2016 EBN Geophysics Symposium: Echoes from Seismic

New Broadband Seismic for a Complex Jurassic Play

Phil Mollicone, Head of Geophysics

STERLING RESOURCES

18th February, 2016

Agenda

- Intro & Acknowledgements
- Survey objectives, planning, execution & processing
- Results
- Conclusions & Thanks

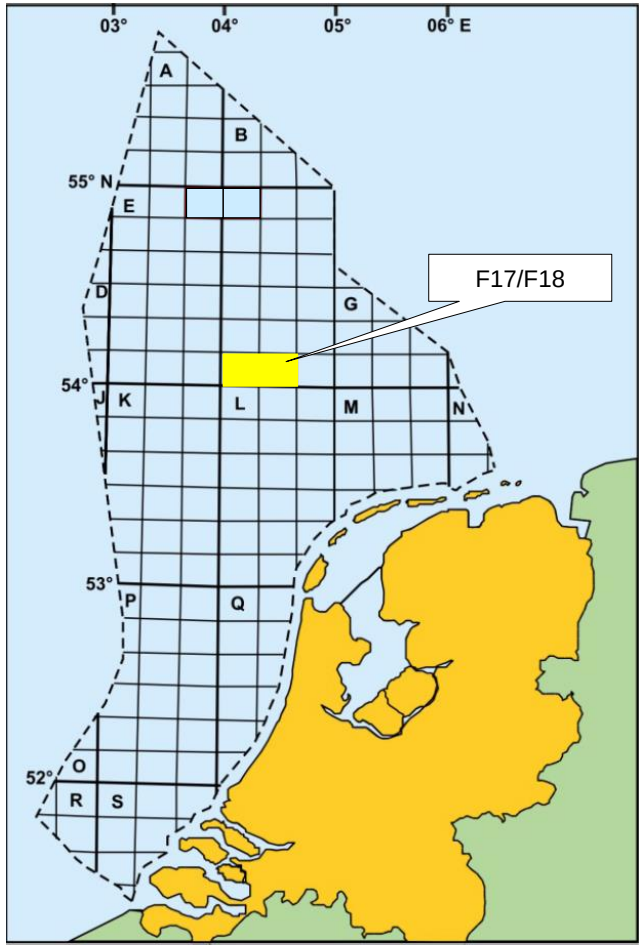
This new, BroadSeis data was acquired and processed by CGG during 2014 & 2015.
Vintage data sourced from NLOG.NL.

Special thanks to Robin Holden of Monarch Geophysical and the CGG processing team in Crawley: Sue Cook, Keith Ibbotson, Andrew Woodcock, Vladislav Angelov, Zuo Xu, Hannah Fosbraey, & Rafal Maka.

Thanks to the Wintershall team, for their valuable contributions during later stages of processing.

Sterling also thanks our license partners.

500 km² broadband 3D seismic – first of its type in Dutch waters



- Targeting Jurassic discoveries in F17 & F18
- Secondary target is salt rim plays at Jurassic levels
- Acquired Q2 2014, on time, w/in budget, good HSE
- PSDM processing completed November, 2015
- Inversion, AVO & QI mapping to follow

Technical Objectives:

- Broadband for vertical resolution
- Long streamer to target salt rim plays
- High fold for noise reduction
- PreStack Depth Migration for salt flank imaging

