



IT1 - Isotropic Tomography

NZ 3D Processing

25 November 2020

cgg.com



INSTITUTE FOR GEOPHYSICS



Passion for Geoscience

- **Objective:**

To update overall velocity trend and get accurate shallow velocity for anisotropy analysis.

- **Procedure:**

The input is migration result after isotropic (ISO) FWI update.

Residual move-out information was picked on CDP gathers on a grid size 50m X 56.25m.

Isotropic non-linear tomography was applied globally from water bottom to 15 km.

- **Display:**

Velocity and migrated depth full stack & gathers.

- **Observation and Recommendation:**

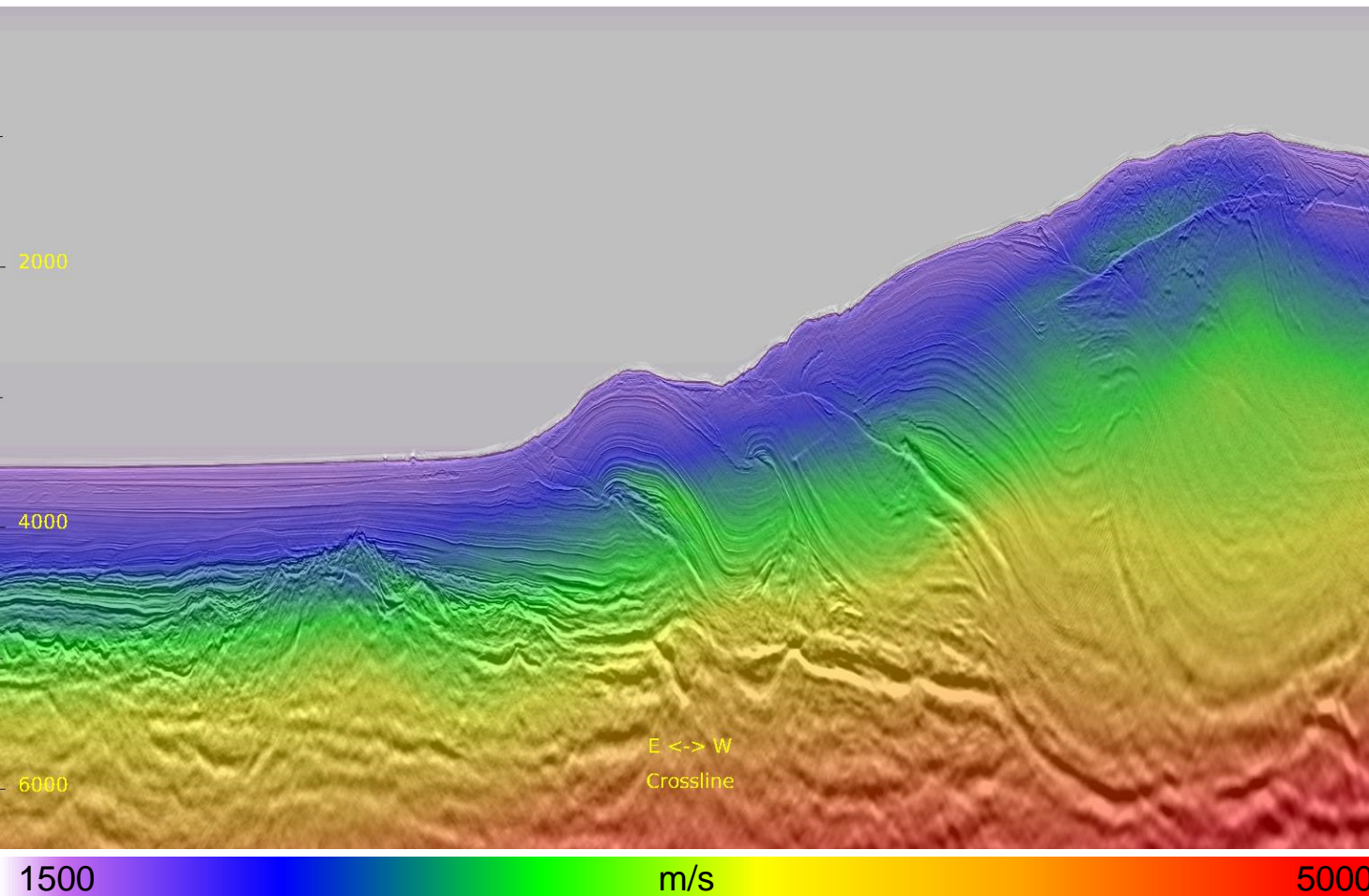
Iteration 1 (IT1) tomography globally flattens CDP gathers. Events in the deep area are simpler and more geological, compared to previous result. Events close to water bottom are flat from near to far angle, indicating a reasonable velocity for anisotropy analysis.

Velocity Model

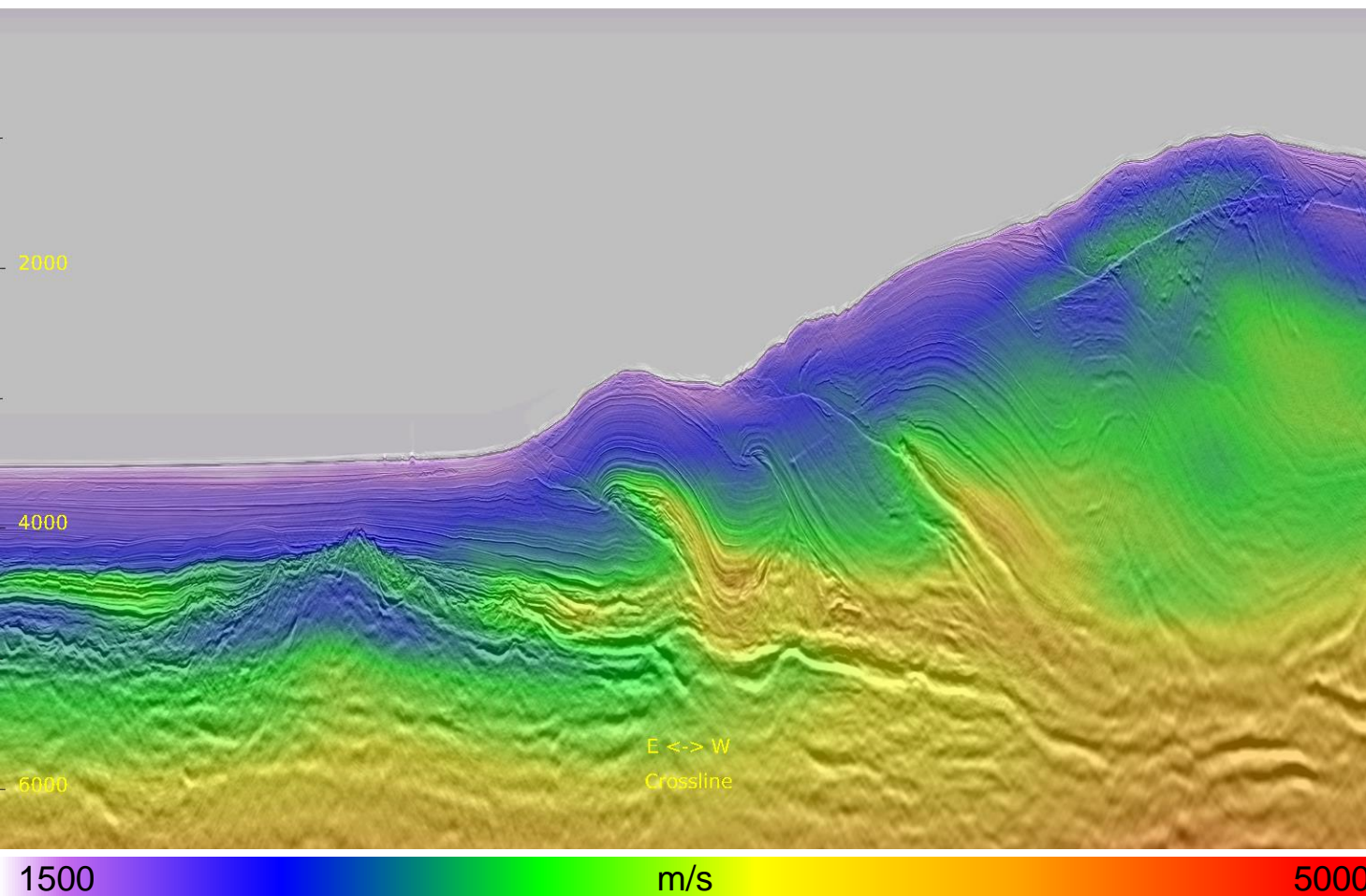


Inline 436 East: ISO FWI Velocity

4



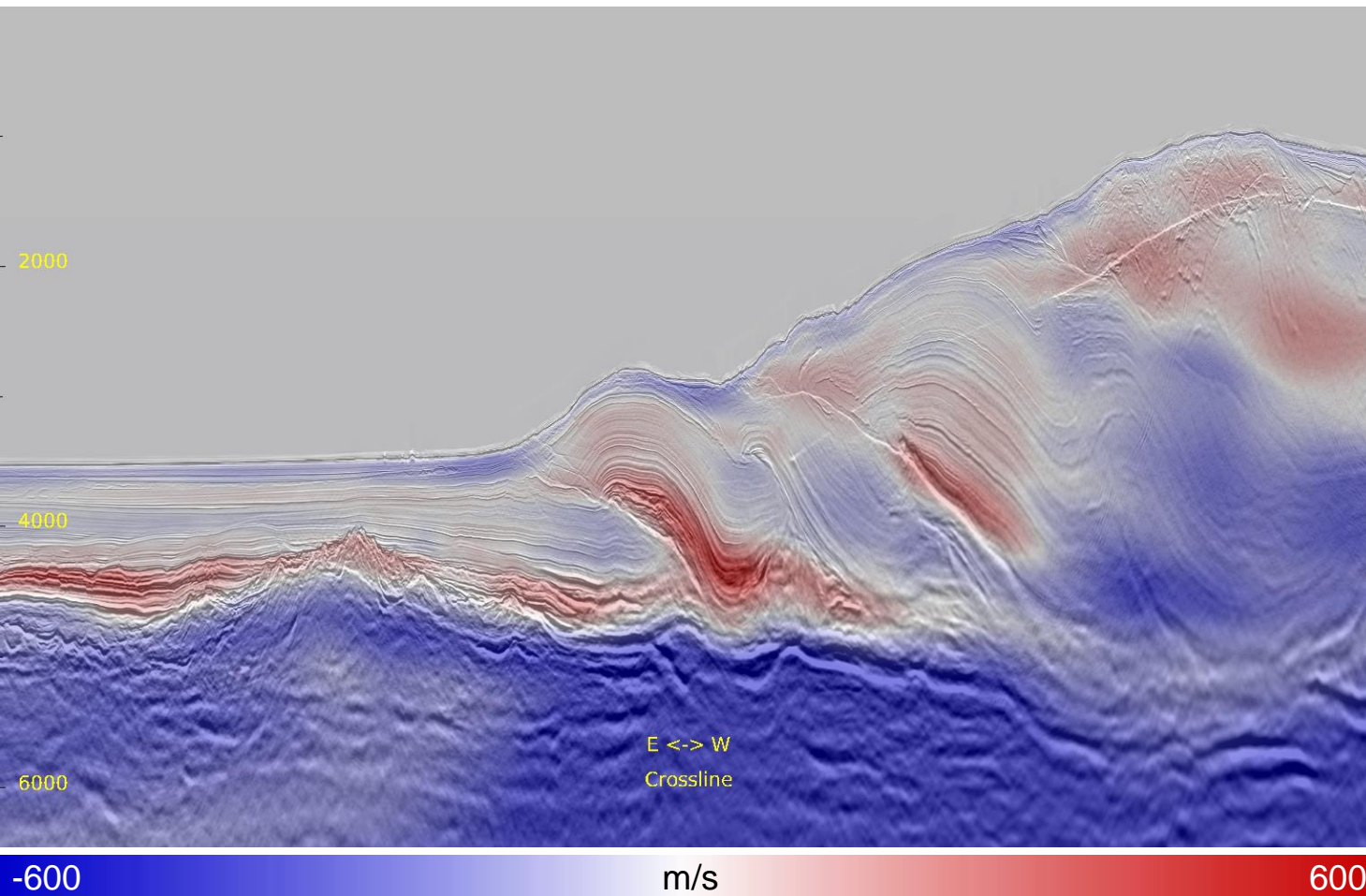
- Starting model is from Modified ISO FWI velocity.
- Deep area velocity trend still follows water bottom.



- IT1 ISO tomography overall slows down the velocity and provides some details that follow geology.

Inline 436 East: Velocity Perturbation

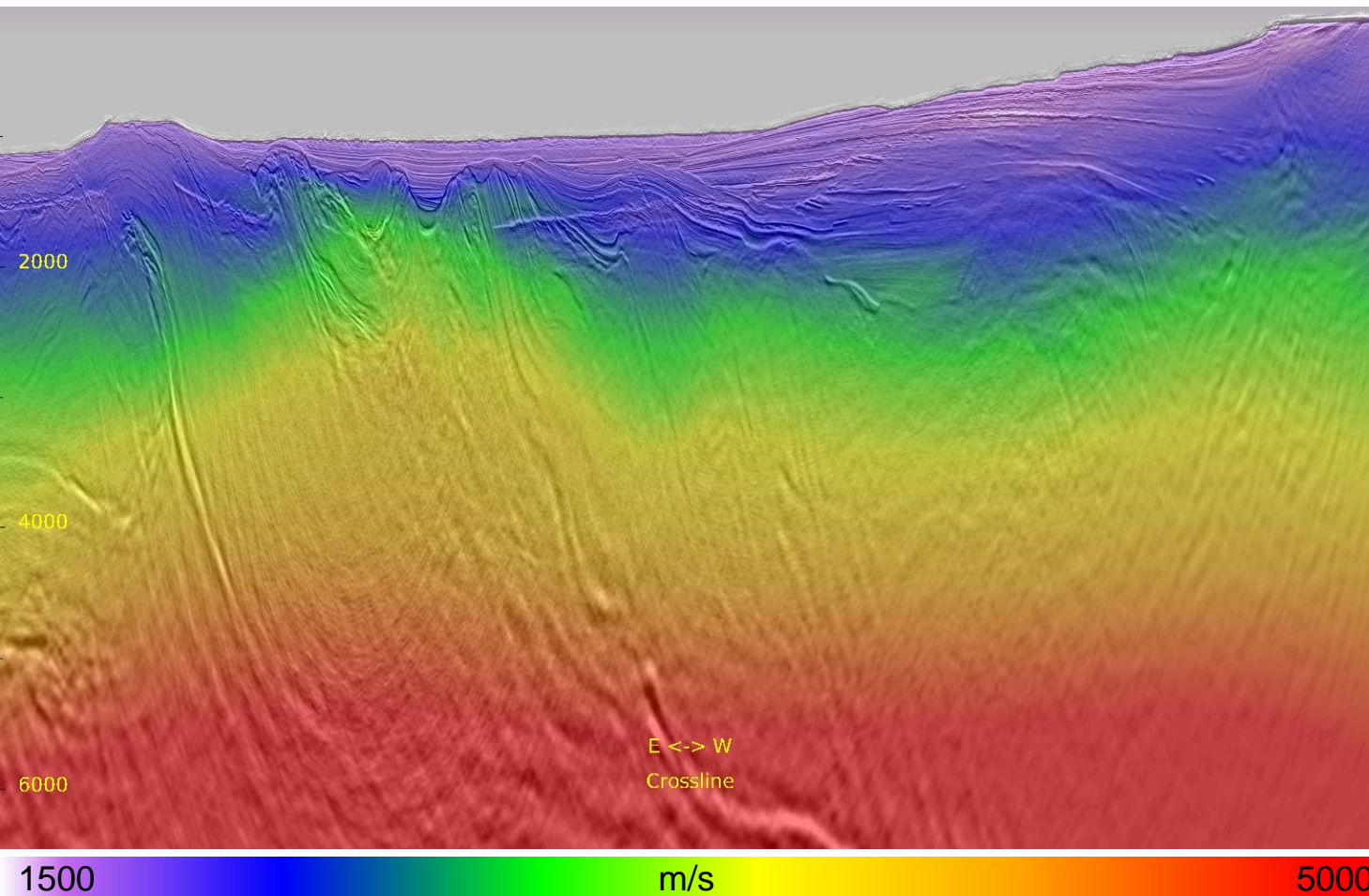
6



- IT1 ISO tomography overall slows down the velocity and provides some details that follow geology.

