Residual Bubble Removal

NZ 3D Processing

25 November 2020

INSTITUTE FOR GEOPHYSICS

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Processing flow

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

Outline

- **Objective:**

  To remove residual bubble energy.

- **Procedure:**

  We proceeded QC for the survey and found some low frequency residual bubble.
  For most saillines, the residual bubble energy is weak, only few lines (seq041) are strongly affected.

  We firstly flatten and align the water bottom using the first channel of near cables, then stack the traces into a wavelet which is used for the debubble filter (gap deconvolution) design. This filter is then applied on the seismic data to attenuate the residual bubble energy.

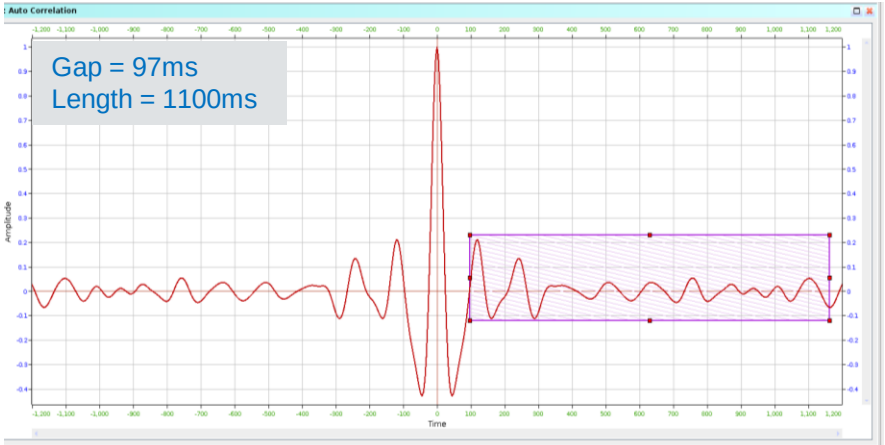
- **Display:**

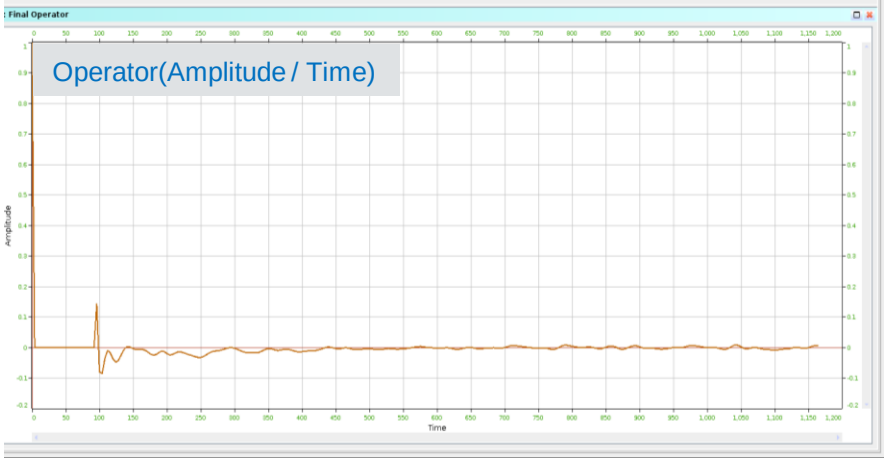
  Sailline 041 (severe) and Sailline 009
  Display: Common channel (aligned water bottom at 1000ms) and stack.

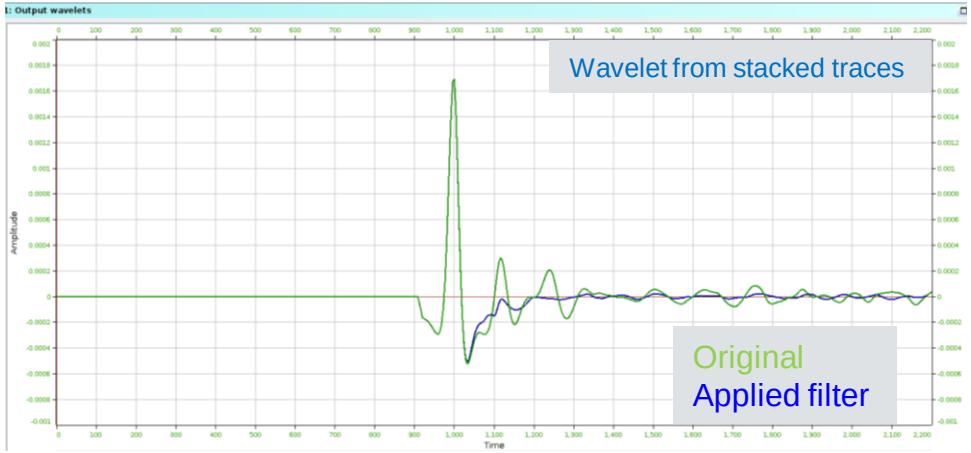
- **Observation and Recommendation:**

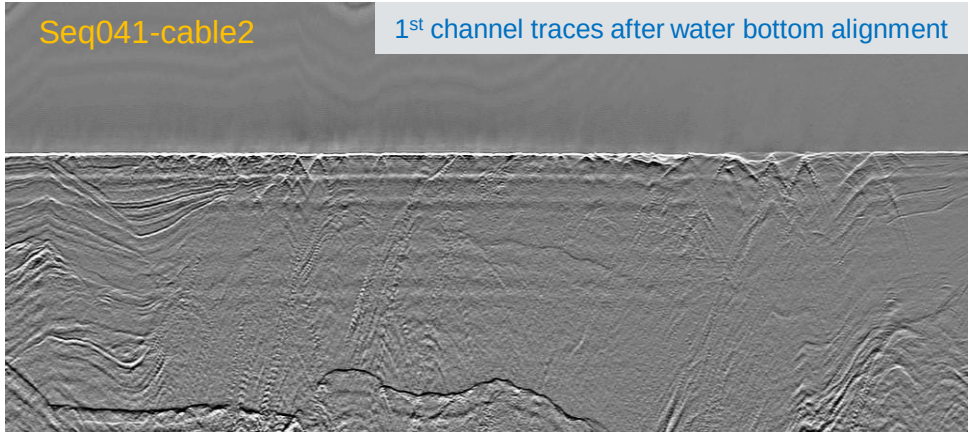
  Debubble filter removes residual bubble energy without touching primaries and high frequency components. Therefore, it’s recommended to apply for production before demultiple.

