

UGOU021 Post Migration Processing Report Update

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

15 JANUARY 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).
- EBN requested additional Radon testing and selected a milder Radon to be applied as shown in the following presentation:
 - (sCAnPr_007_UGOU021_PostMigRadonTesting_210113.pdf).
- DUG noted that there is some residual dipping noise on the final stack using the standard post migration flow. Therefore DUG recommended using a harsher time-variant dip filter with a larger analysis window:
 - Previous dip filter: 0.5 ms/trace in the shallow, 3 ms/trace in mid, 1 ms/trace in deep.
 - Revised dip filter: 0.5 ms/trace in the shallow and 1 ms/trace in mid and deep.
- Note that 'shallow' refers to the top 300 ms, and deep to the area below a smooth horizon just below the Base North Sea.
- This update report includes the milder Radon and updated post-stack dip filter.

Processing sequence

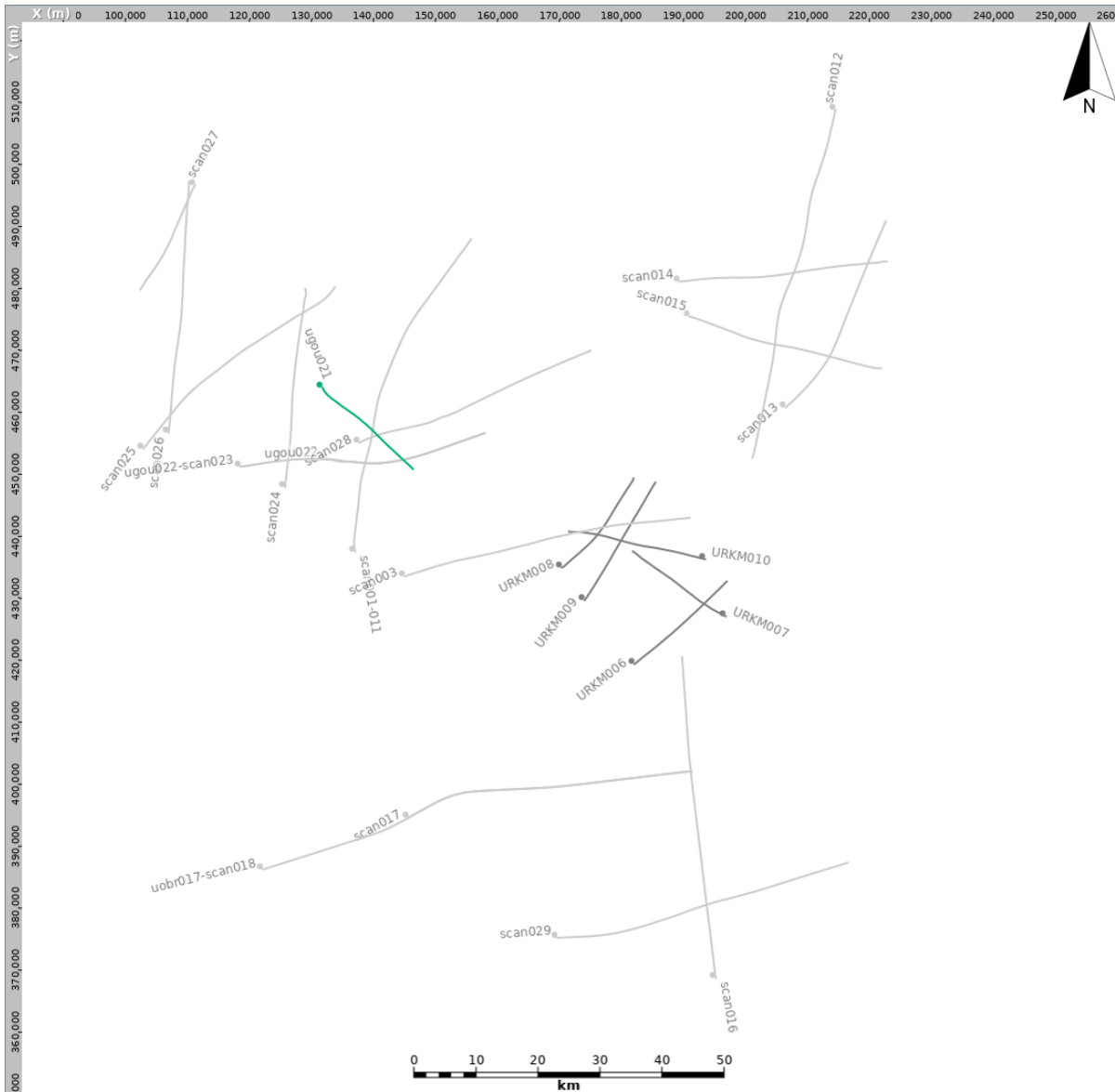
- Data reformat: SEGY to internal format
- Geometry: Crooked line with 2.5 m CDP interval
- Weak shots: 0-500 m offsets only
- Spherical divergence correction: T
- Geophone response correction:
- Refraction statics: Delay time using $V_0 = 1000$ m/s $V_R = 1700$ m/s $SRD = NAP$
- Noise attenuation: +/-1250 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
- Residual statics: Surface consistent using MASTT
- Velocity analysis: 1 km interval
- Residual statics: Surface consistent using MASTT
- SCAC 2: Source and receiver designed on NMO corrected gathers over 200-2200 ms

Processing sequence (continued)

- 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 require
Effective Eta picked automatically every 250 m
- Migration (PreSTM 2): Kirchhoff VTI migration using smoothed (2000-200-2) 2nd order picked velocities
- 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)
- 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)

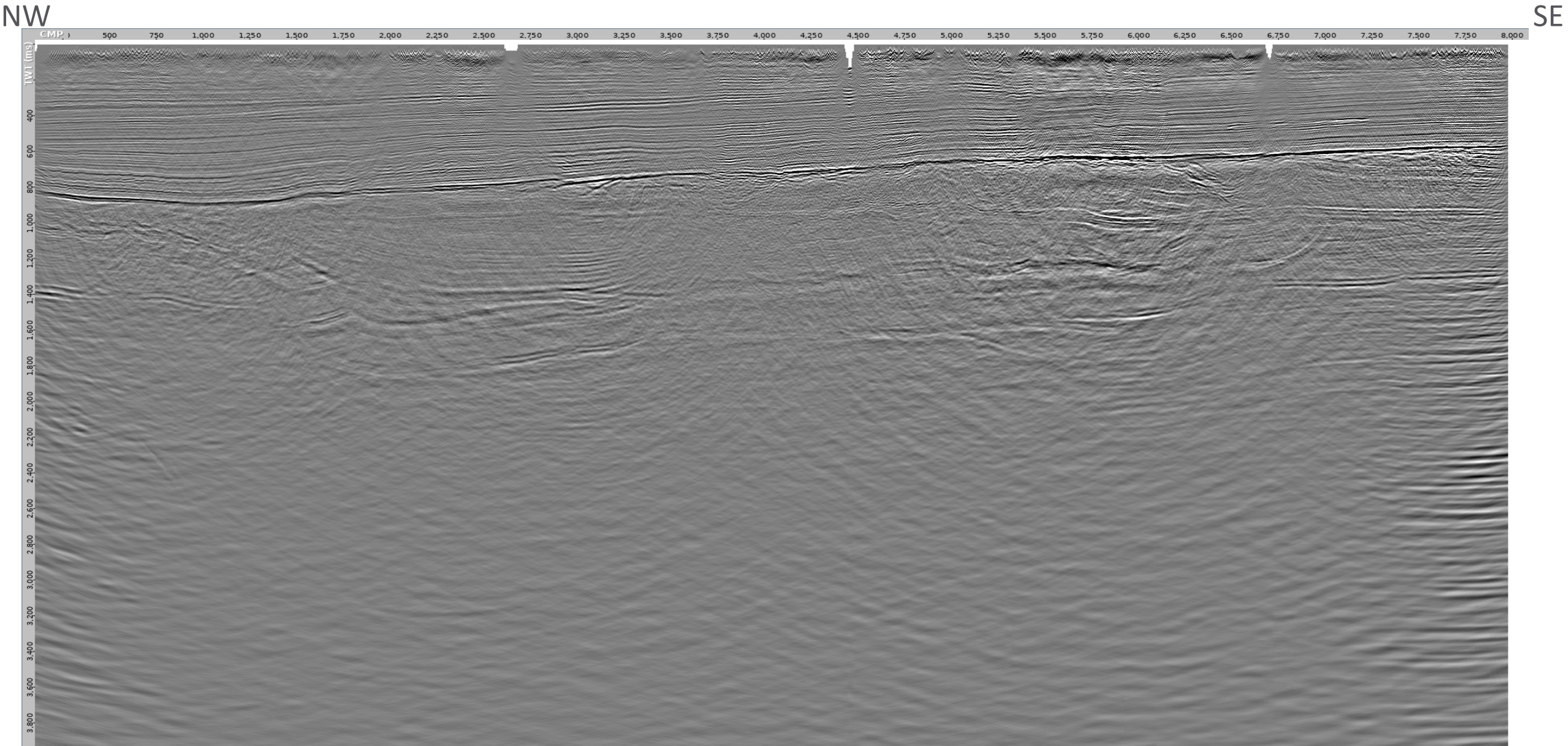
Processing sequence (continued)

- Spectral broadening: Using True Amplitude Frequency Equalisation (TAFE) frequency gain pairs
- Noise attenuation: 0.5 ms/trace dip filter in shallow, 1 ms/trace in mid to 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 SEG-Y