Inline 436 West: ISO FWI Velocity

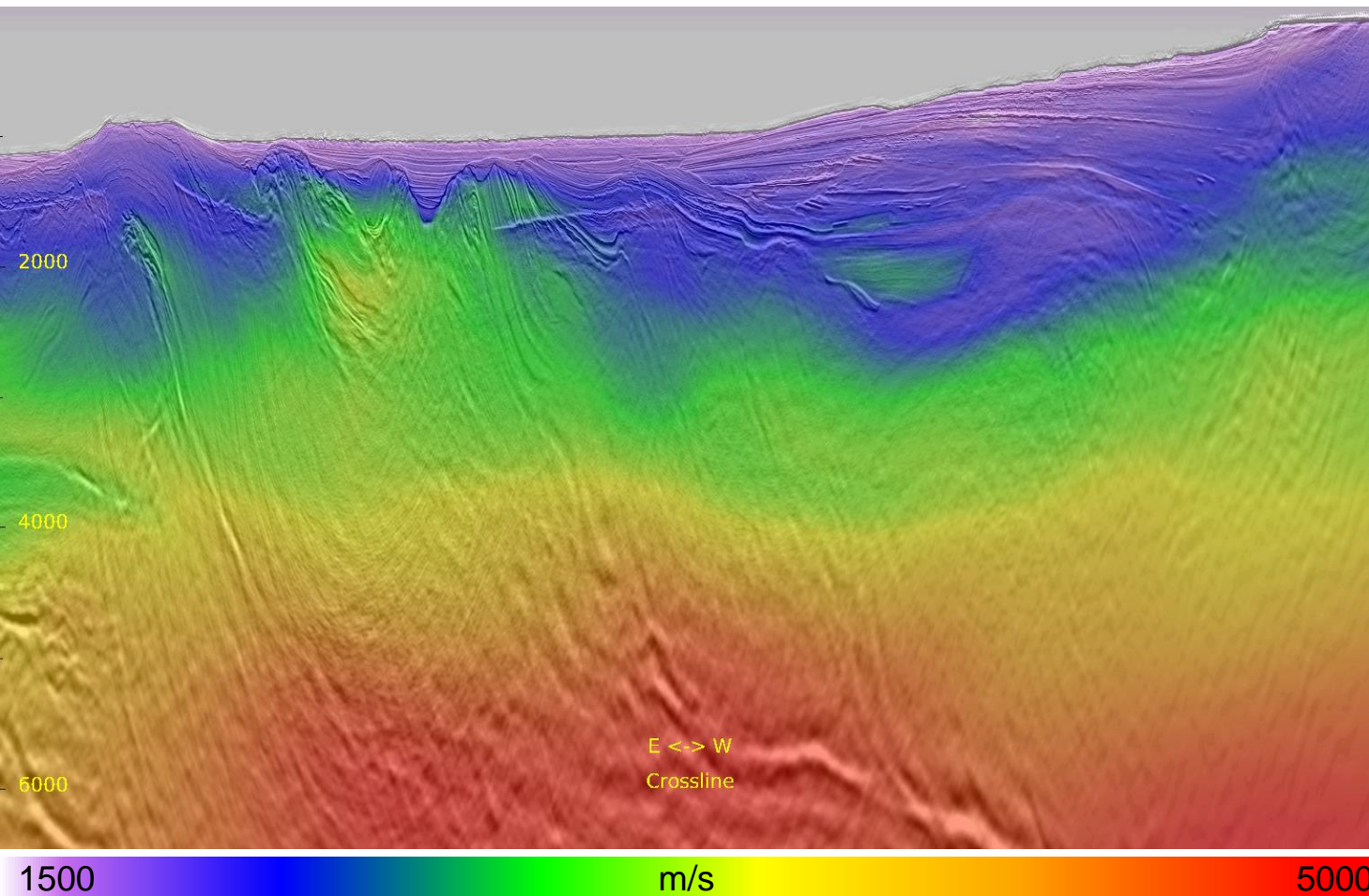
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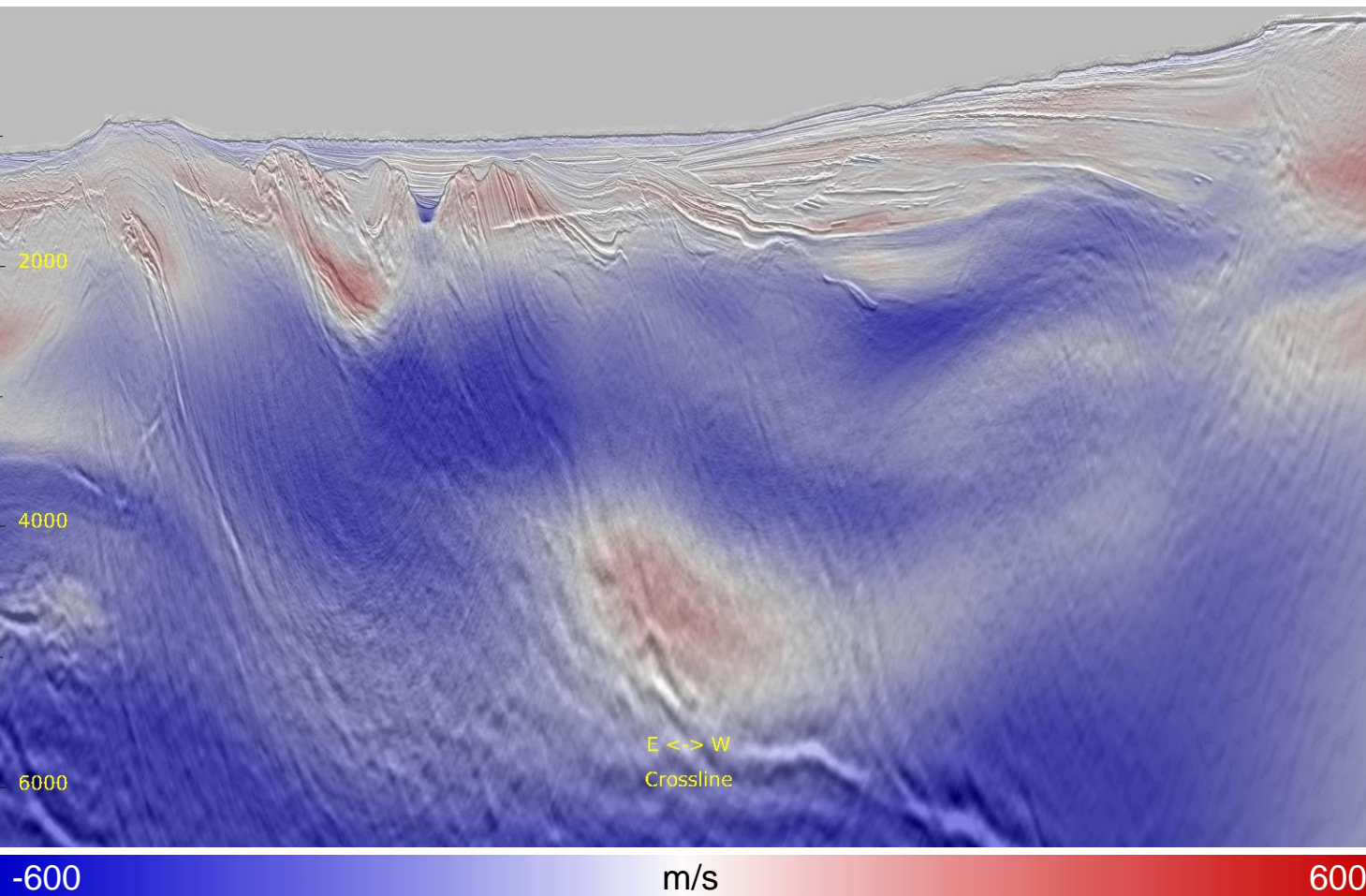
- Starting model is from Modified ISO FWI velocity.
- Deep area velocity trend still follows water bottom.

Inline 436 West: IT1 ISO Tomography Velocity

8



- IT1 ISO tomography overall slows down the velocity and provides some details that follow geology.
- More smoothed update in low S/N area.



- IT1 ISO tomography overall slows down the velocity and provides some details that follow geology.
- More smoothed update in low S/N area.

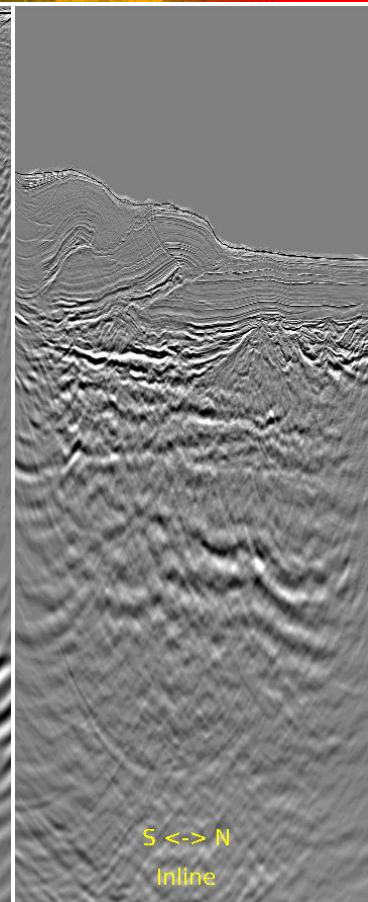
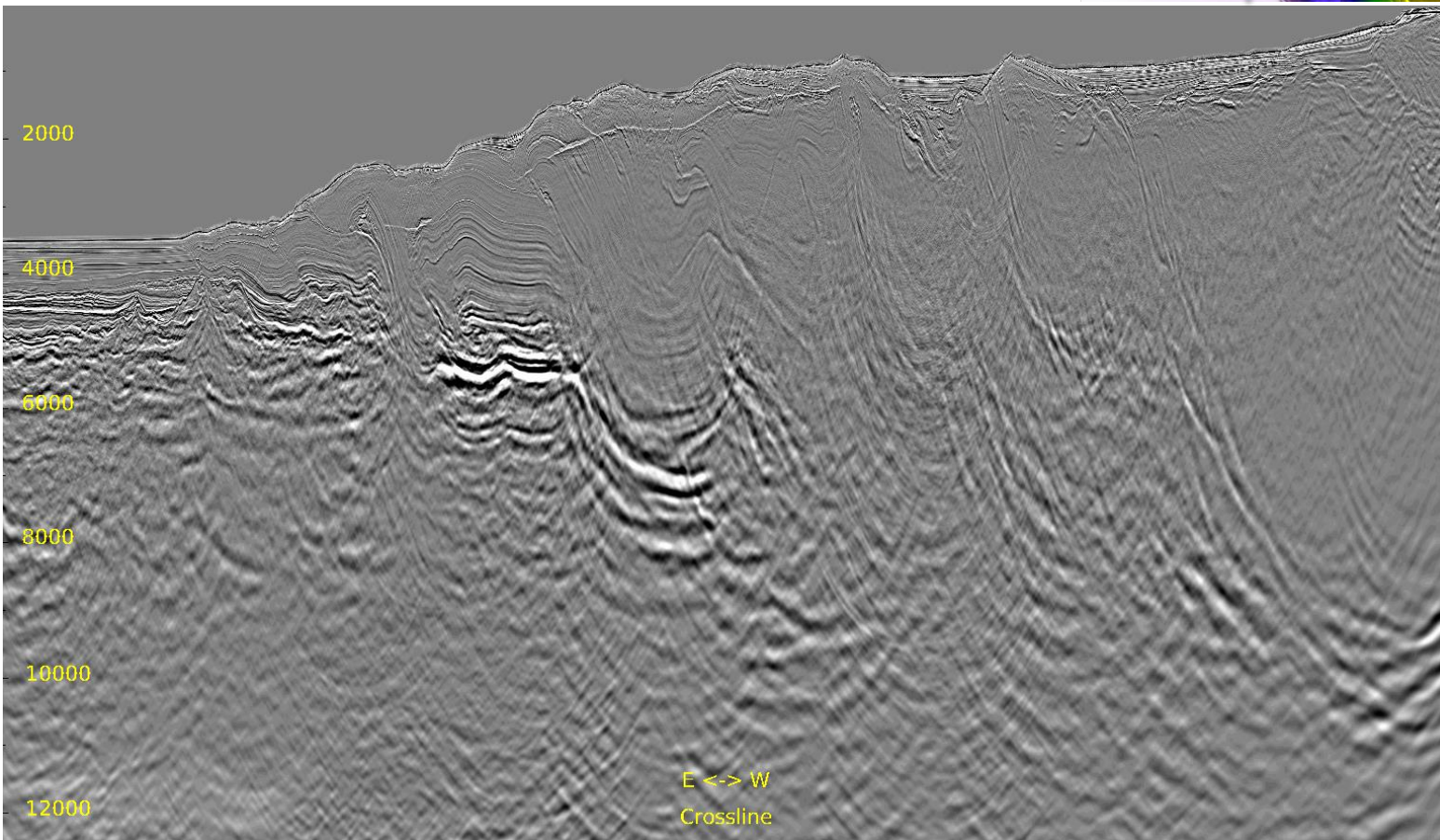
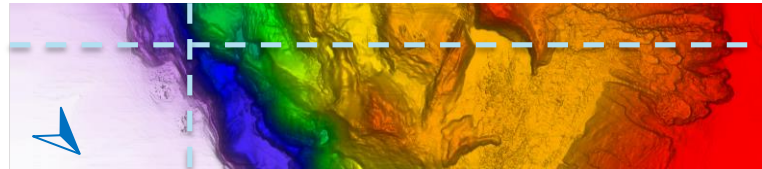
Kirchhoff Depth Migration