Residual Debubble Filter





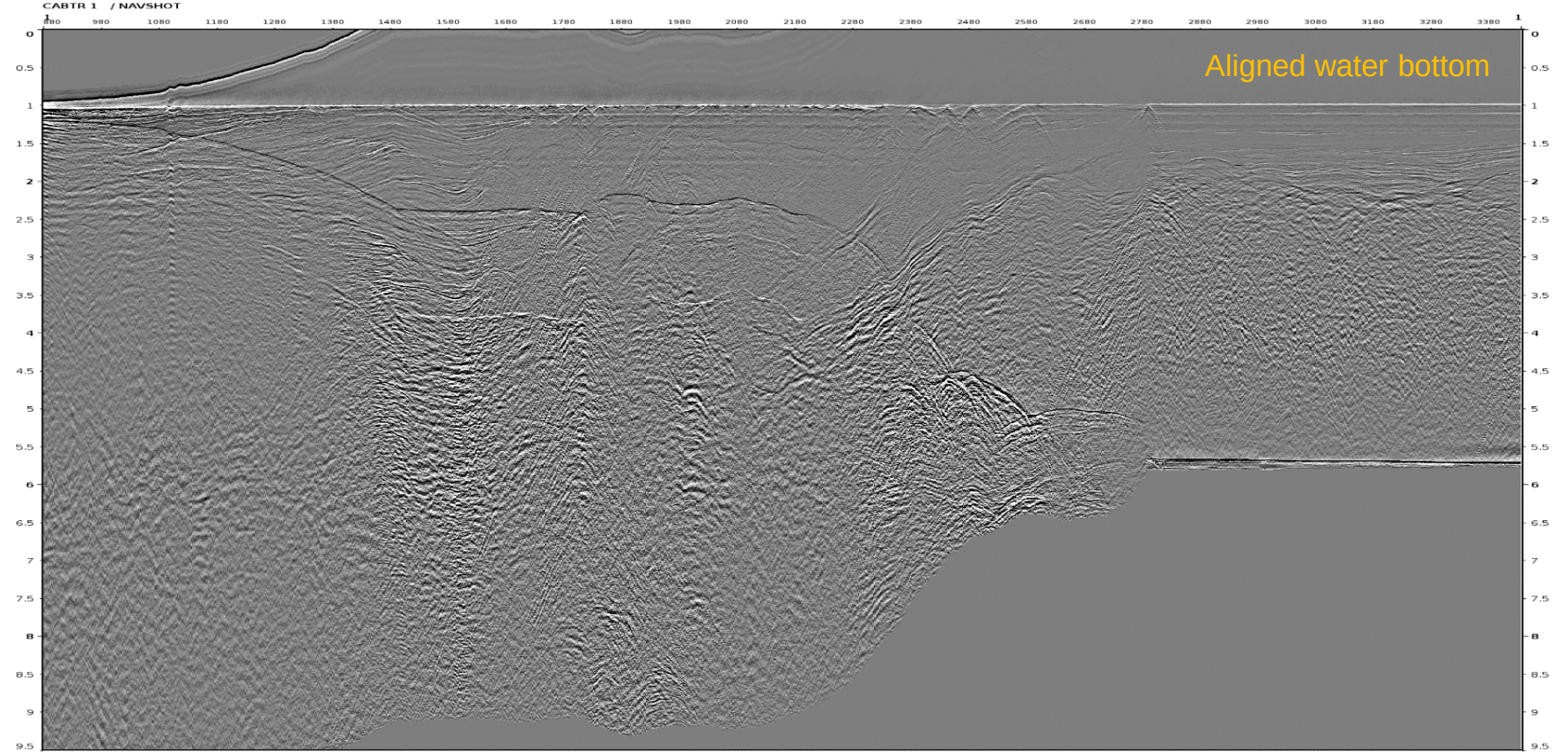




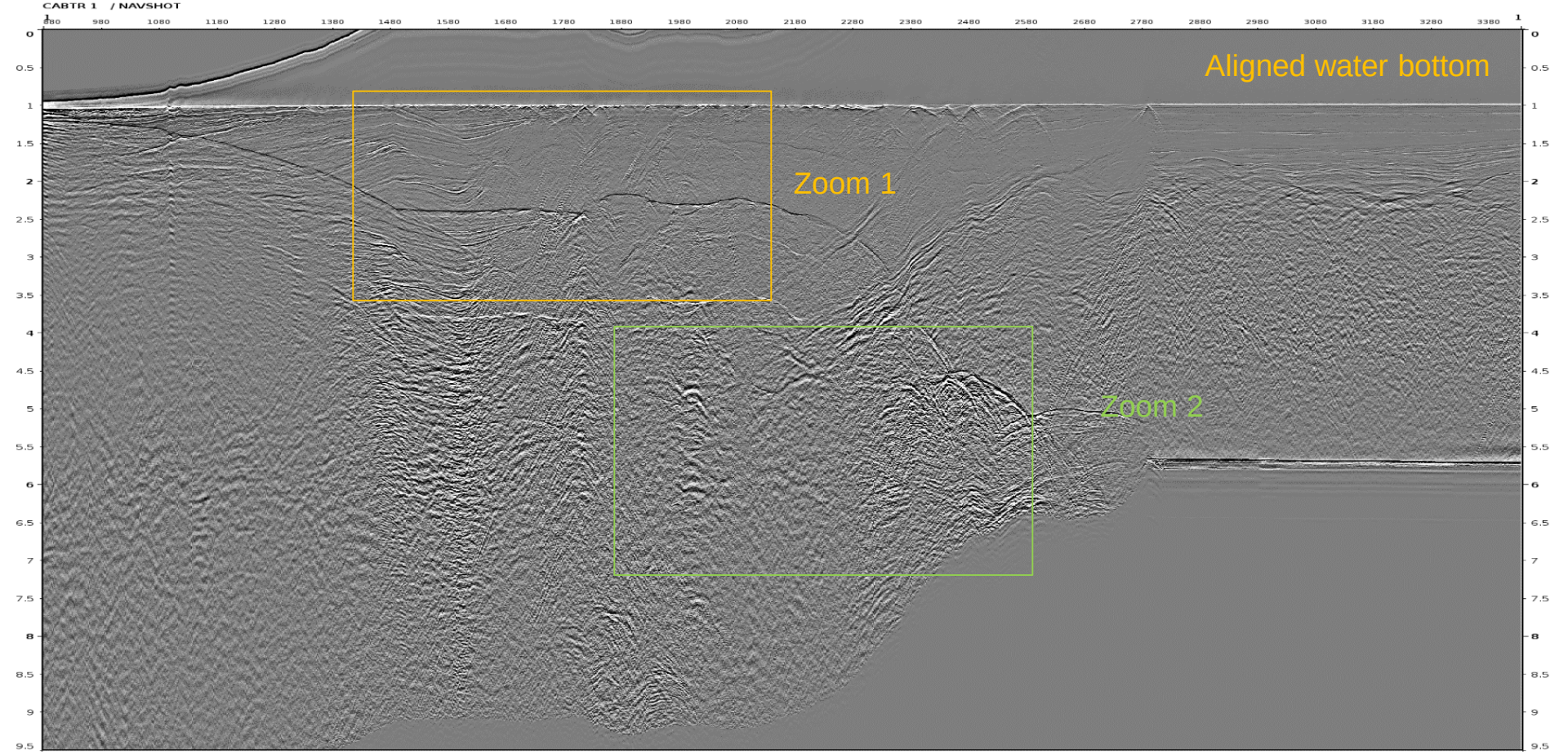
Seq 041

Common Channel (flatten water bottom)
Stack

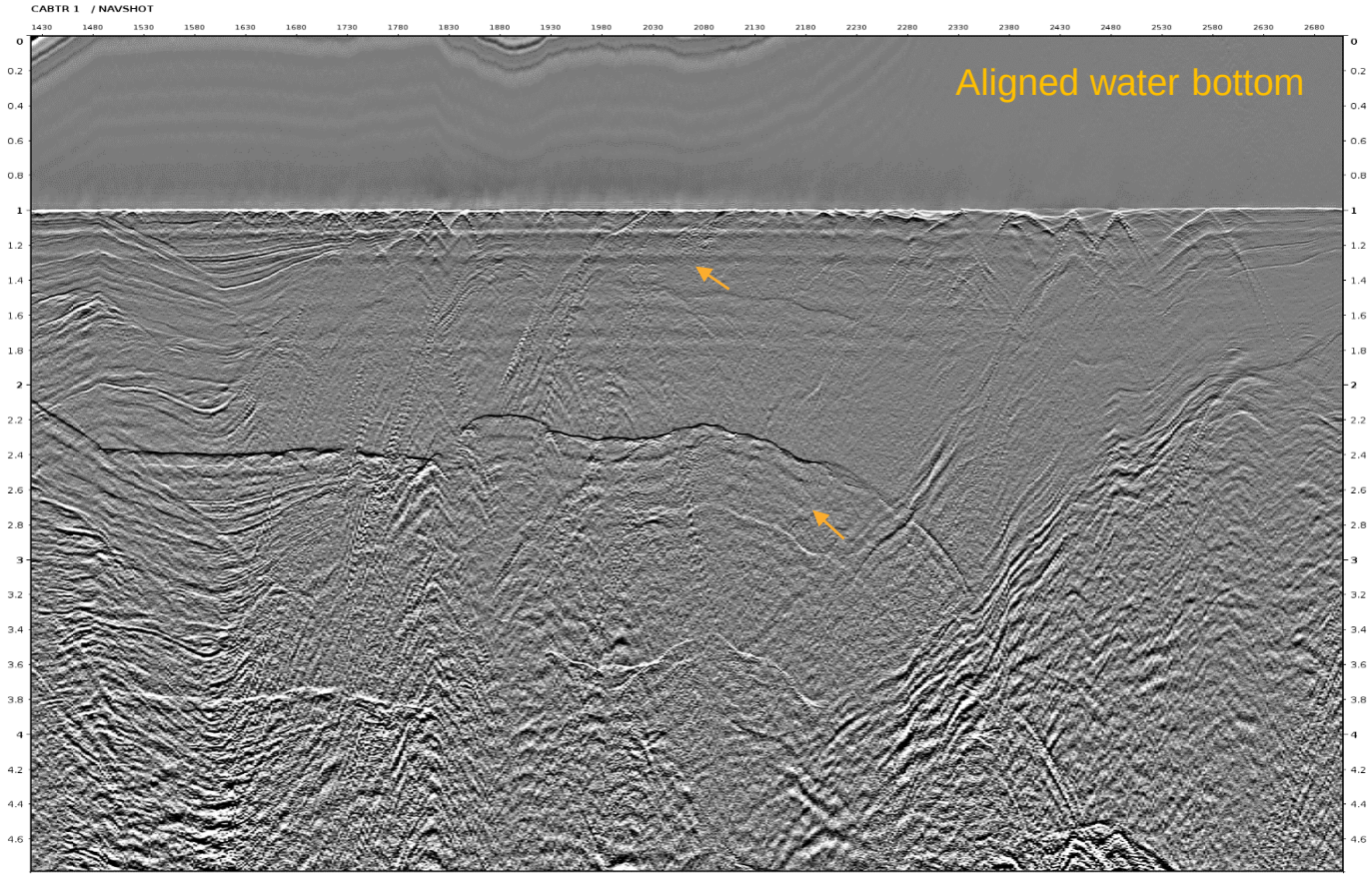
Common Channel before Residual Debubble



Common Channel after Residual Debubble

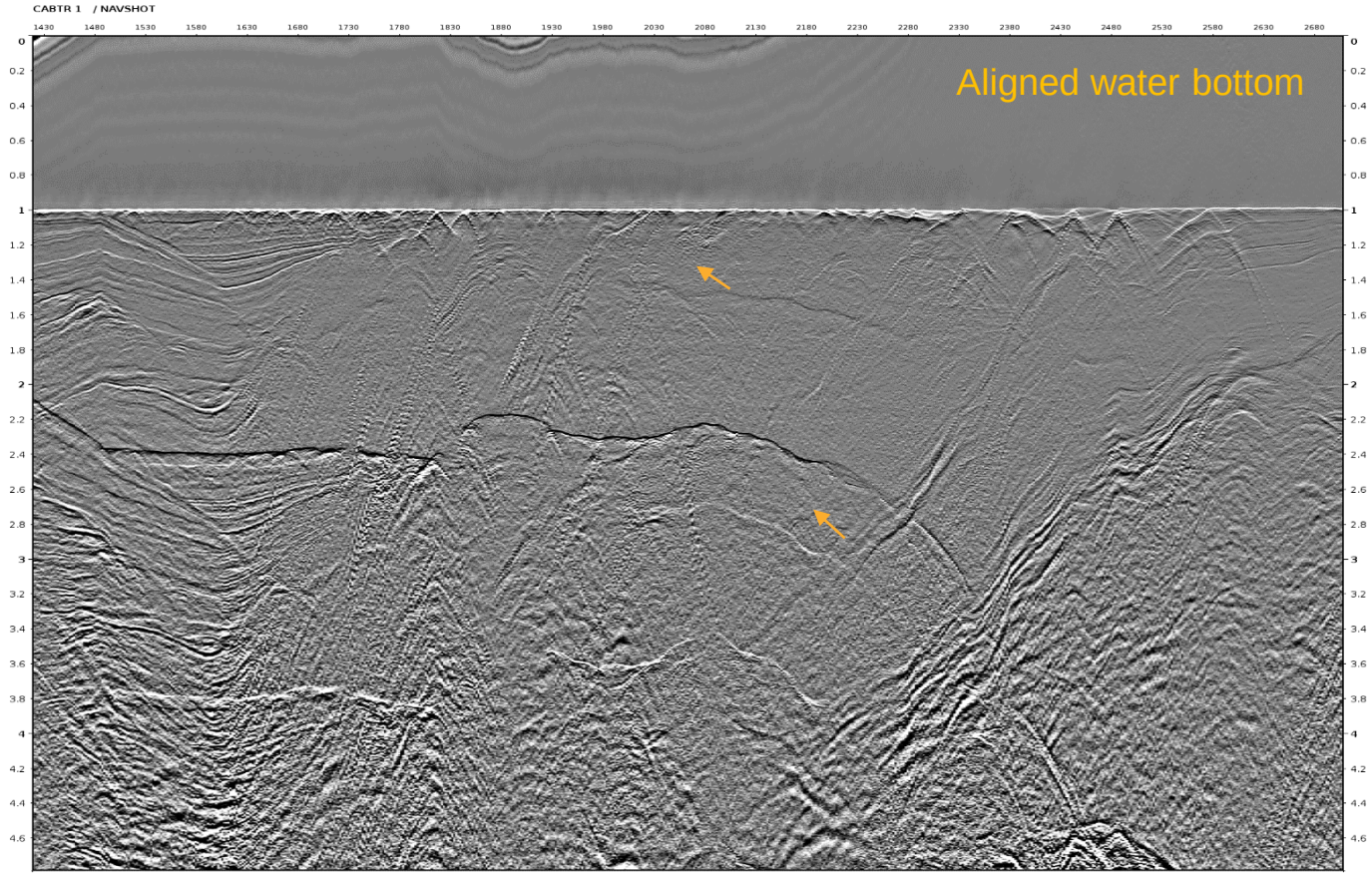


Zoom in Common Channel before Residual Debubble



- The residual bubble energy followed with aligned water bottom is removed.