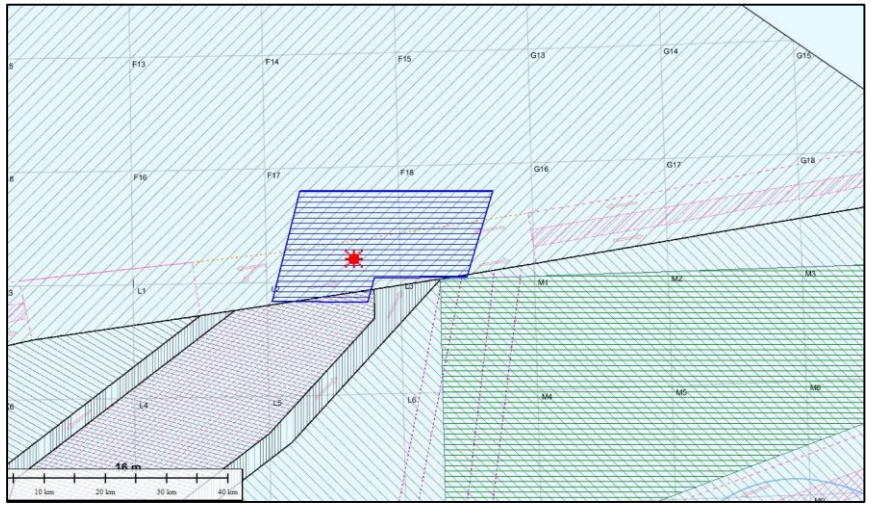
Commercial Objectives

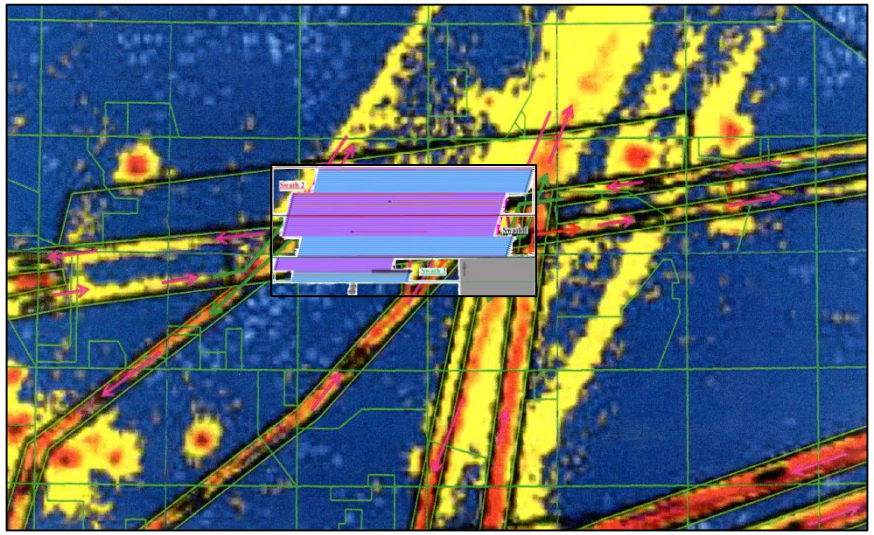
- Discriminate HC bearing reservoir from coal
- Identify HC bearing compartments
- Predict connectivity

Jurassic discoveries are structurally & stratigraphically complex

- Thin, interbedded sands/shales/coals
- Structural inversion & removal of reservoir by early Cretaceous down-cutting
- Faulted, compartmentalized
- Multiple contacts; water over oil
- Amplitude conformance to structure poorly understood, QI mapping difficult
- AVO/Inversion dominated by coal response(?)

Planning & Acquisition





HSE First!

Site is at intersection of high density traffic lanes
Extra chase boat. Pilots on duty 24/7
MMO + PAM 24/7
No Go in Military Zone to SE of site