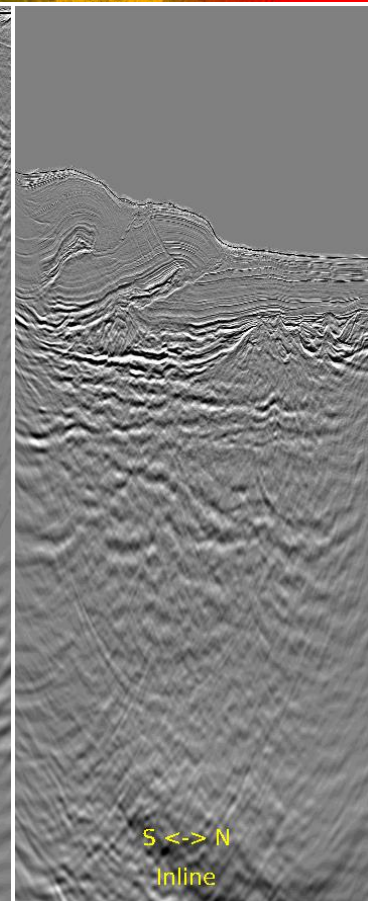
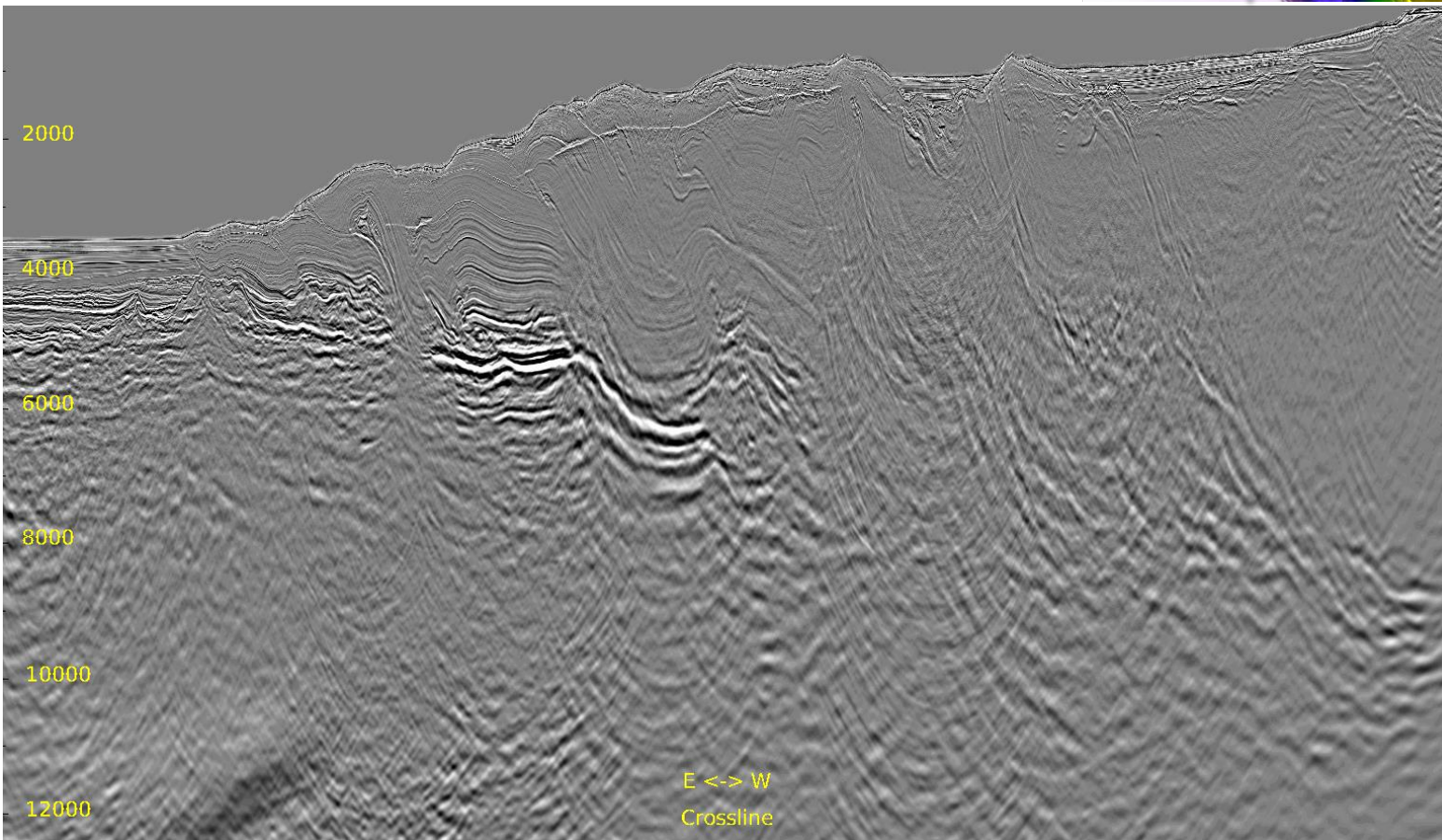
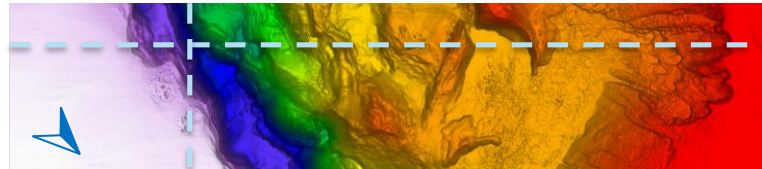
Full Stack: ISO FWI

Inline 236 & Crossline 1540



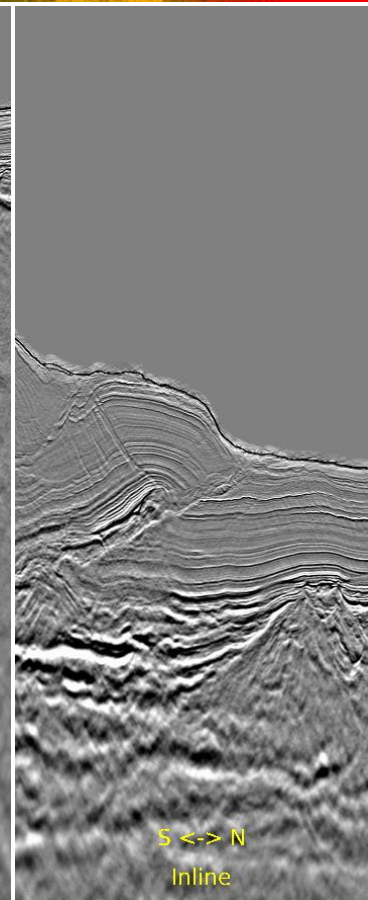
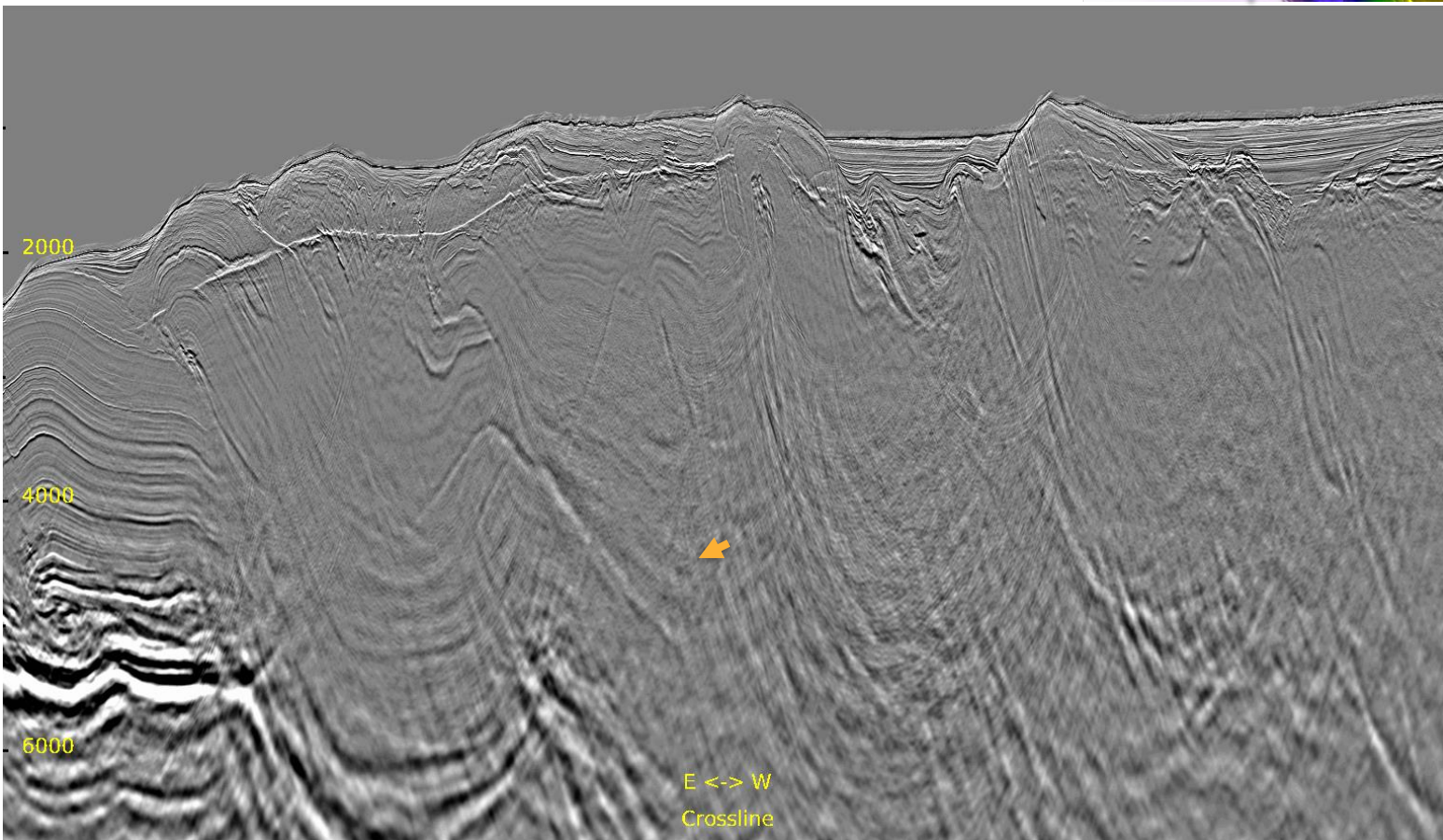
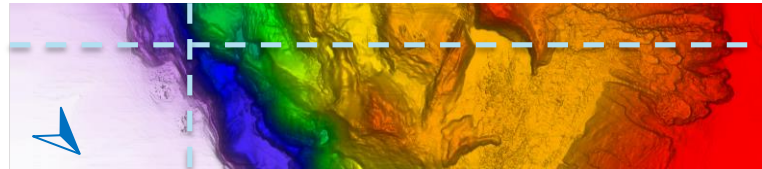
Full Stack: IT1 ISO Tomogray

Inline 236 & Crossline 1540



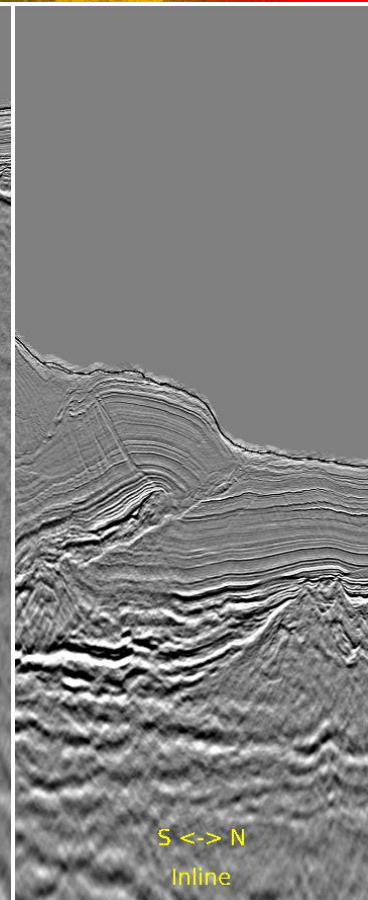
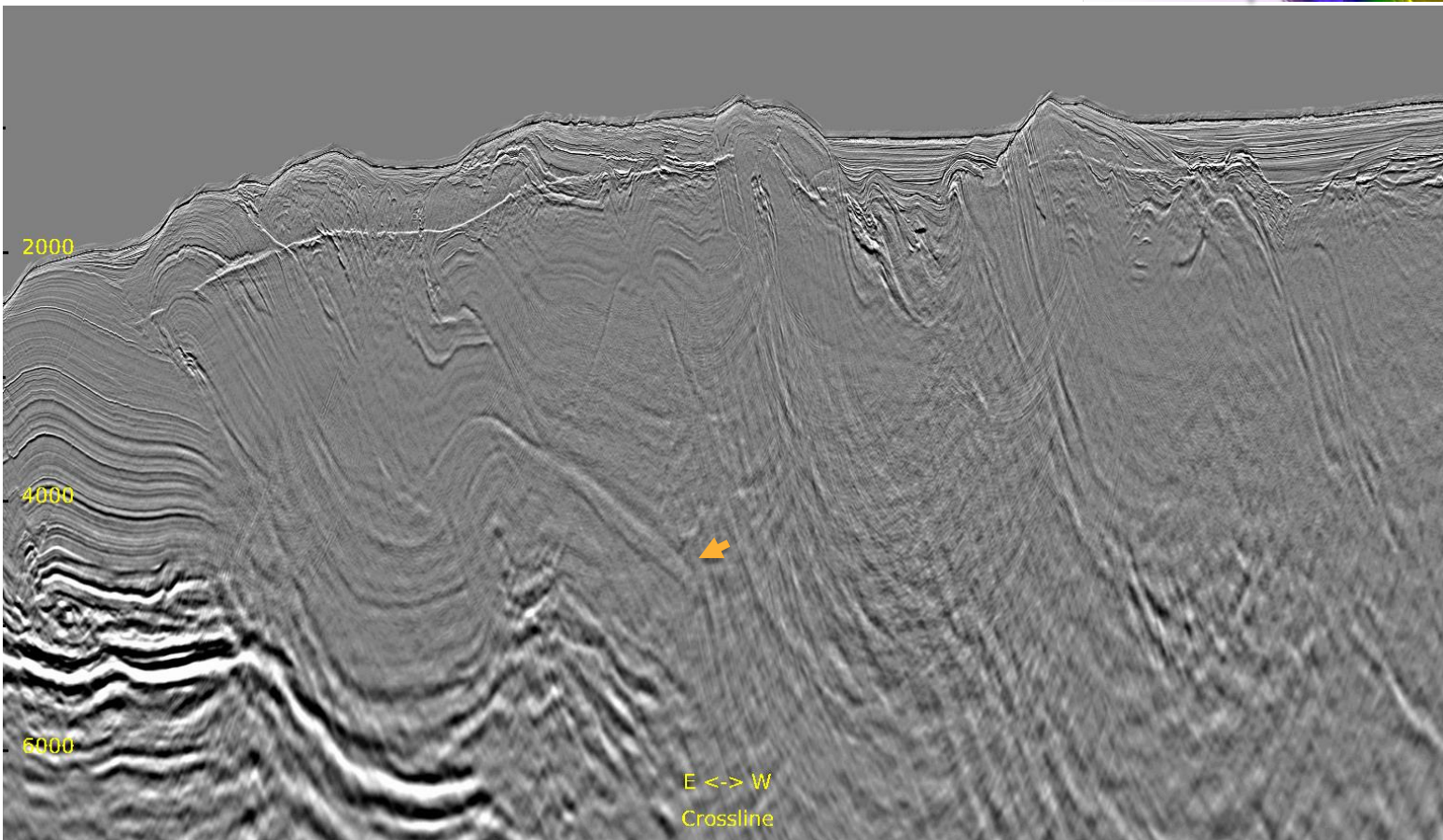
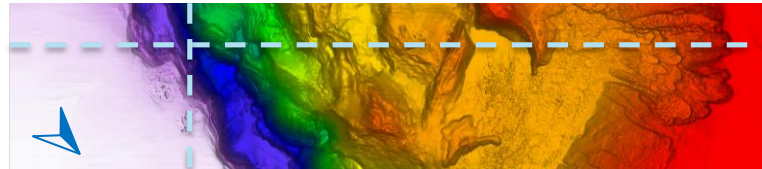
Zoomed Full Stack: ISO FWI