Zoom in Common Channel after Residual Debubble



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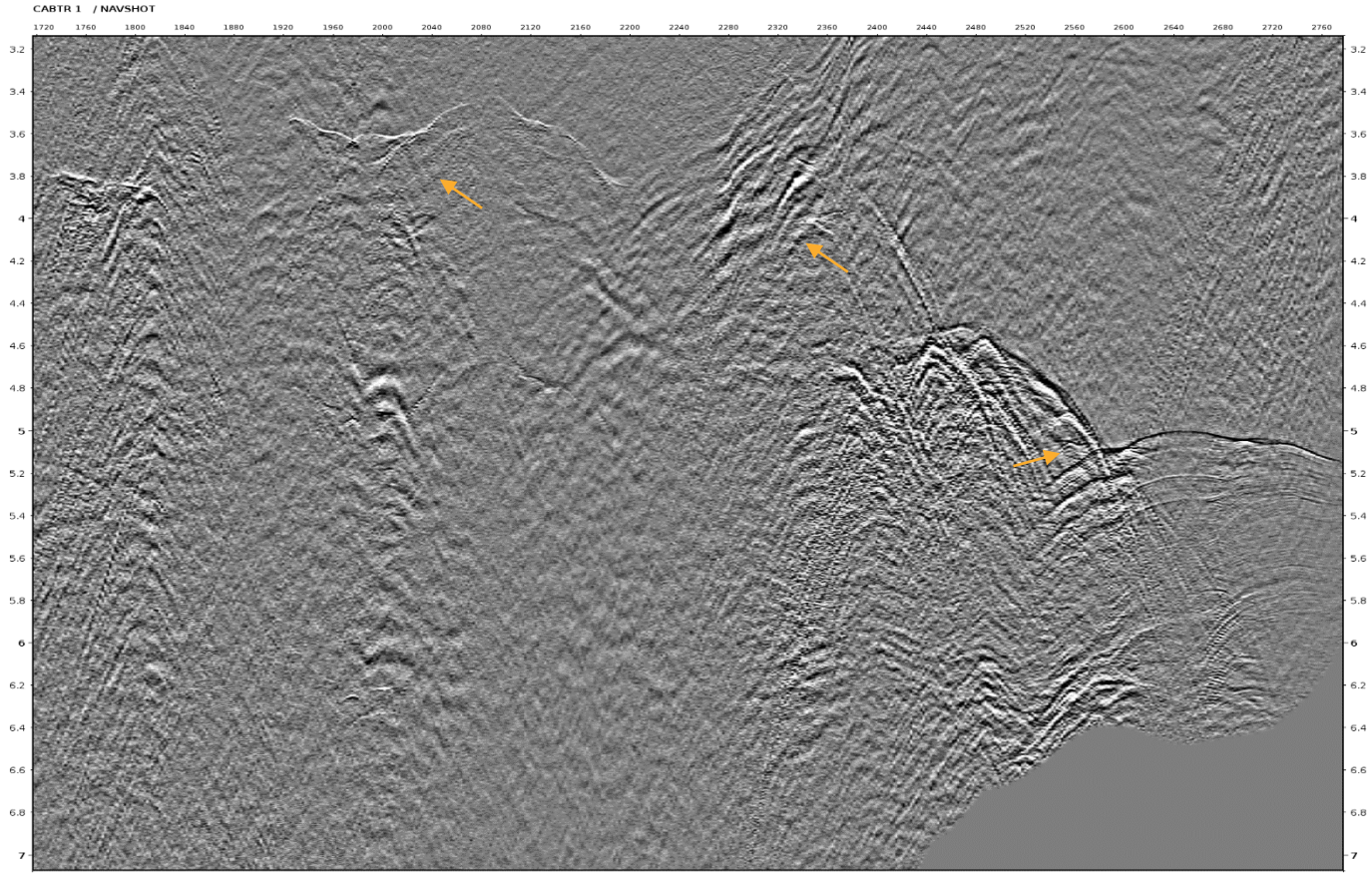
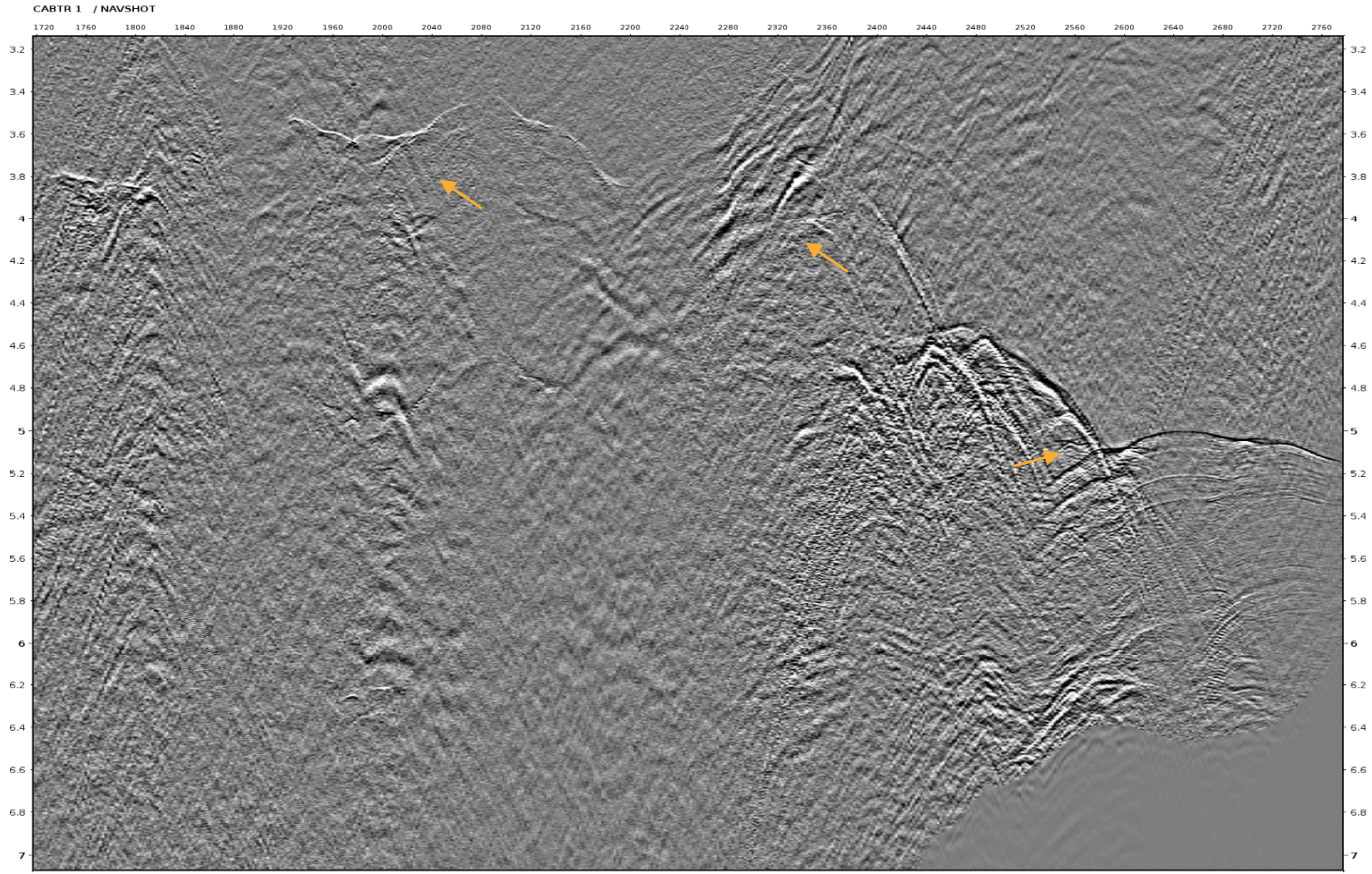
Zoom in Common Channel before Residual Debubble



- In deeper part, reverberation caused by residual bubble energy is also removed.

Zoom in Common Channel after Residual Debubble



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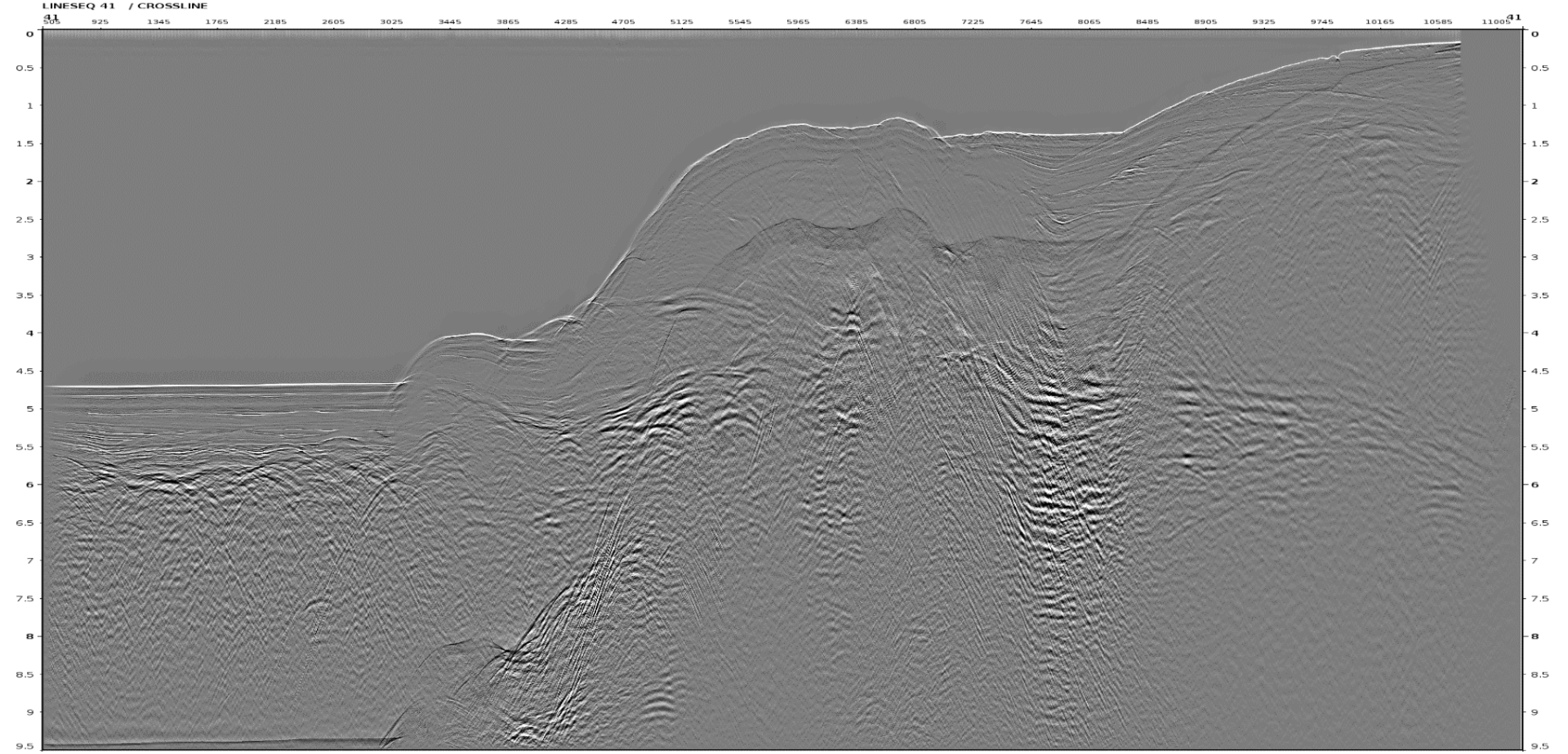
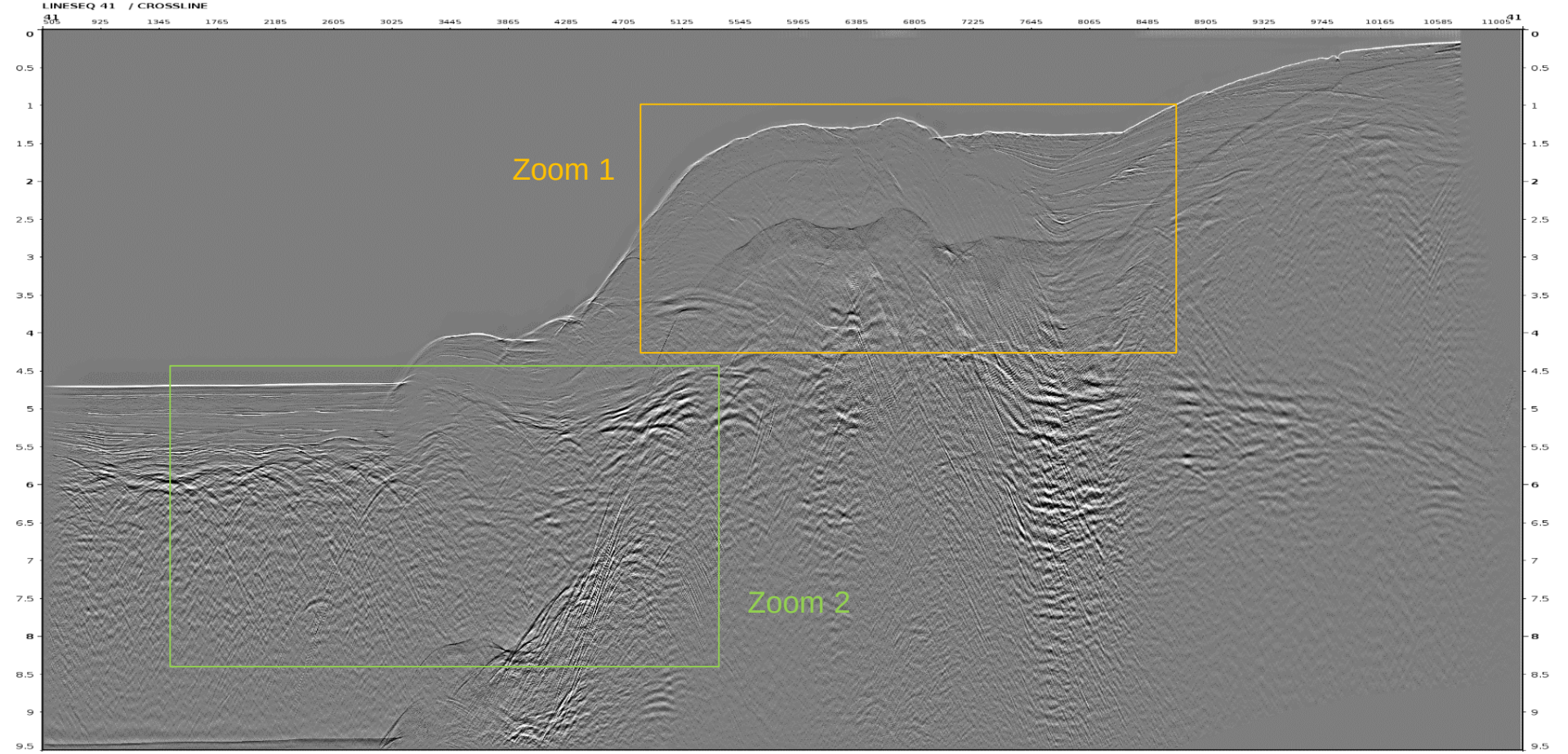
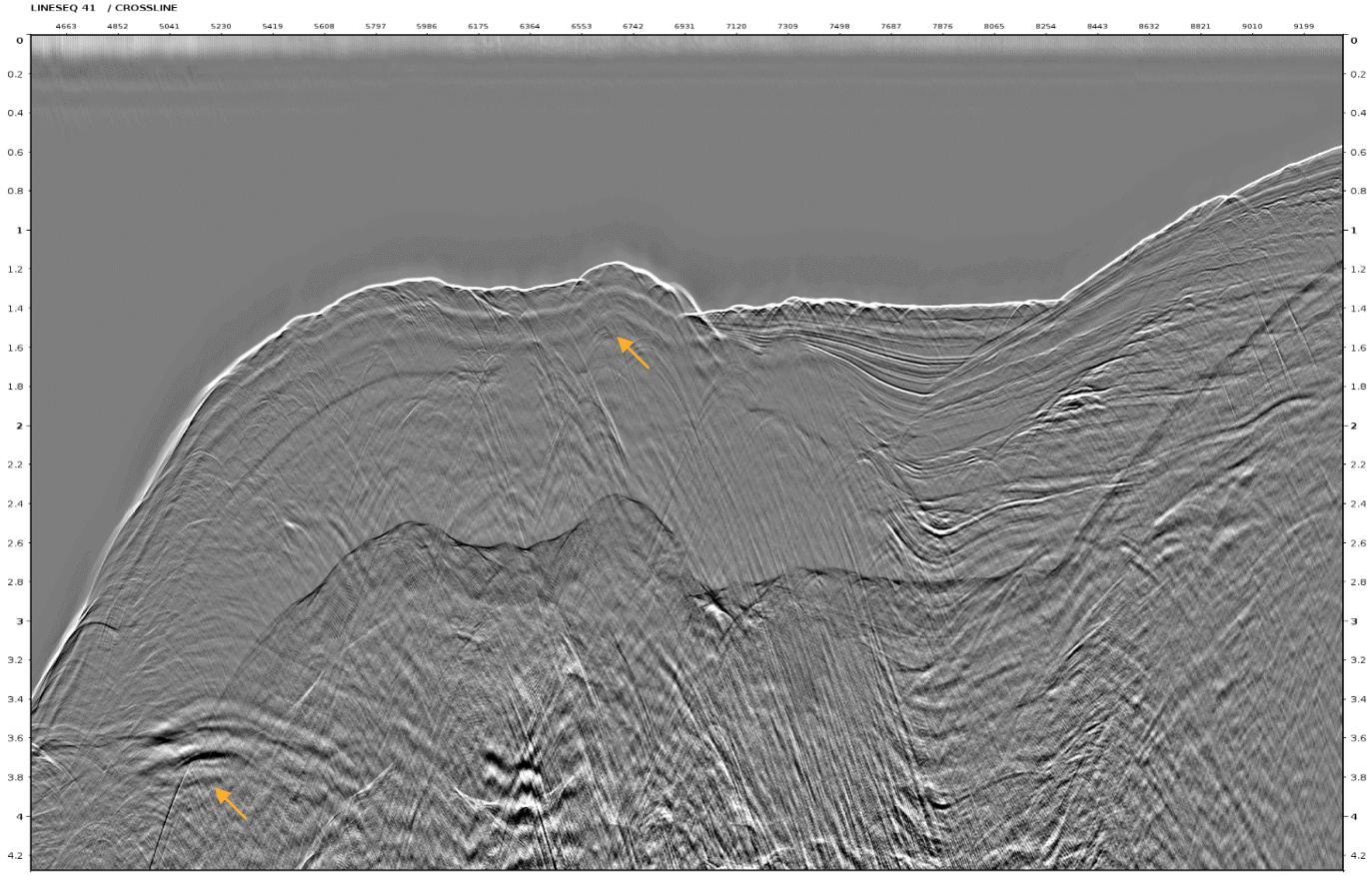
Stack before Residual Debubble