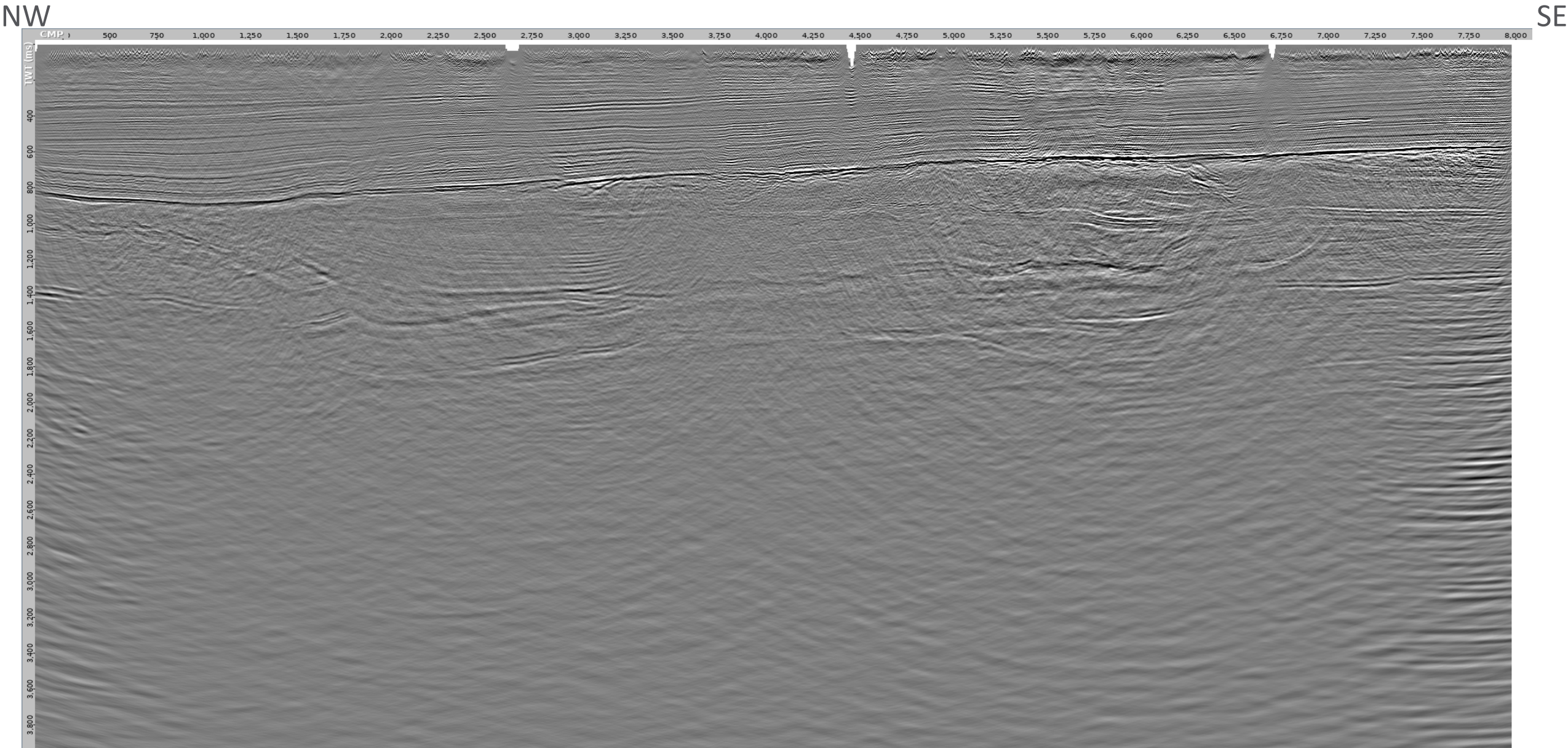
UGOU021 PreSTM 3 stack

At floating datum



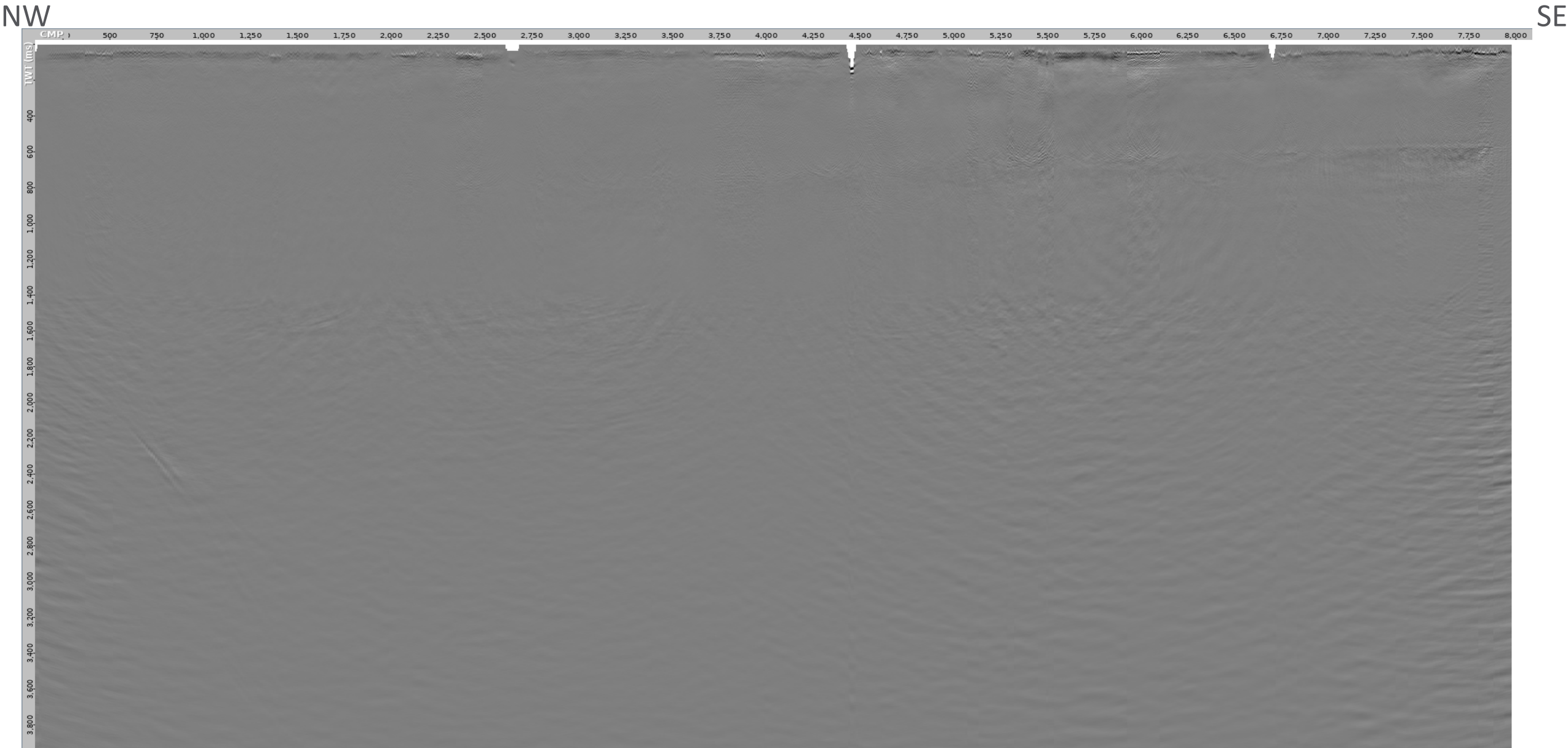
UGOU021 stack with Radon and dip filter on CDPs

At floating datum



UGOU021 stack with Radon and dip filter on CDPs difference

At floating datum



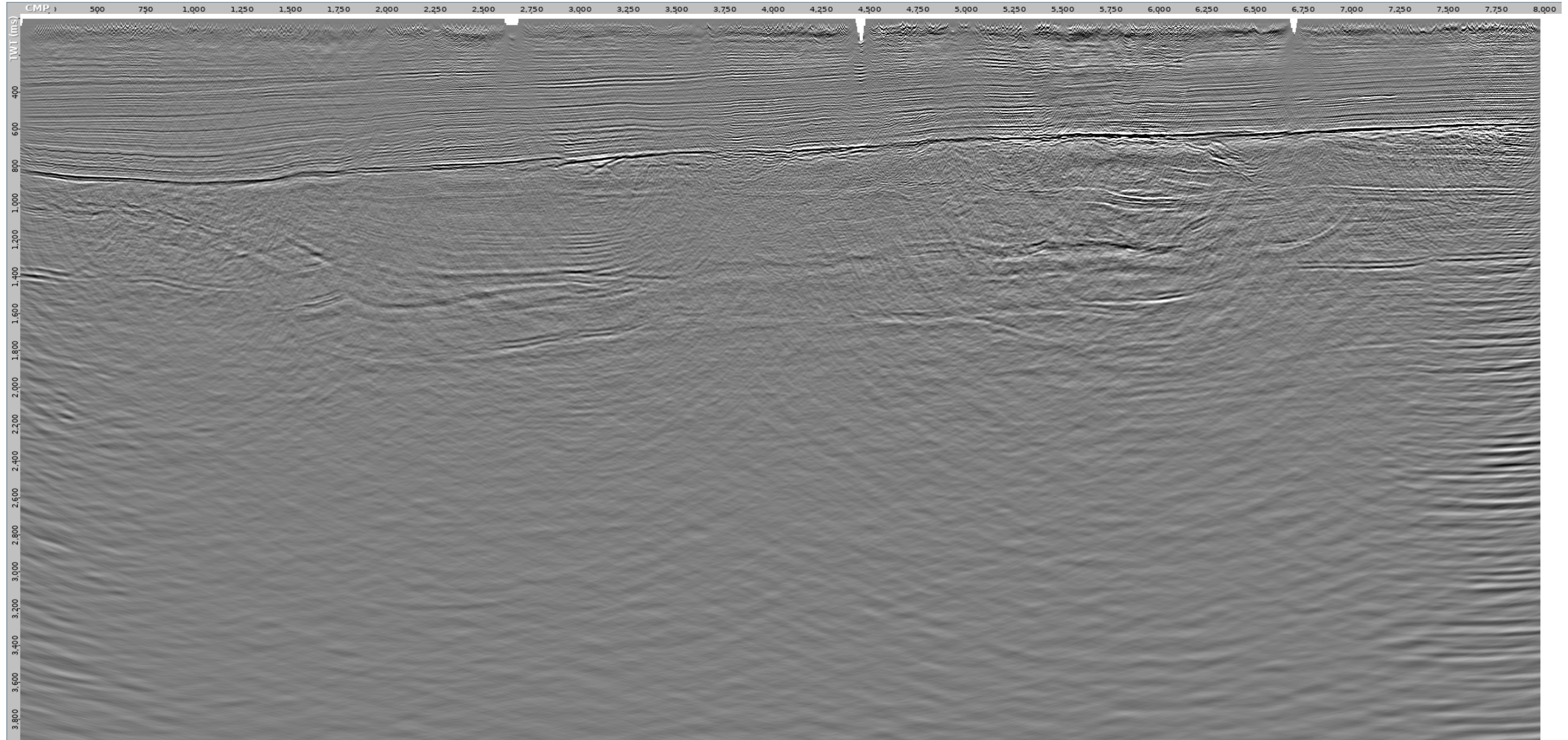
UGOU021 stack with Radon and dip filter on CDPs (REPEAT SLIDE)