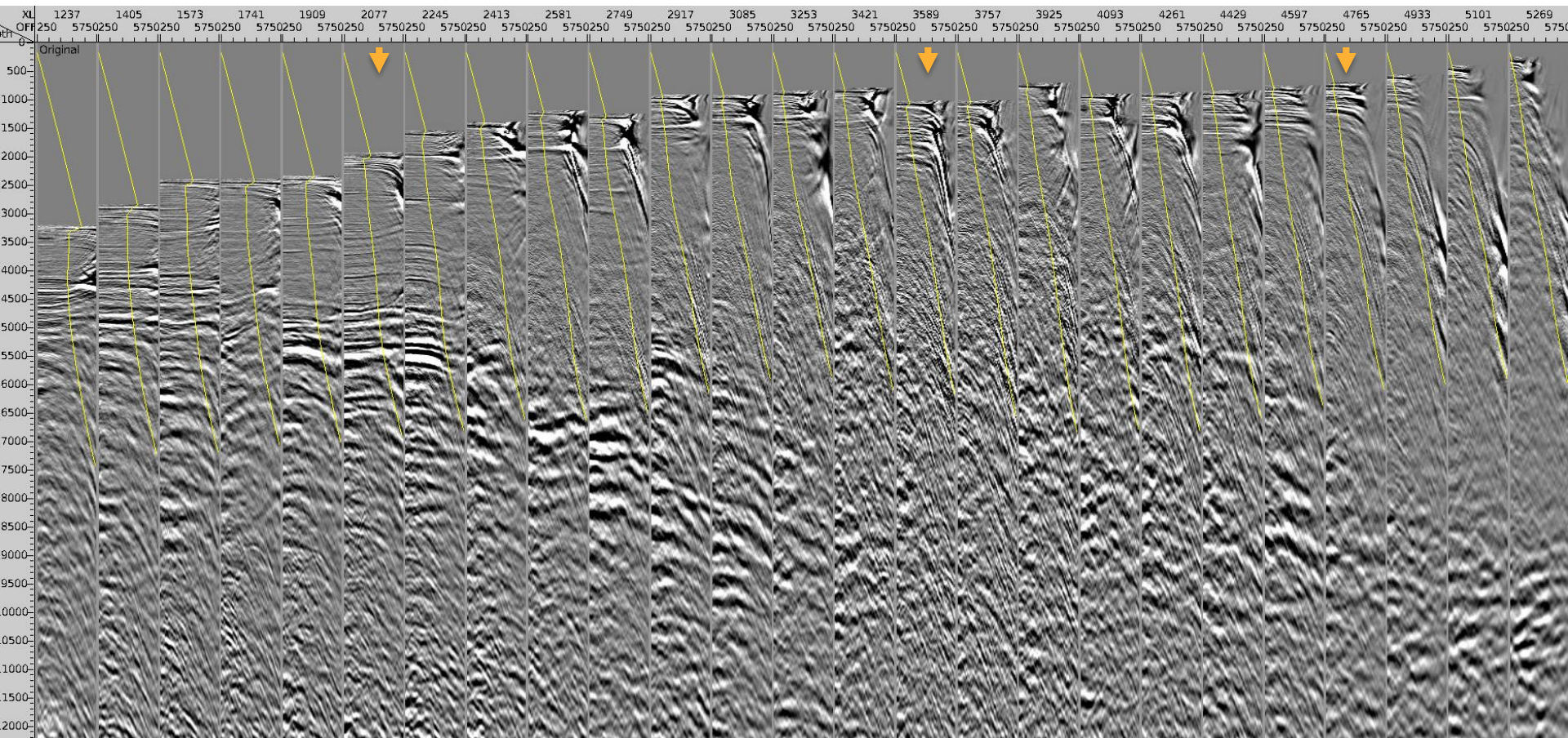
Inline 236 & Crossline 1540



Zoomed Full Stack: IT1 ISO Tomogray

Inline 236 & Crossline 1540



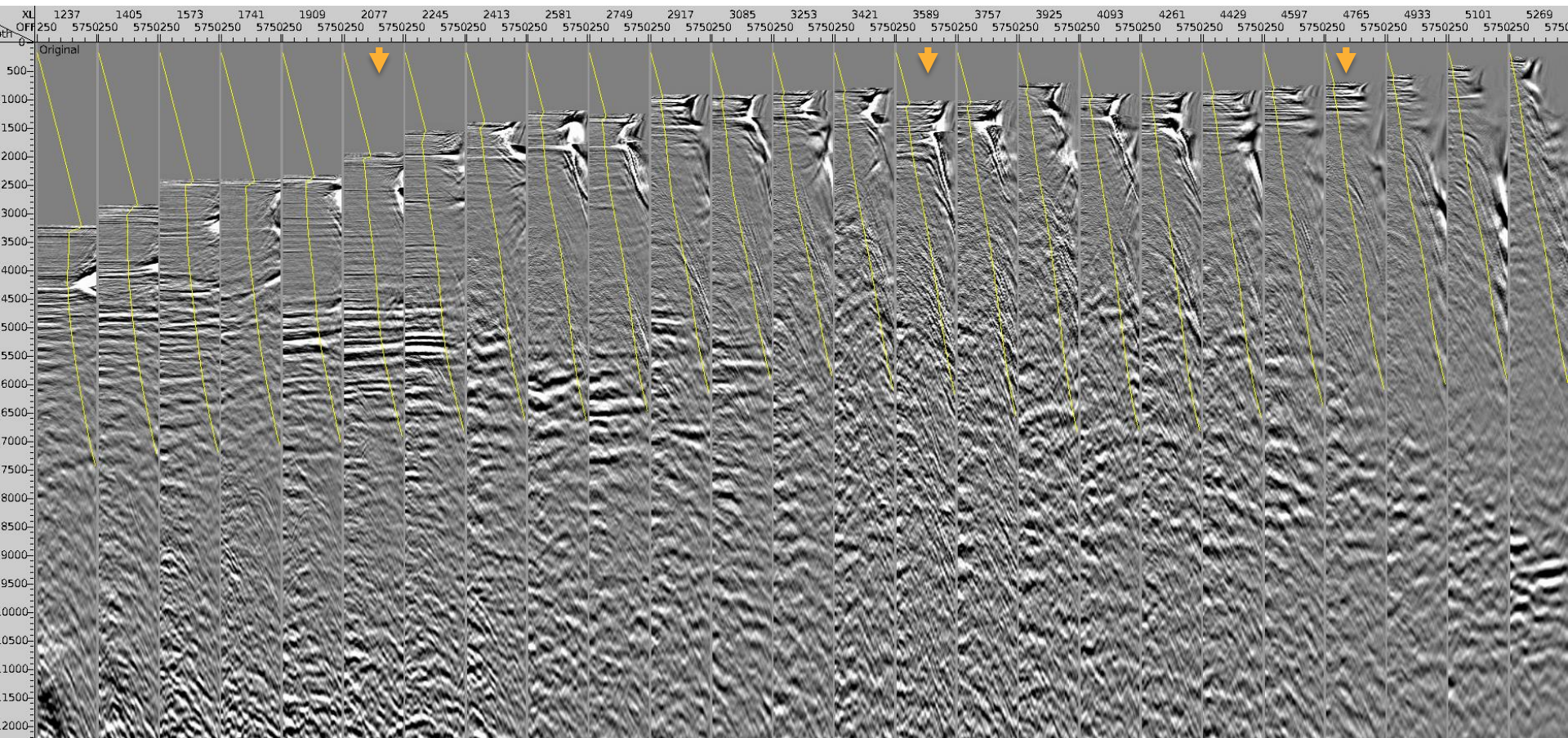




Inline 236 CDP Gathers: IT1 ISO Tomogray

— 35° Mute

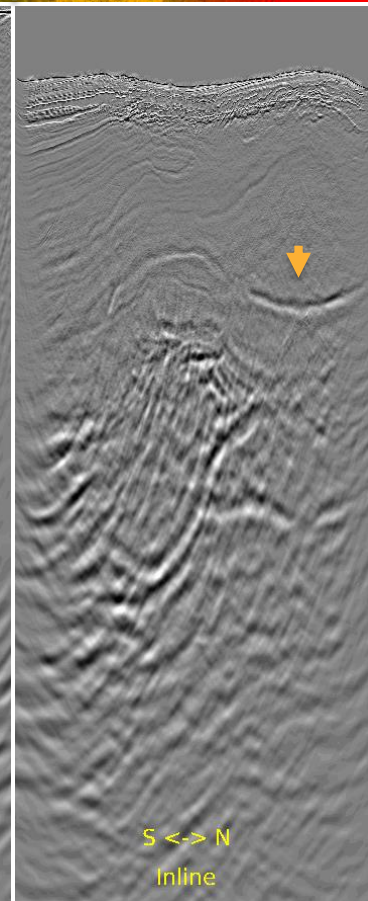
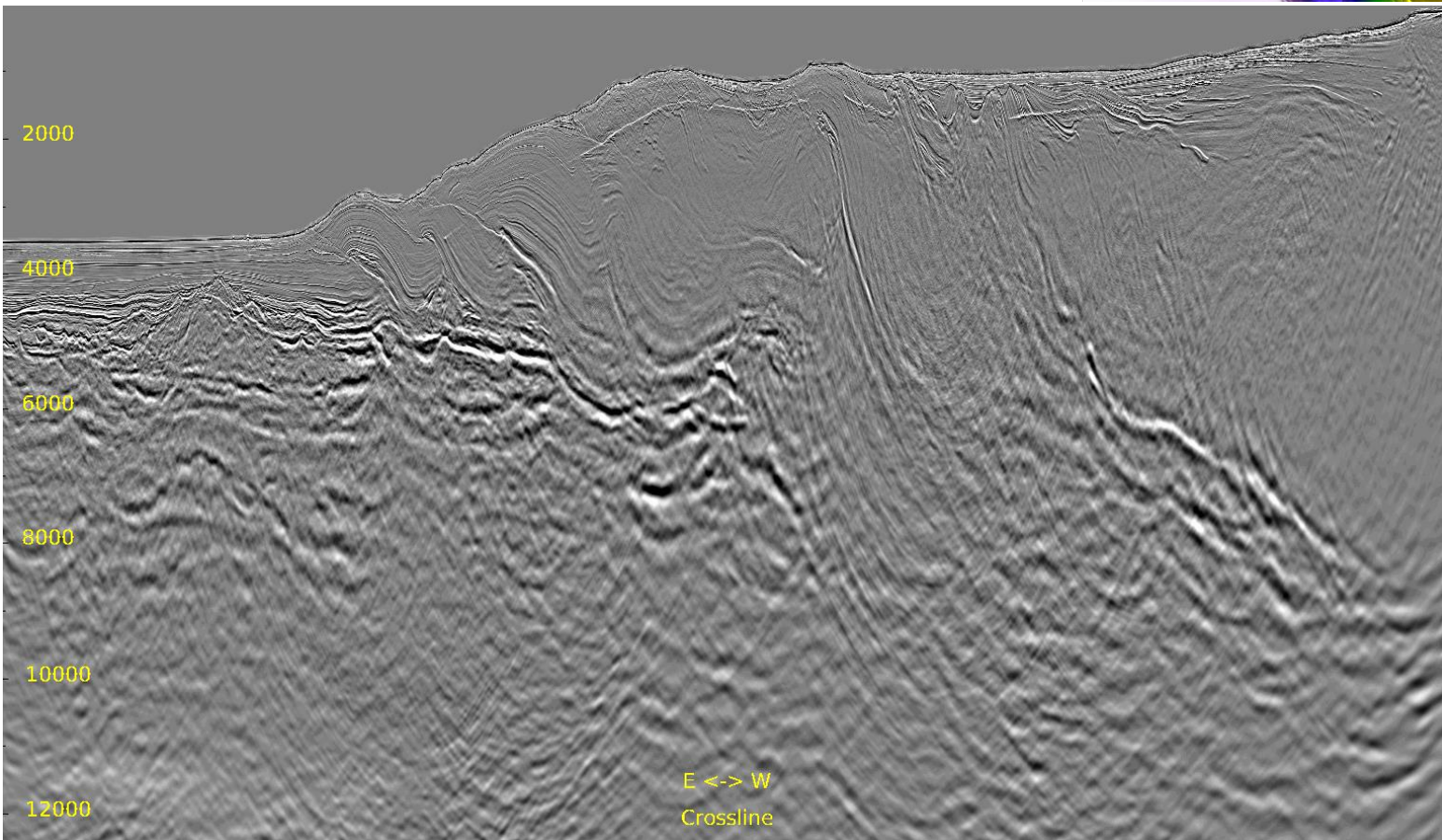
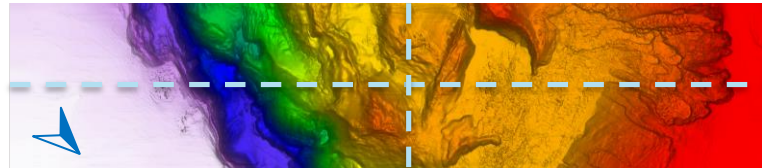
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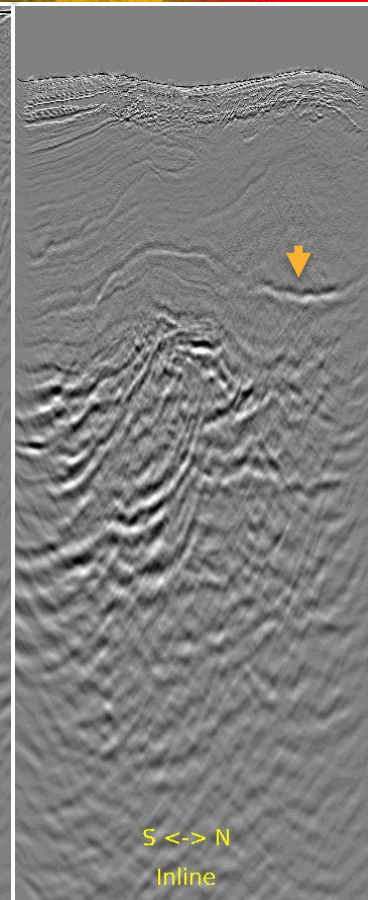
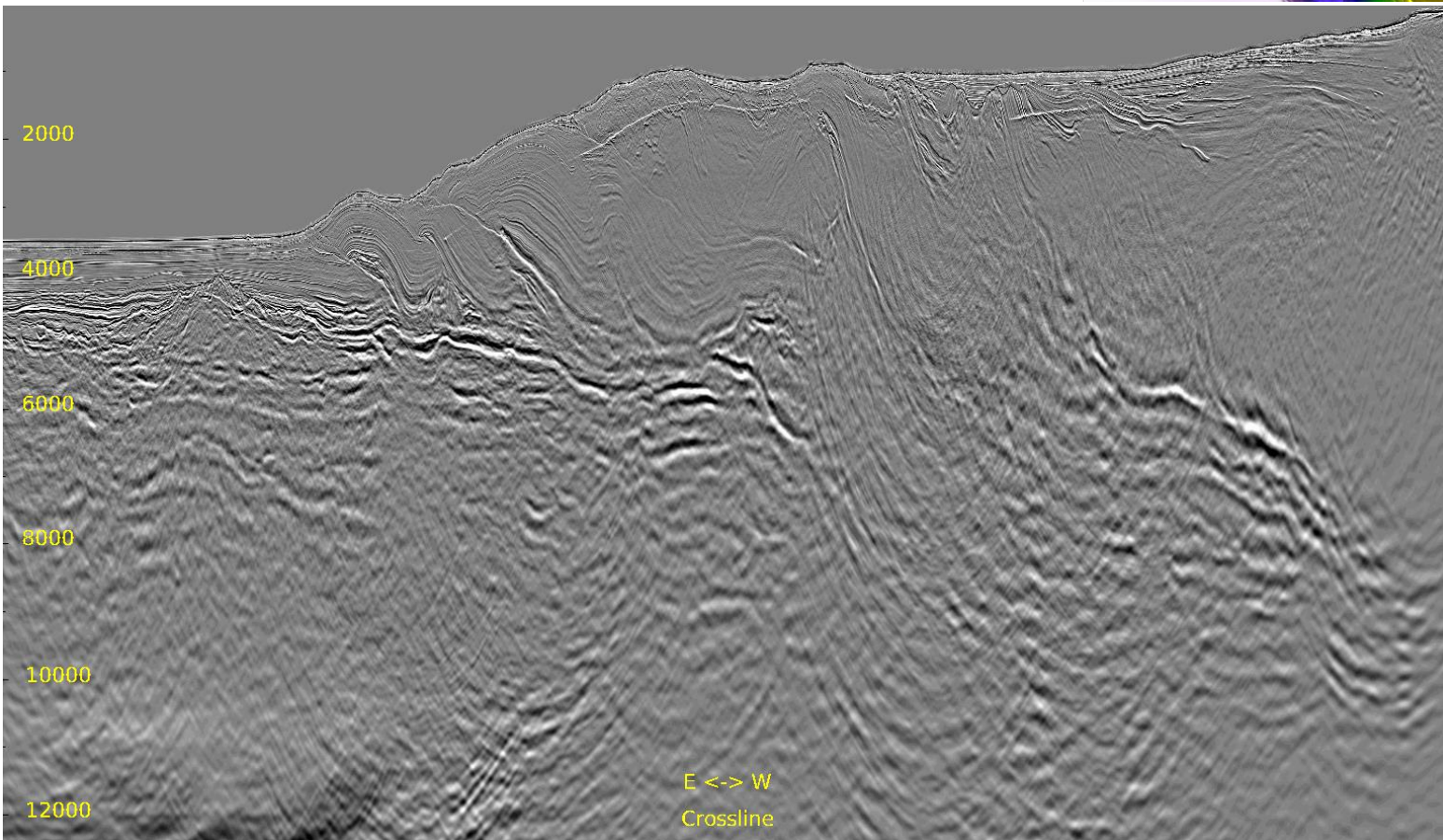
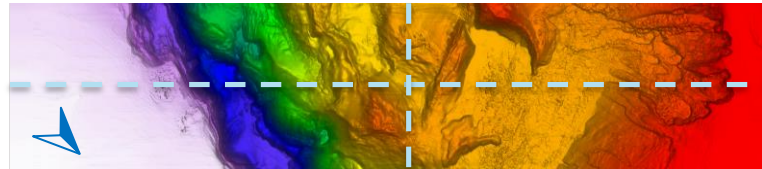
Full Stack: ISO FWI