Stack after Residual Debubble

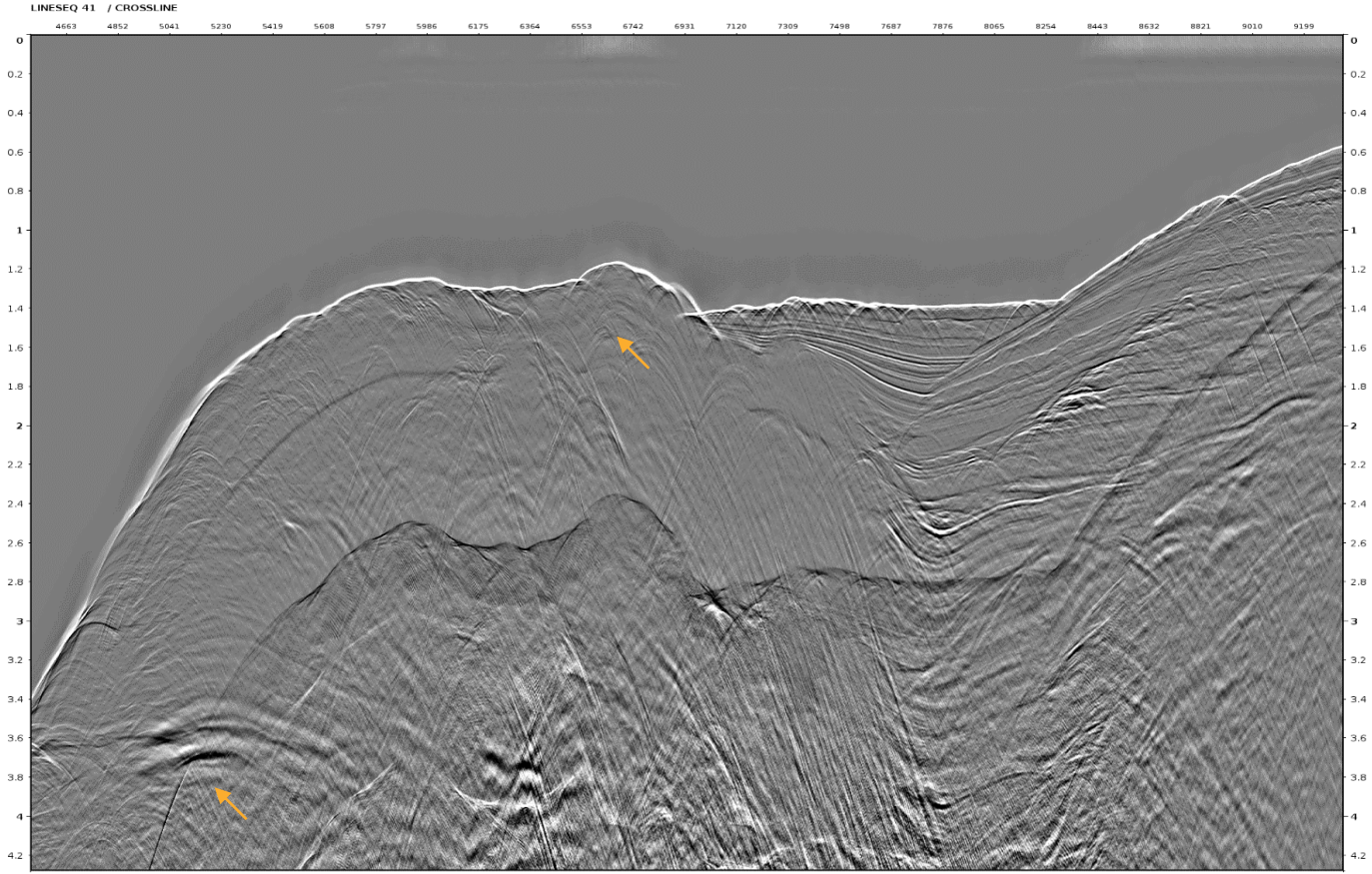


Zoom in Stack before Residual Debubble



- The residual bubble energy followed with water bottom is removed.
- In deeper part, reverberation caused by residual bubble energy is also removed.

Zoom in Stack after Residual Debubble



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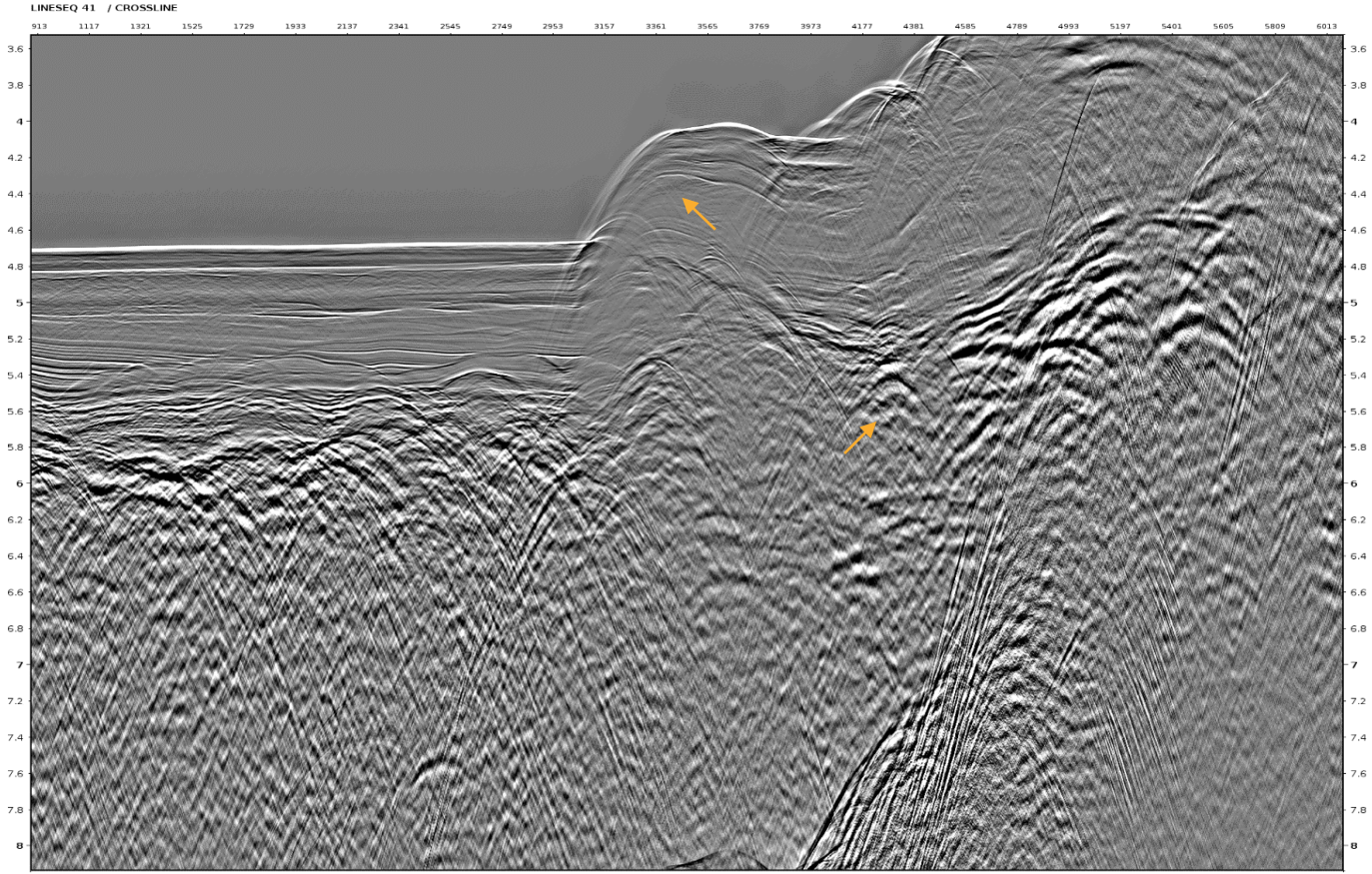
Zoom in Stack before Residual Debubble



