



IT2 – TTI Tomography

NZ 3D Processing

23 December 2020

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INSTITUTE FOR GEOPHYSICS



Passion for Geoscience

- **Objective:**

To adjust TTI velocity model for TTI FWI.

- **Procedure:**

We updated delta and epsilon base on the new unconformity surfaces. We further updated the velocity using TTI tomography (TOMO) to get better starting model for TTI FWI.

- **Display:**

Velocity models and migrated depth full stack & gathers.

- **Observation and Recommendation:**

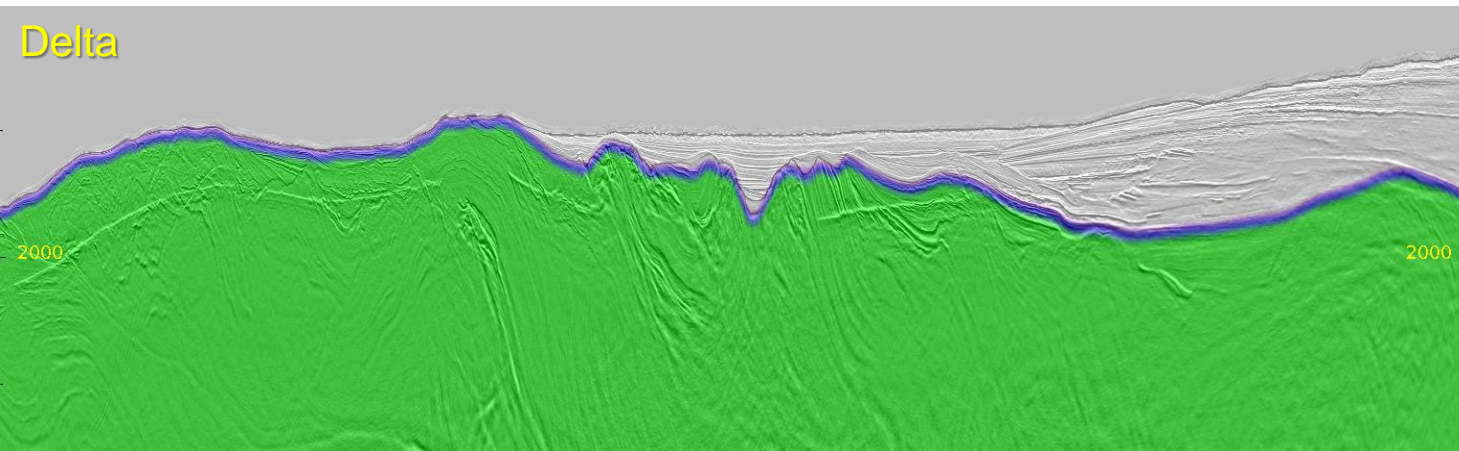
The TTI tomography reasonably improves the gather flatness and event focus on stack. We recommend to move on to TTI FWI.

Velocity Models

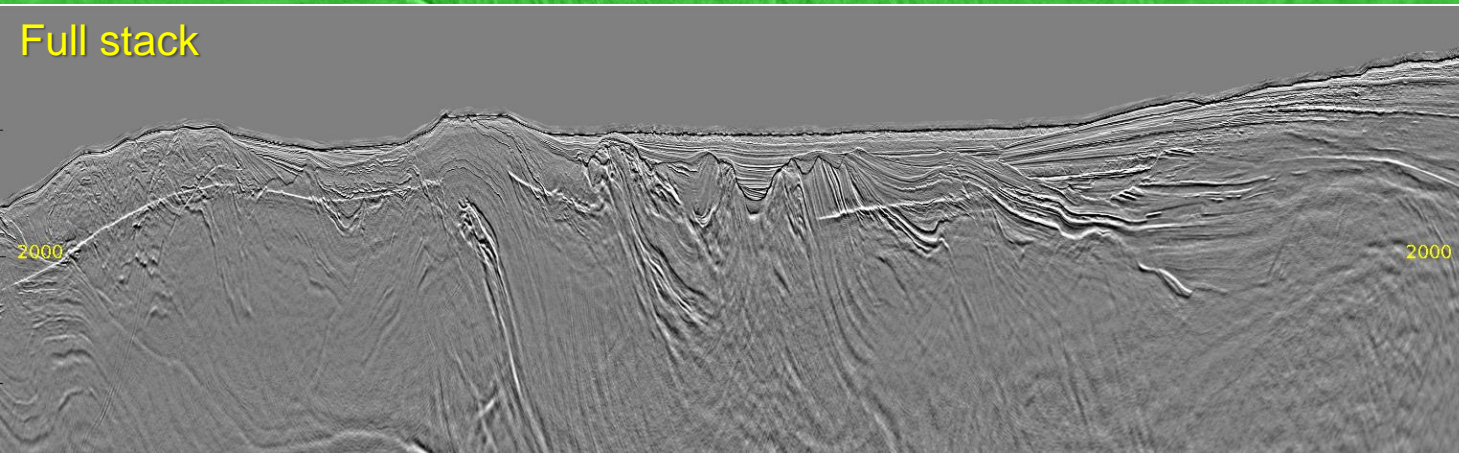


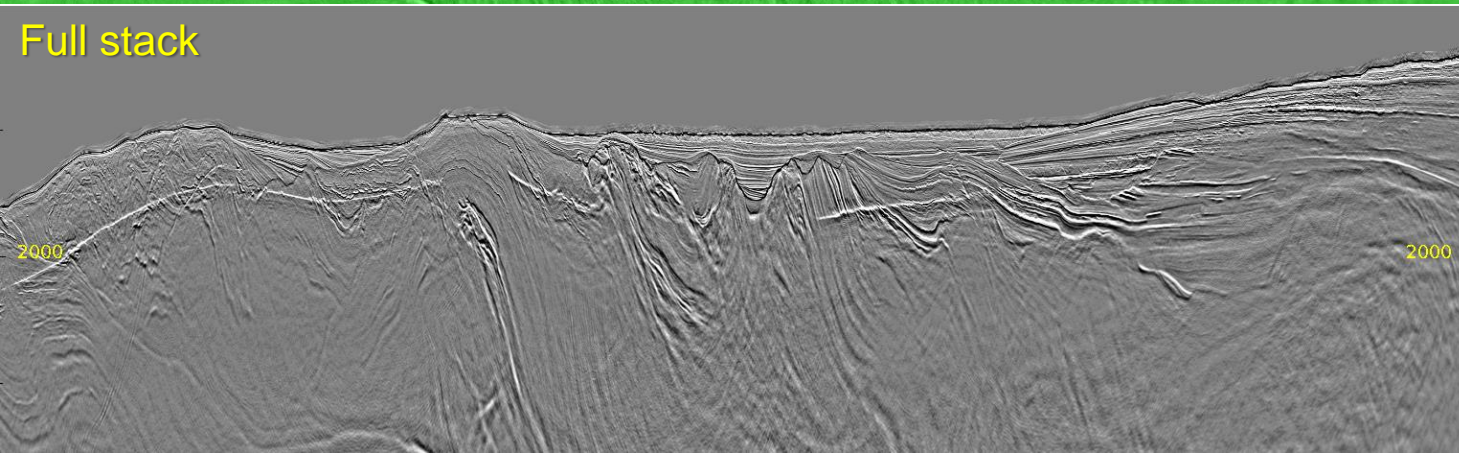
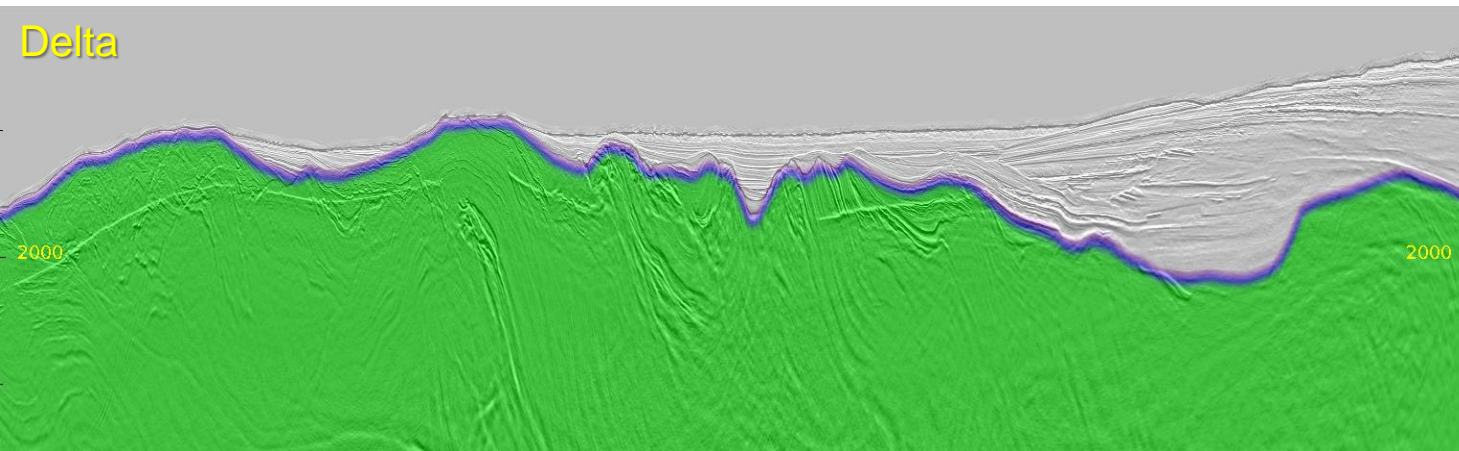
Inline 436: IT2 TTI Stack with Old Delta & Epsilon

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- Old delta and corresponding seismic.