Inline 436 & Crossline 3040



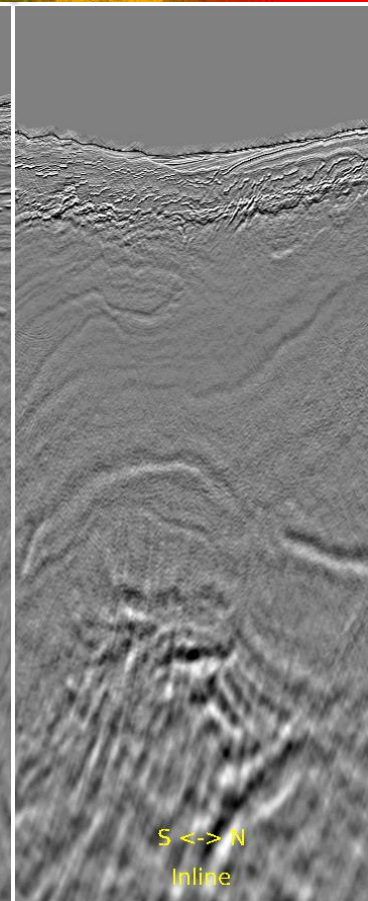
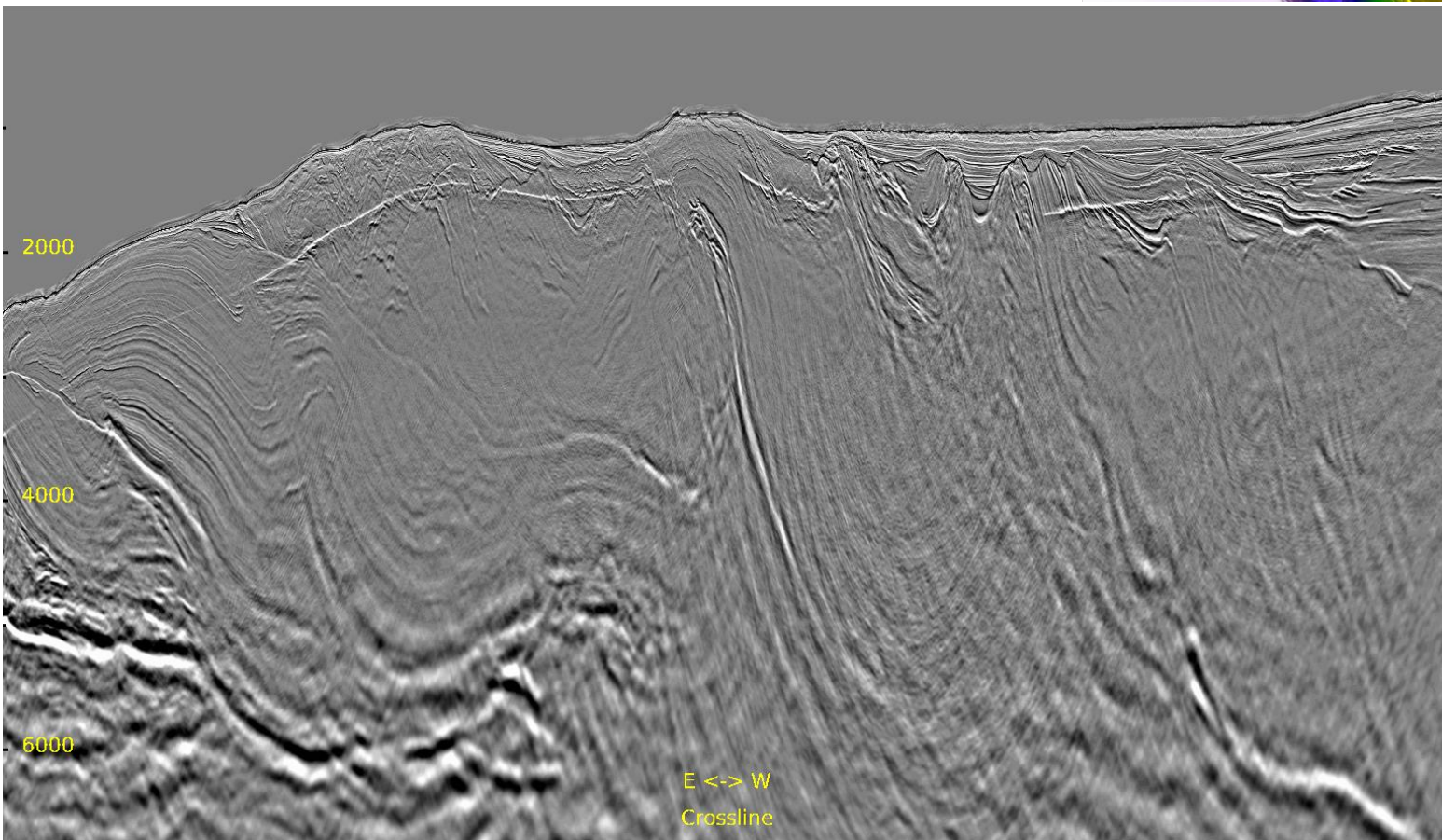
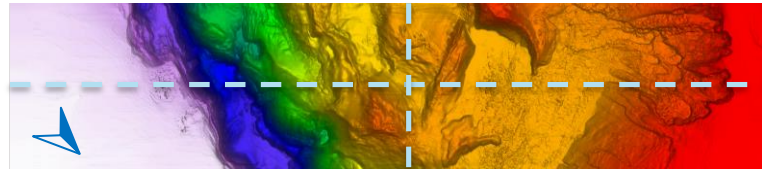
Full Stack: IT1 ISO Tomogray

Inline 436 & Crossline 3040



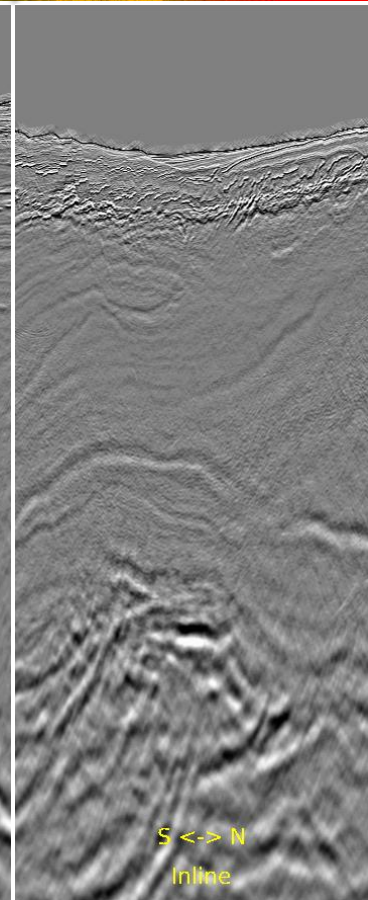
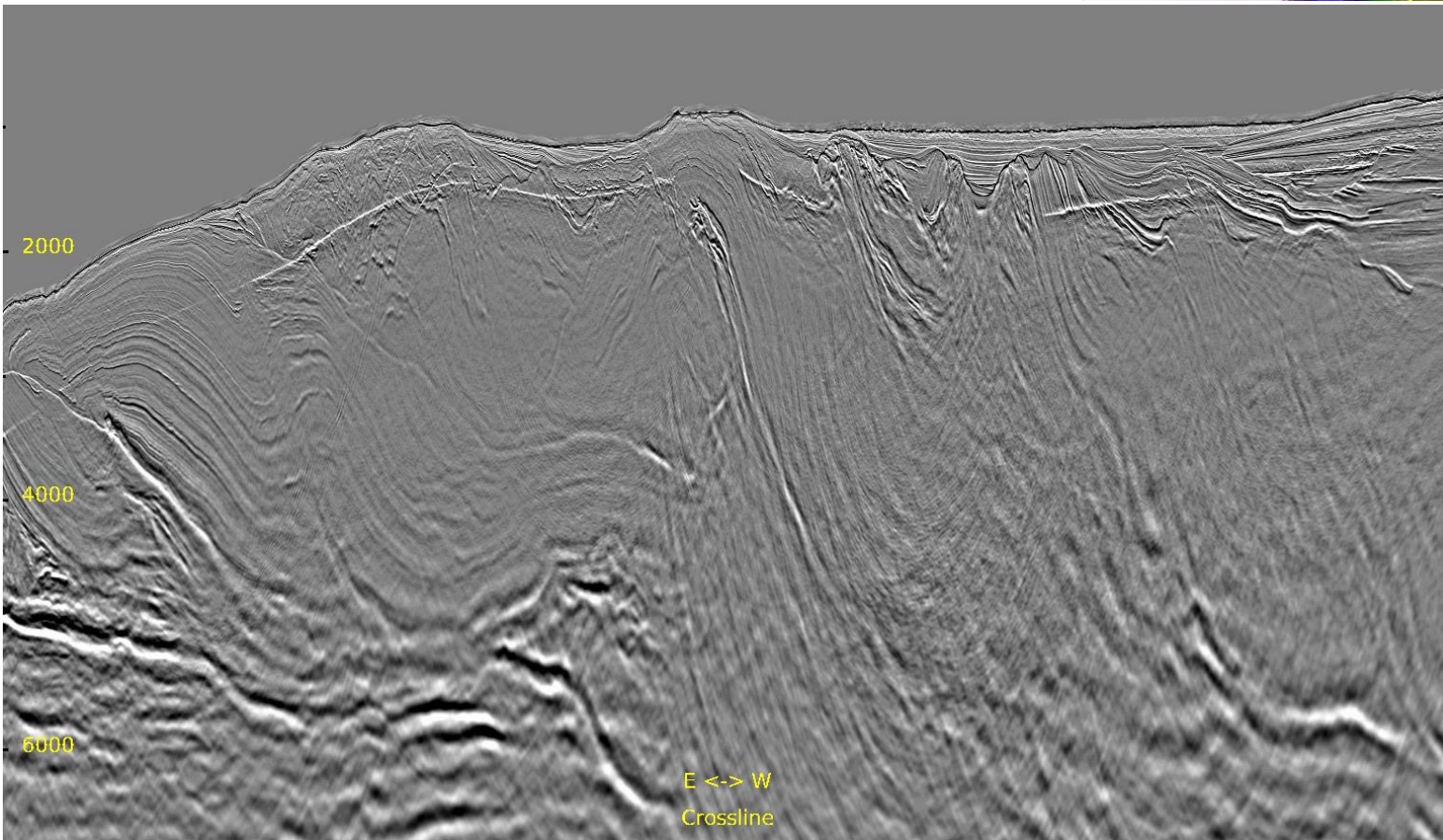
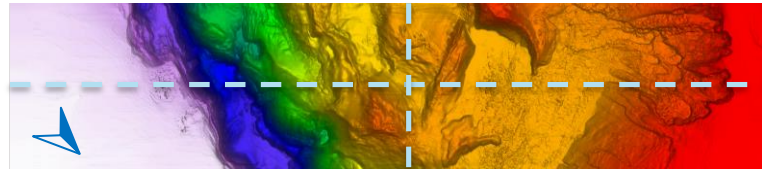
Zoomed Full Stack: ISO FWI