At floating datum



NW

SE



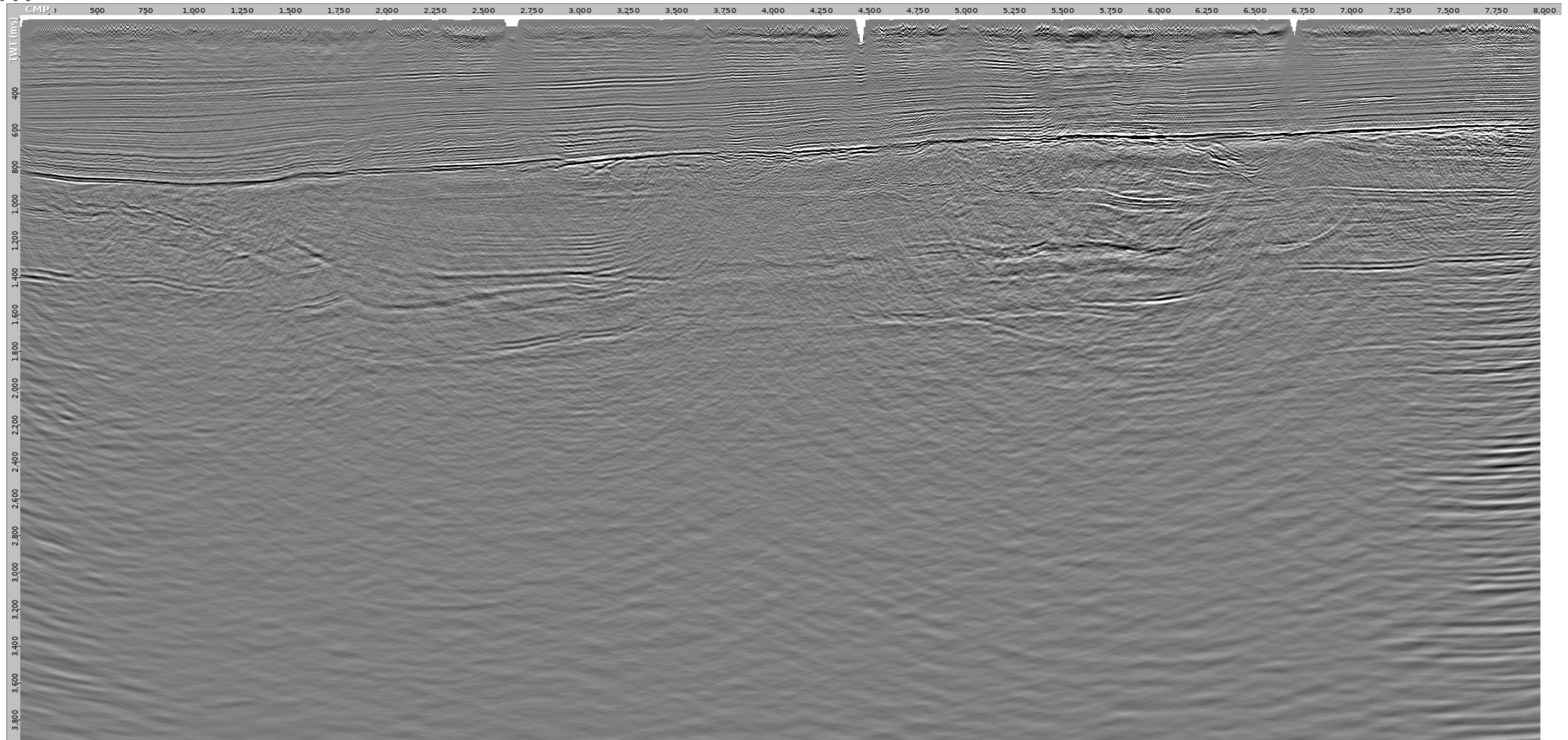
UGOU021 stack with trim statics

At floating datum



NW

SE



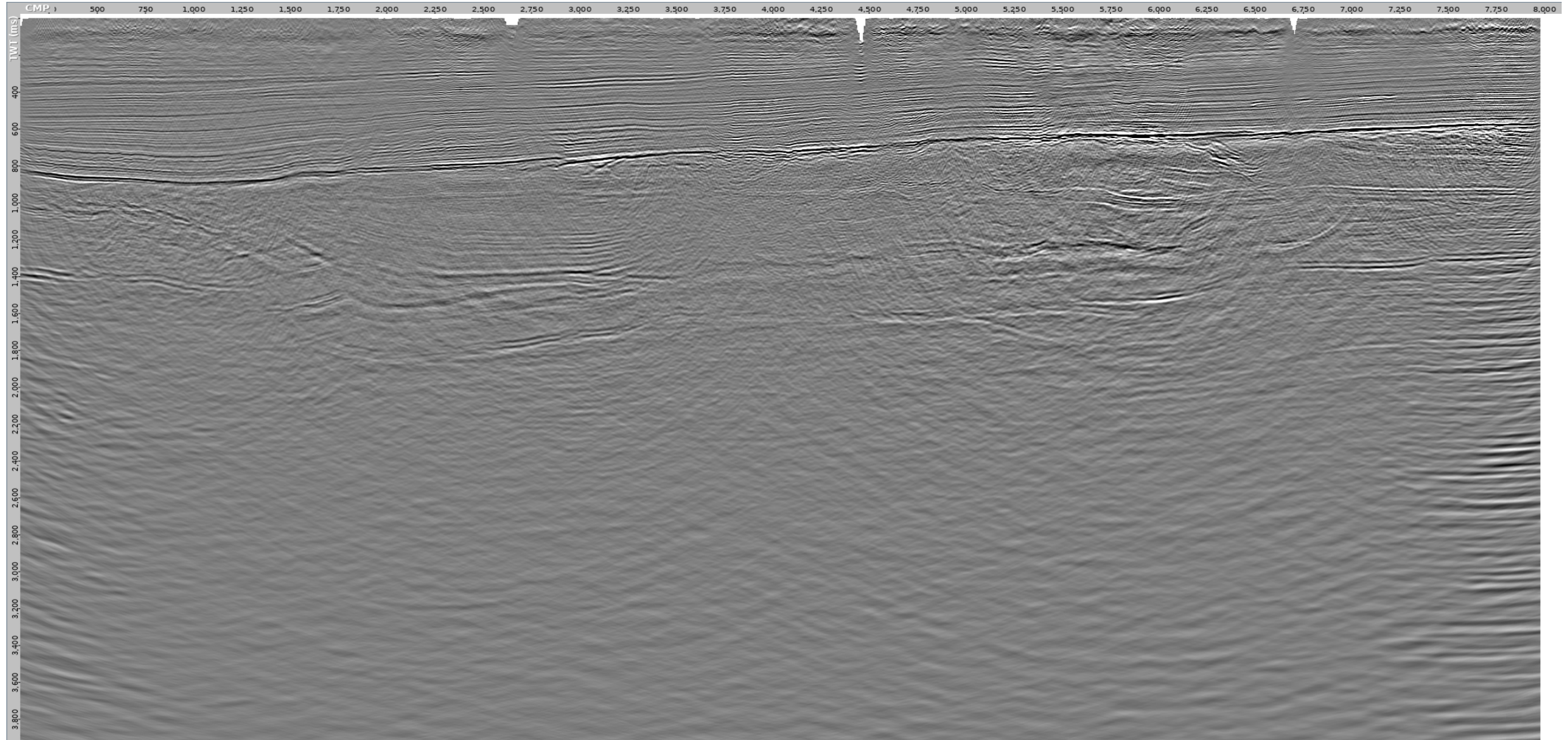
UGOU021 stack with CDP Cadzow noise attenuation, dip filter

At floating datum



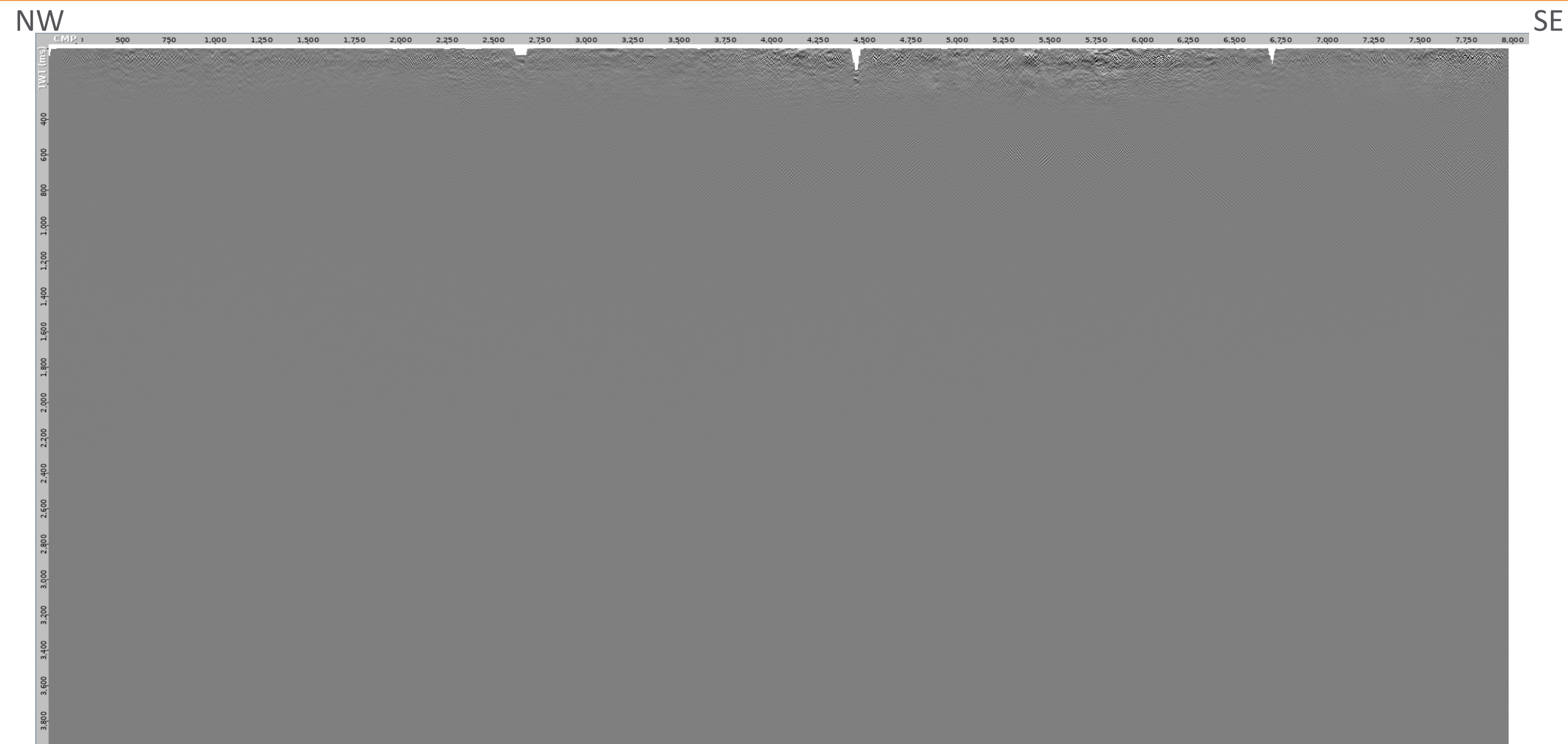
NW

SE



UGOU021 stack with CDP Cadzow noise attenuation and dip filter difference

At floating datum



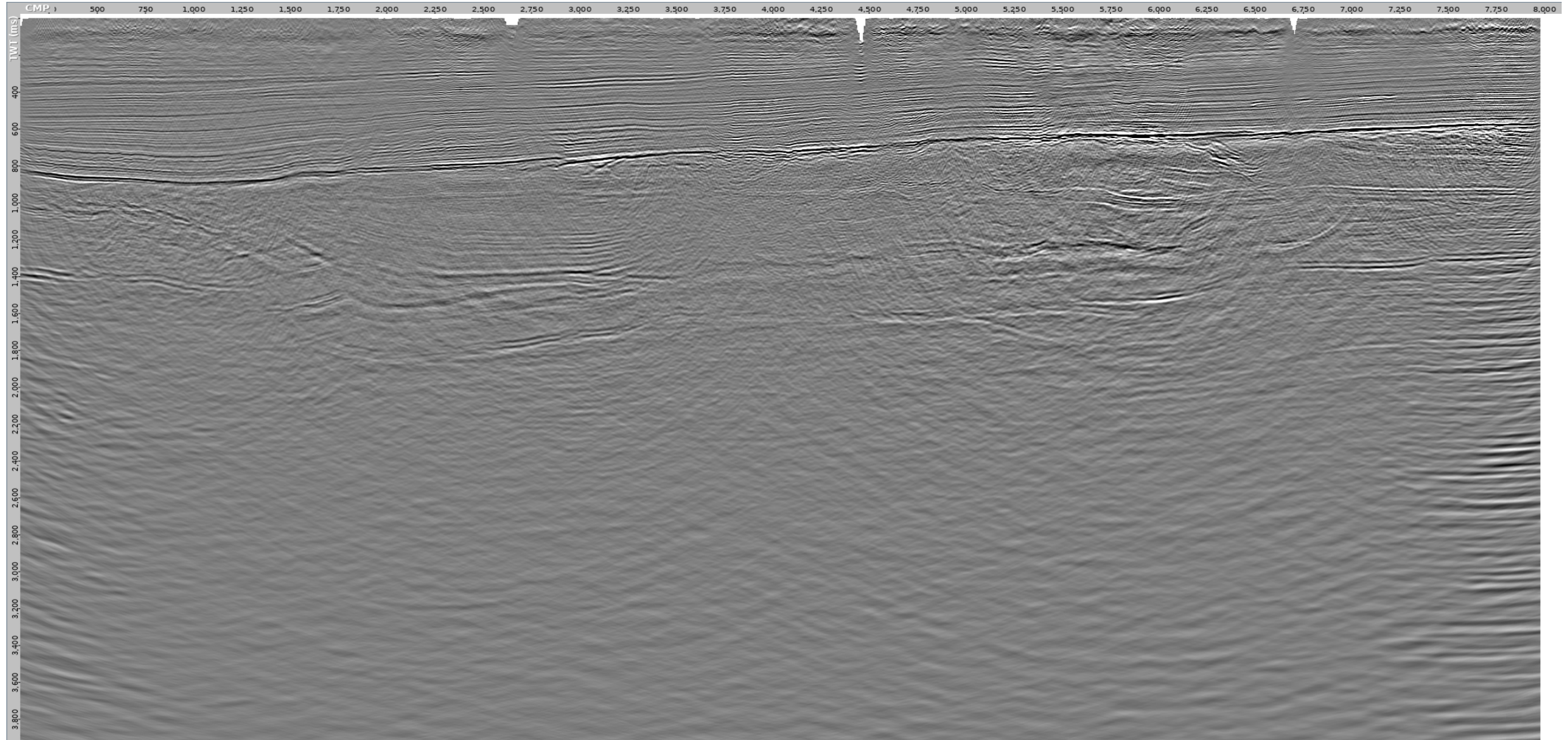
UGOU021 stack with CDP Cadzow noise attenuation, dip filter (REPEAT SLIDE)