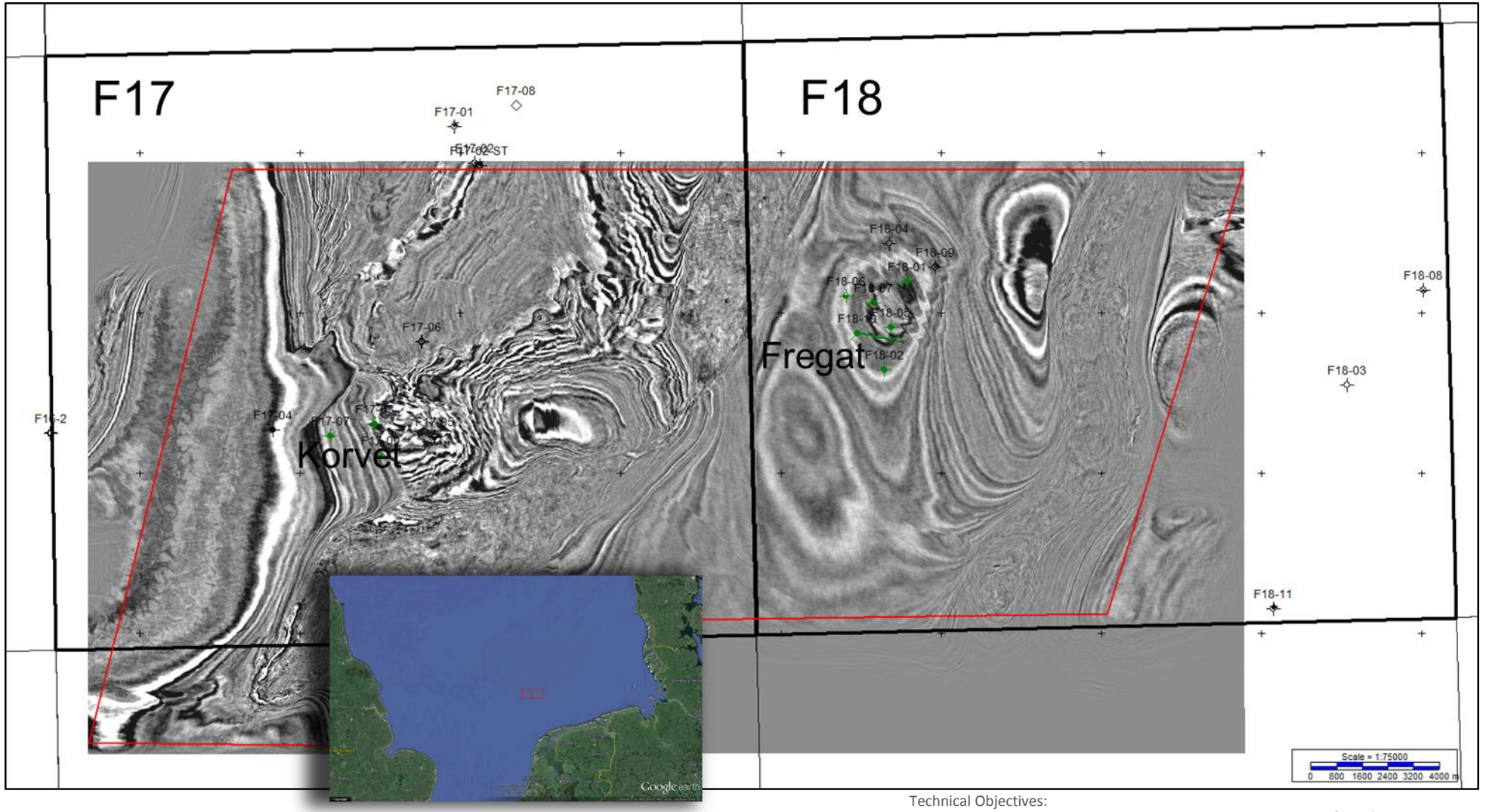
- BroadSeis Streamers
  - Curved cable: Near offset 7m tow, far offset 21m tow, solid cable
  - 12 x 6000m cable, 480 channels x 12.5m
    - Legacy data is 4 x 3000m cable, 25m groups, flat 7m tow
- Source: 3120 in^3 array
  - 7m tow depth, 12.5m flip/flop SP interval (120 fold)
    - Legacy data is 3162 in^3, 5.5m tow 18.75m Quad-Quad (20 Fold)
- Record Length 5.0 sec

- Fast-Track PSTM delivered 2 months after 1st shot

- PSDM delivered November 2015
  - BroadSeis de-ghosting
  - 3D SRME + curvelet domain subtraction
  - Recursive MWD + curvelet domain subtraction
  - Velocity model build for Tomography
    - Iterative salt flank modelling
  - Kirchoff final migration, Beam interim QC tools

