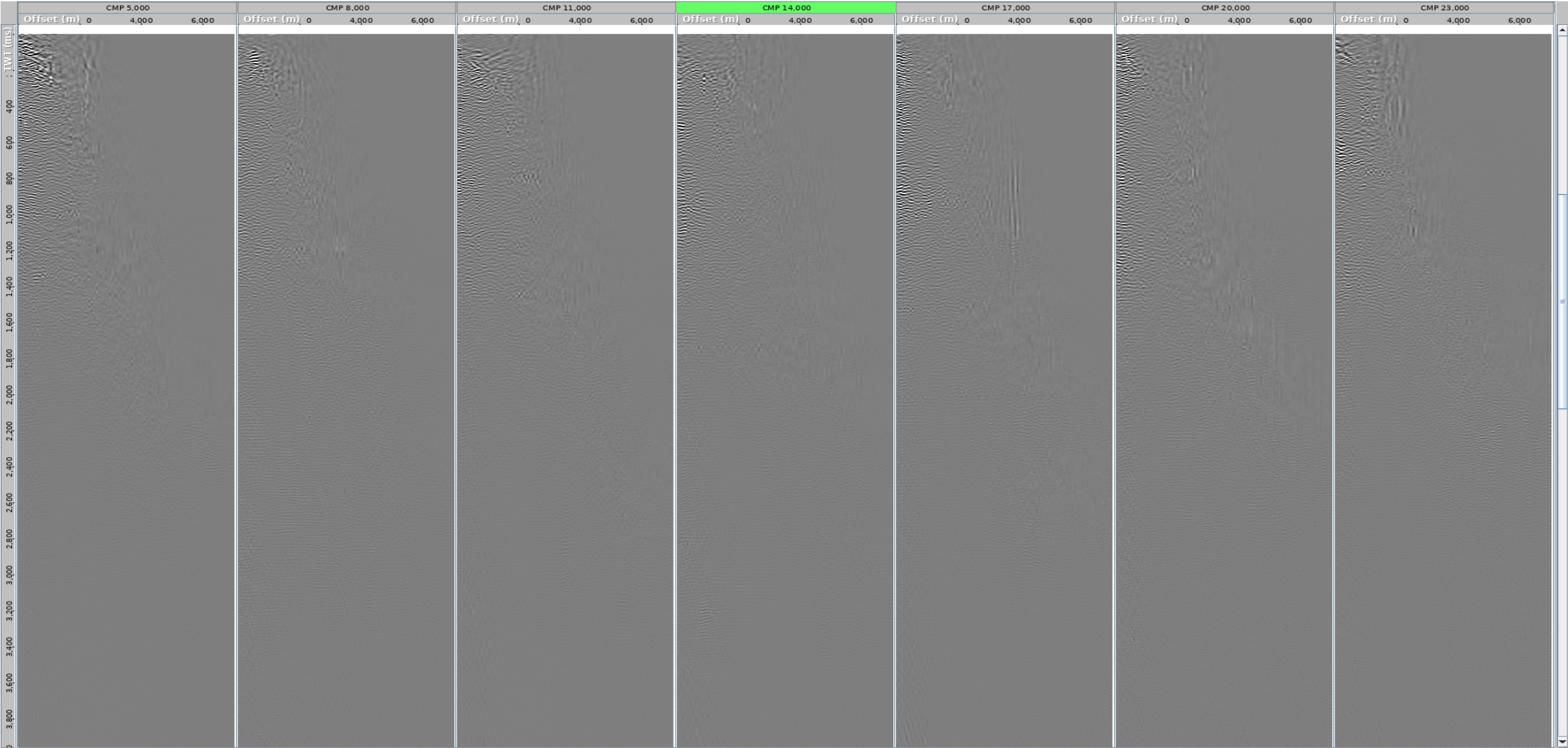
E

UOBR017-SCAN018 CDPs with Cadzow on CDP-offset and dip filter difference

At floating datum



W