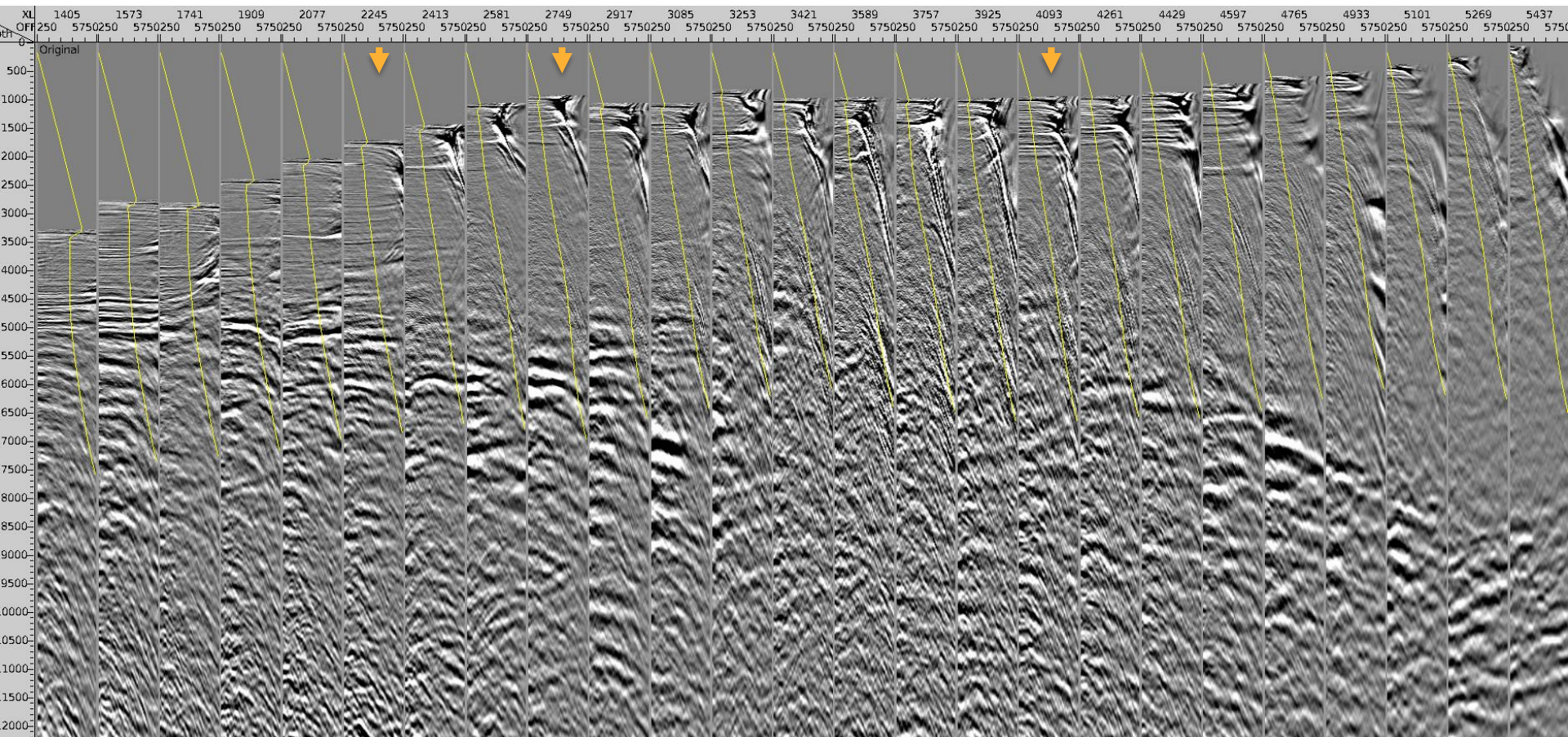
Inline 436 & Crossline 3040



Zoomed Full Stack: IT1 ISO Tomogray

Inline 436 & Crossline 3040



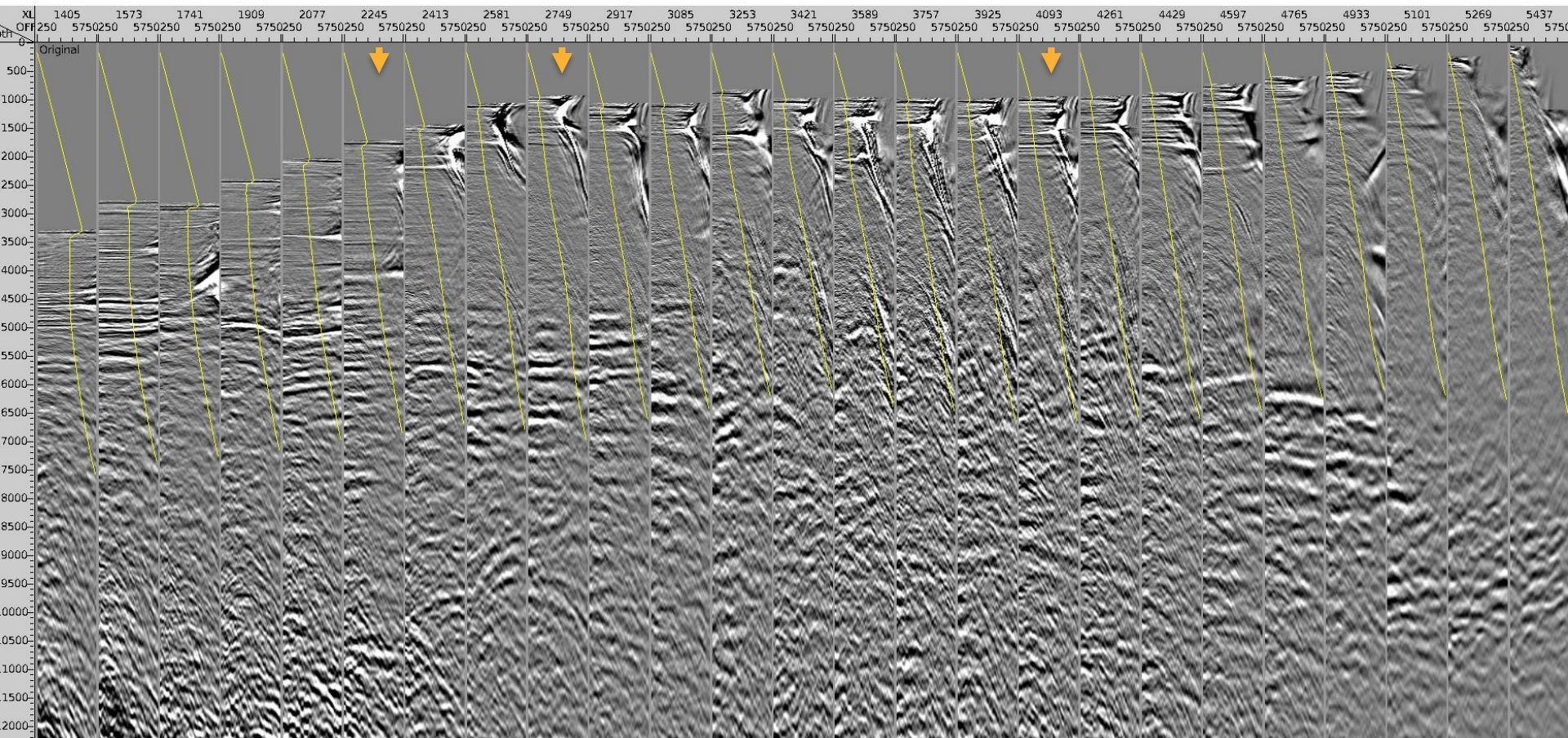




Inline 436 CDP Gathers: IT1 ISO Tomogray

— 35° Mute

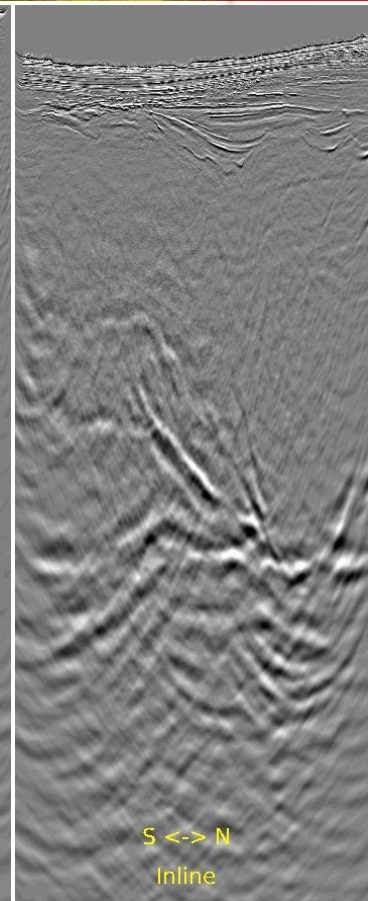
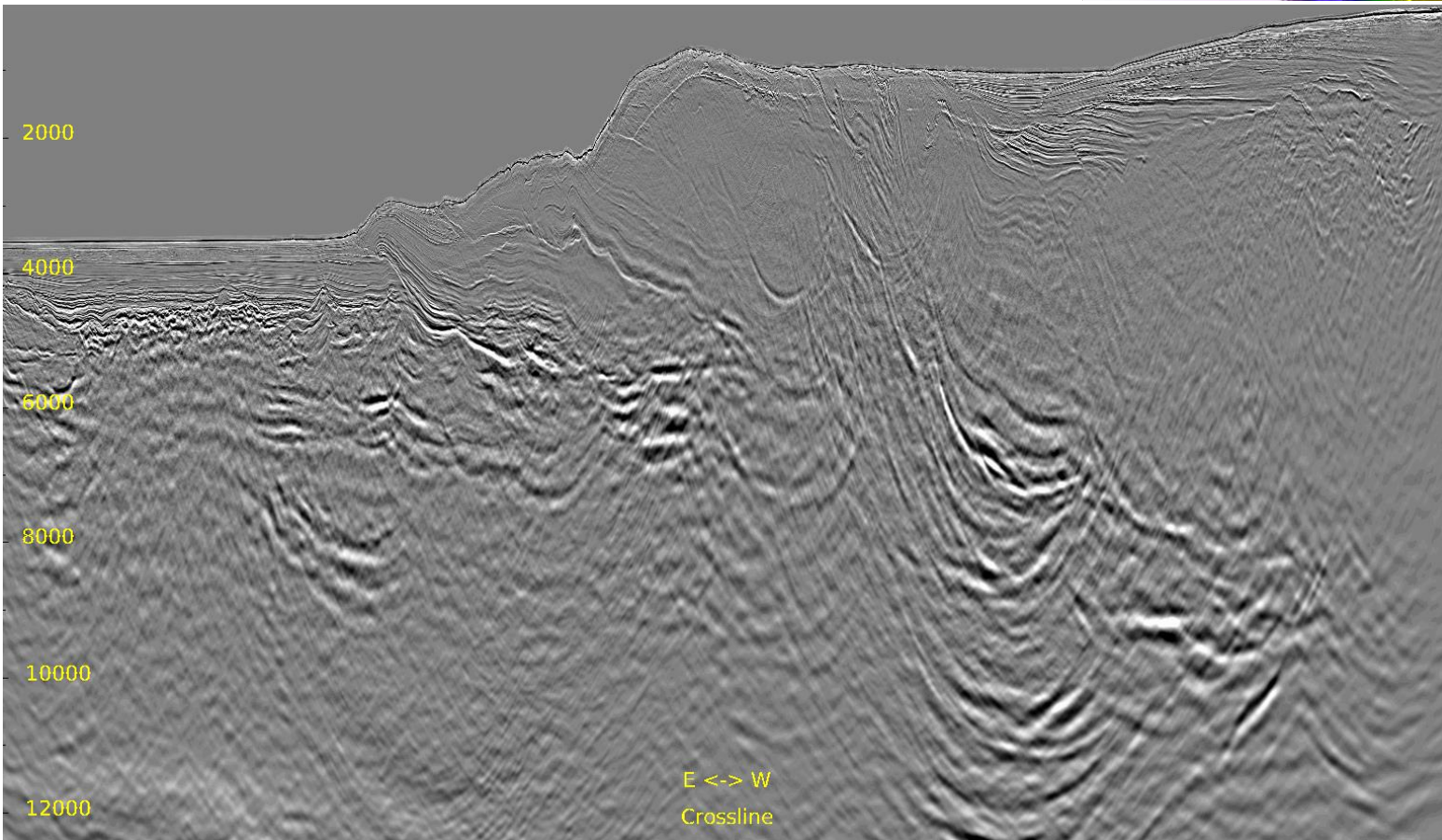
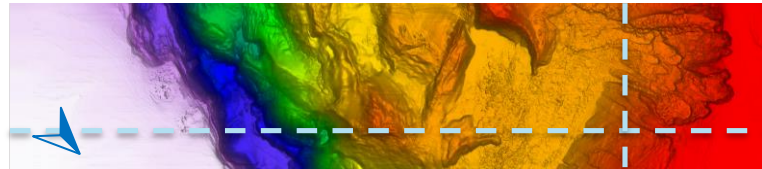
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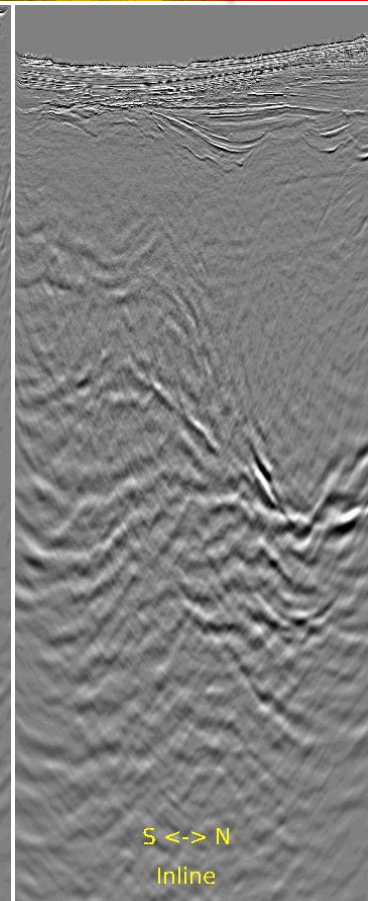
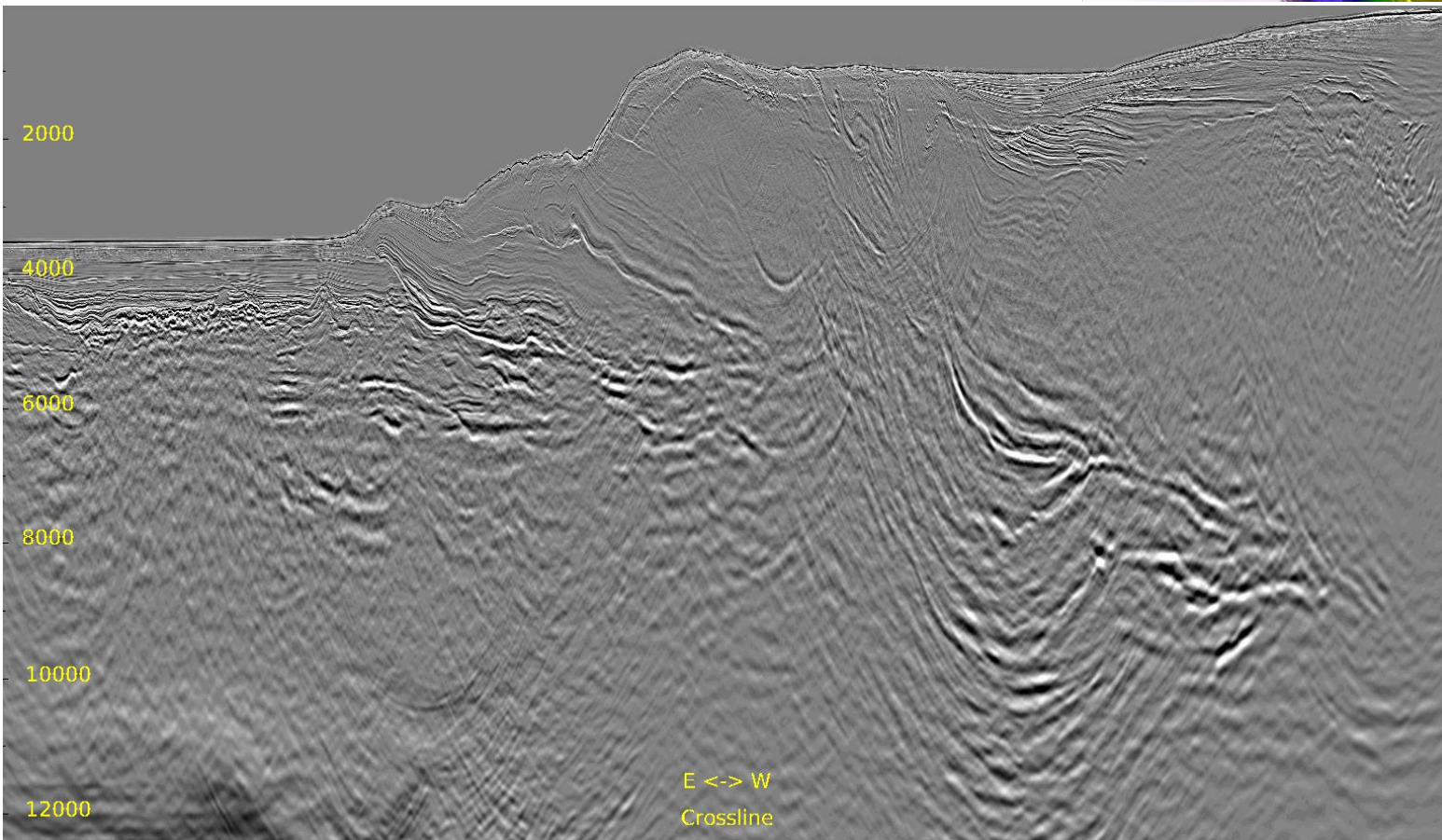
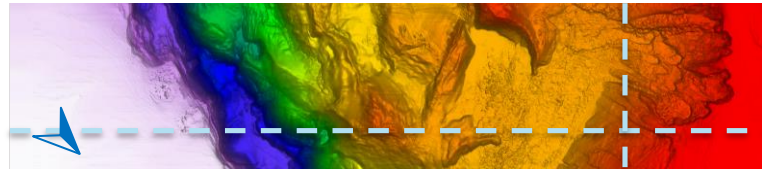
Full Stack: ISO FWI

Inline 636 & Crossline 4540



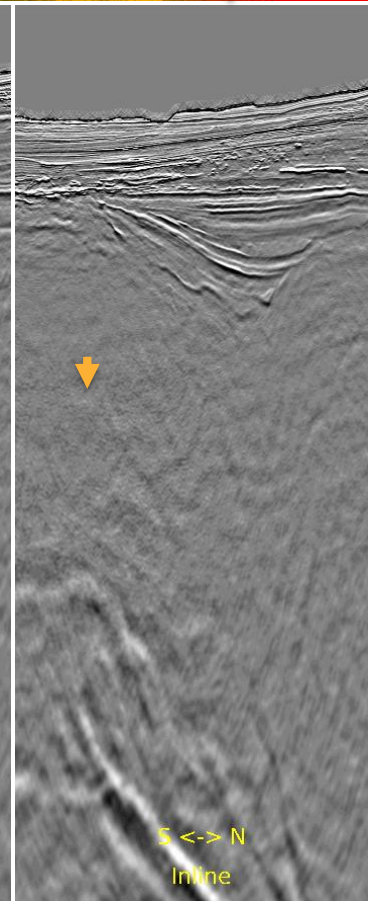
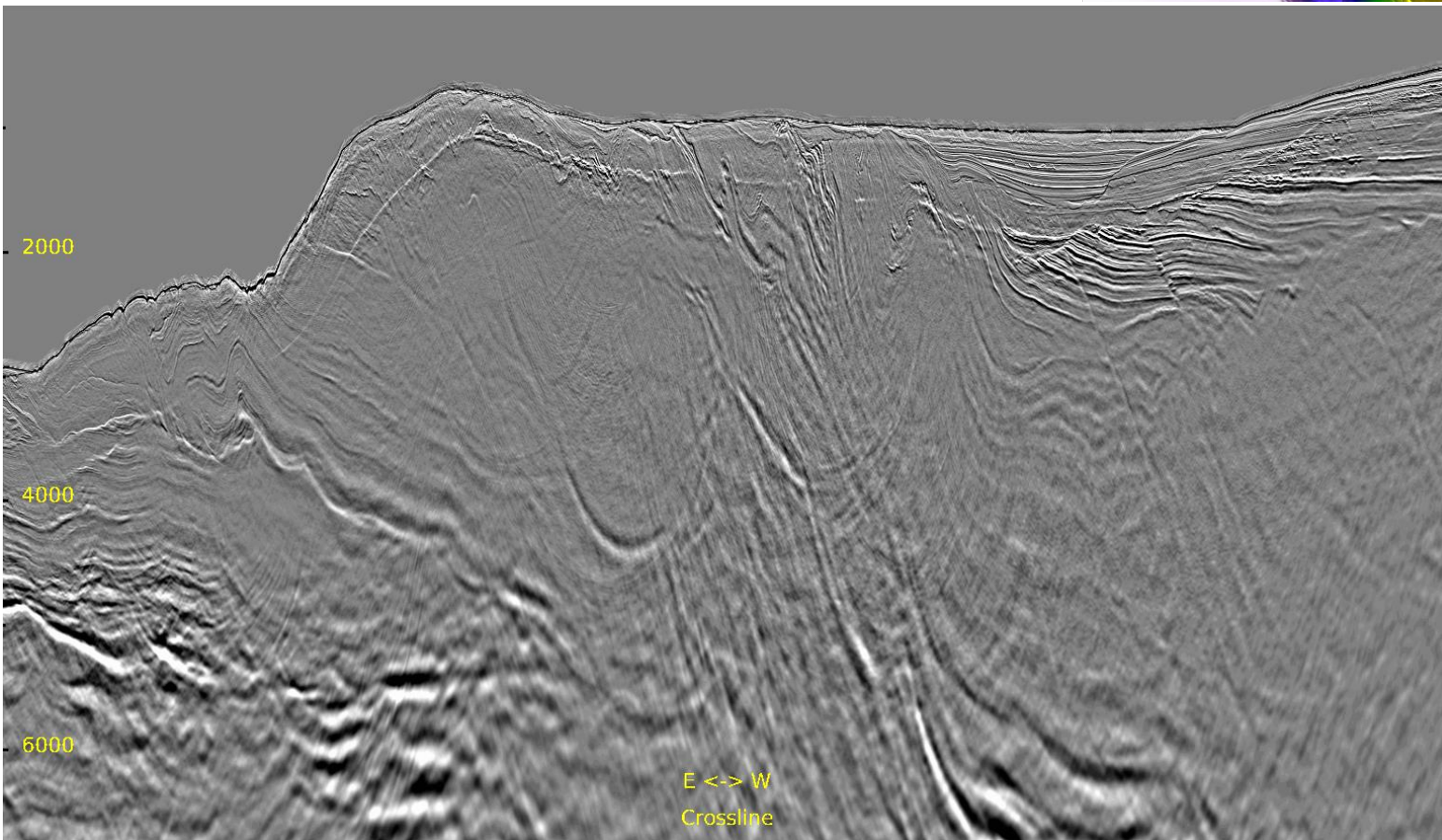
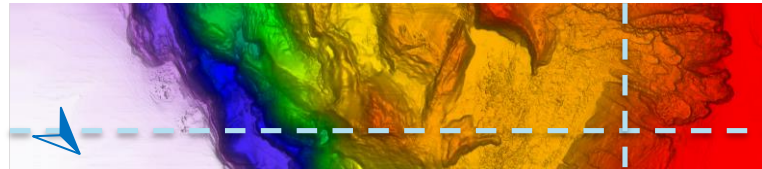
Full Stack: IT1 ISO Tomogray