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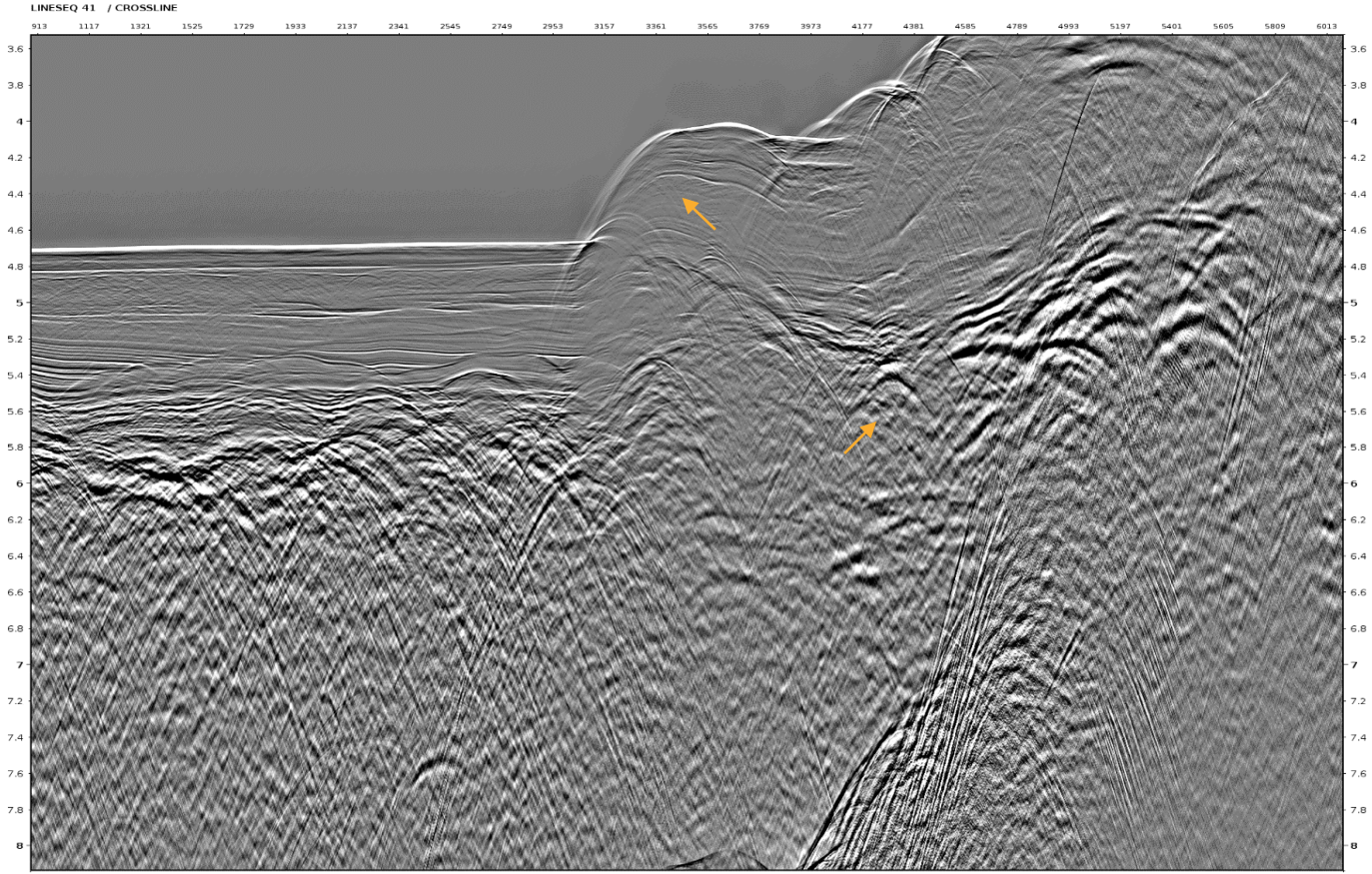
Zoom in Stack after Residual Debubble

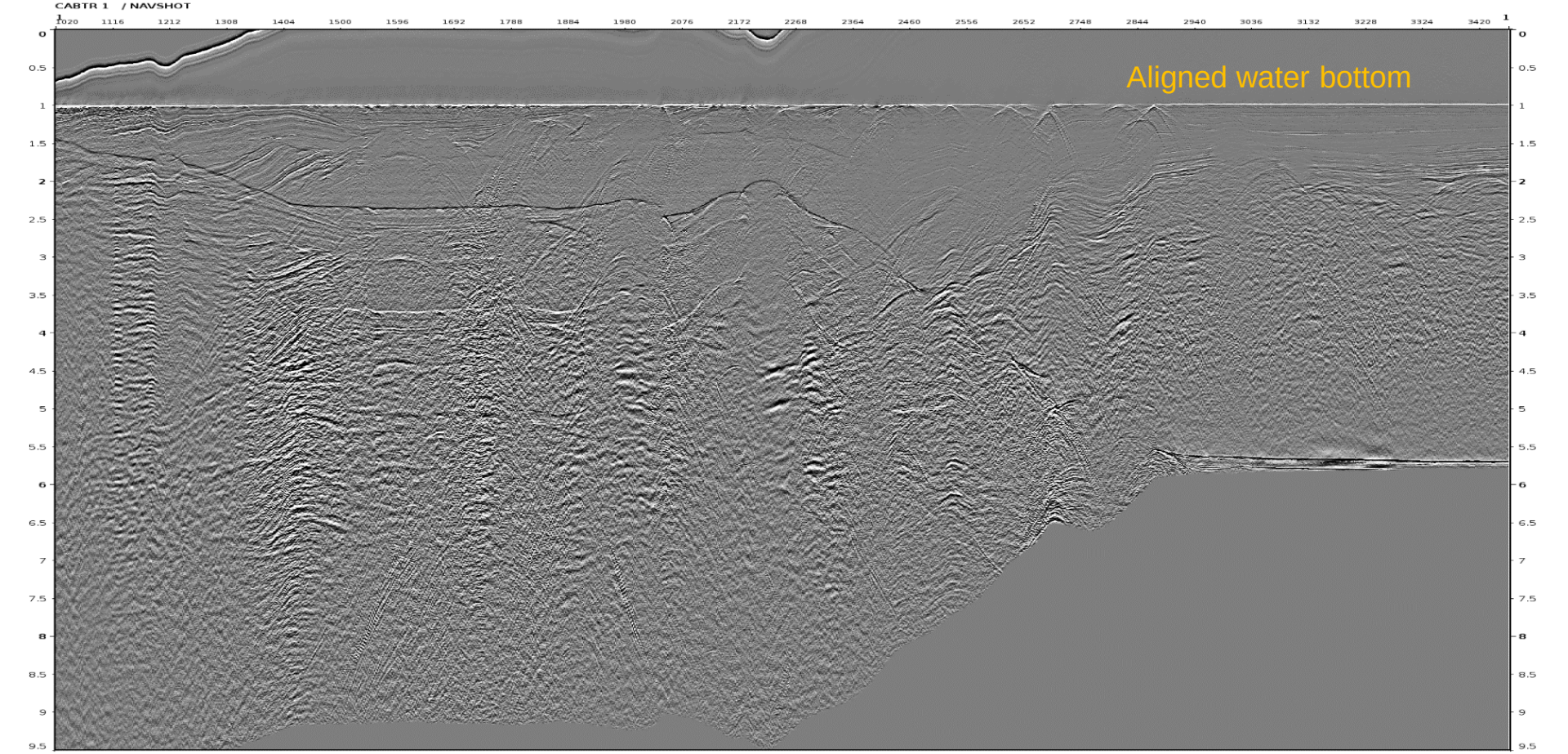


- The residual bubble energy followed with water bottom is removed.
- In deeper part, reverberation caused by residual bubble energy is also removed.