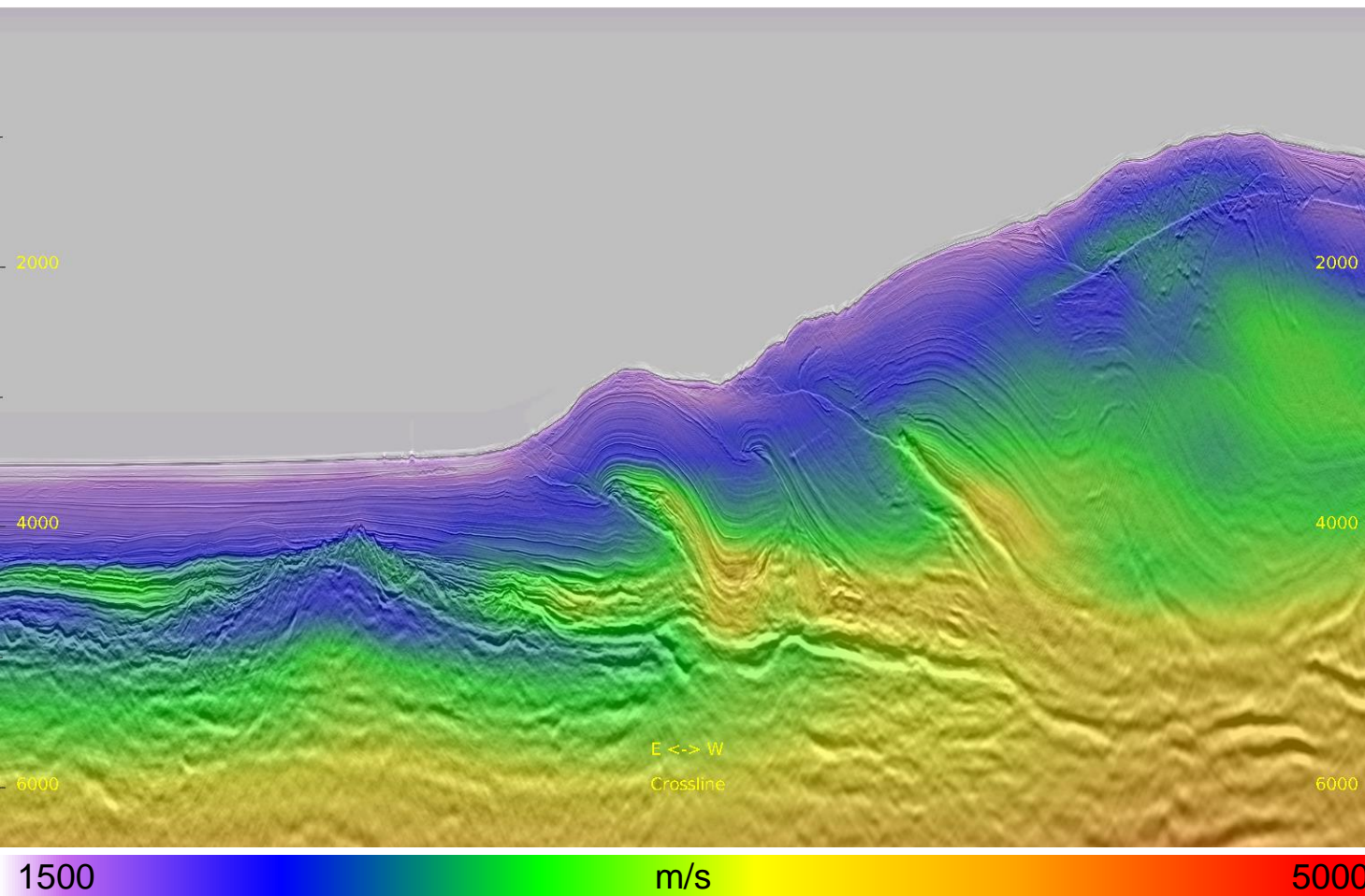


- New data and corresponding seismic.
- The change of delta causes minor shift on the seismic, due to corresponding velocity change.



Inline 436 East: IT2 TTI Velocity before Tomography

6

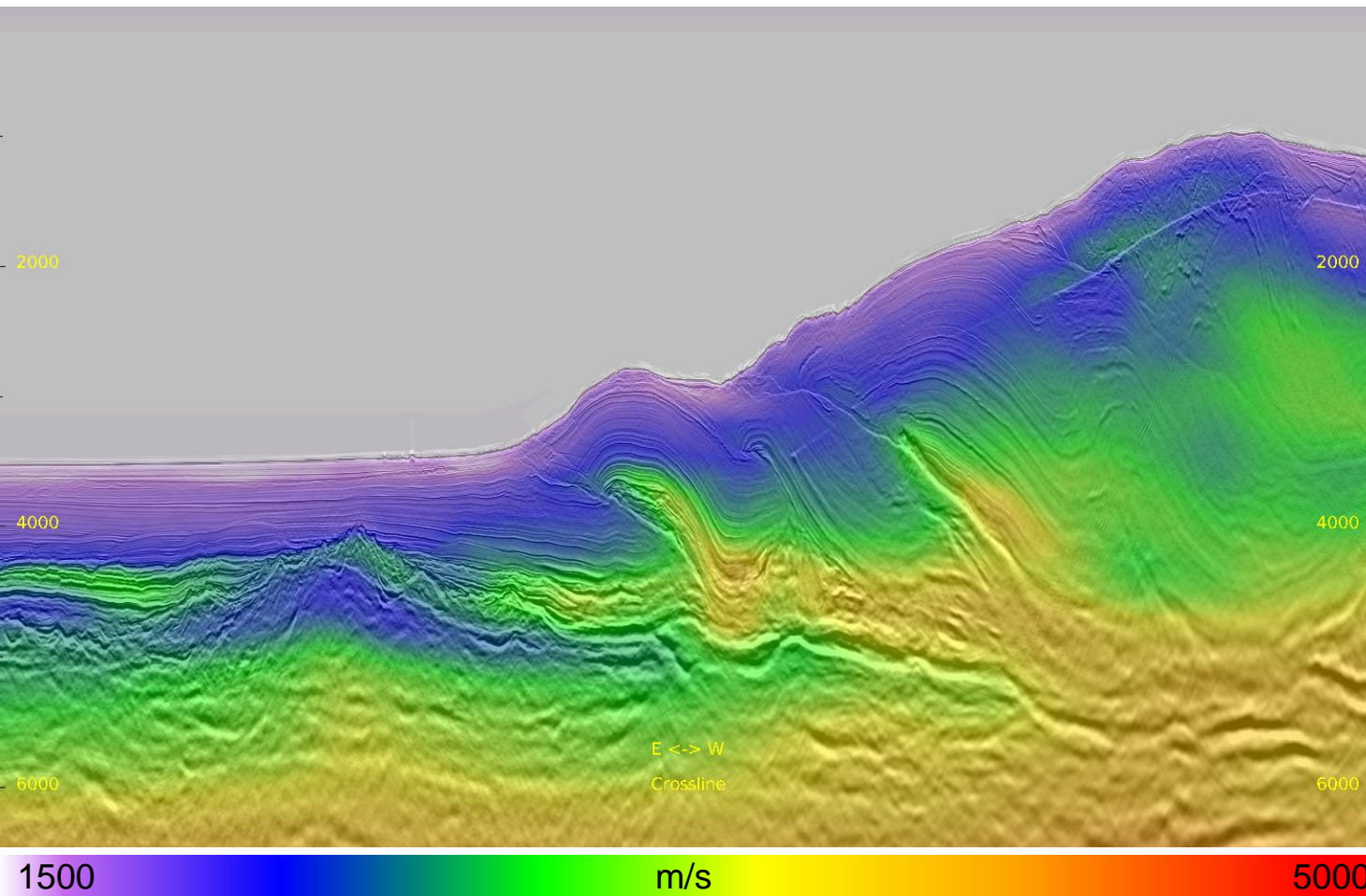


- IT2 converted TTI velocity with new delta and epsilon.

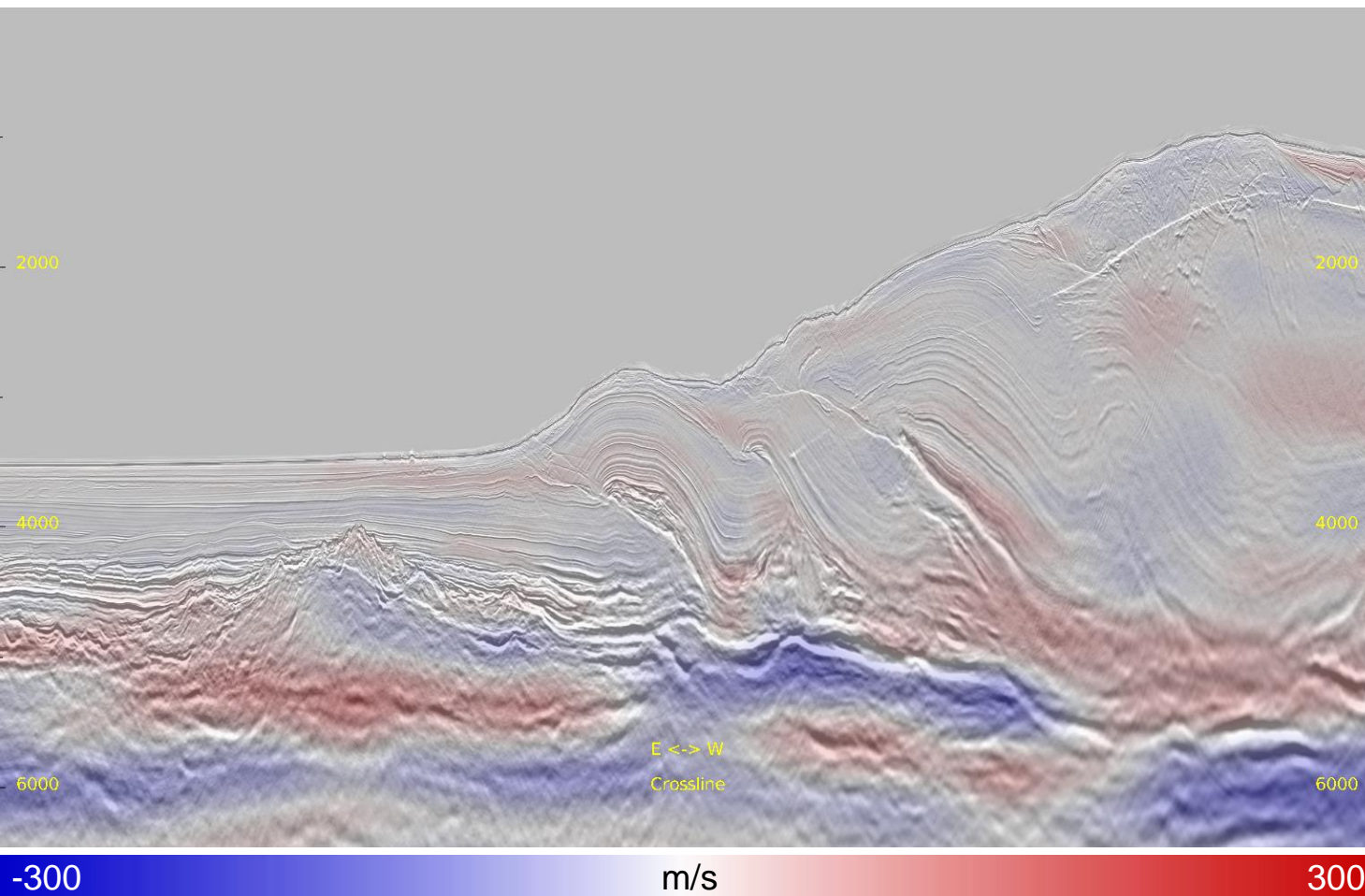


Inline 436 East: IT2 TTI Velocity **after** Tomography

7



- IT2 tomographic TTI velocity with new delta and epsilon.