Inline 636 & Crossline 4540



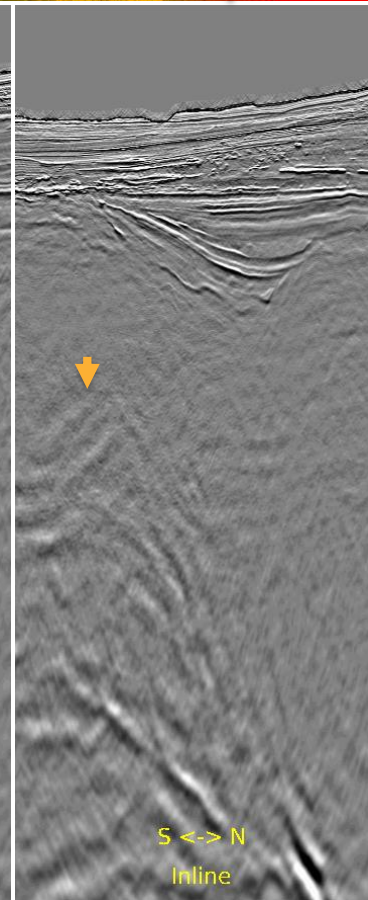
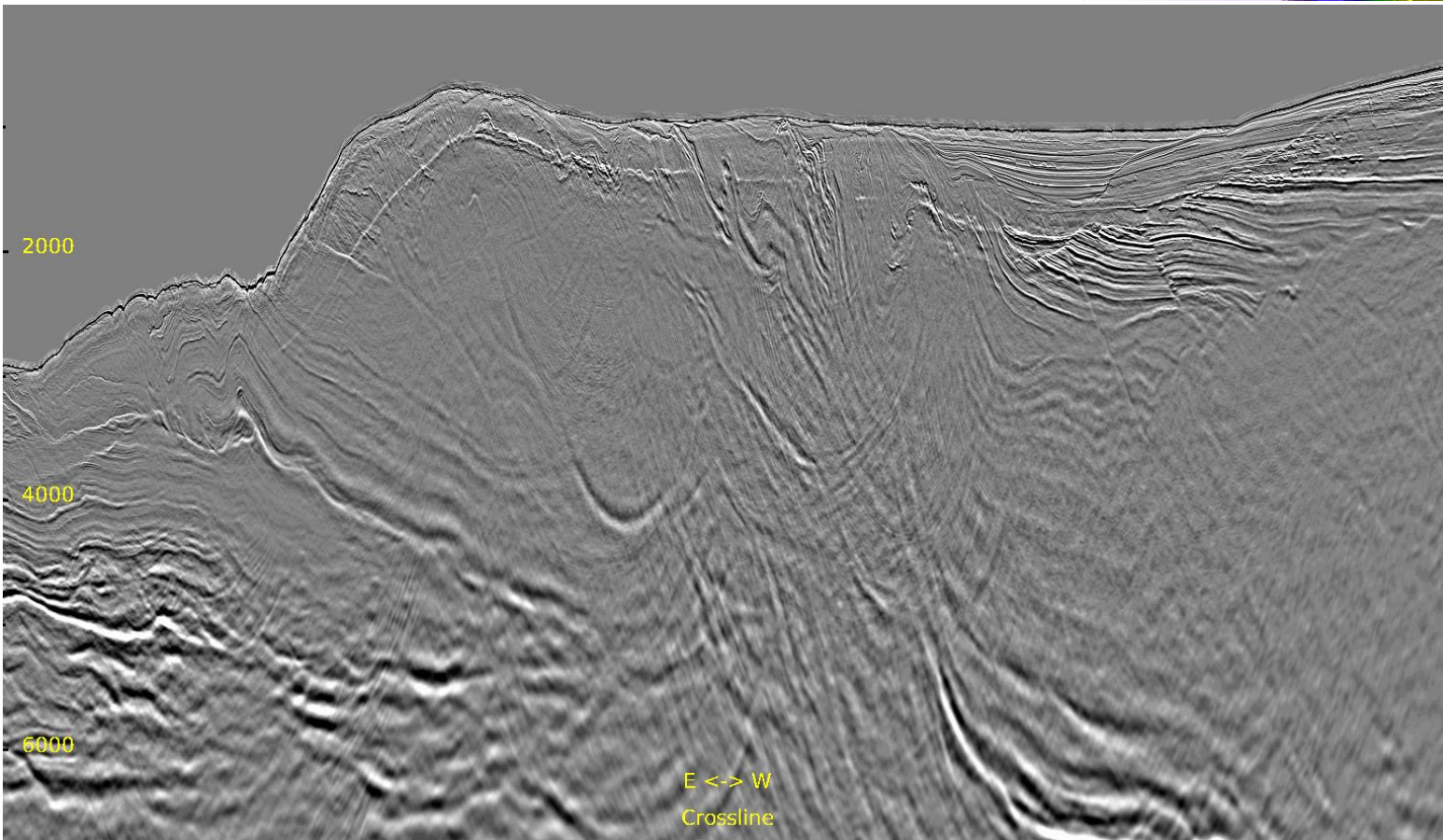
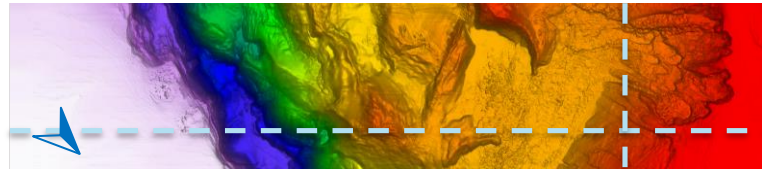
Zoomed Full Stack: ISO FWI