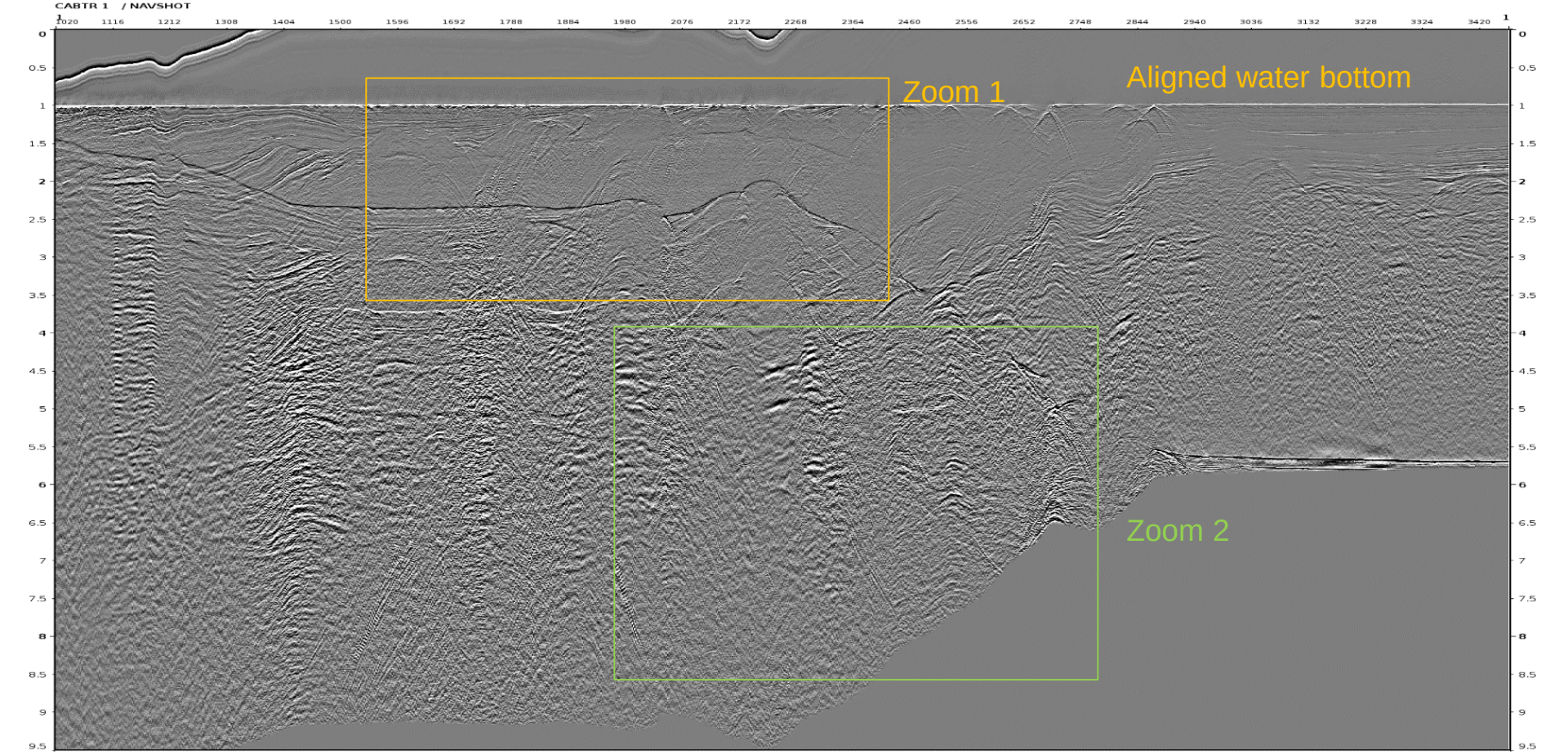
Seq 009

Common Channel (flatten water bottom) Stack

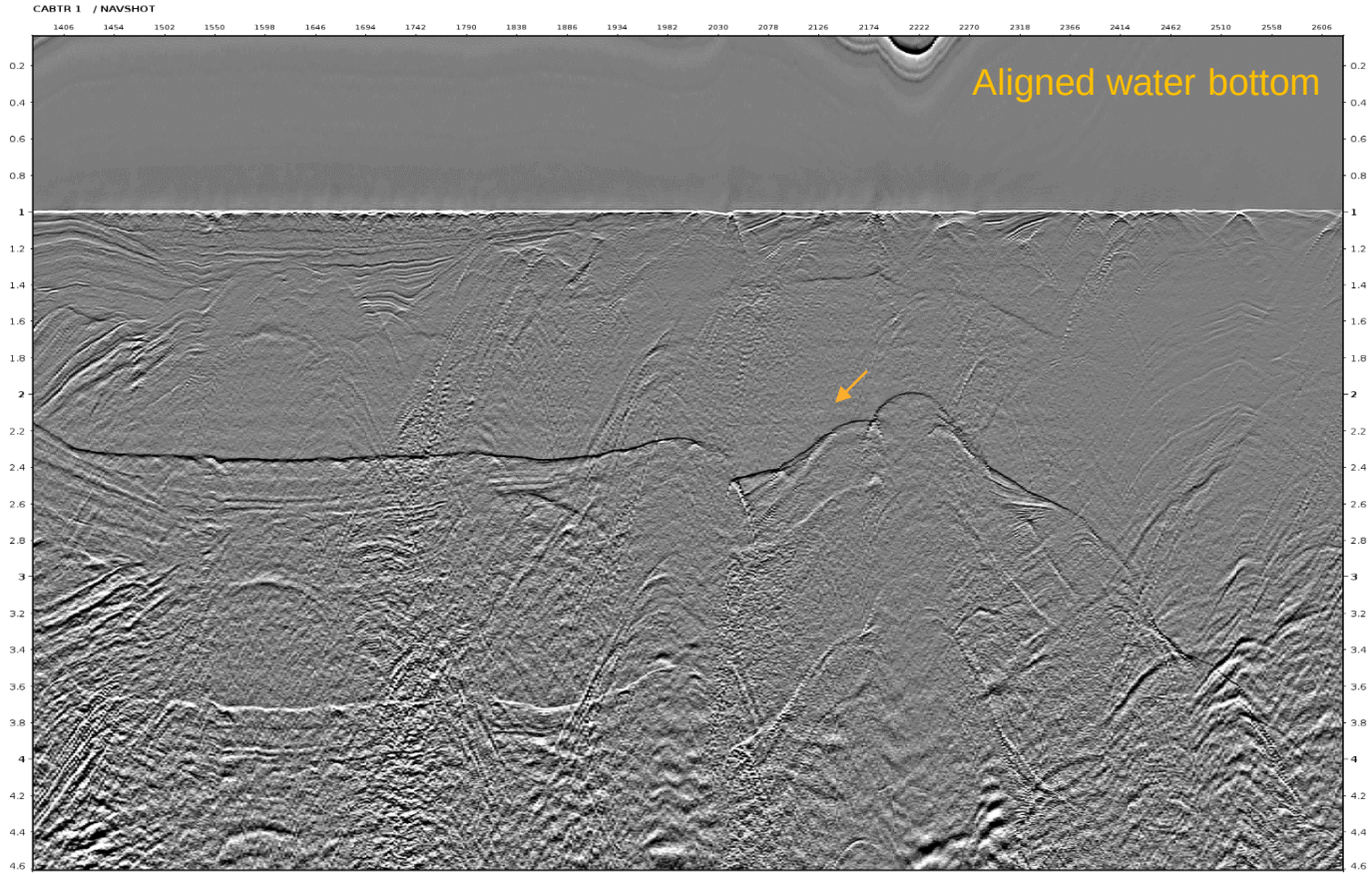
Common Channel before Residual Debubble



Common Channel after Residual Debubble

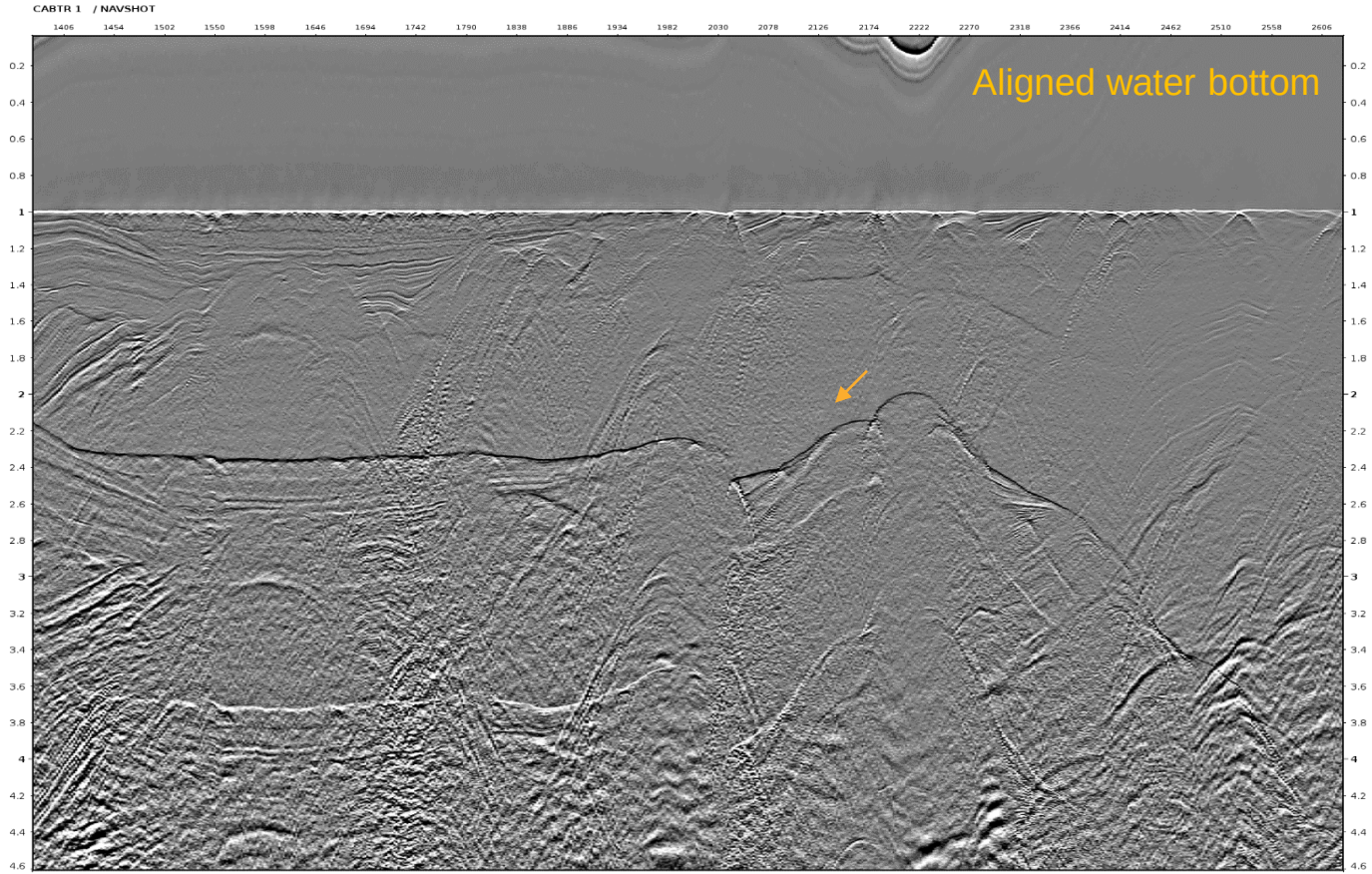


Zoom in Common Channel before Residual Debubble



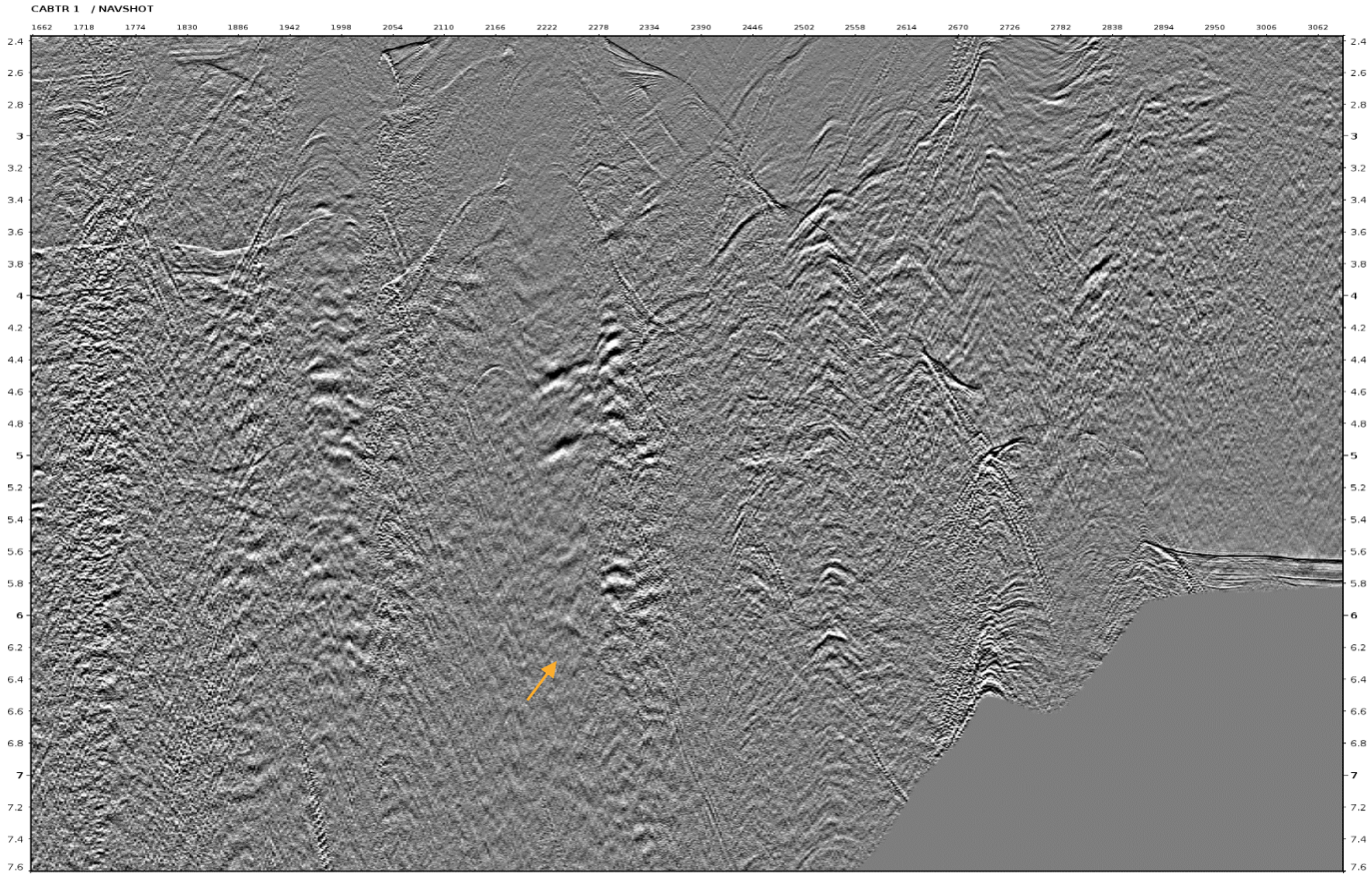
- The residual bubble energy followed with aligned water bottom is observed and removed.

Zoom in Common Channel after Residual Debubble



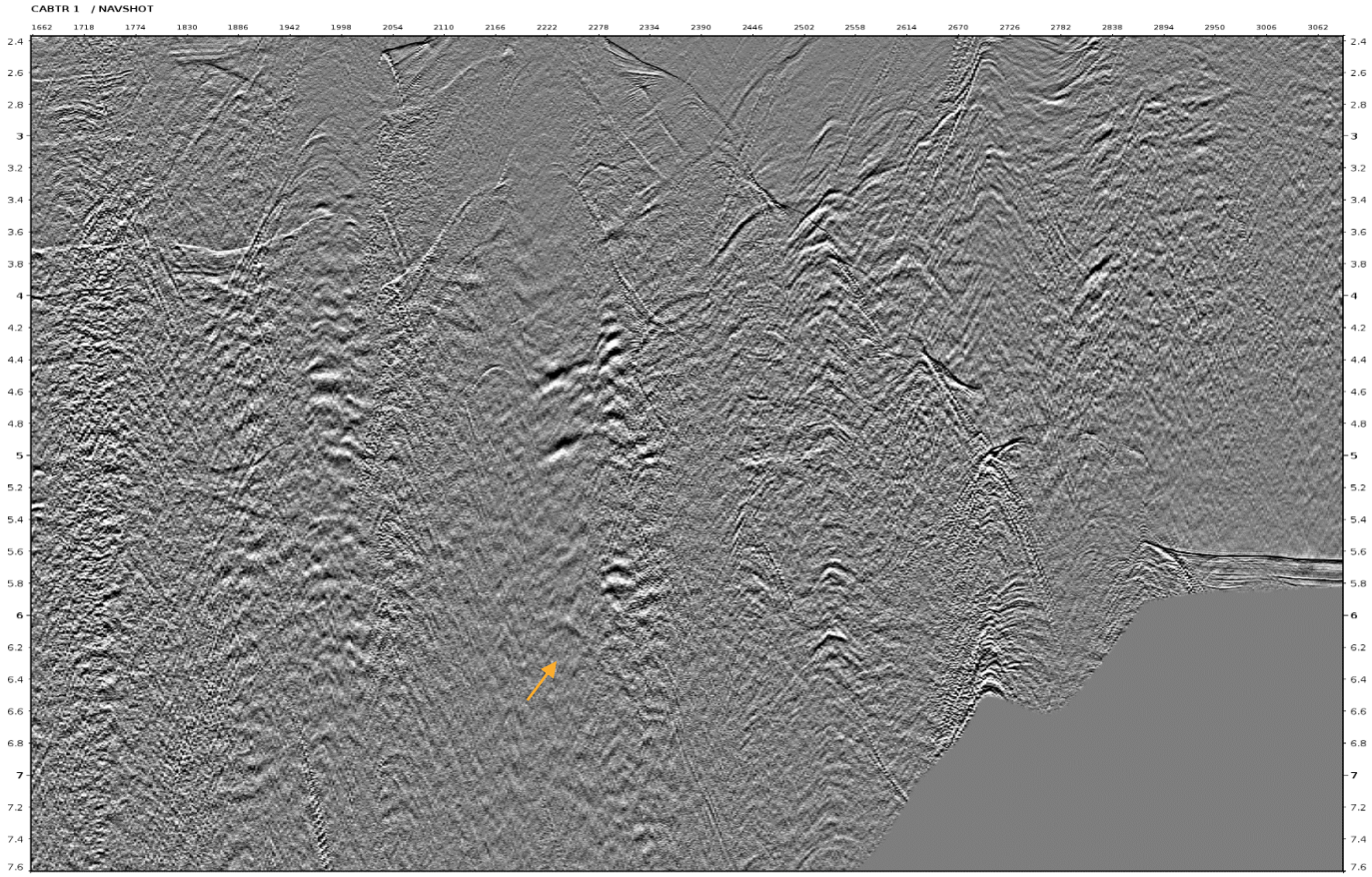
- The residual bubble energy followed with aligned water bottom is observed and removed.