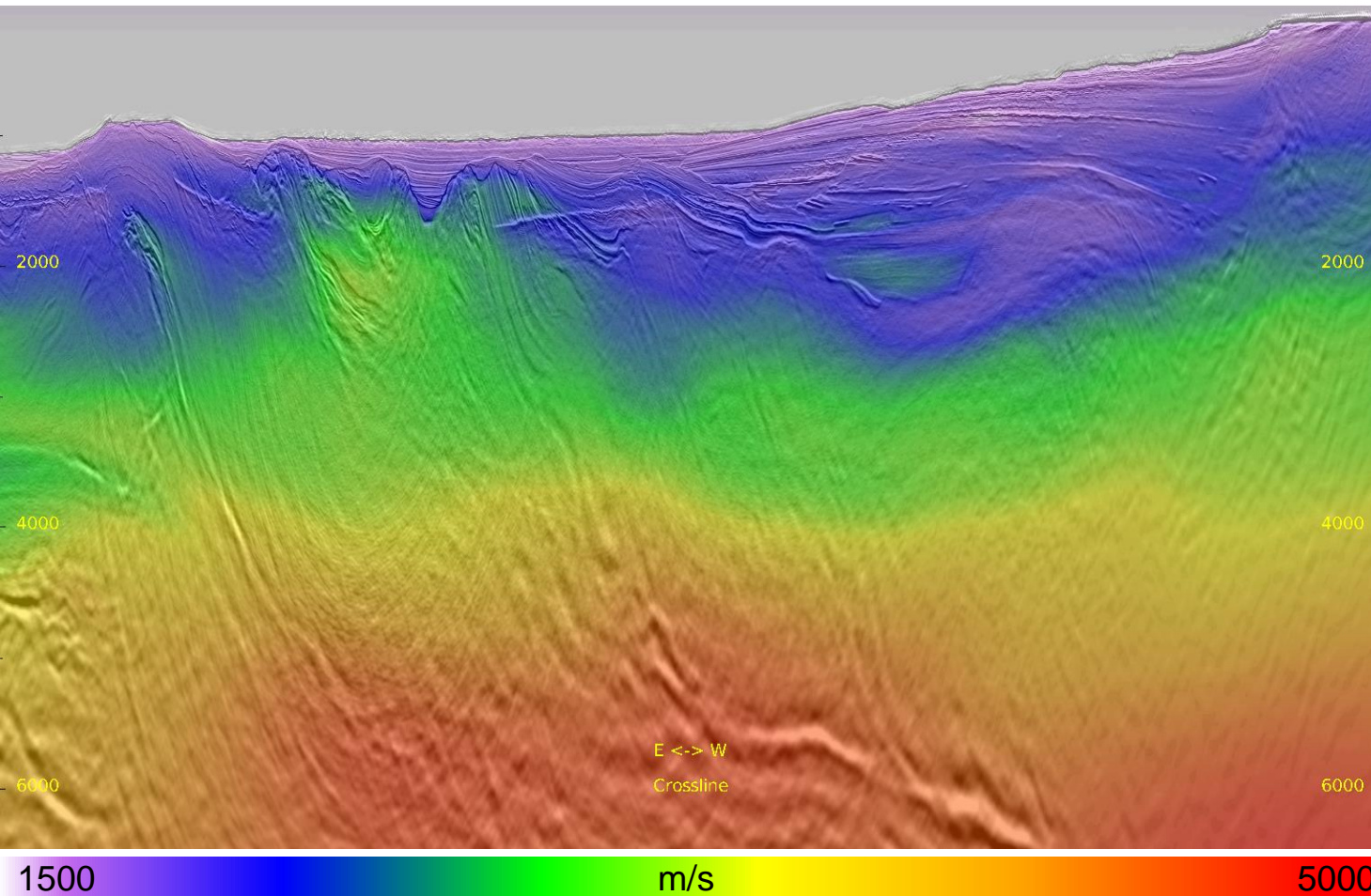


- Starting from a better velocity, IT2 TTI tomography gives smaller perturbation compared to IT1 ISO tomography.



Inline 436 West: IT2 TTI Velocity before Tomography

9

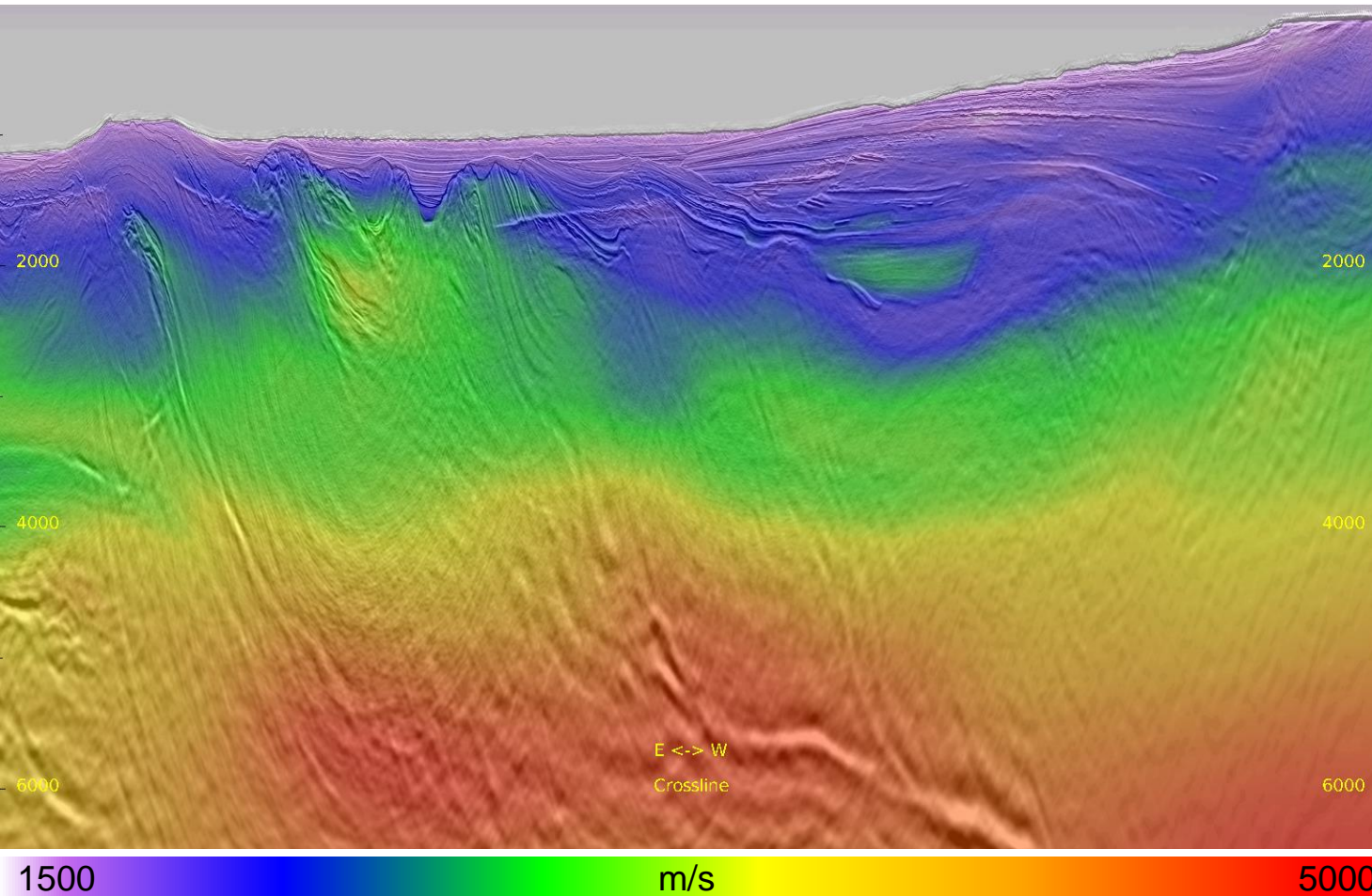


- IT2 converted TTI velocity with new delta and epsilon.

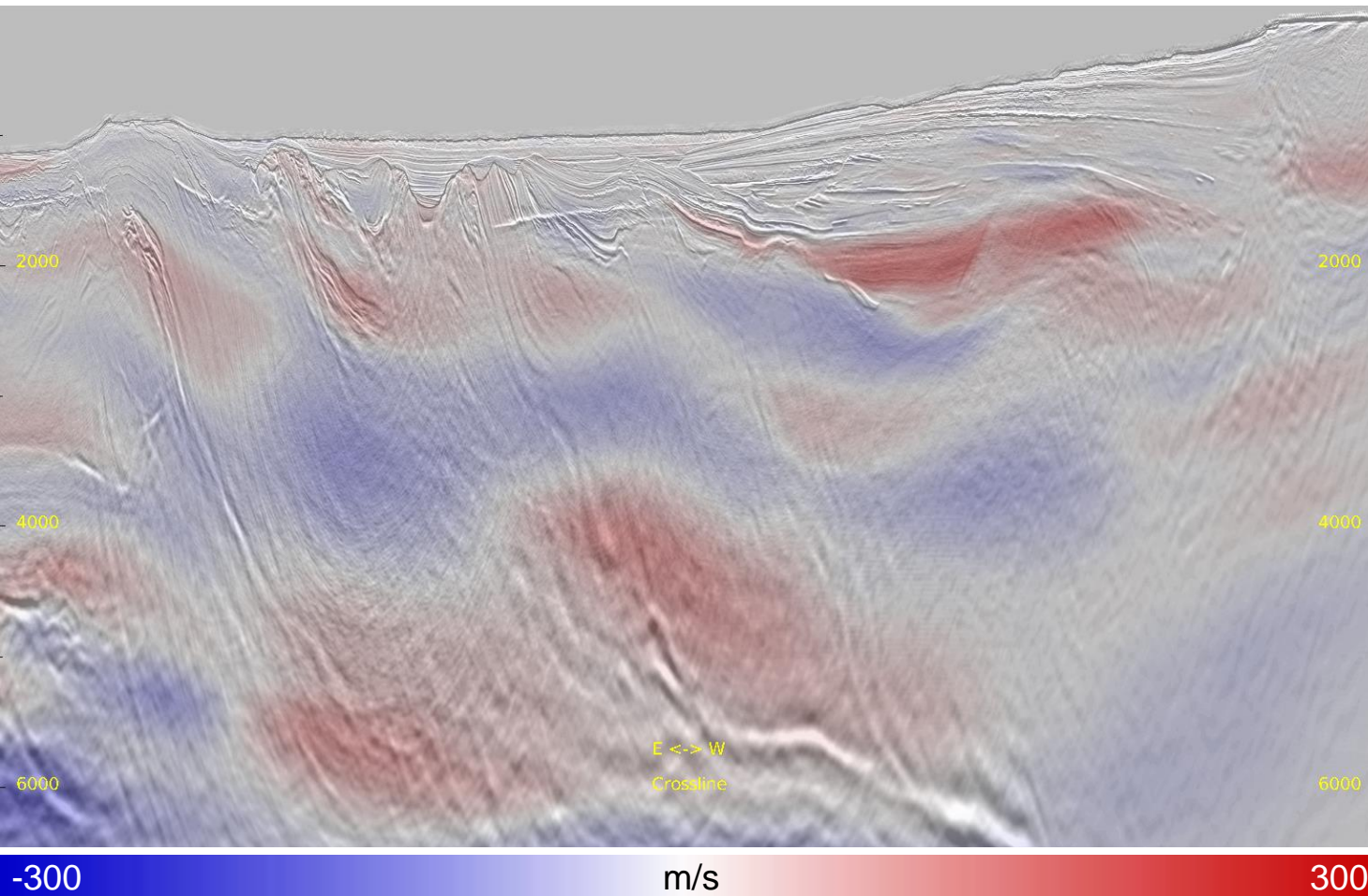


Inline 436 West: IT2 TTI Velocity **after** Tomography

10



- IT2 tomographic TTI velocity with new delta and epsilon.