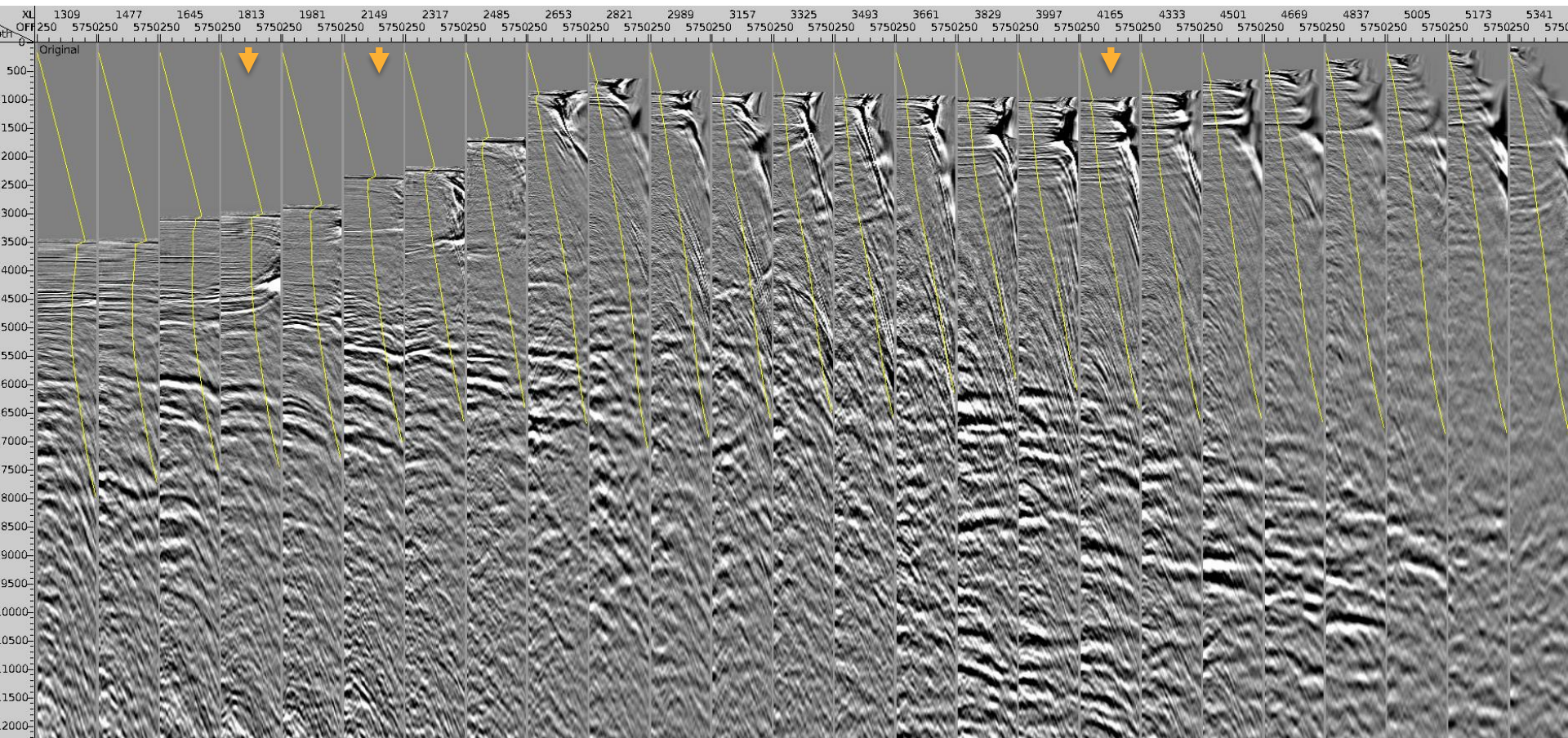
Inline 636 & Crossline 4540



Zoomed Full Stack: IT1 ISO Tomogray

Inline 636 & Crossline 4540



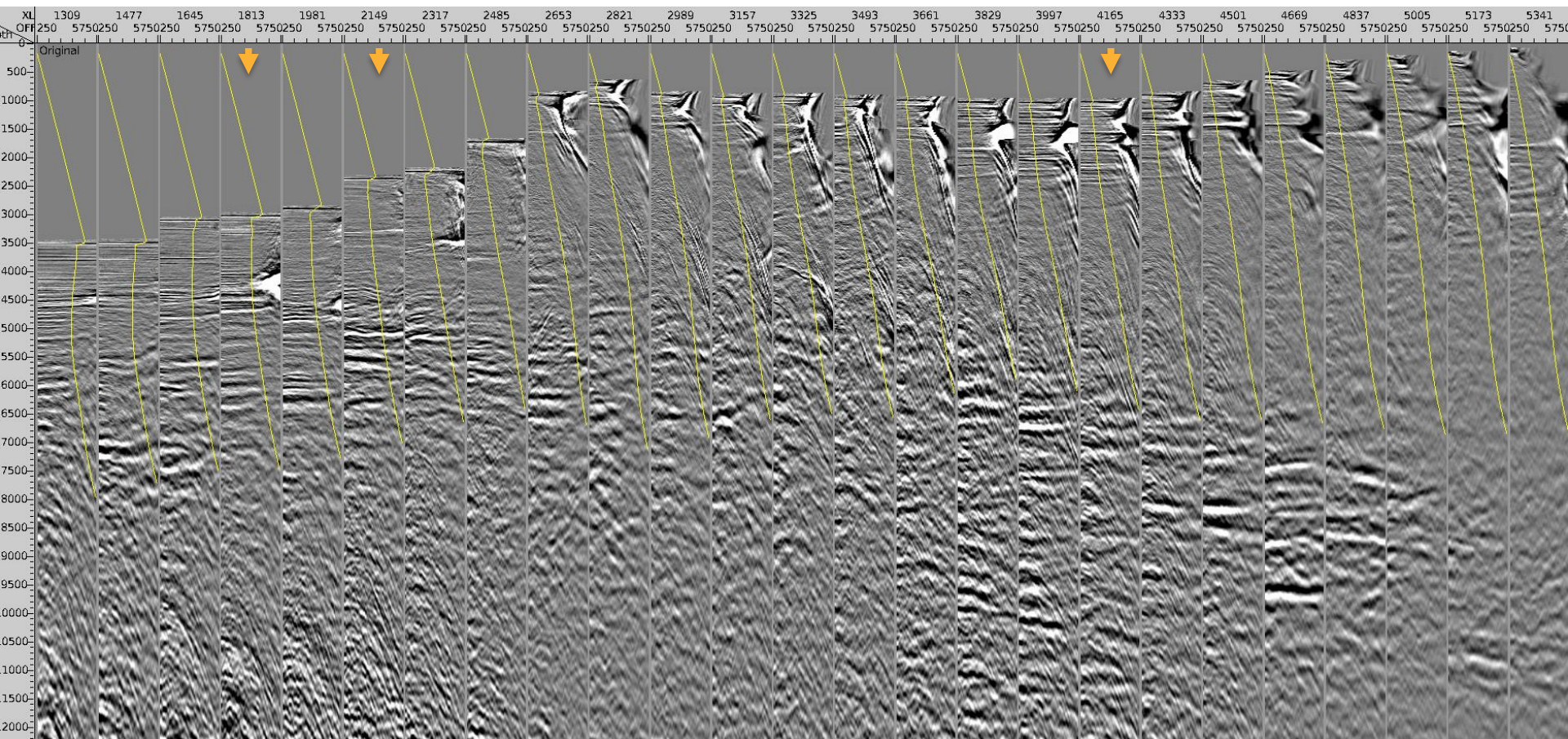


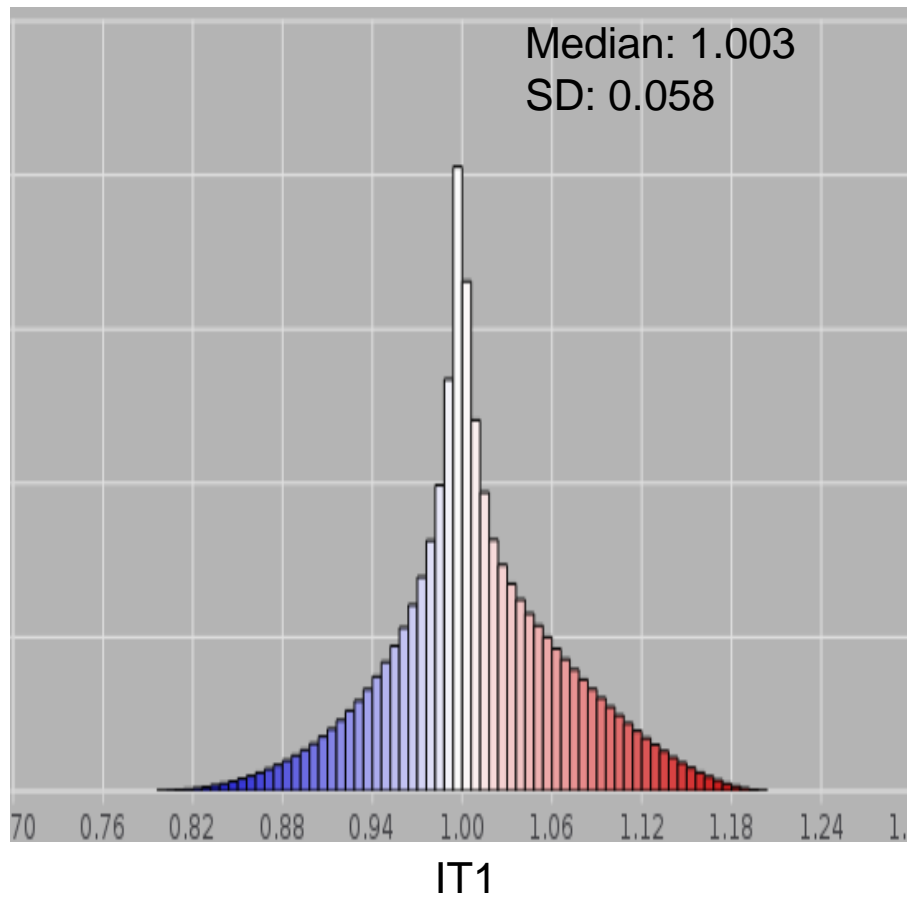
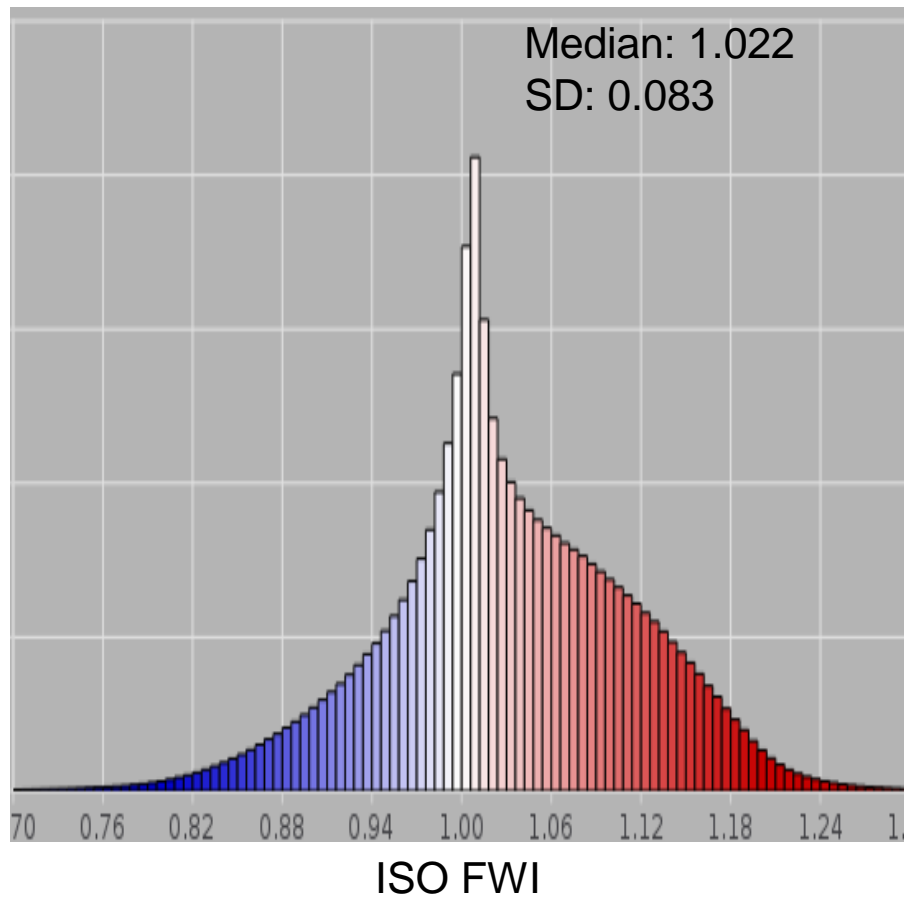


Inline 636 CDP Gathers: IT1 ISO Tomogray

— 35° Mute

28





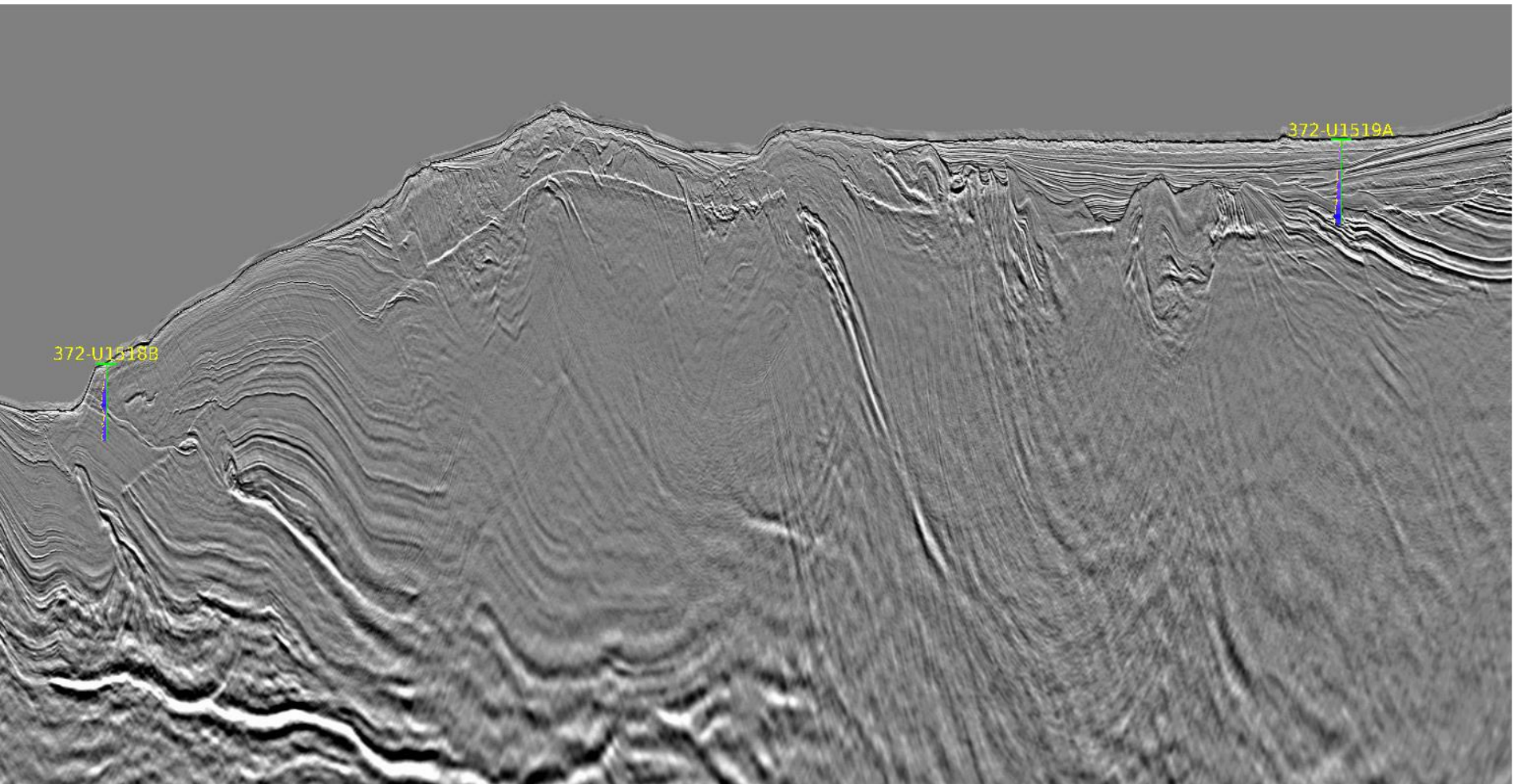
- IT1 ISO tomography gives accurate velocity close to water bottom that can be used to derive anisotropic parameters.
- IT1 gives reasonable deep velocity update which can be a good starting point for TTI FWI.

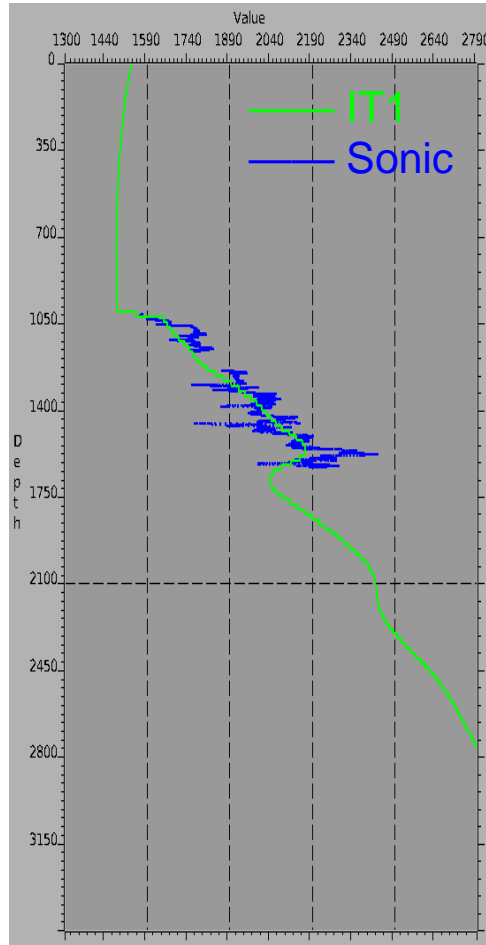
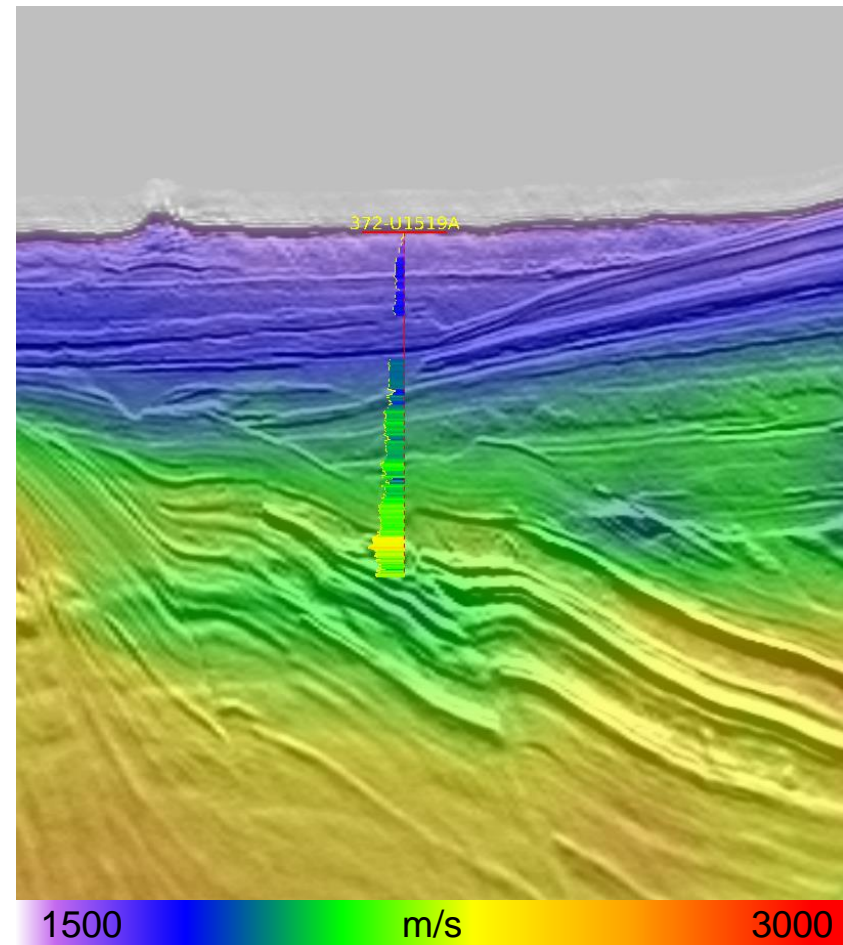
Initial Well Analysis



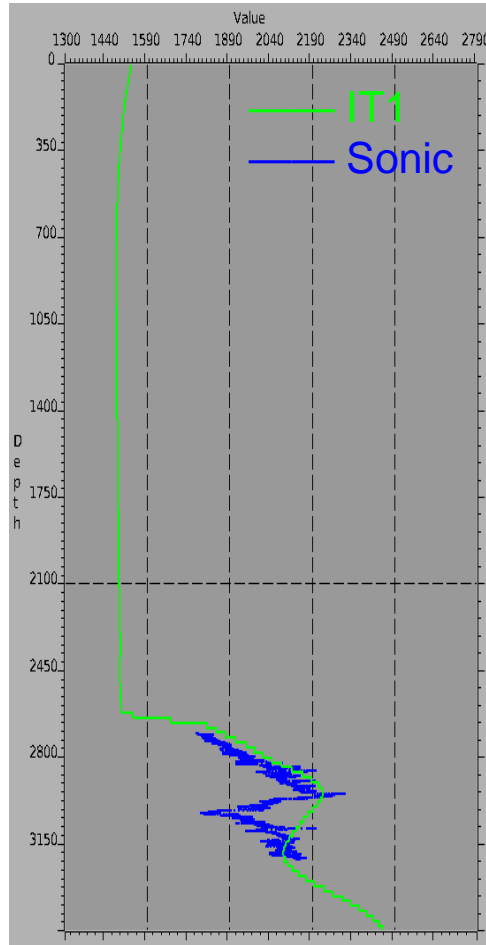
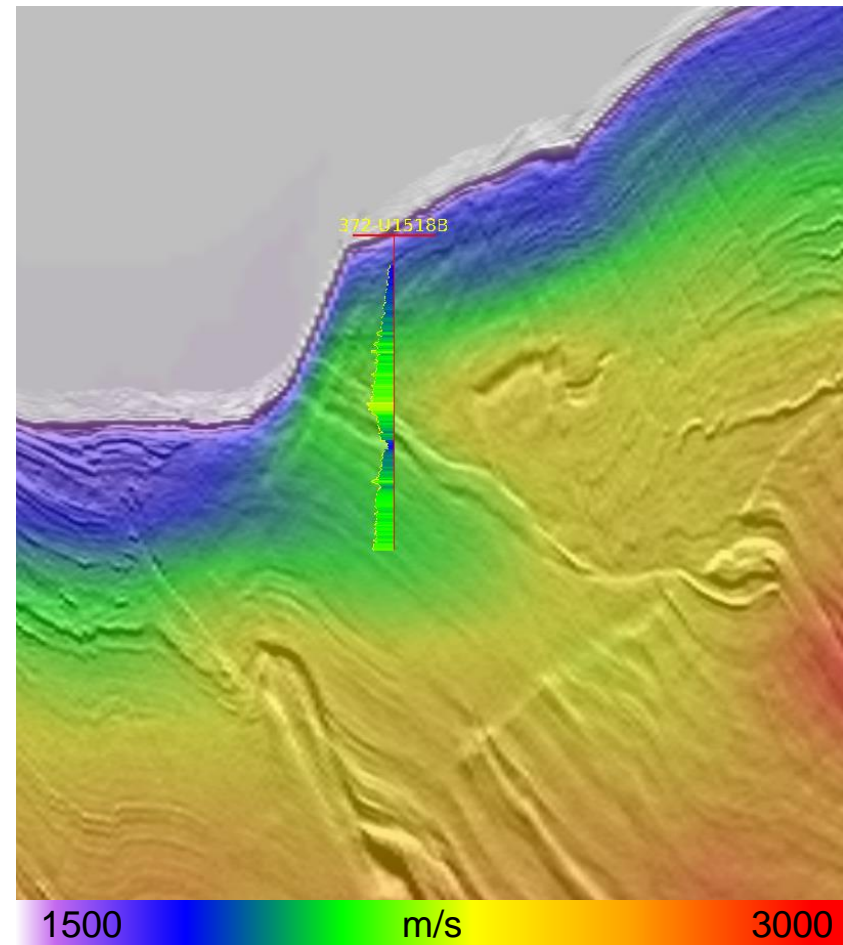


- Among the 3 available wells, only 2 of them are in our survey coverage, U1519A and U1518B.
- Both wells are close to Inline 500.





- At U1519A, ISO velocity matches with well sonic quite well, indicating 0 delta.



- At U1518B, ISO velocity follows the well sonic trend and faster than the sonic.
- An estimated 4% delta is needed to make velocity match the well sonic.