At floating datum



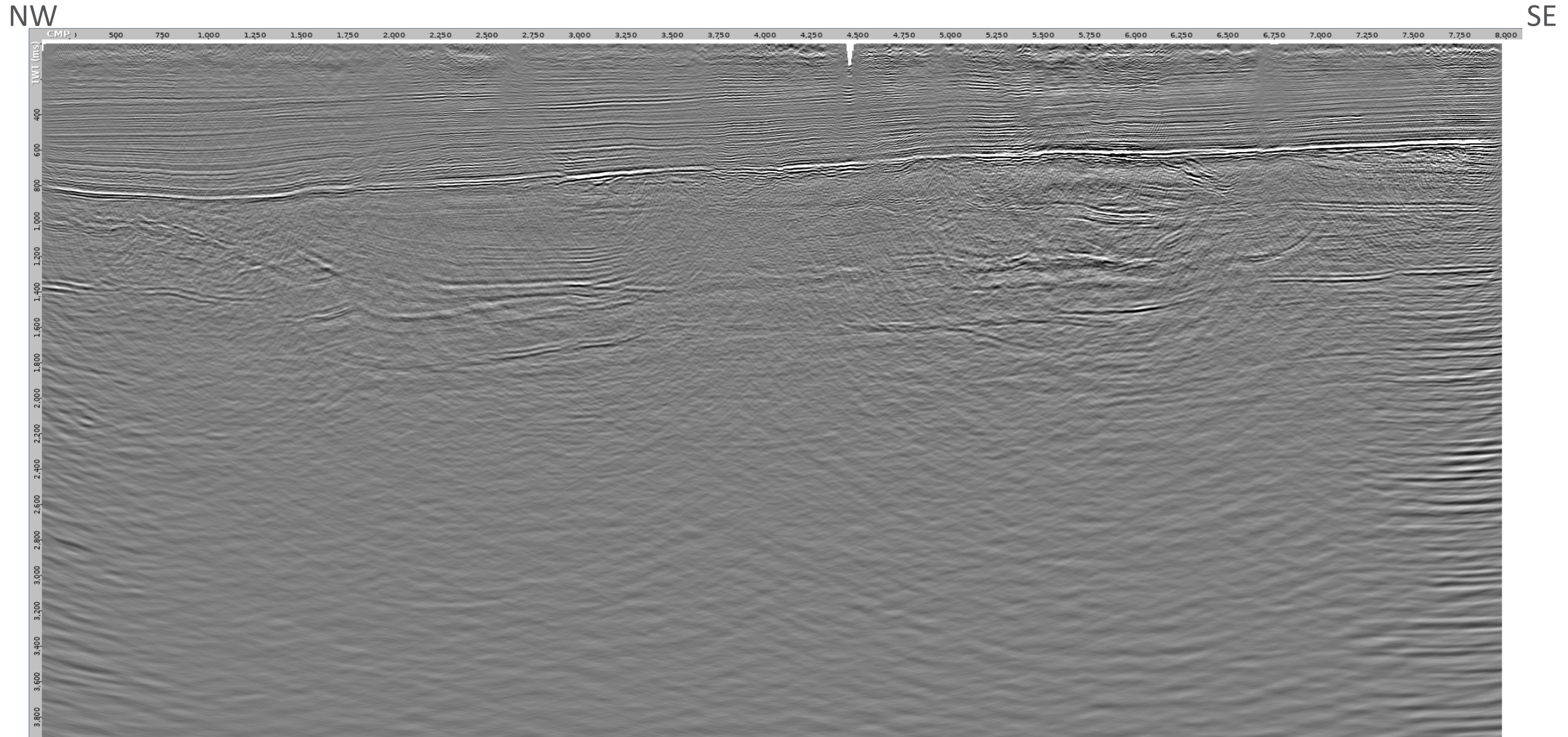
NW

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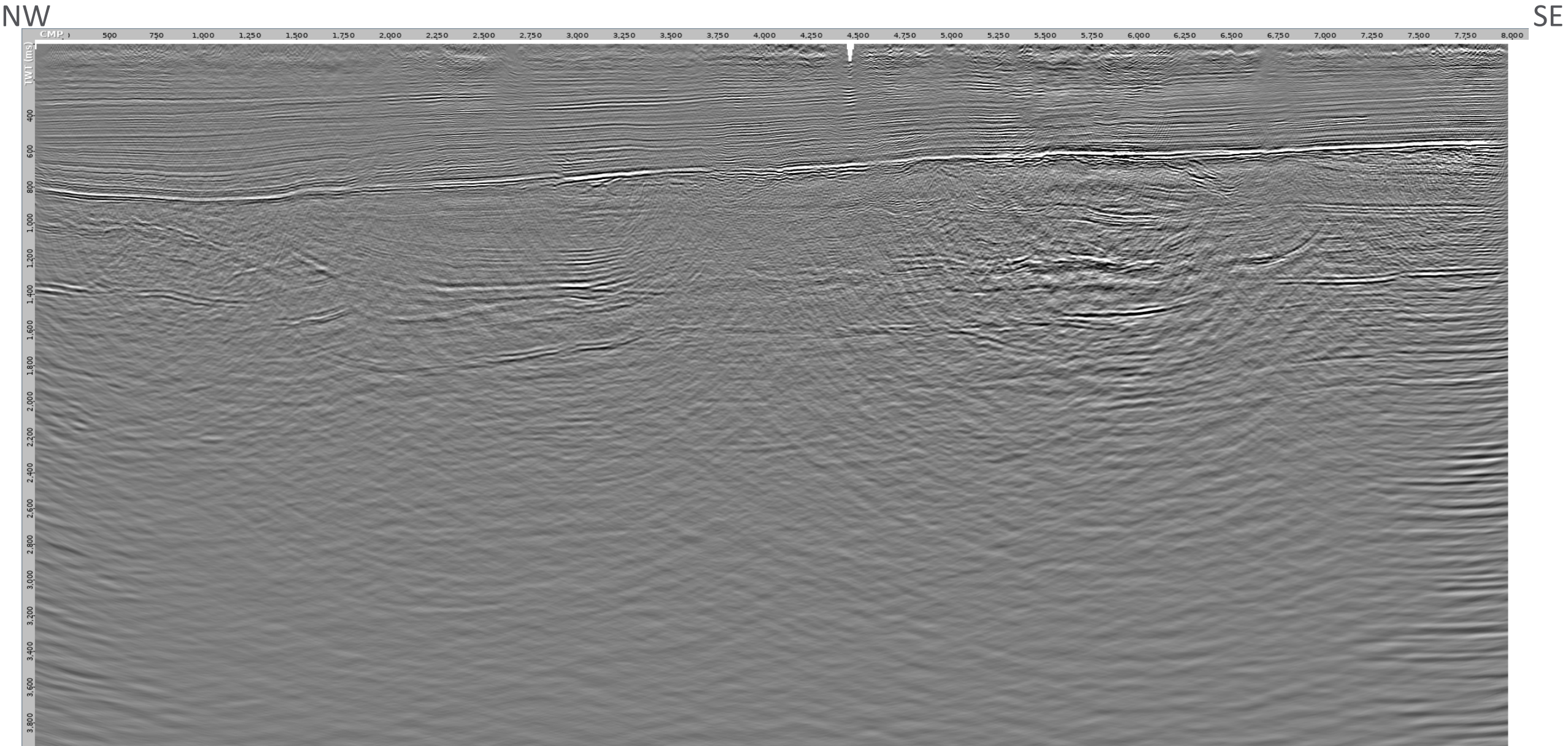
UGOU021 stack with CDP Cadzow noise attenuation, dip filter, zero phase operator applied

At floating datum



UGOU021 stack with picked mute

At floating datum



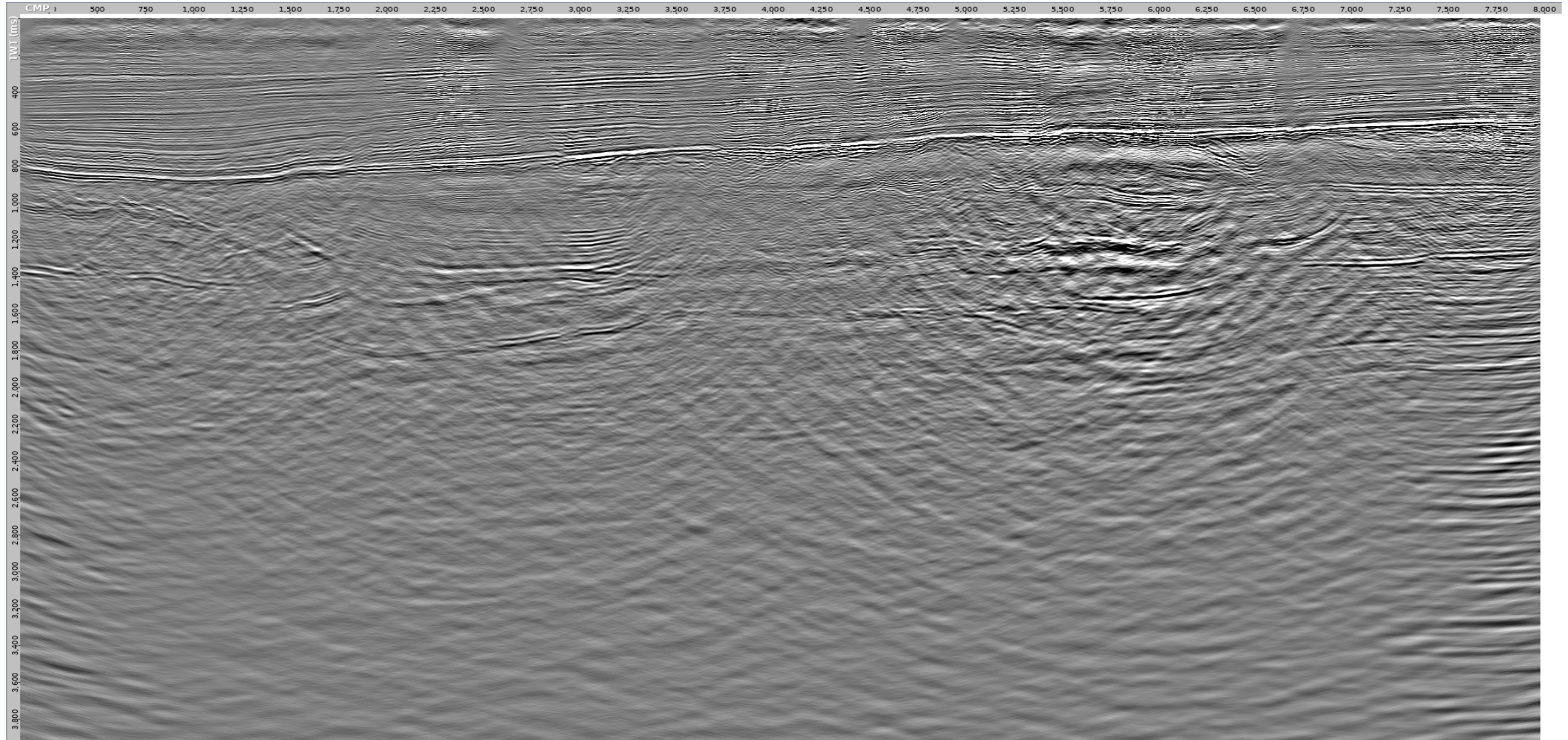
UGOU021 stack with spectral broadening and dip filter