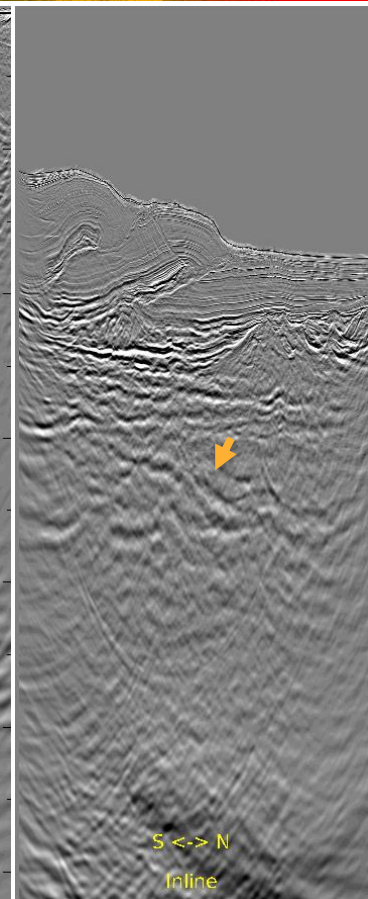
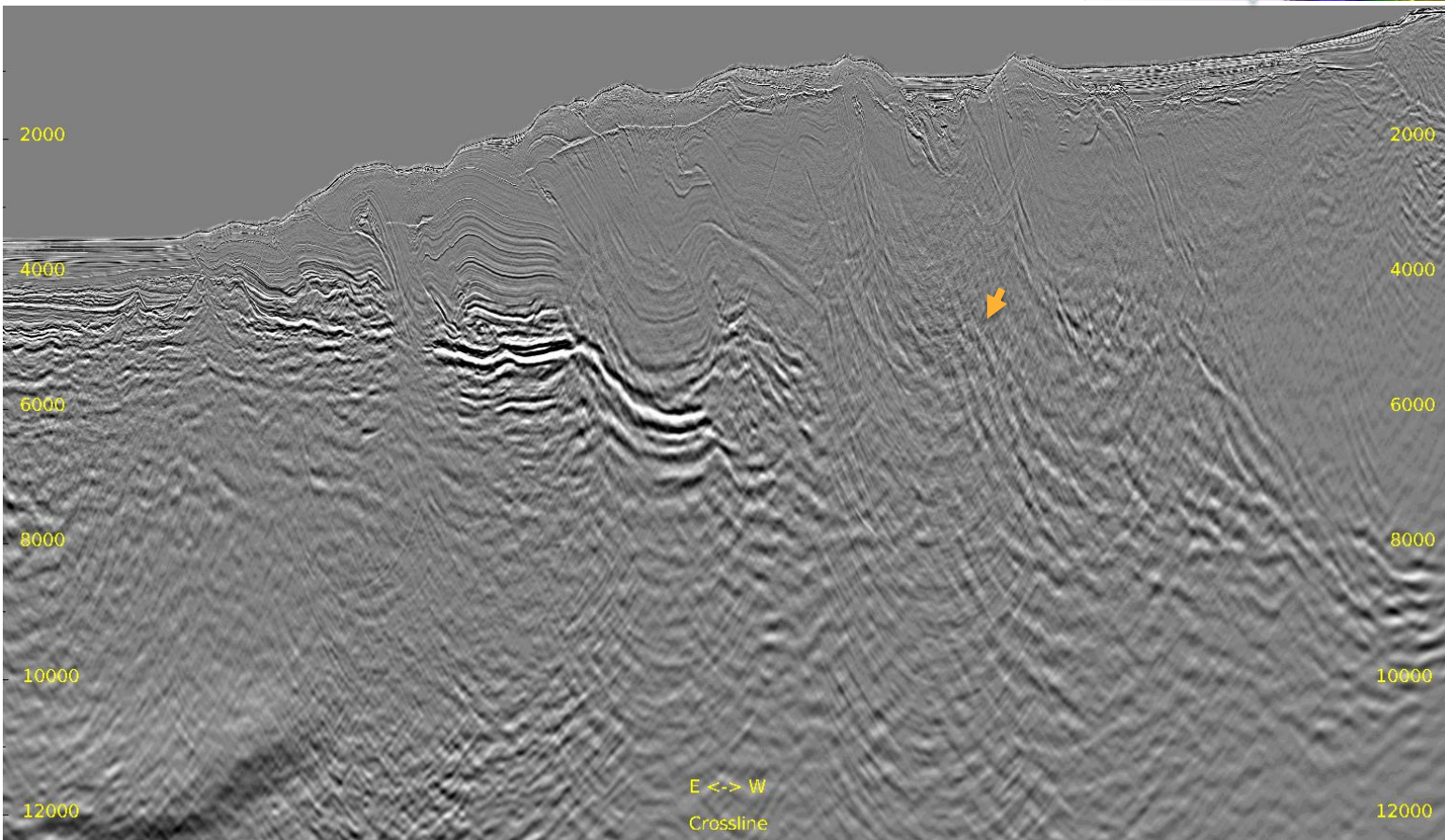
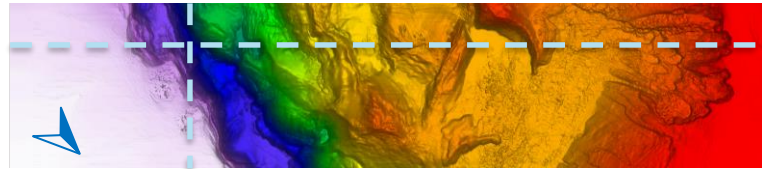
- Starting from a better velocity, IT2 TTI tomography gives smaller perturbation compared to IT1 ISO tomography.

Kirchhoff Depth Migration



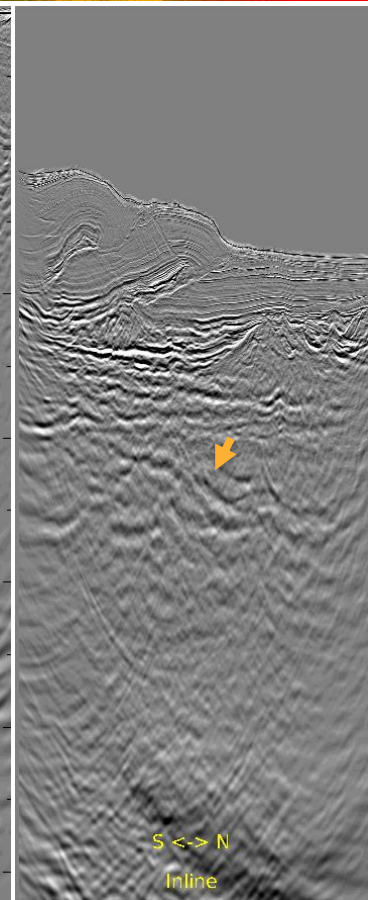
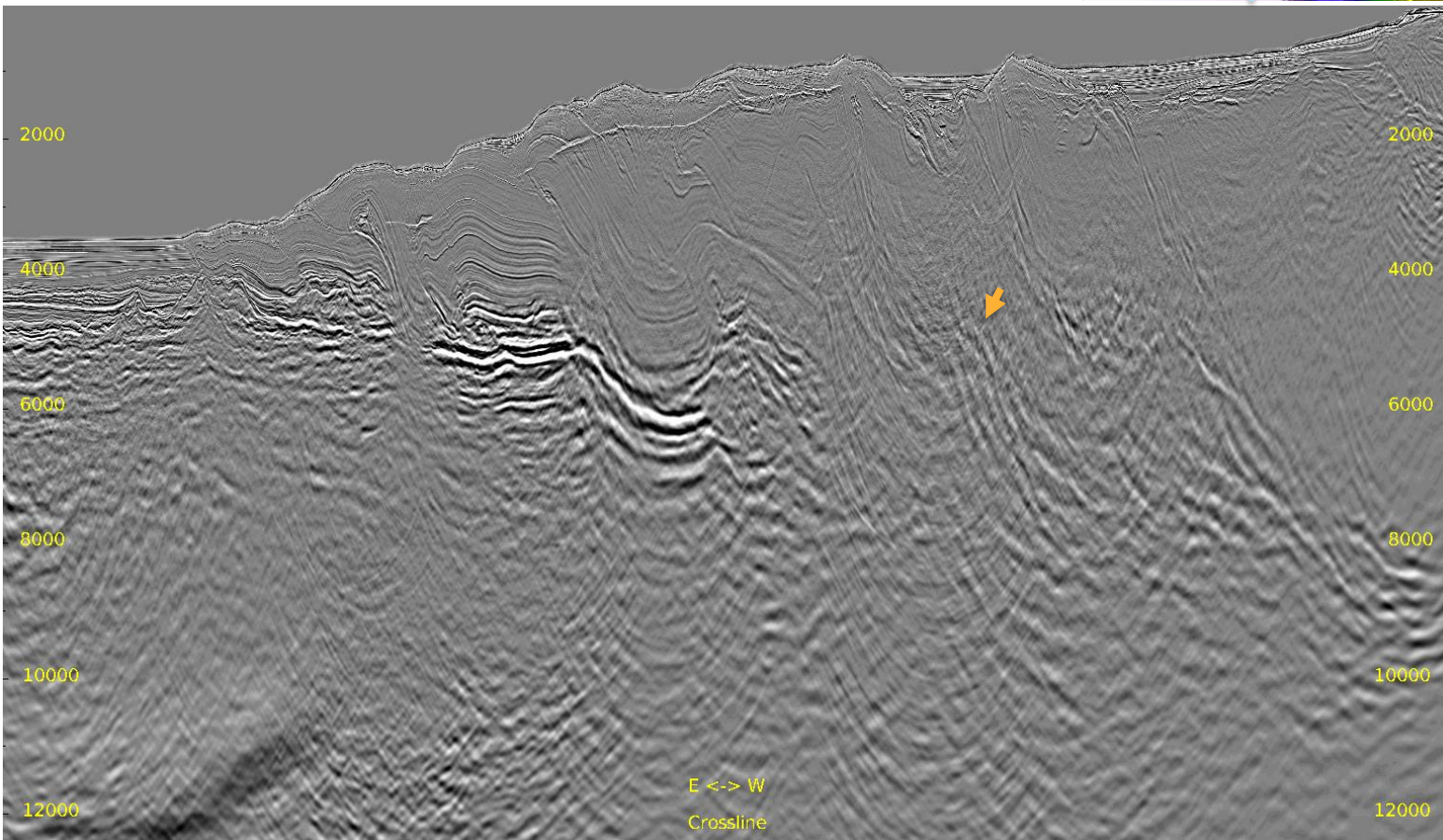
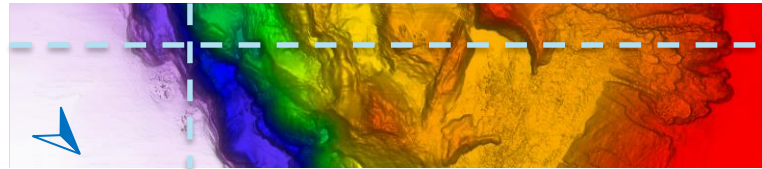
Full Stack: before TTI TOMO