Zoom in Common Channel before Residual Debubble



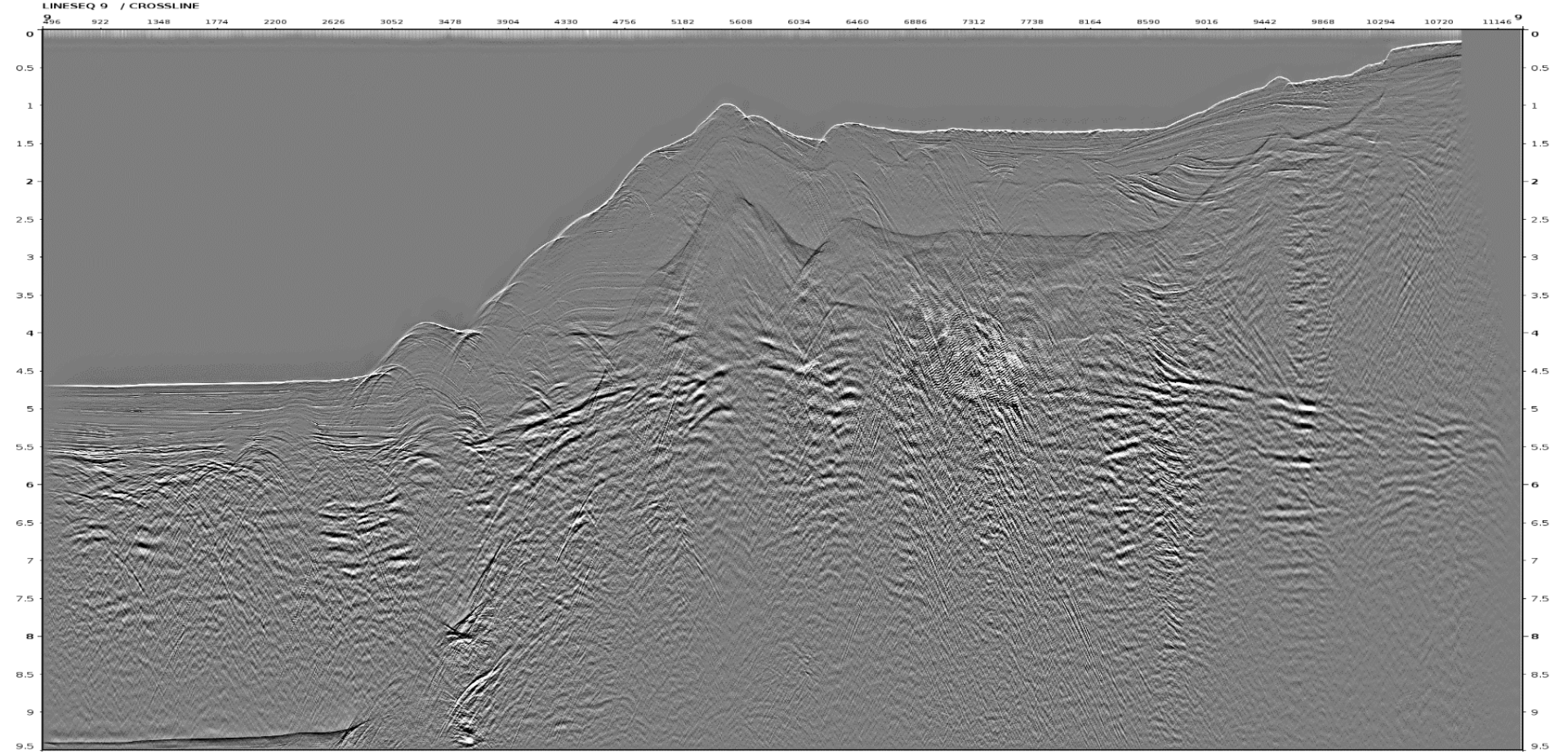
- In deeper part, tiny reverberation caused by residual bubble energy is also removed.

Zoom in Common Channel after Residual Debubble



- In deeper part, tiny reverberation caused by residual bubble energy is also removed.

Stack before Residual Debubble



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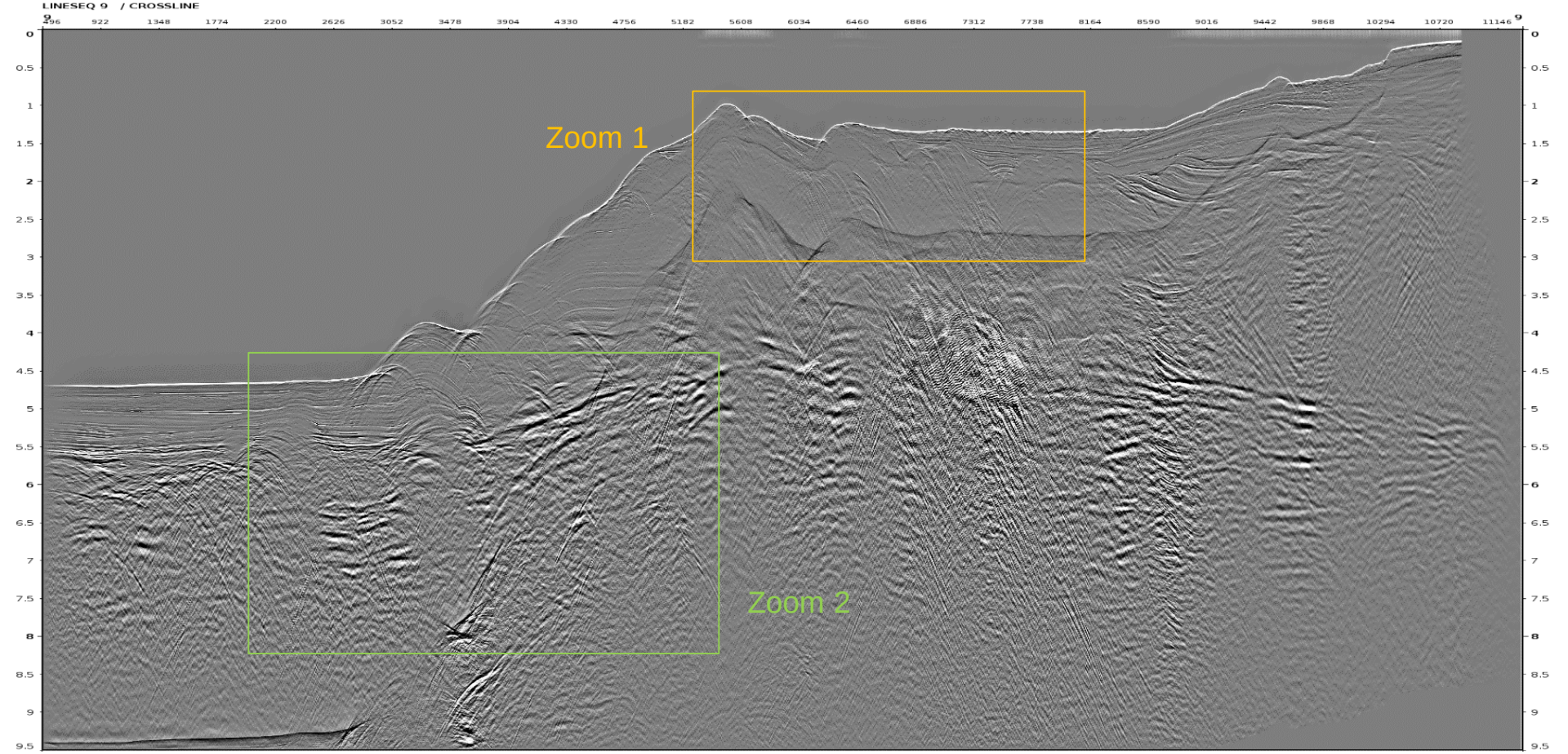
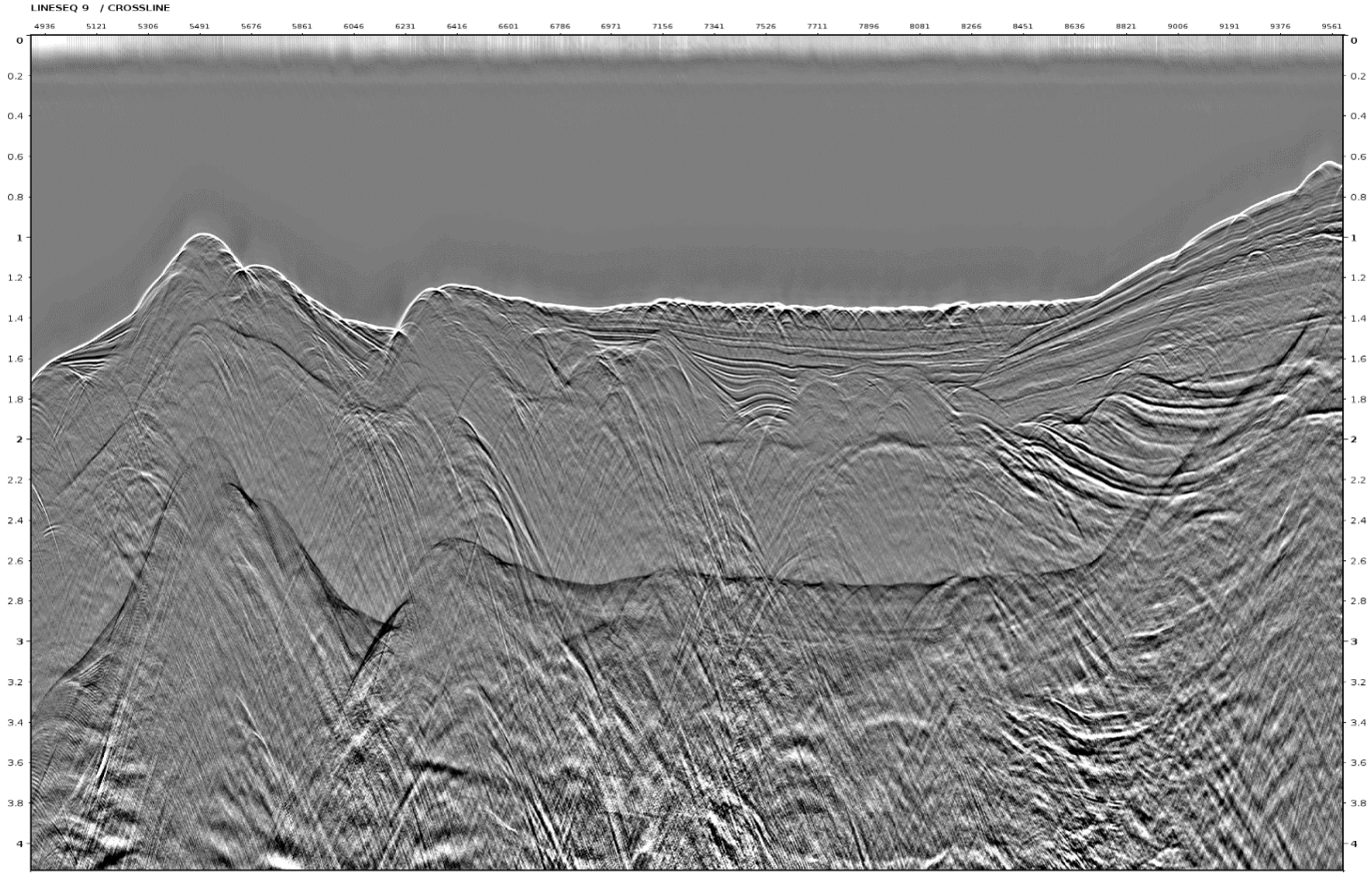
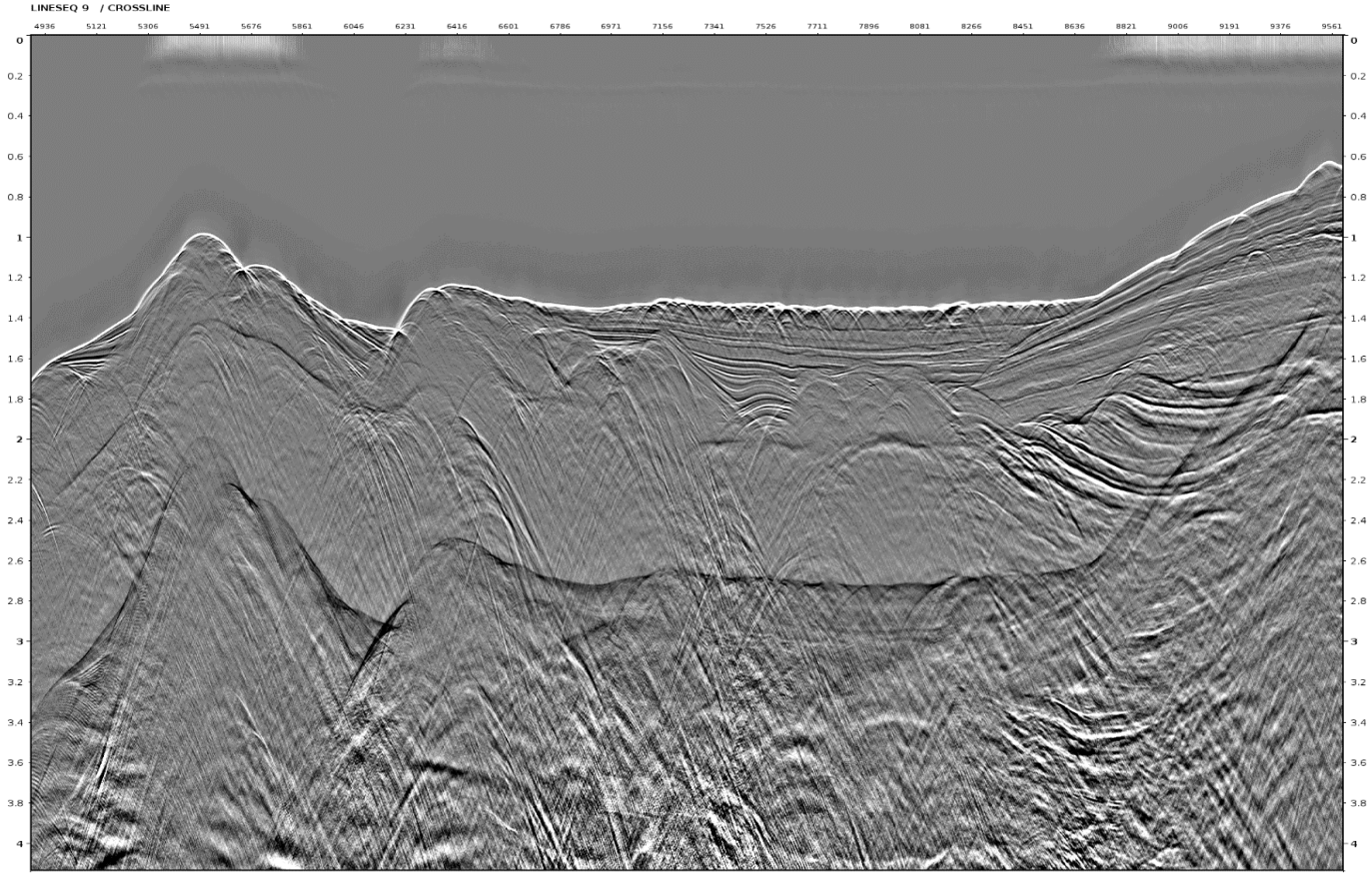