At floating datum



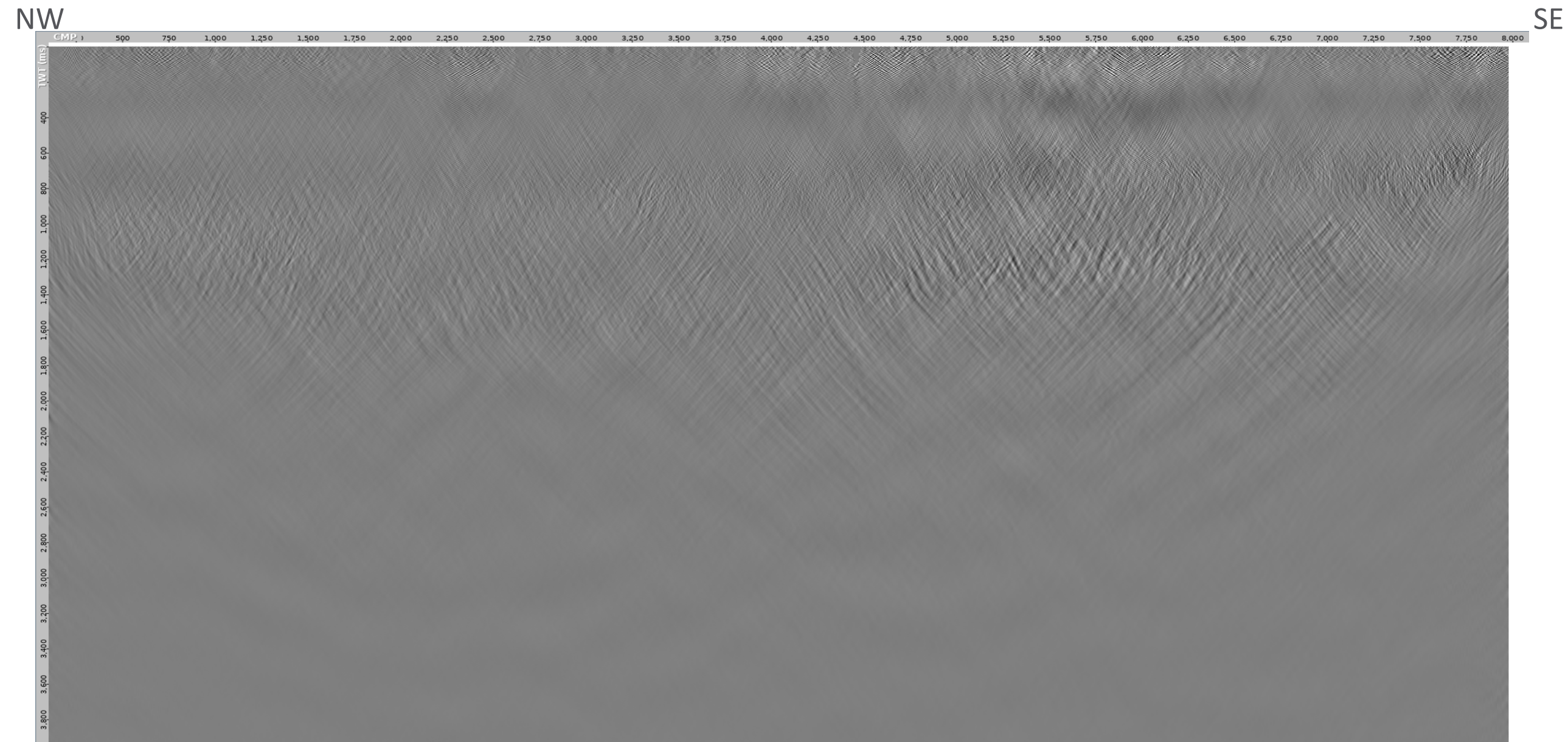
NW

SE



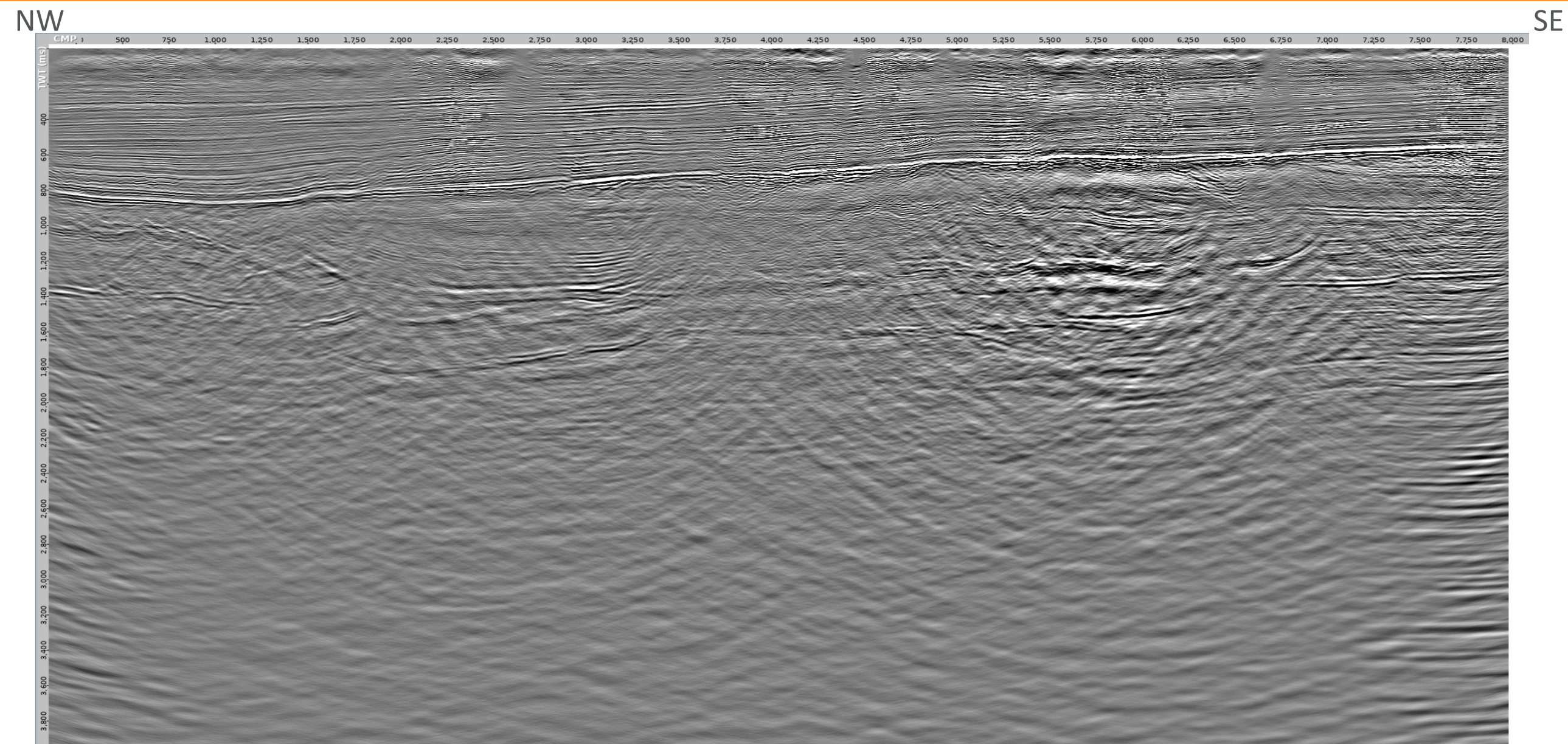
UGOU021 stack difference with dip filter relative to no dip filter

At floating datum



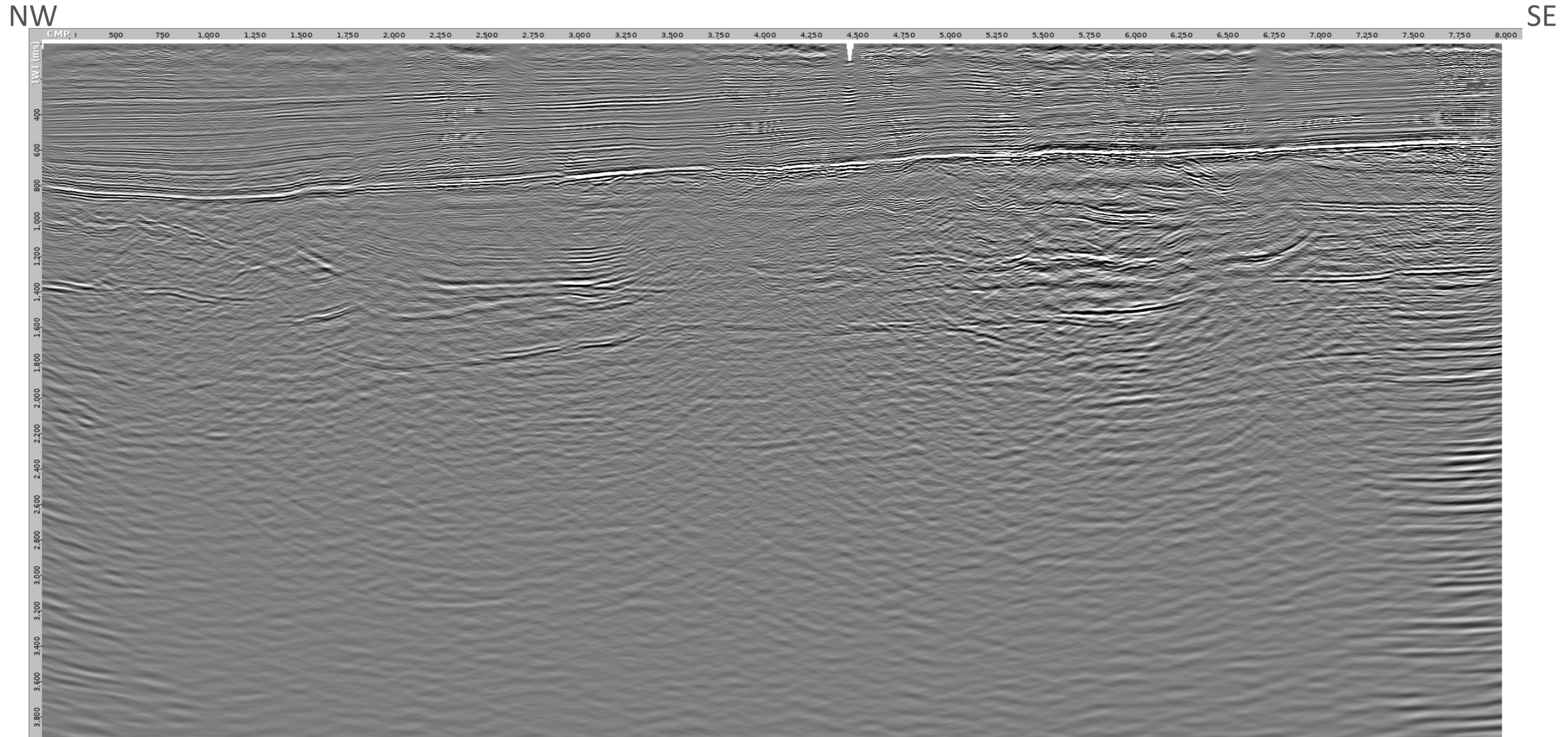
UGOU021 stack with spectral broadening and dip filter (REPEATED)

At floating datum



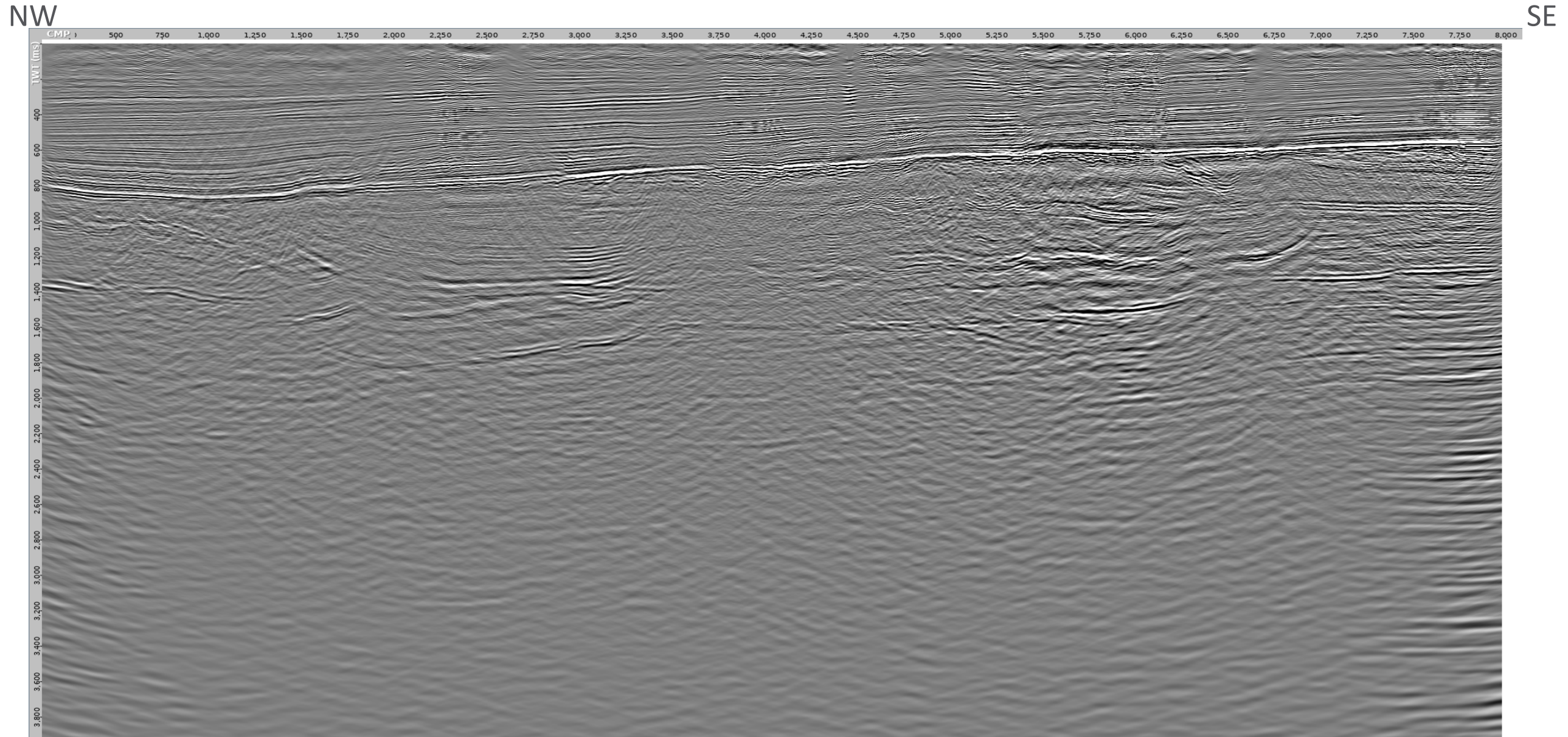
UGOU021 stack with original dip filter, SOF and time-variant bandpass filter stack