Inline 236 & Crossline 1540



Full Stack: after TTI TOMO

Inline 236 & Crossline 1540

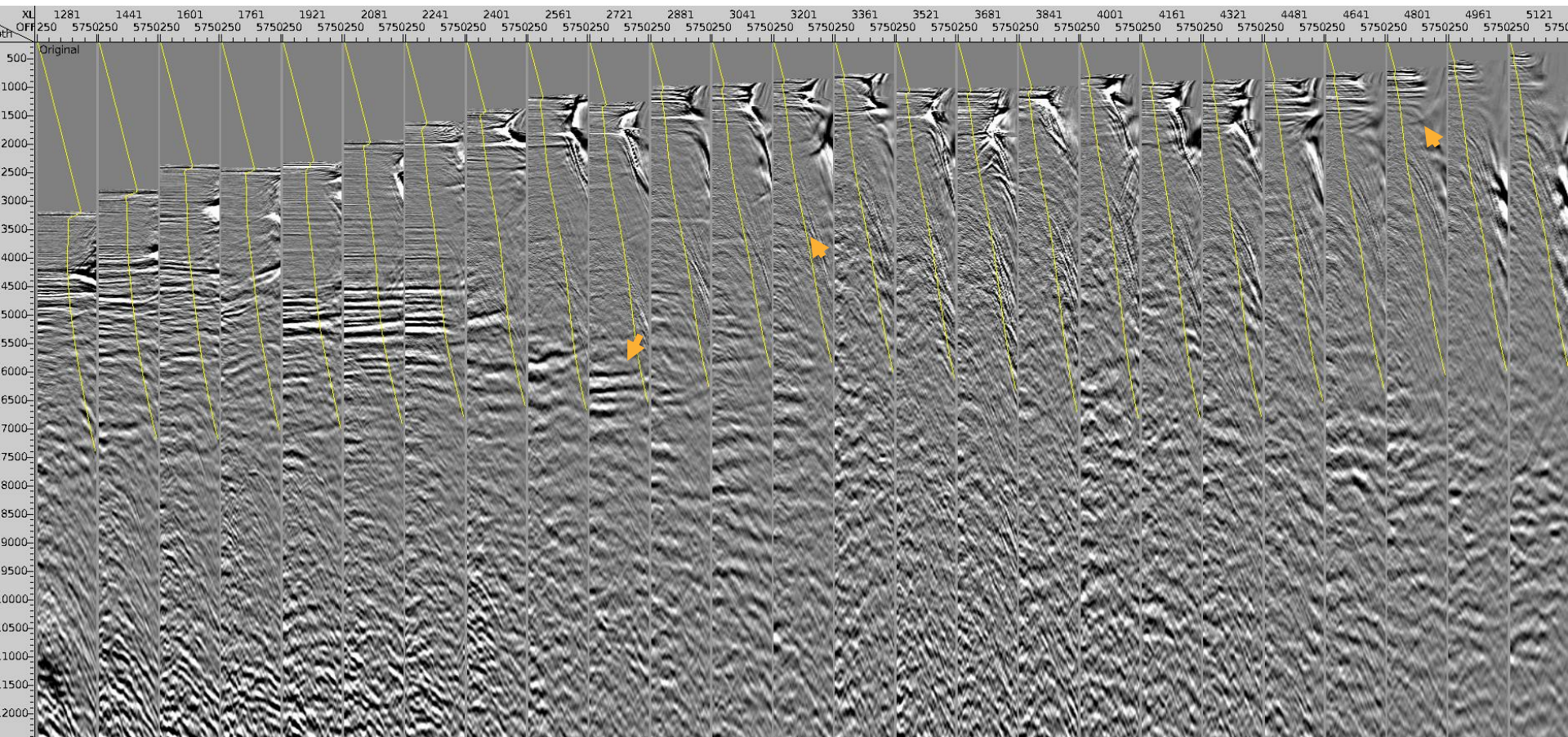




Inline 236 CDP Gathers: before TTI TOMO

— 35° Mute

15

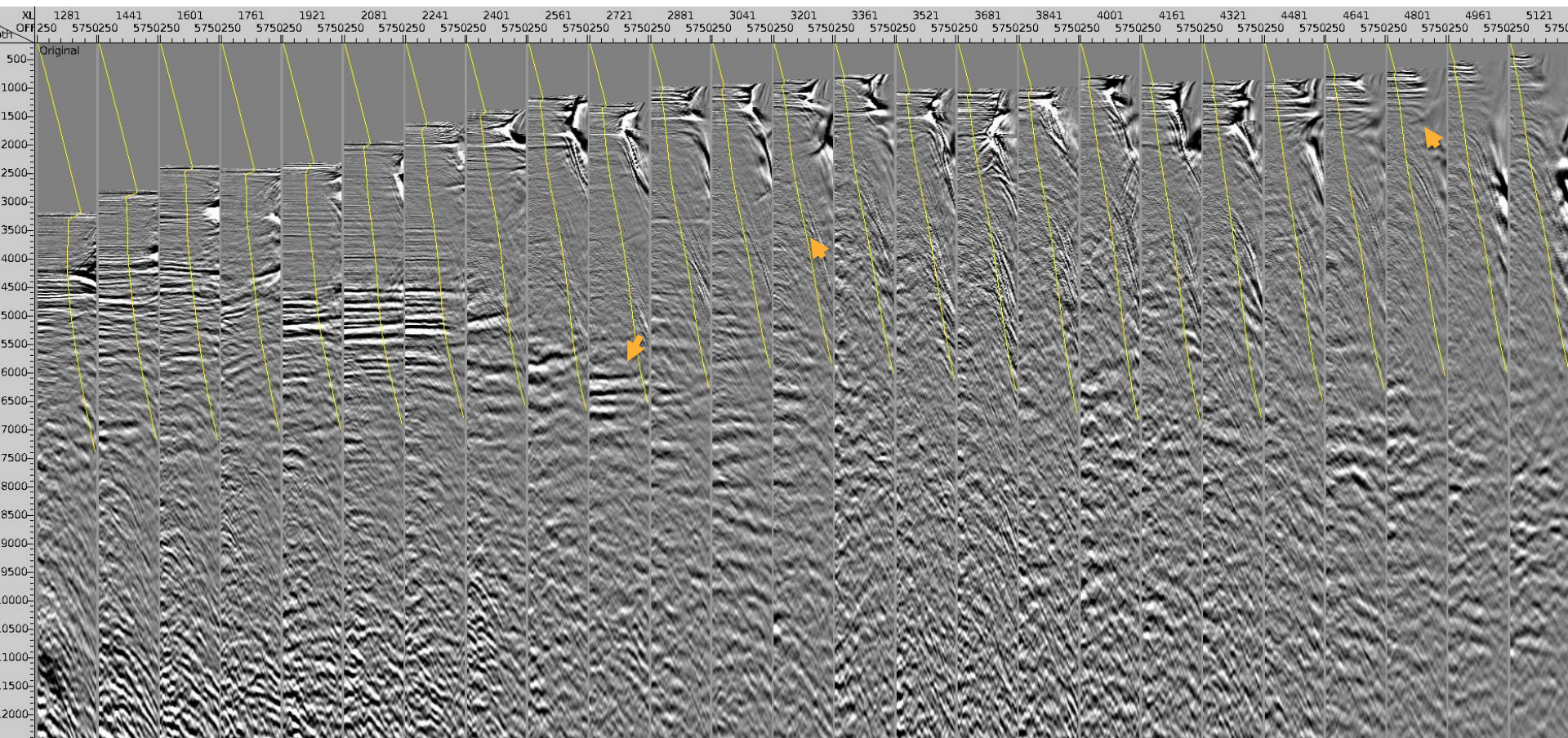




Inline 236 CDP Gathers: **after** TTI TOMO

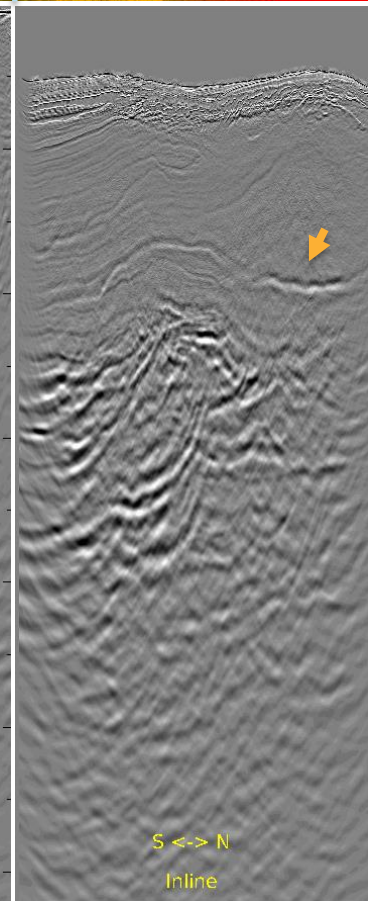
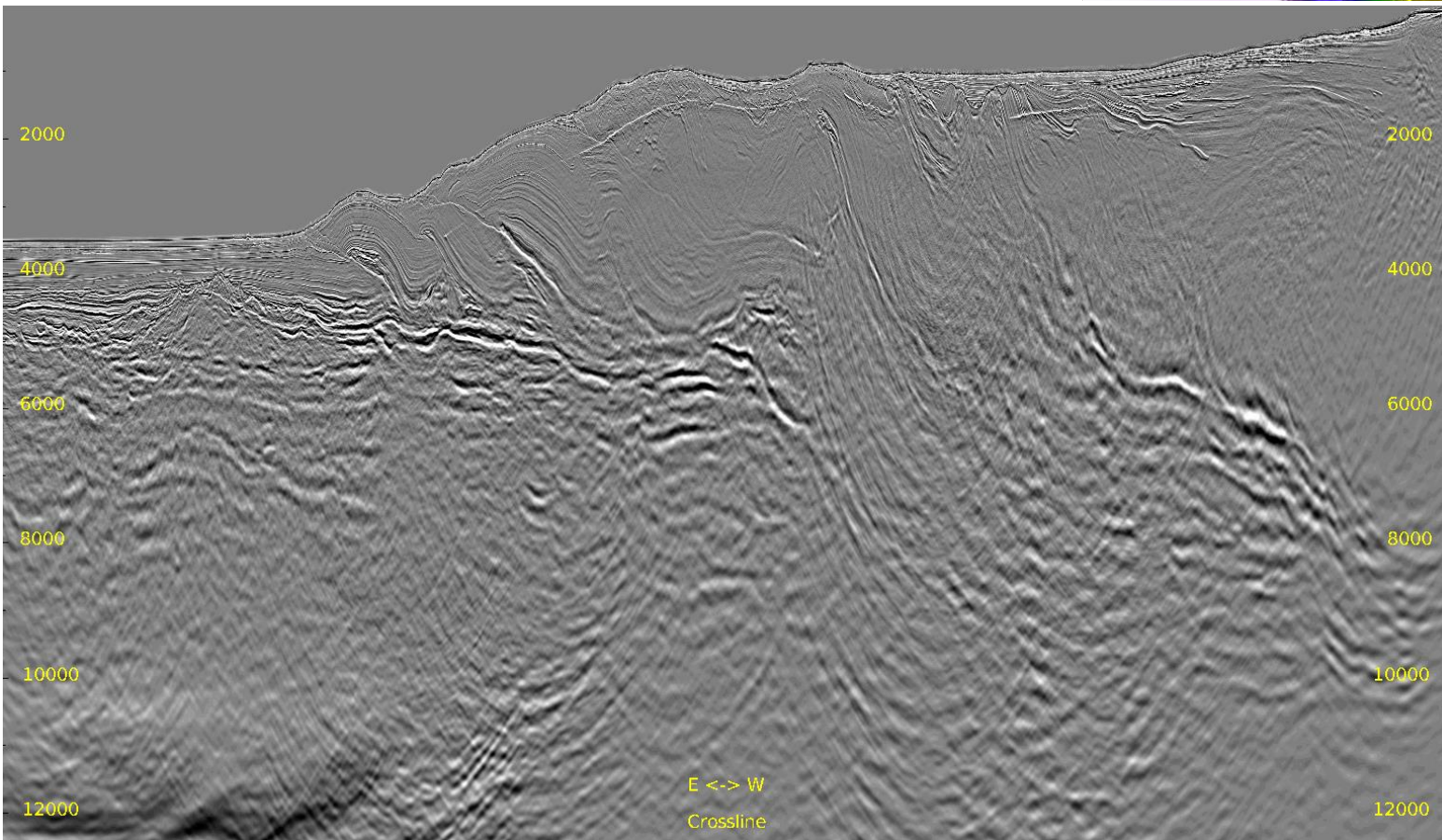
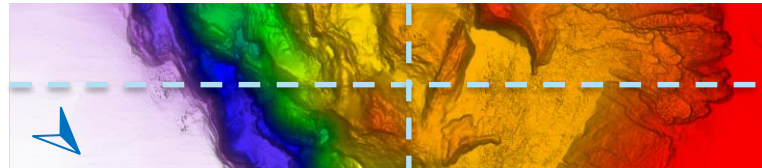
— 35° Mute