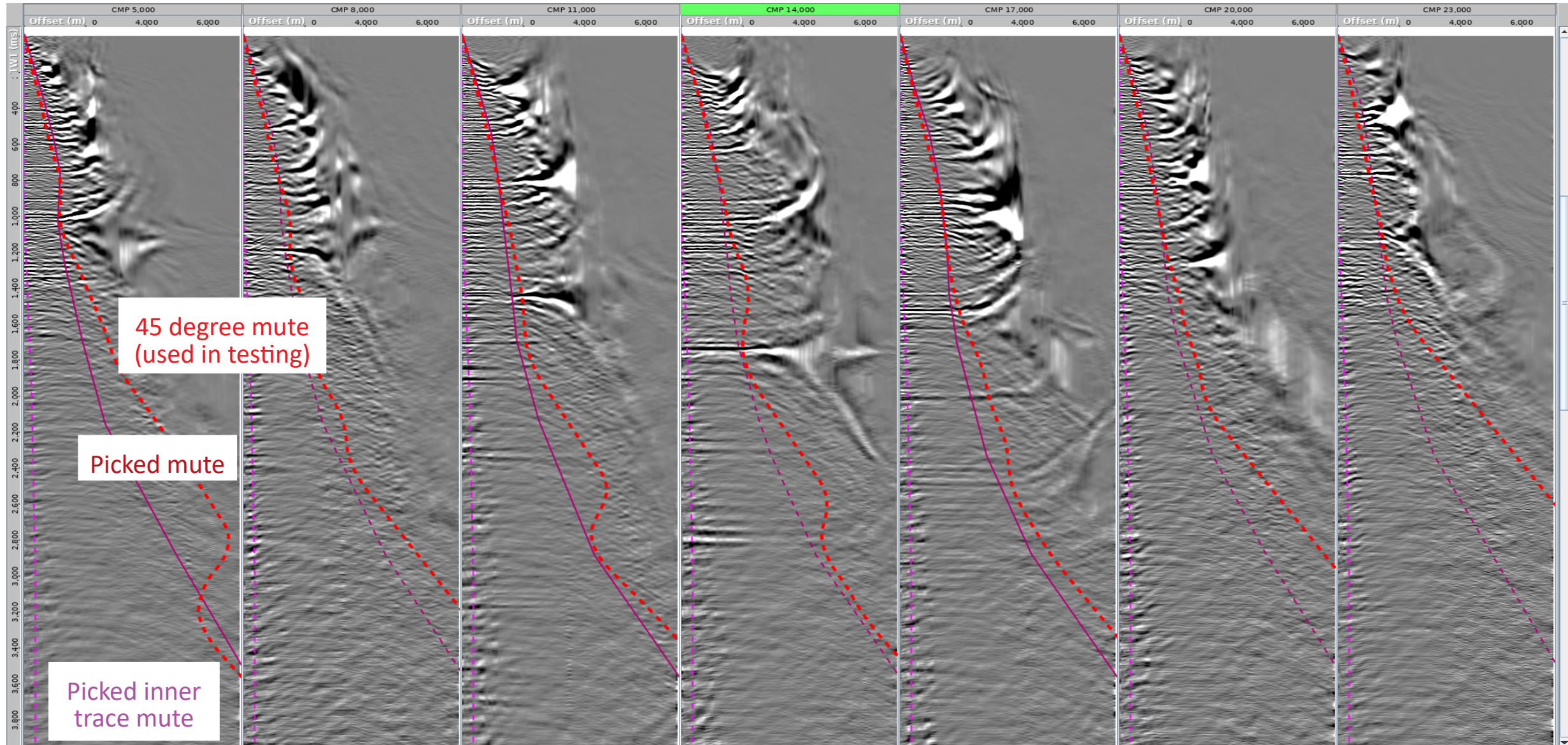
E

UOBR017-SCAN018 CDPs with Cadzow on CDP-offset and dip filters, with mute overlay

At floating datum



W



E