At floating datum



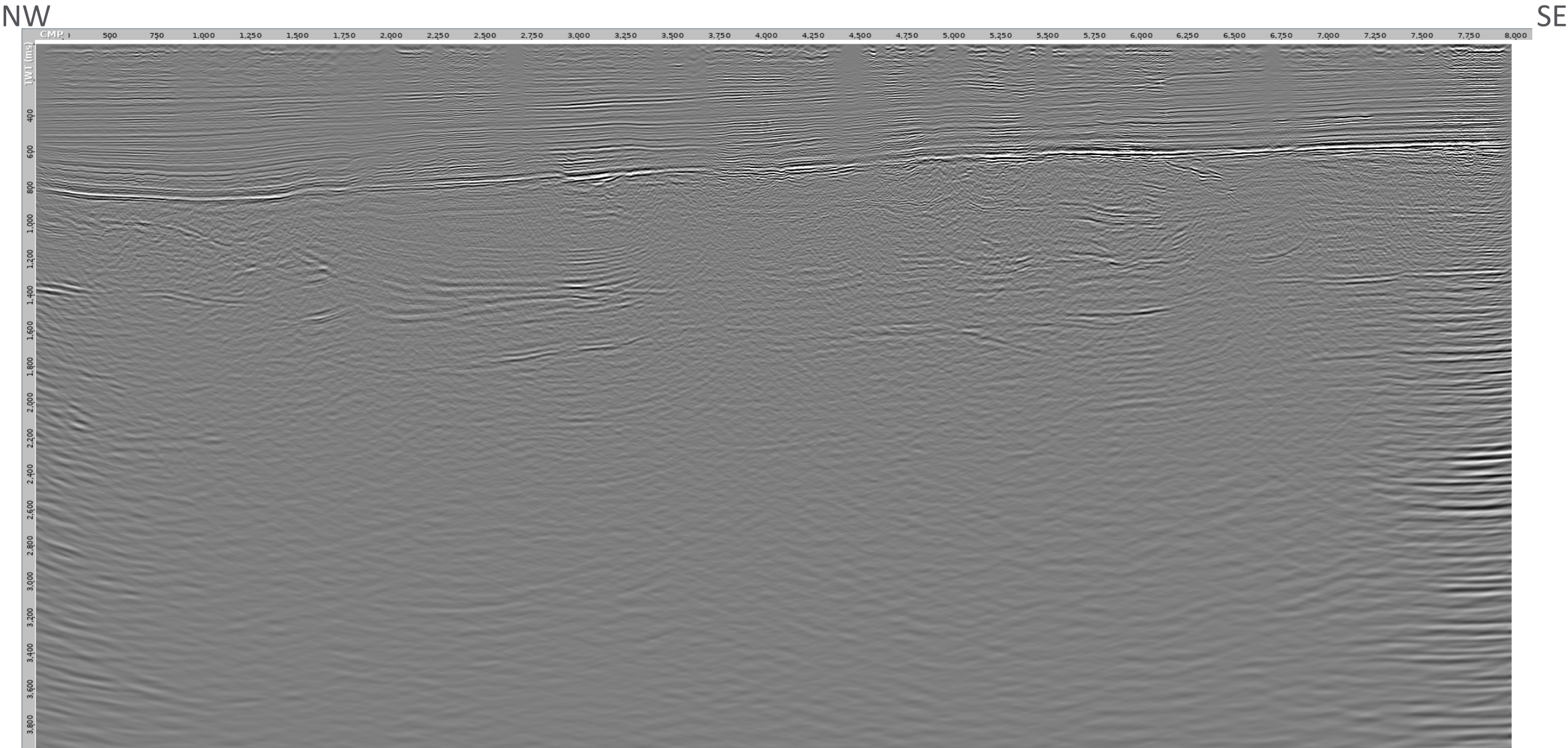
UGOU021 stack with original dip filter, SOF and time-variant bandpass filter stack on flat datum