16



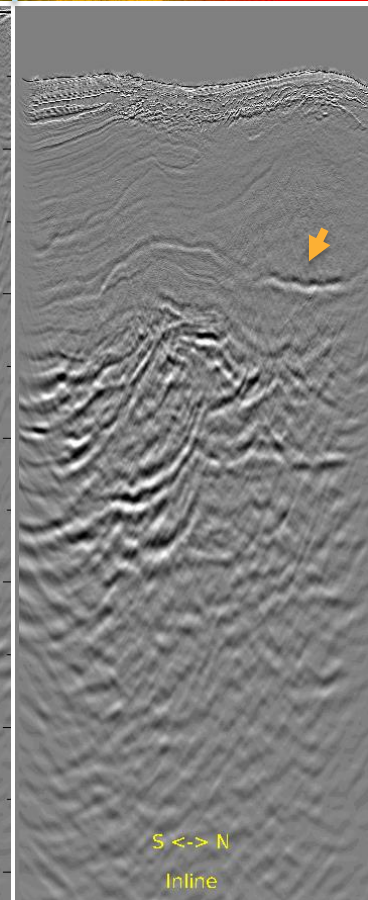
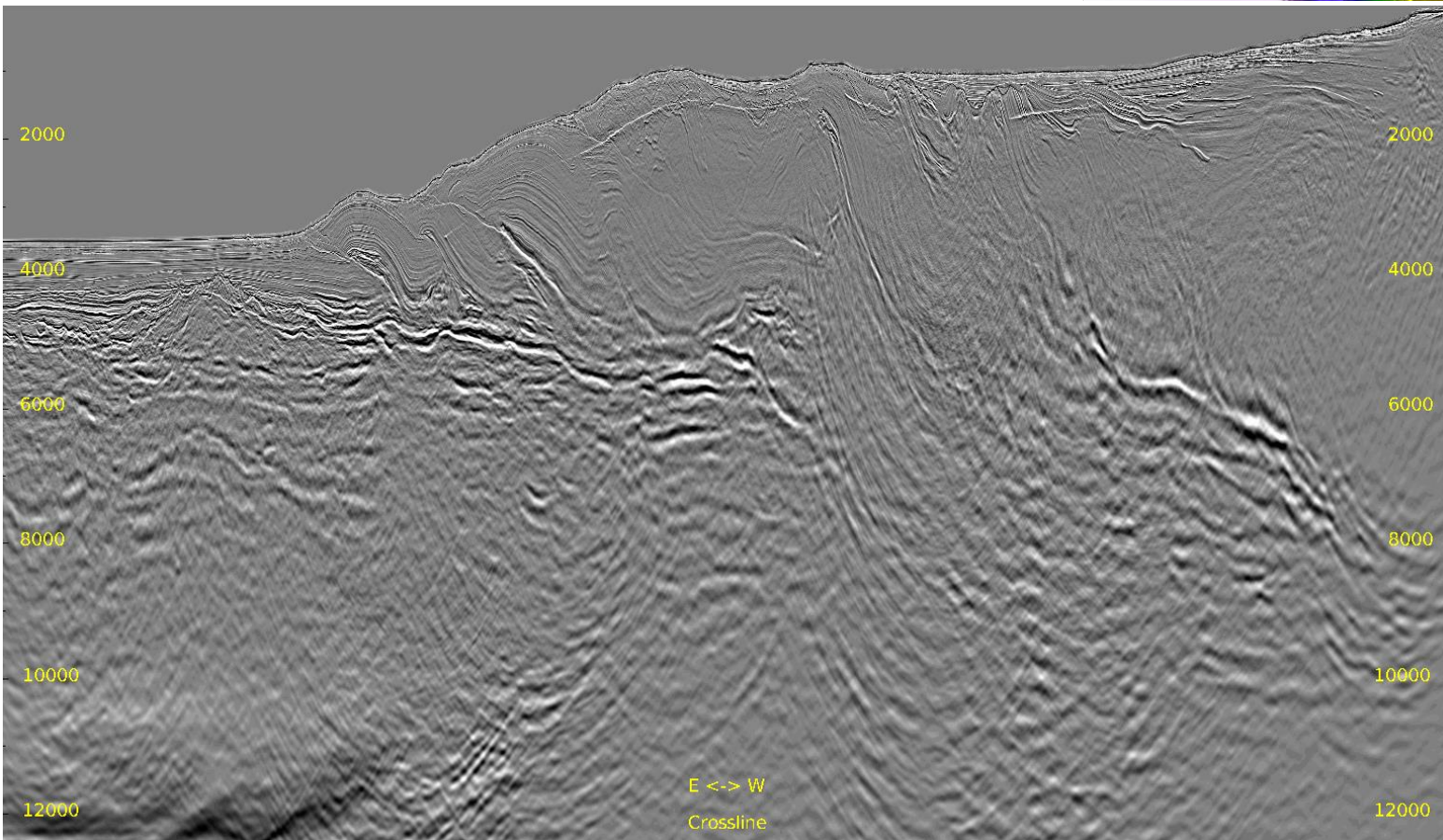
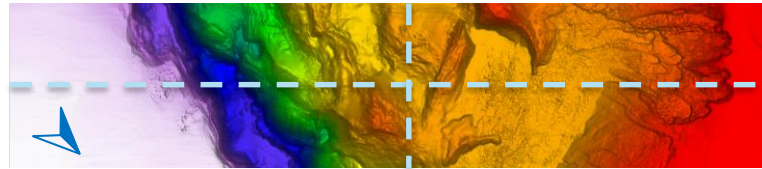
Full Stack: before TTI TOMO