- Inversion & QI to follow initial mapping

500 km² Broadband 3D Seismic, acquired 2014, PSDM delivered November 2015



- On time
- On budget
- No incidents or accidents

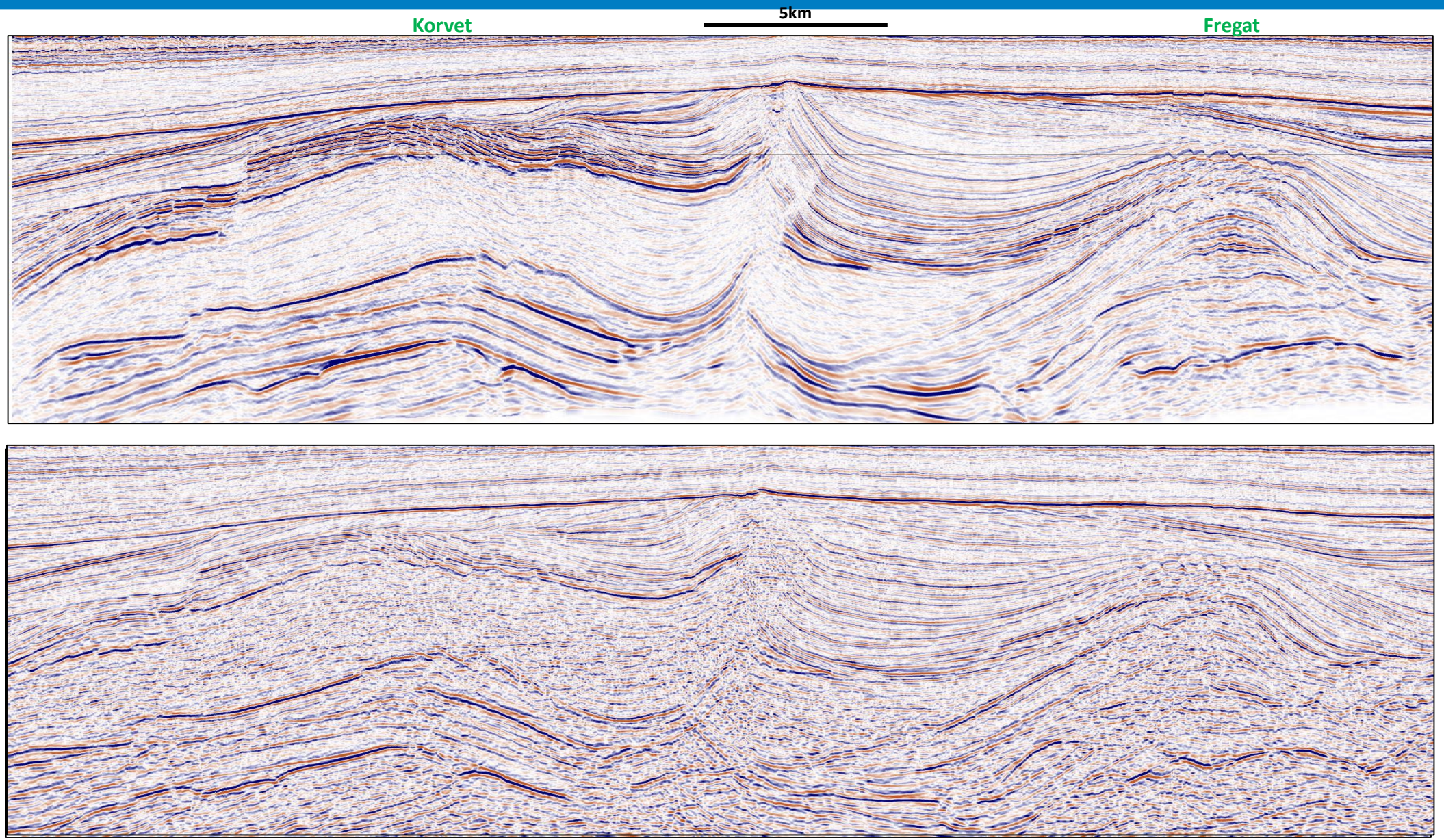
Technical Objectives:

- Broadband for vertical resolution & inversion
- Long streamer to target salt rim plays
- High fold for noise reduction
- PreStack Depth Migration for salt flank imaging