Zoom in Stack before Residual Debubble



- The residual bubble is weak and is not obvious on the stack.

Zoom in Stack after Residual Debubble



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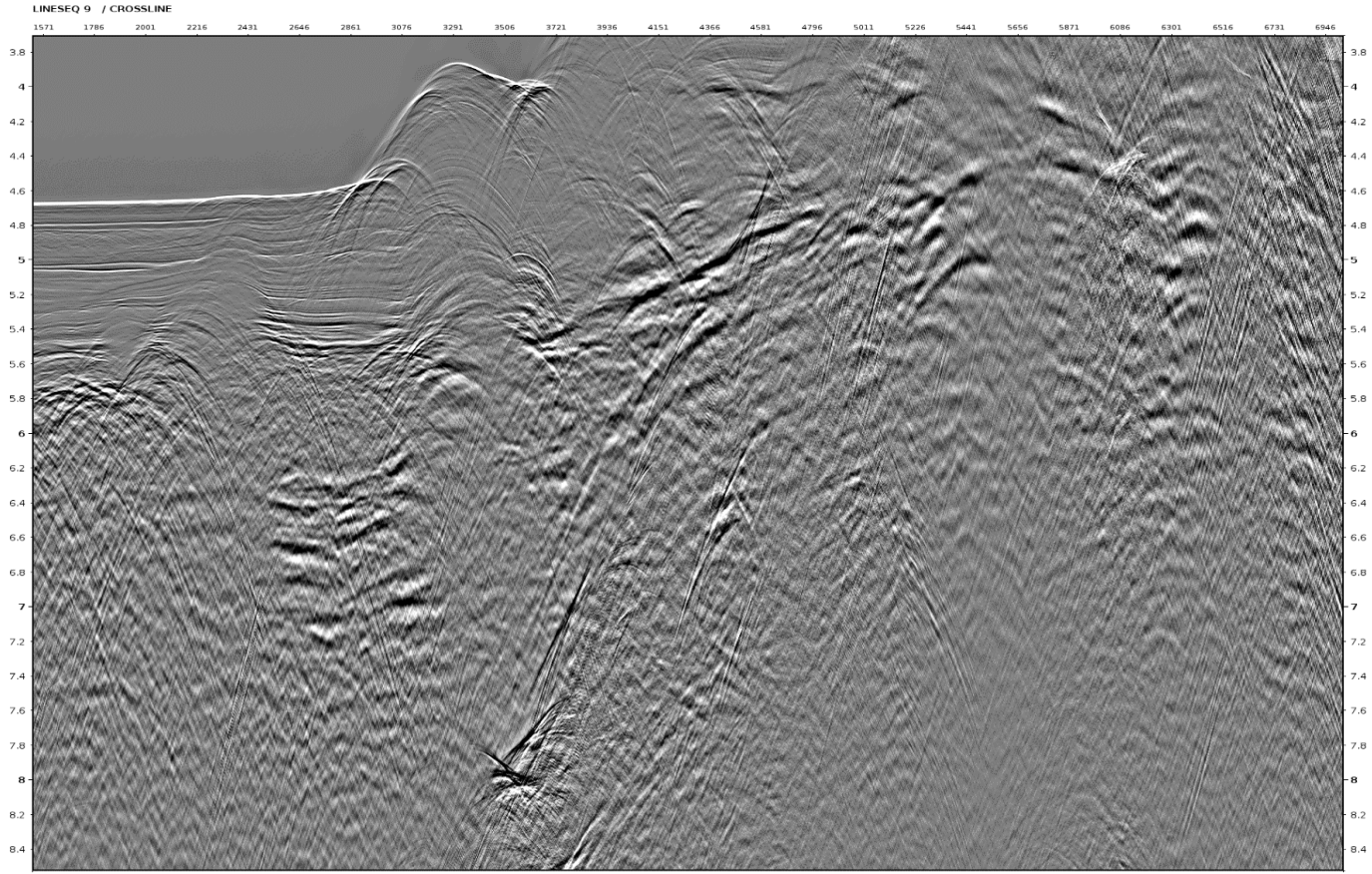

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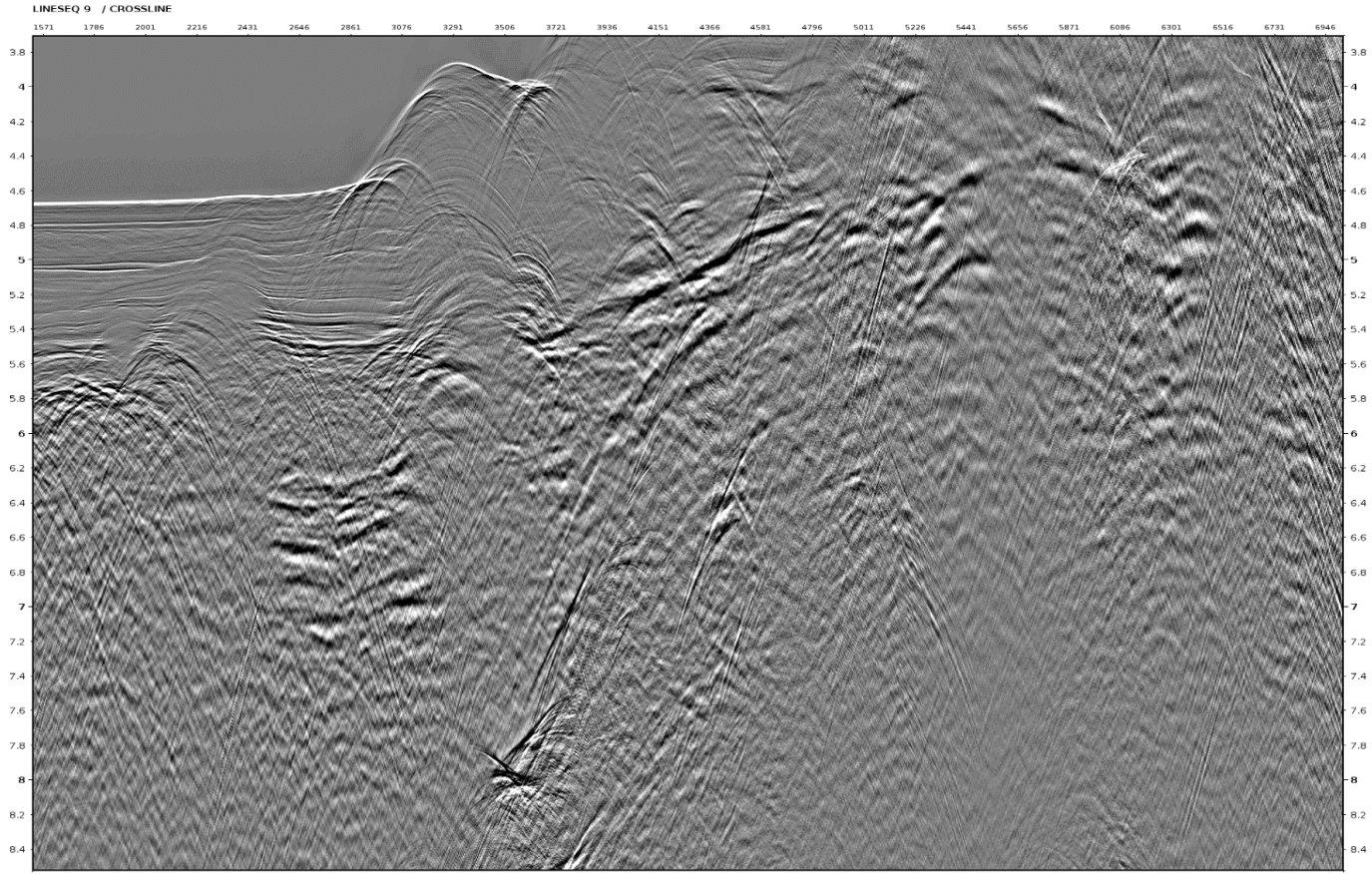

- The residual bubble is weak and is not obvious on the stack.

Summery

- Deghosting boosts low frequency energy including residual bubble energy.
- For few specific seqline (seq041), the source is unstable, the data is strongly affected by residual bubble energy.
- Residual bubble energy may affect final quality of dataset, therefore, it is necessary to be removed.