Inline 436 & Crossline 3040



Full Stack: after TTI TOMO

Inline 436 & Crossline 3040

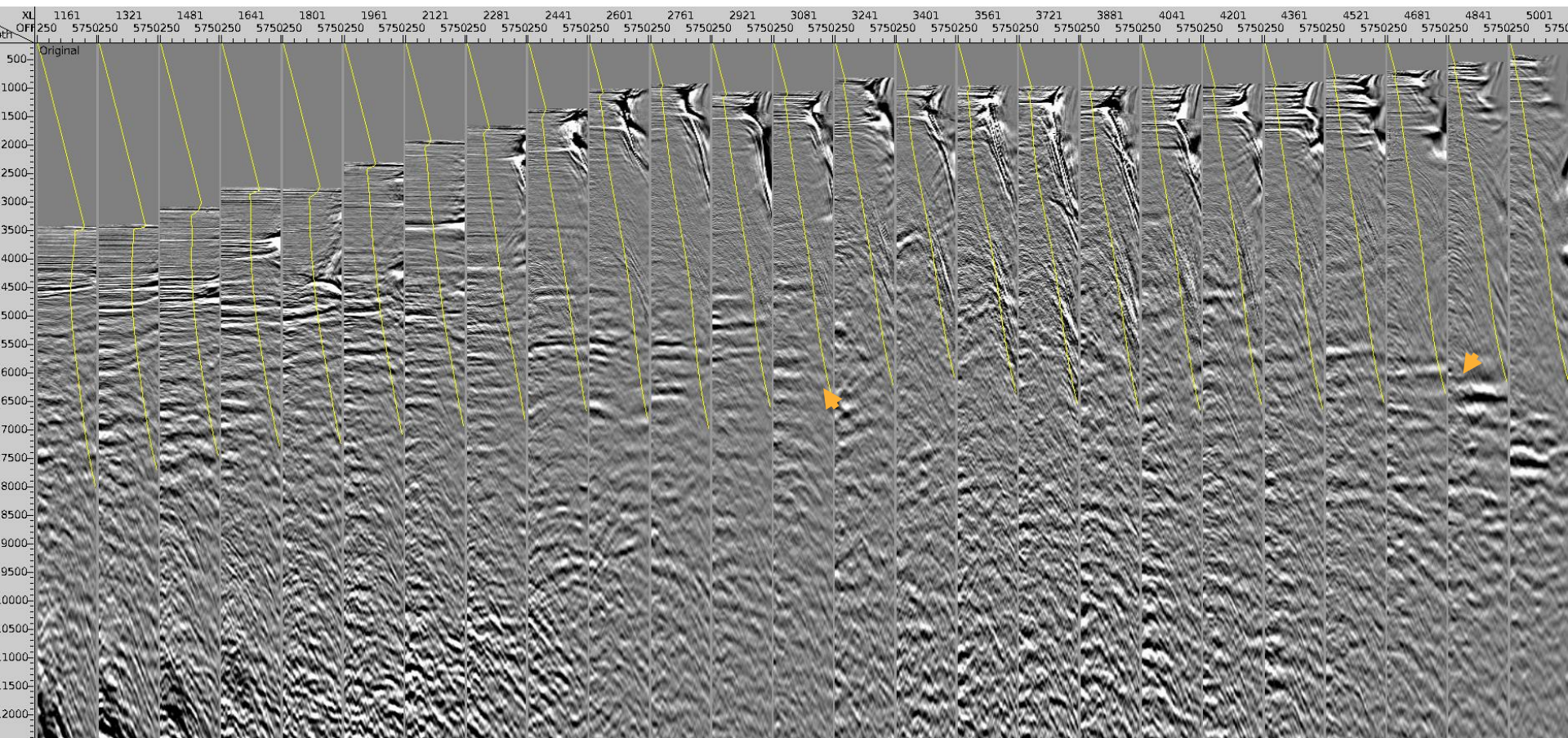




Inline 436 CDP Gathers: before TTI TOMO

— 35° Mute

19

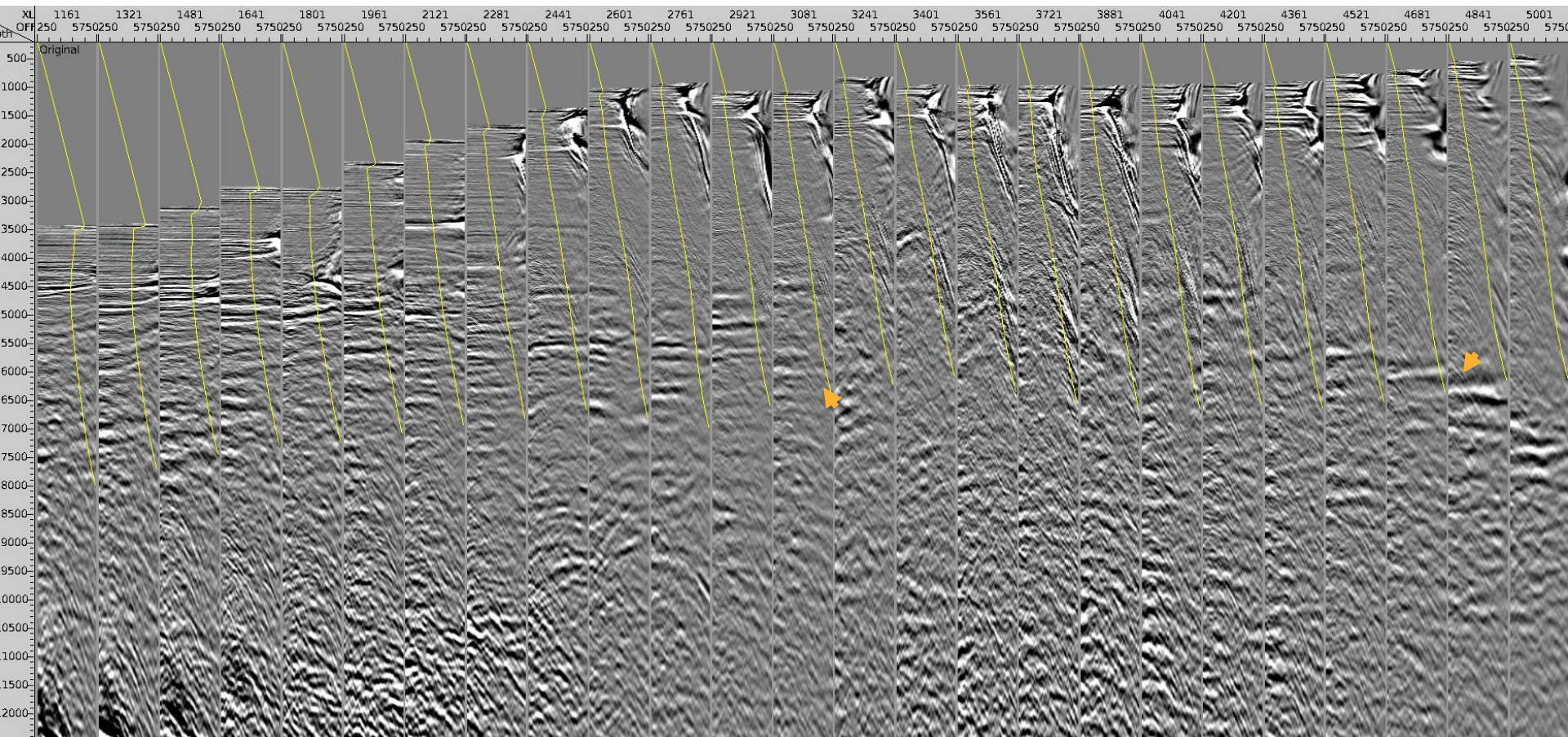




Inline 436 CDP Gathers: after TTI TOMO

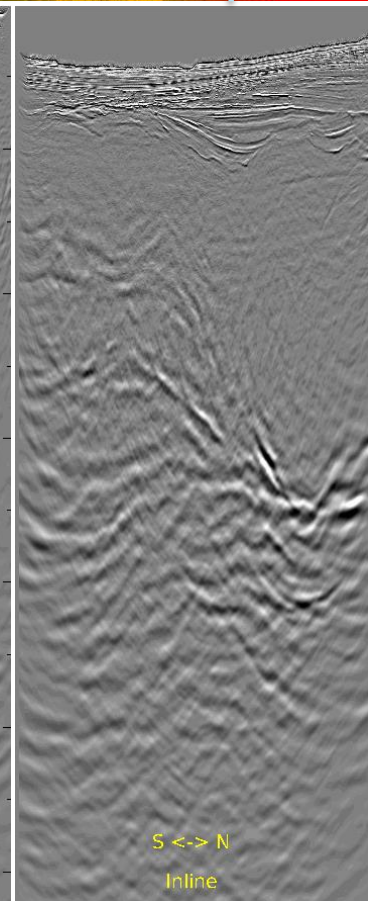
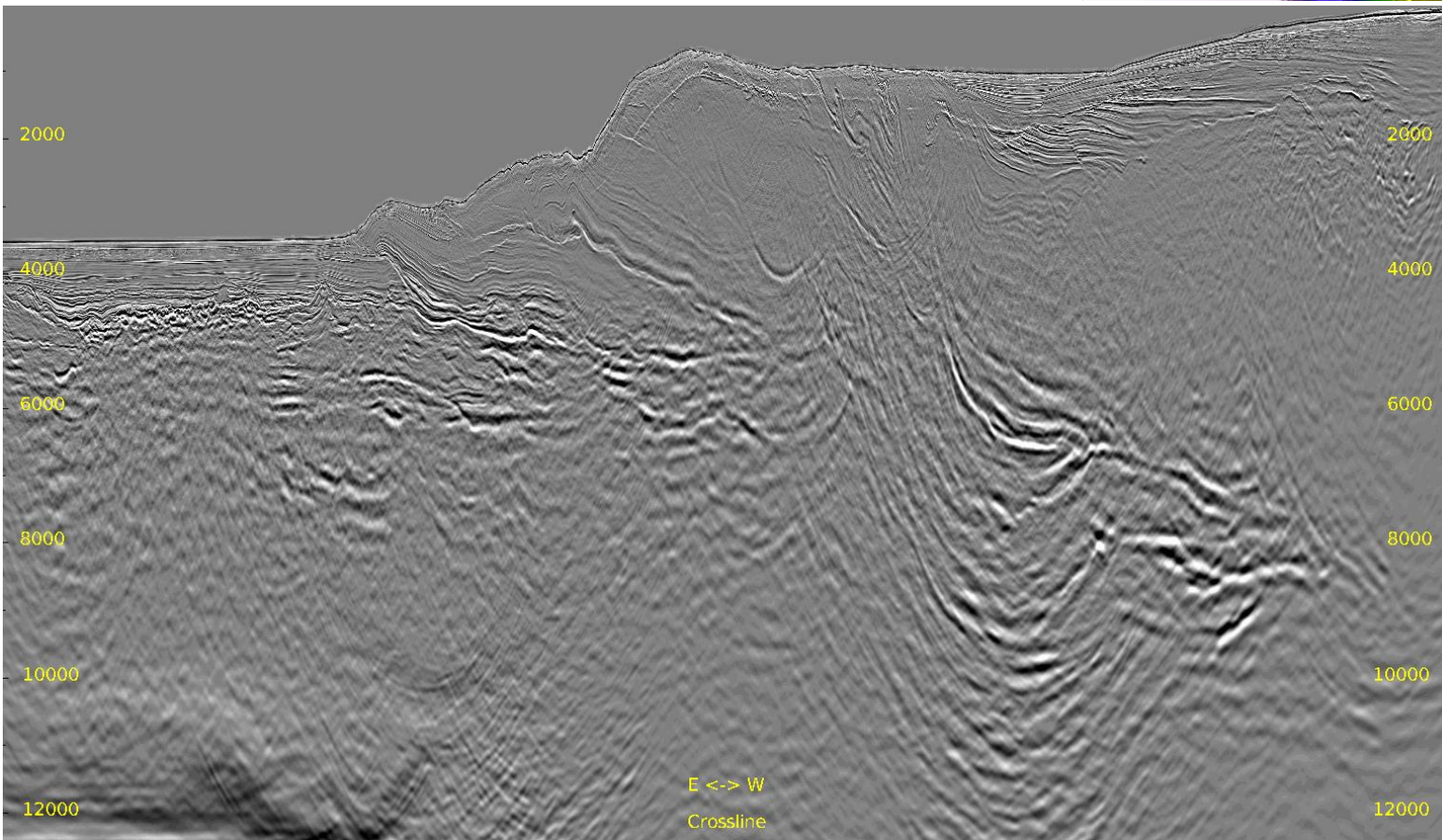
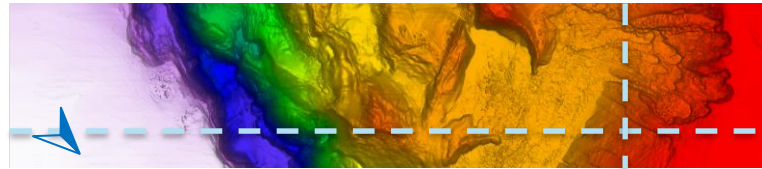
— 35° Mute