G & G Objectives

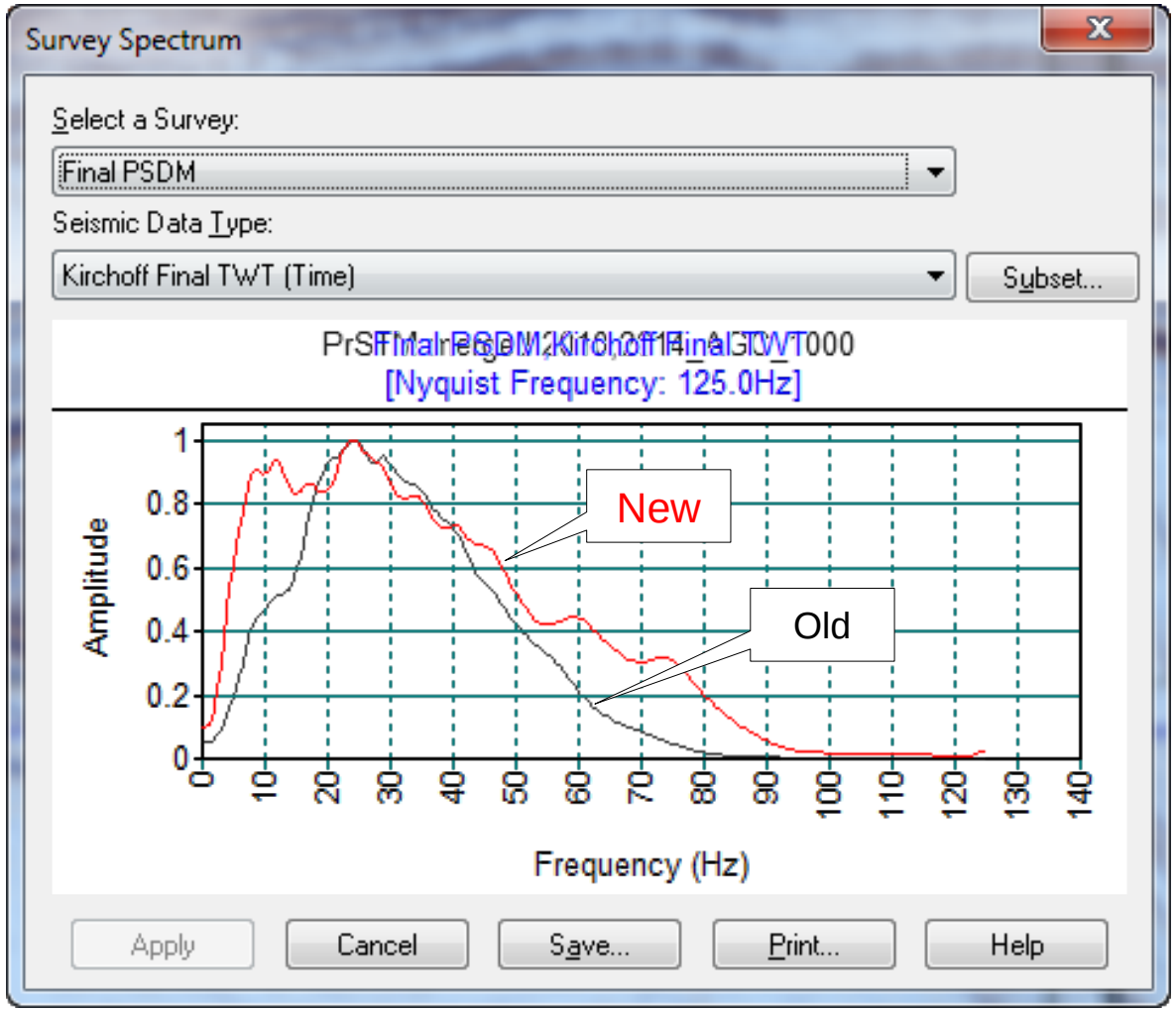
- Discriminate HC bearing reservoir from coal
- Identify HC bearing compartments
- Predict connectivity