At flat datum



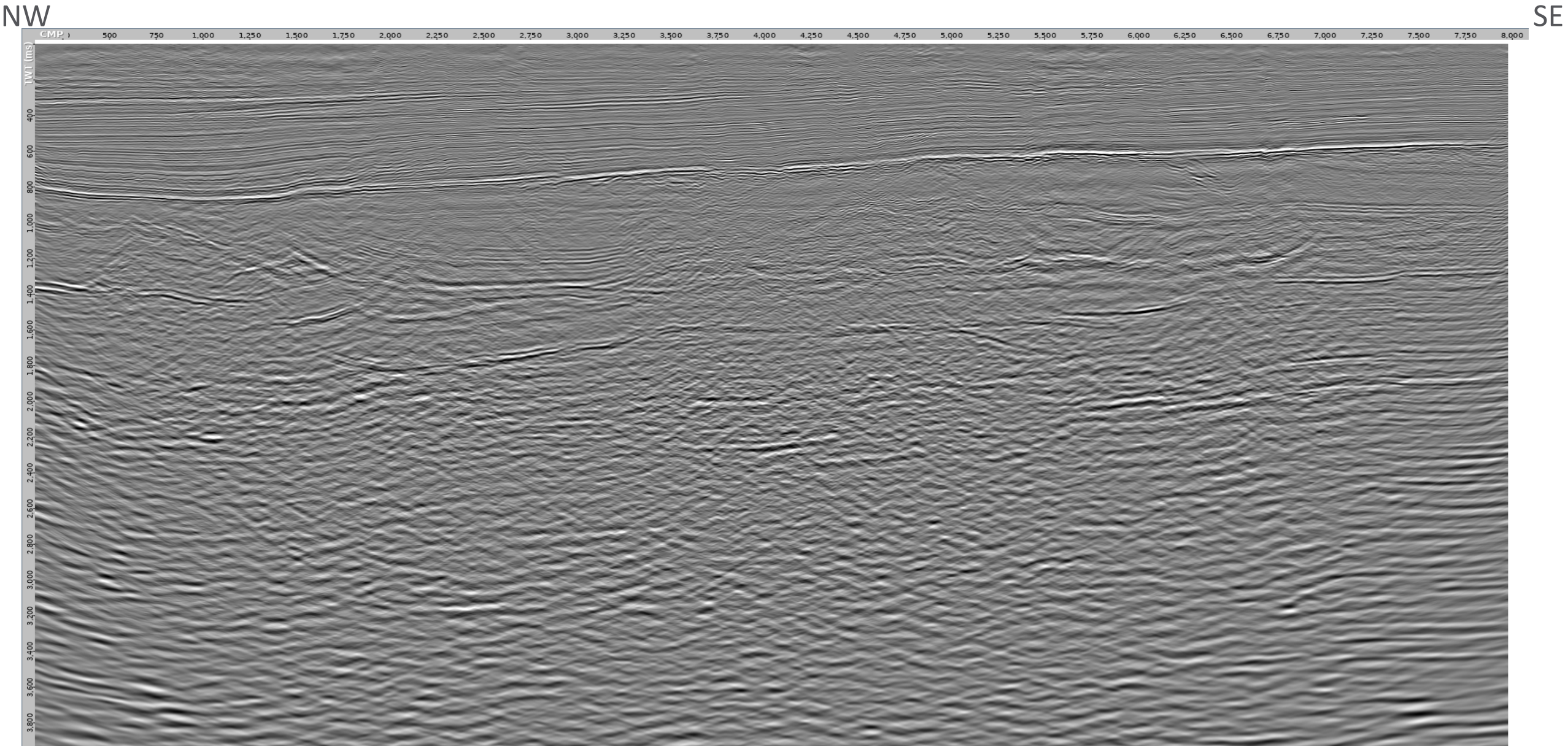
UGOU021 fast-track true amplitude stack

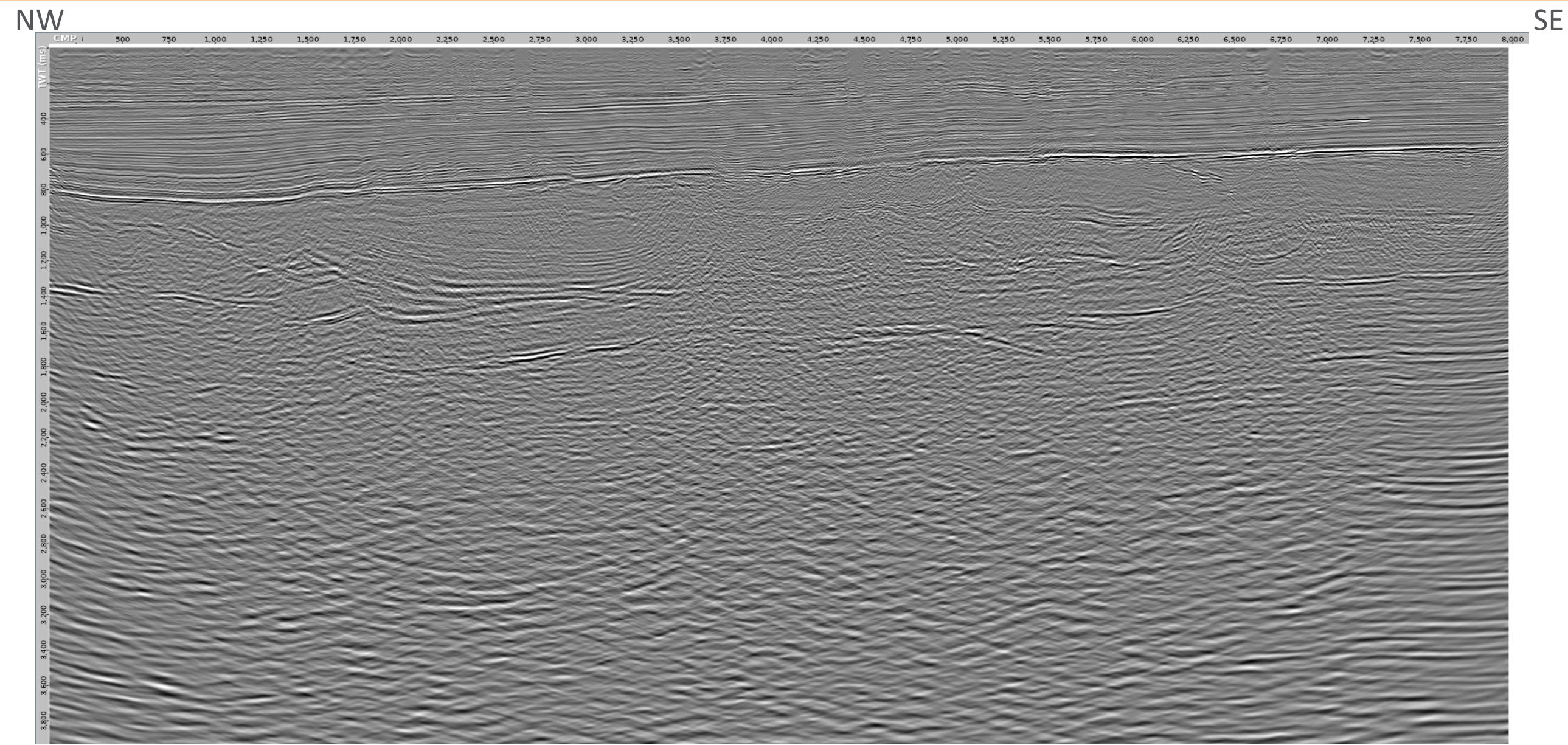
At flat datum

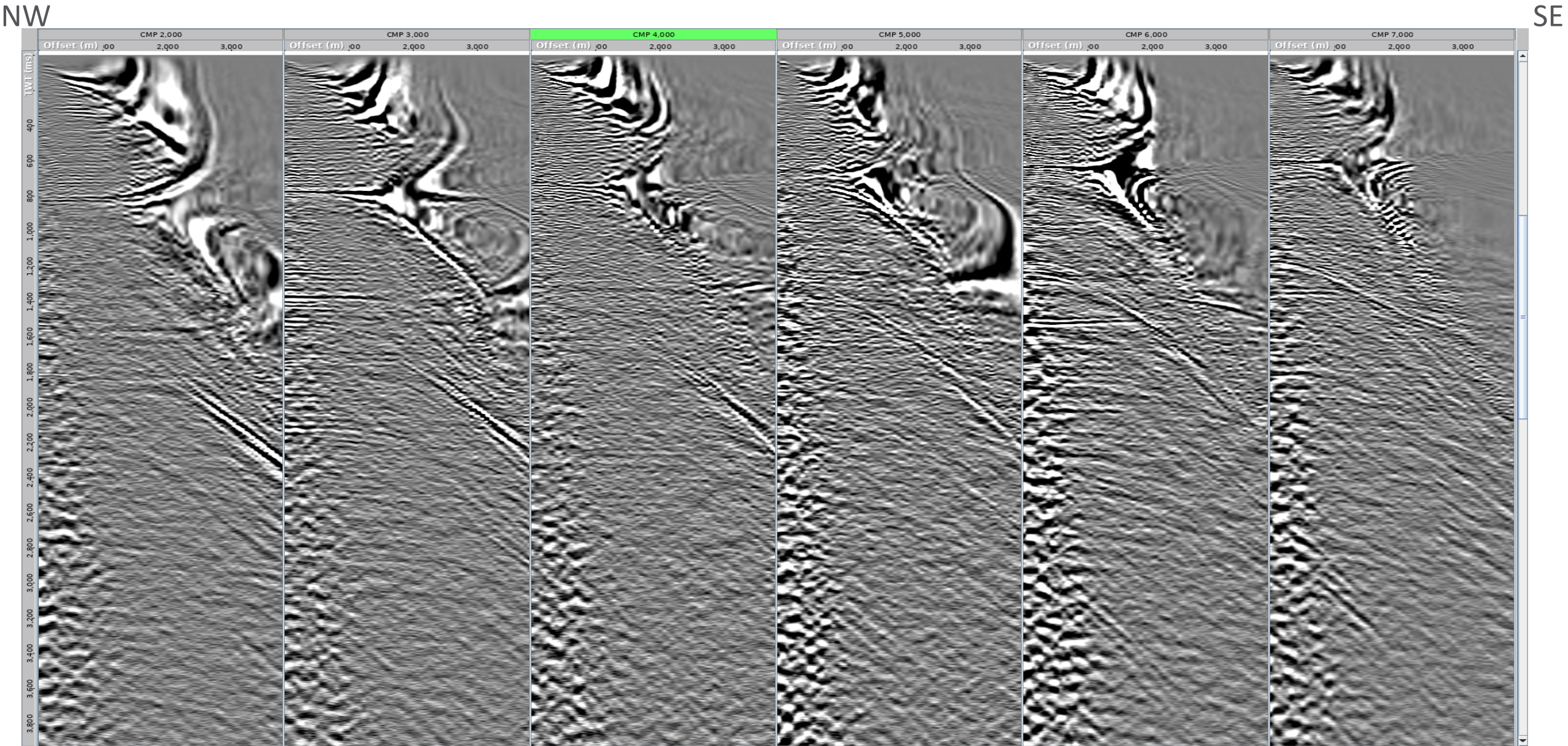


UGOU021 final AGC stack on flat datum

At flat datum

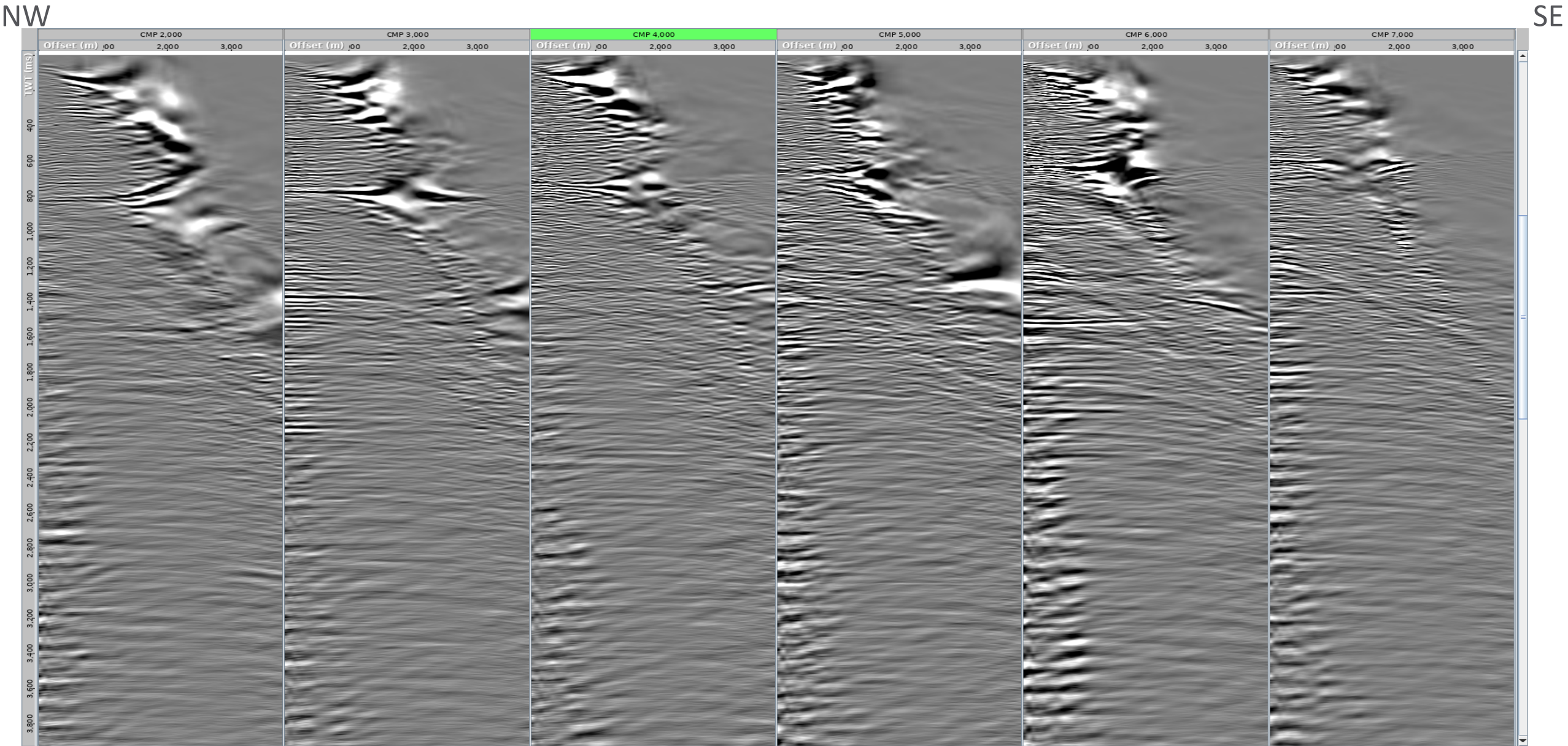






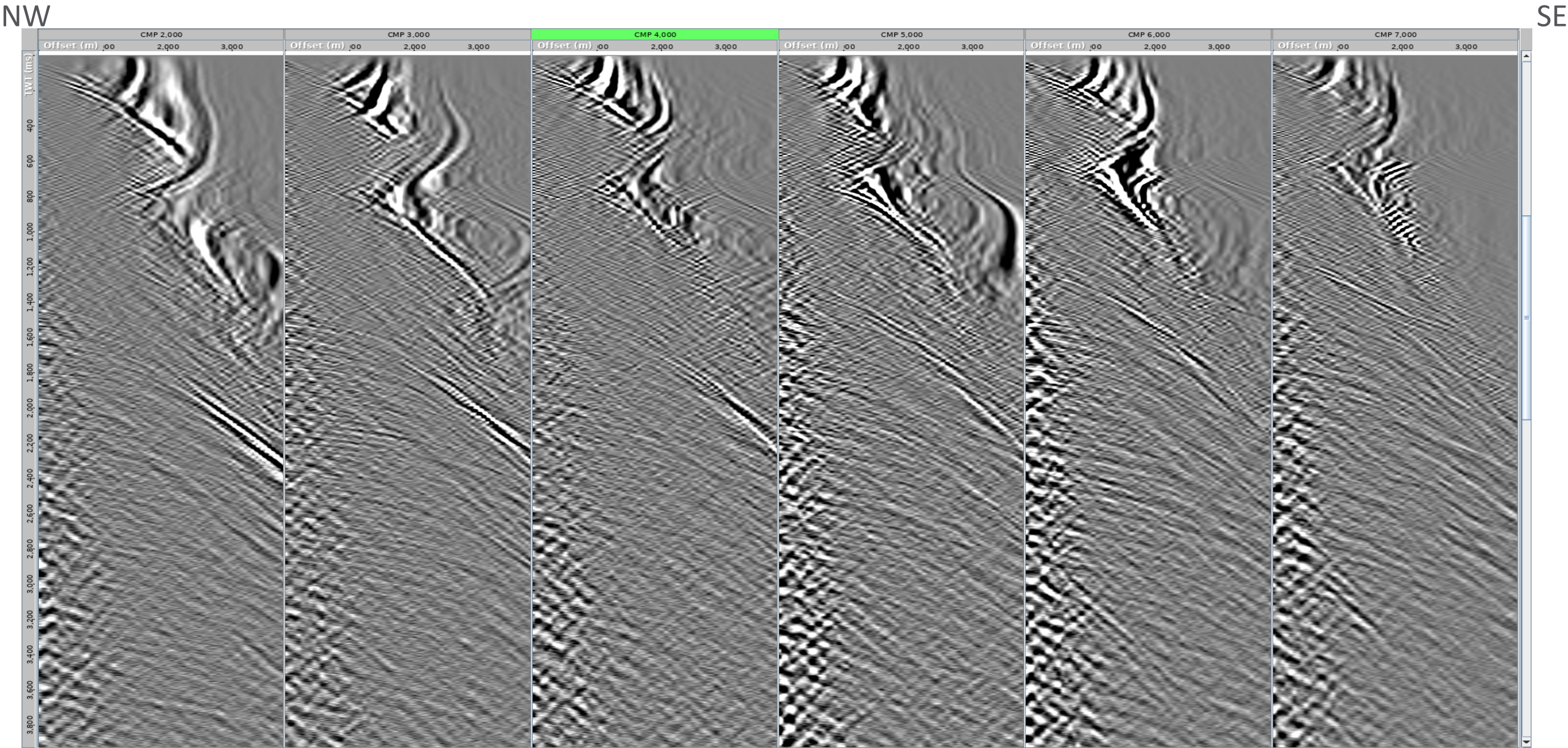
UGOU021 CDPs with Radon and dip filter

At floating datum



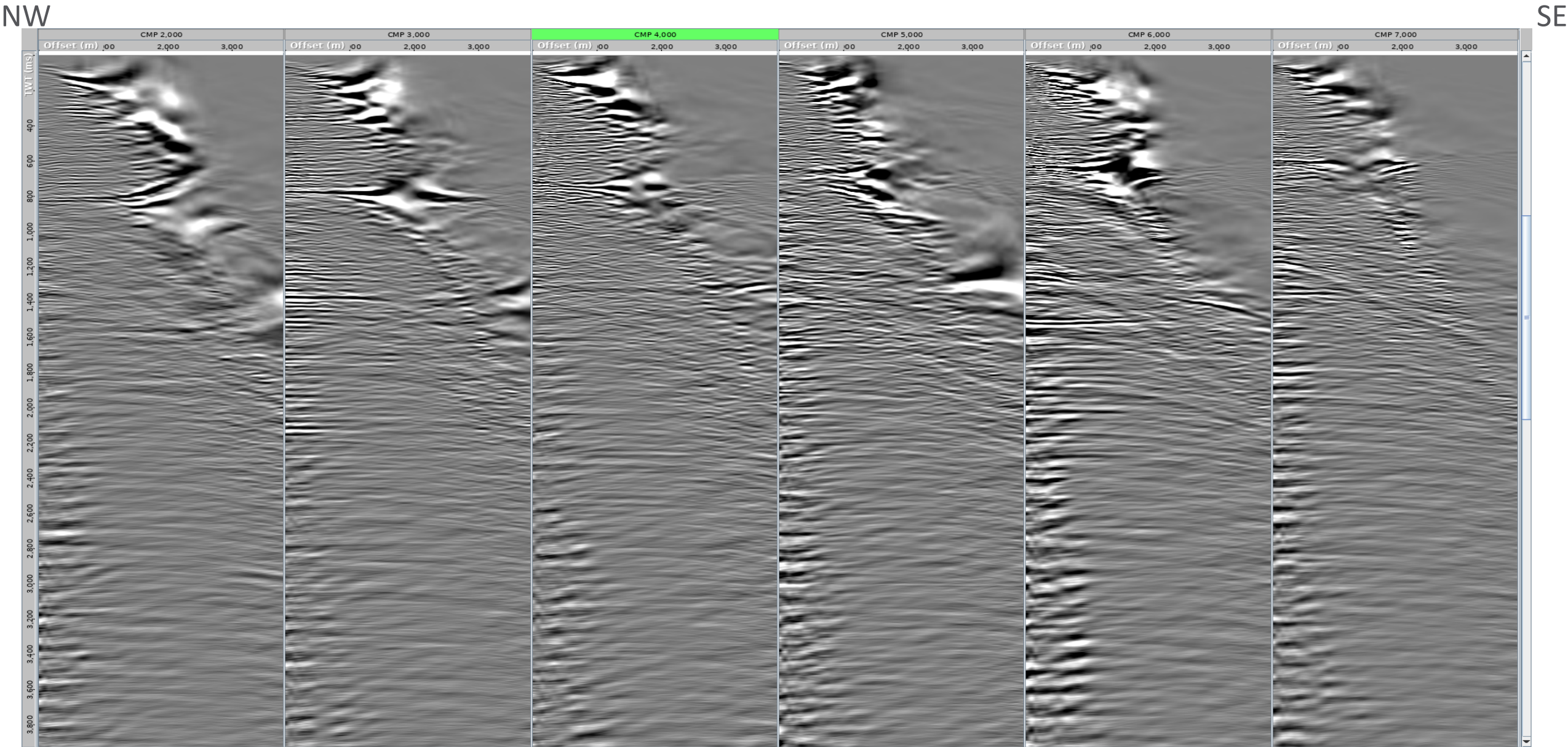
UGOU021 CDPs with Radon and dip filter difference