20



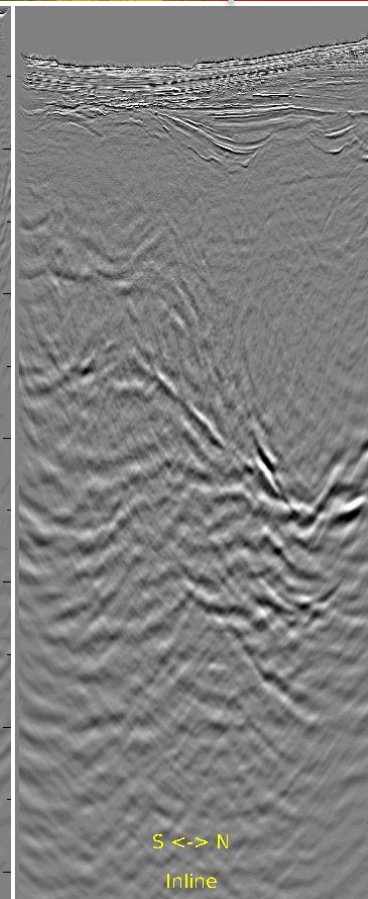
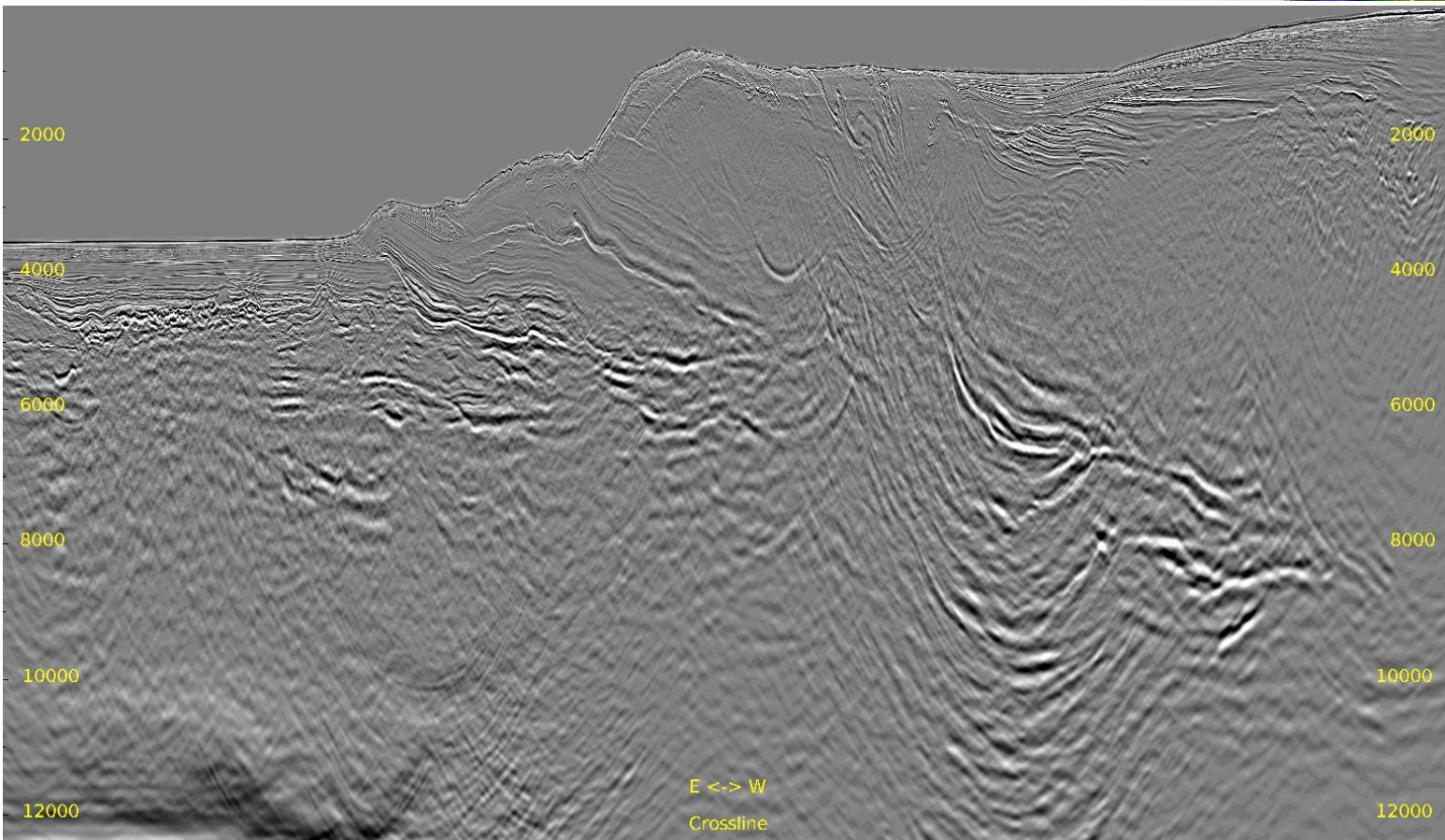
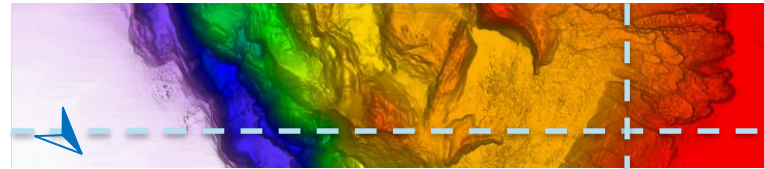
Full Stack: before TTI TOMO

Inline 636 & Crossline 4540



Full Stack: after TTI TOMO

Inline 636 & Crossline 4540

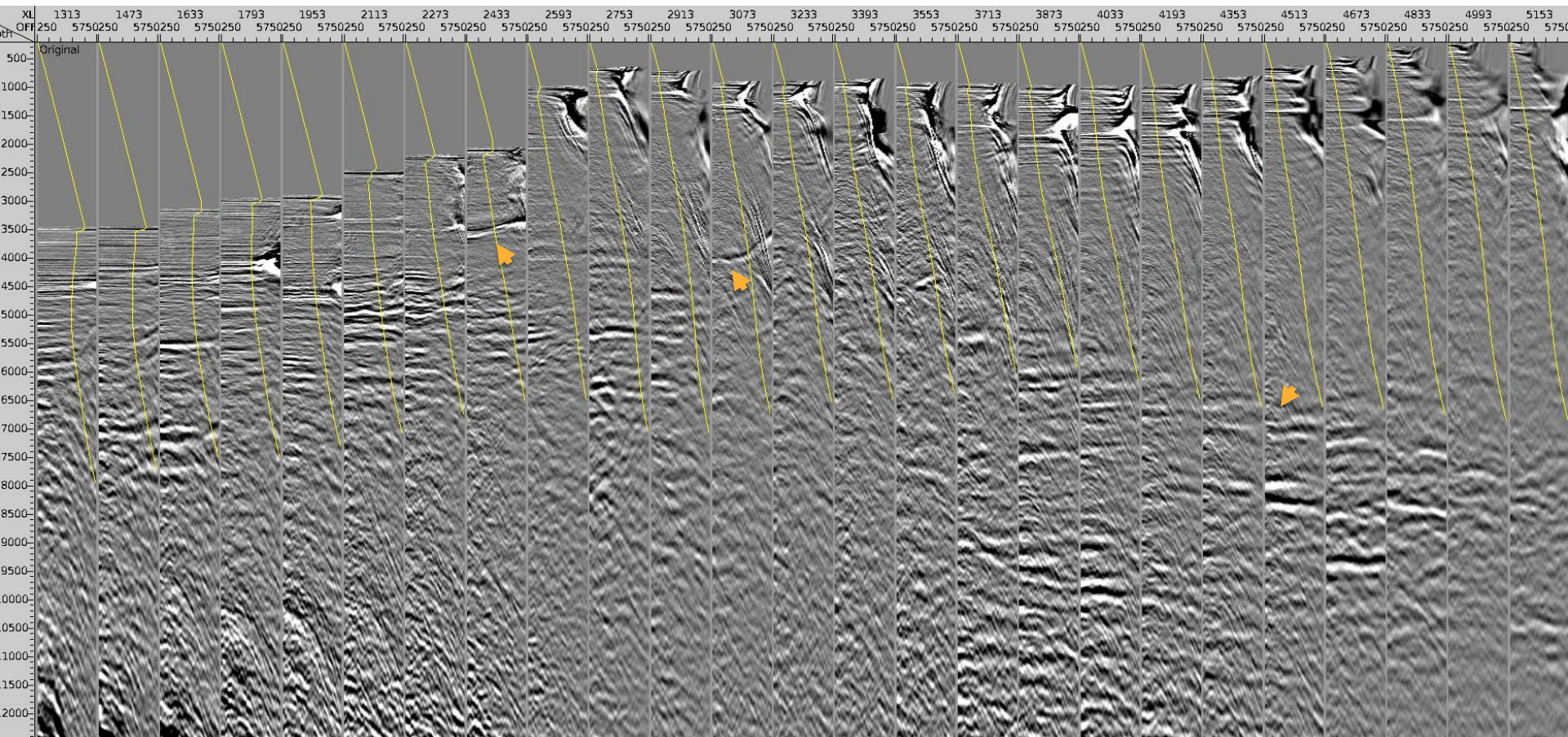




Inline 636 CDP Gathers: before TTI TOMO

— 35° Mute

23

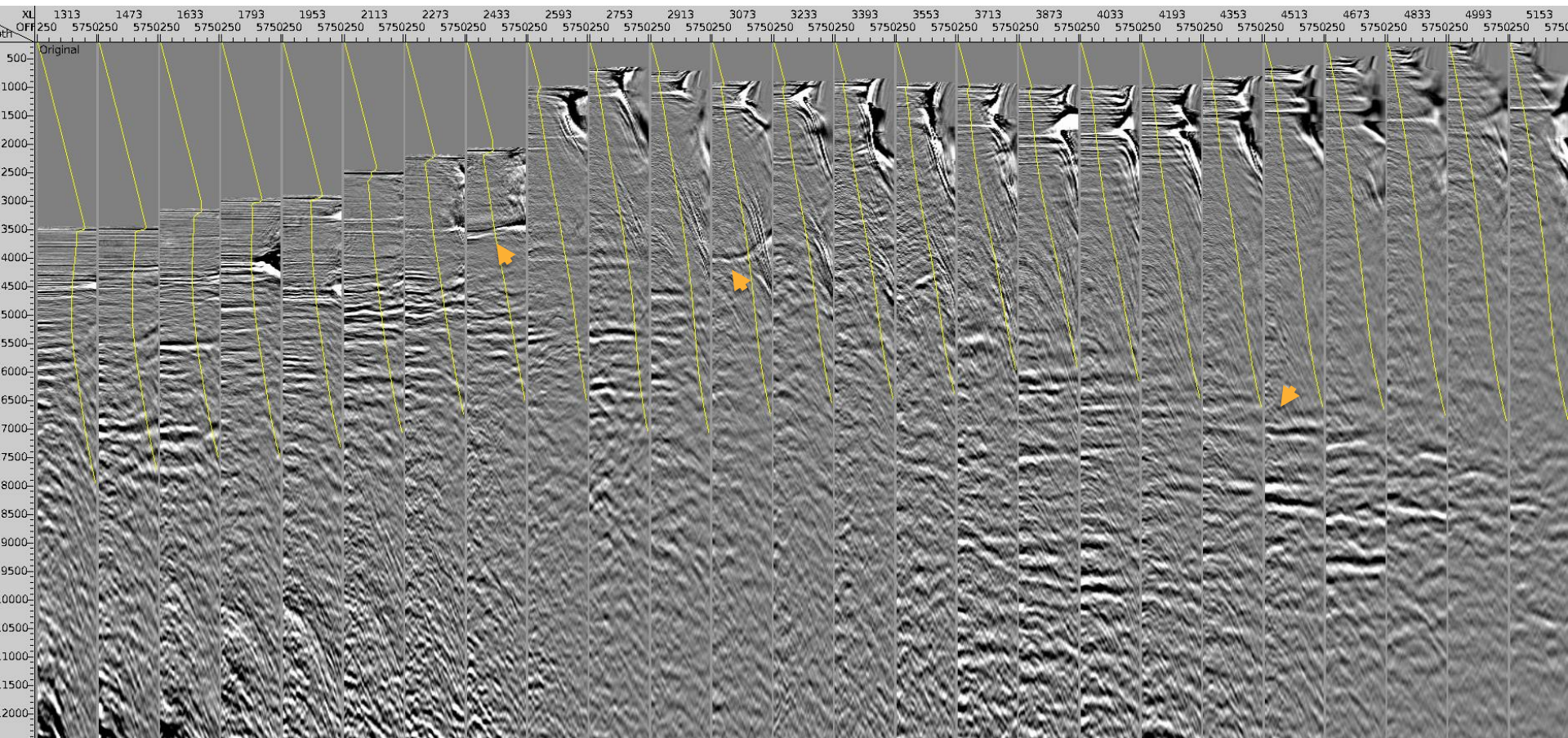




Inline 636 CDP Gathers: **after** TTI TOMO

— 35° Mute

24



- TTI tomography overall gives reasonable improvement.
- High resolution velocity is needed in the shallow (2~3 km beneath the water bottom) to heal the weird shape of events on gathers.
- Following TTI FWI will target at a high resolution update to further improve the result.