20+ years of progress

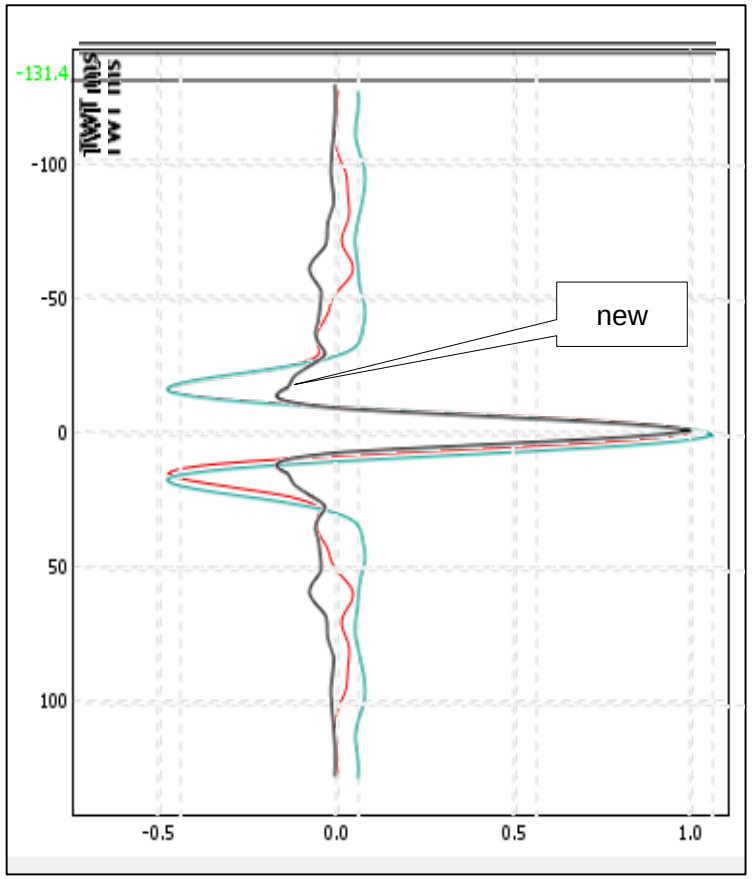


Bandwidth Expectations

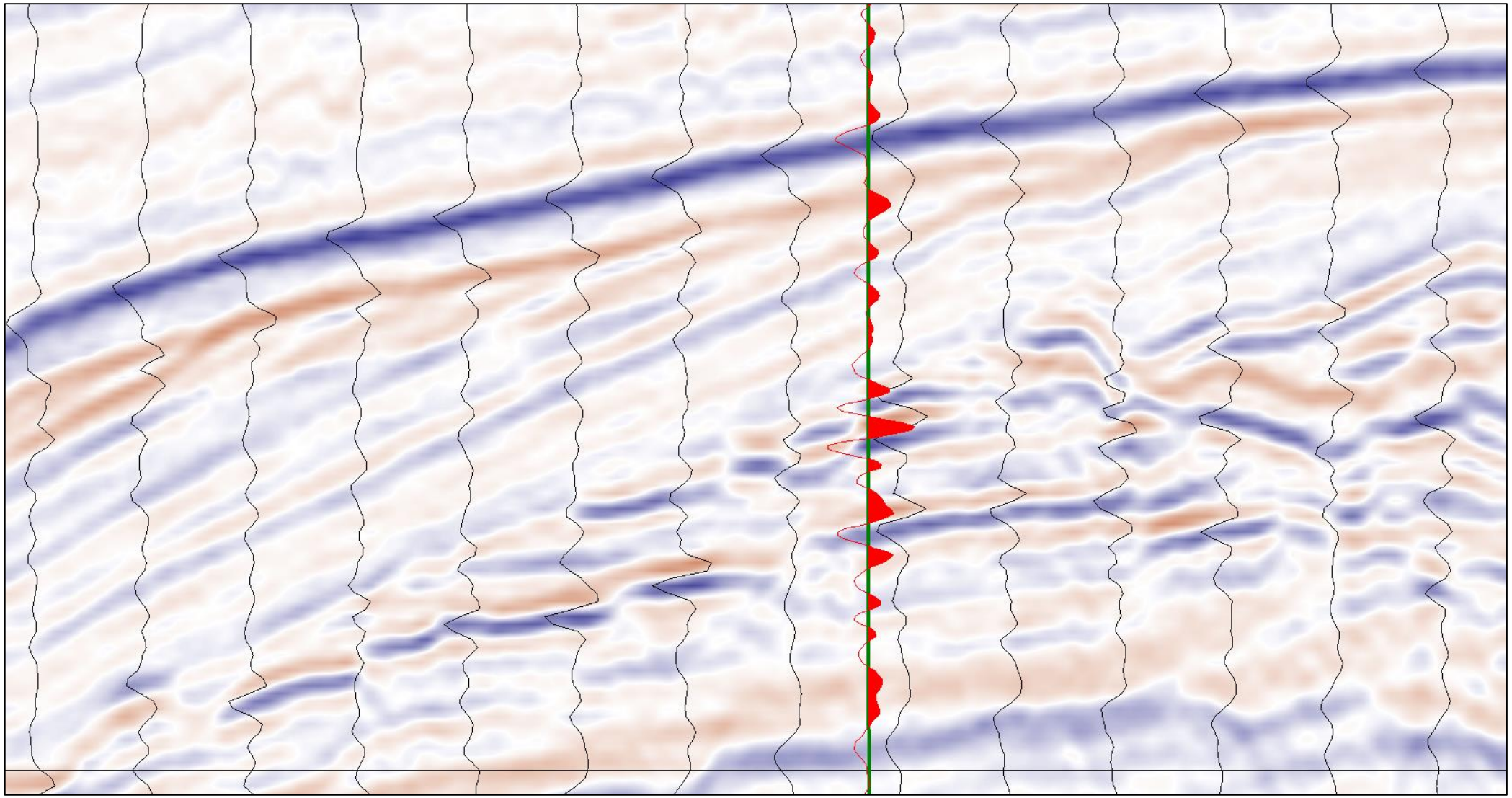