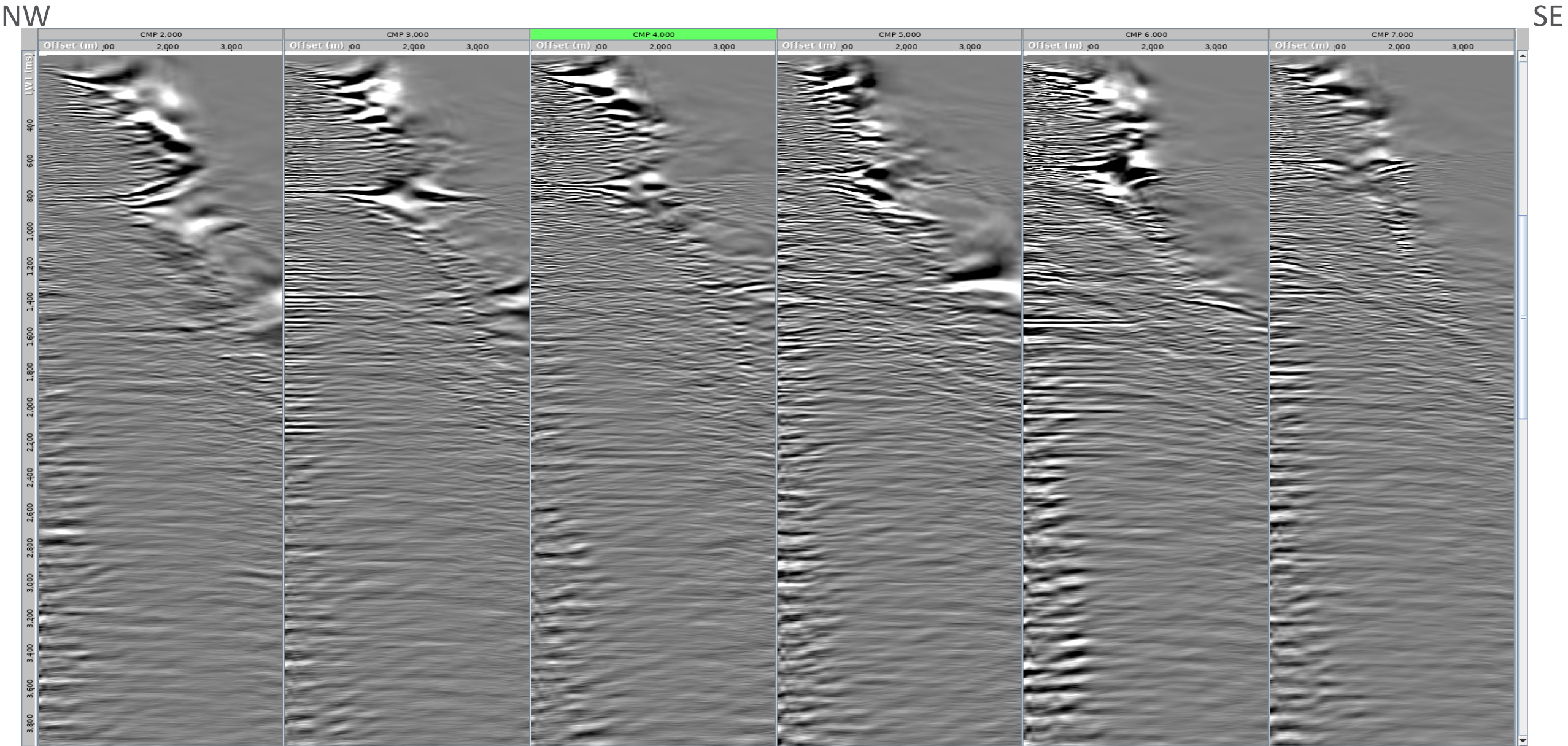
At floating datum



UGOU021 CDPs with Radon and dip filter (REPEAT SLIDE)

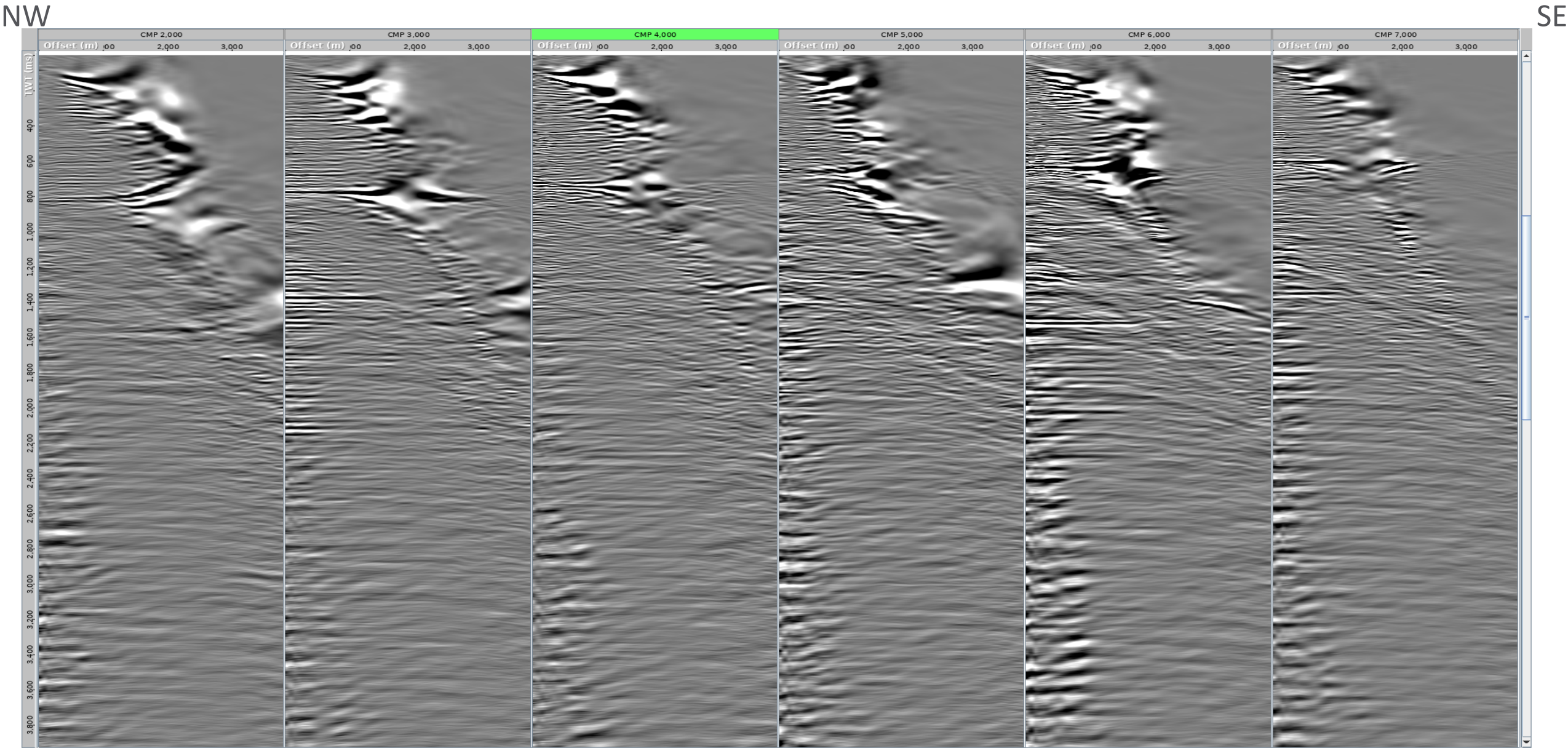
At floating datum





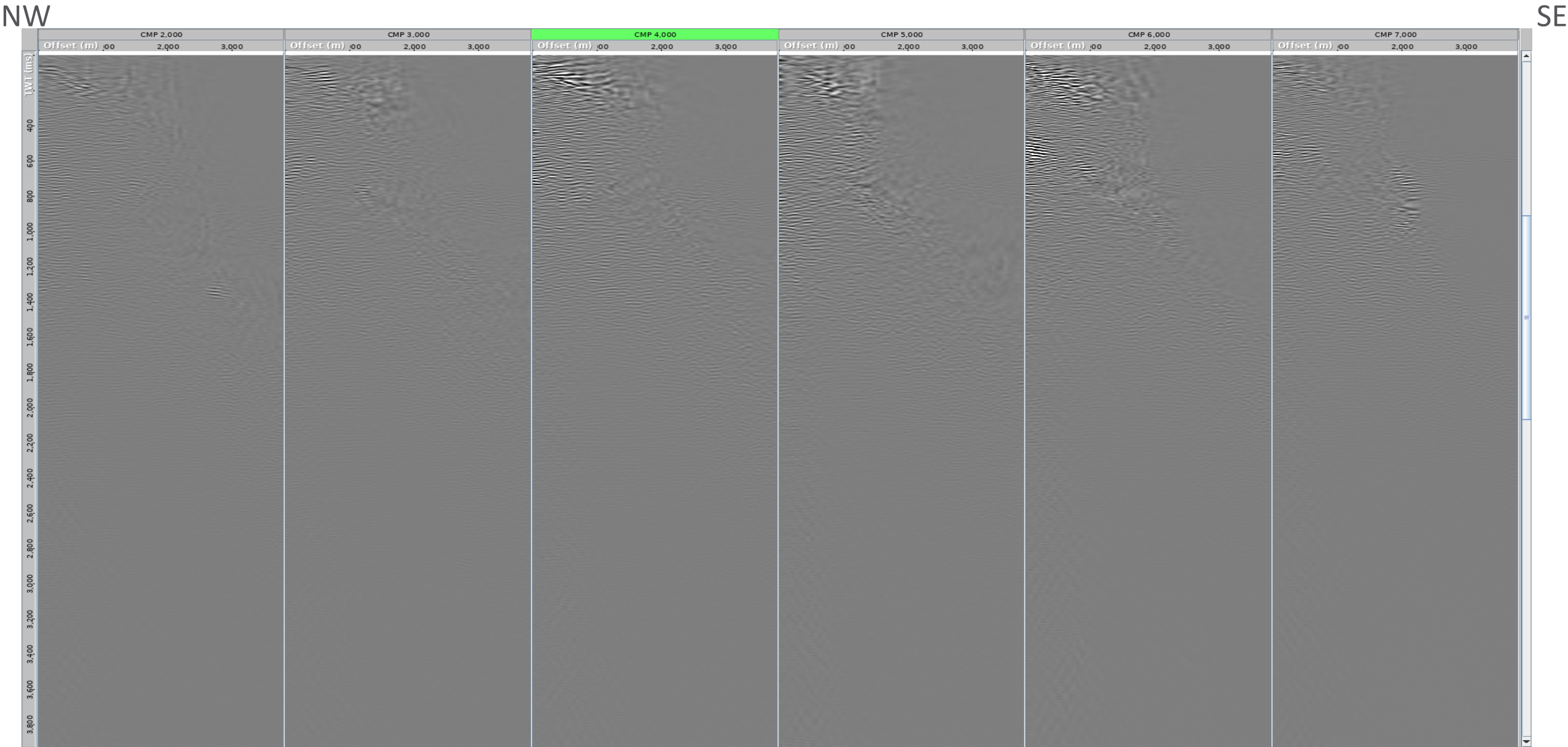
UGOU021 CDPs with trim, Cadzow on CDP-offset and dip filter

At floating datum



UGOU021 CDPs with Cadzow on CDP-offset and dip filter difference

At floating datum



UGOU021 CDPs with Cadzow on CDP-offset and dip filters, with mute overlay

At floating datum



NW

SE