- Final 2+ octaves on low end vs Legacy



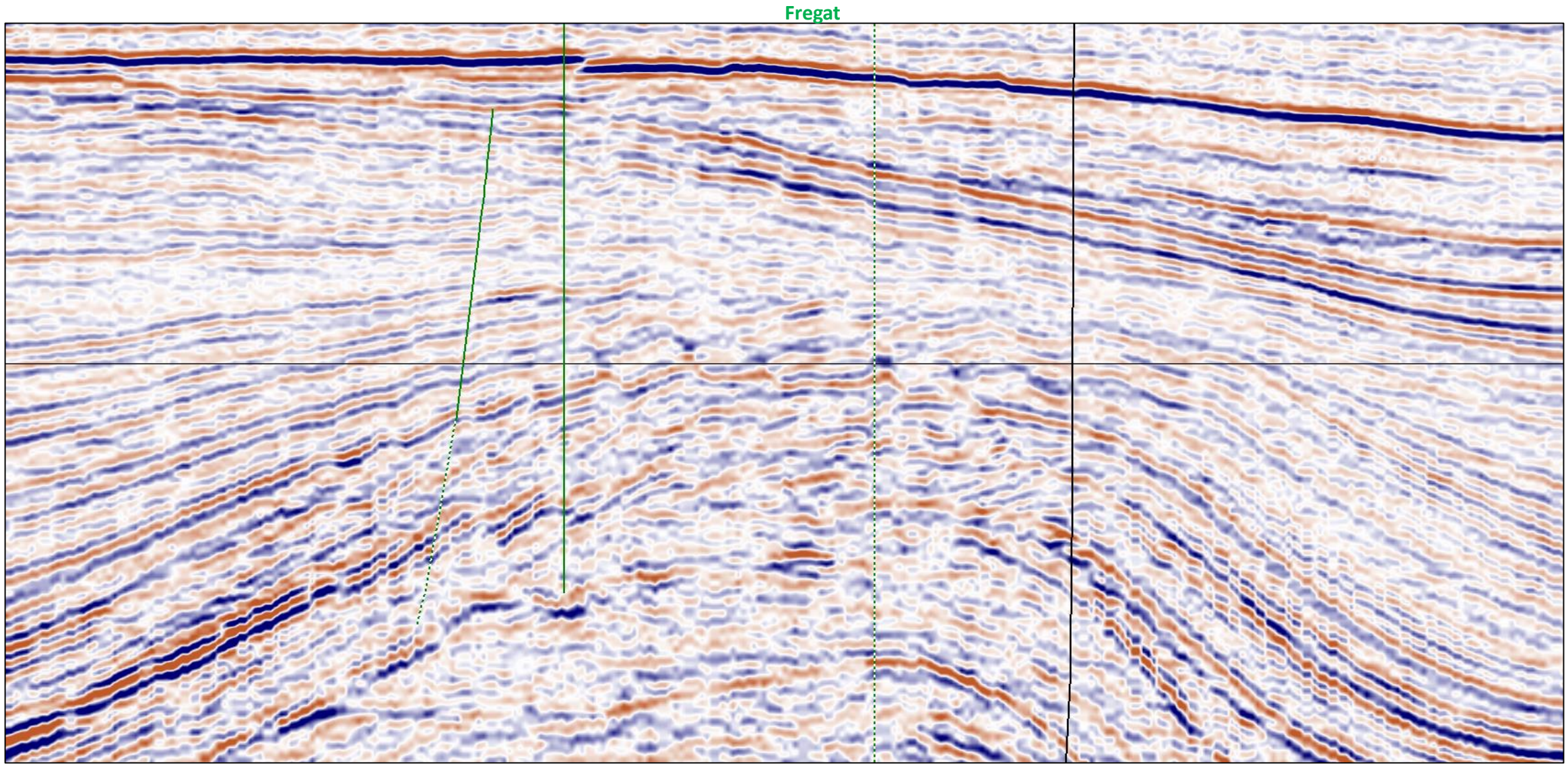
- Final wavelet tighter, smaller sidelobes



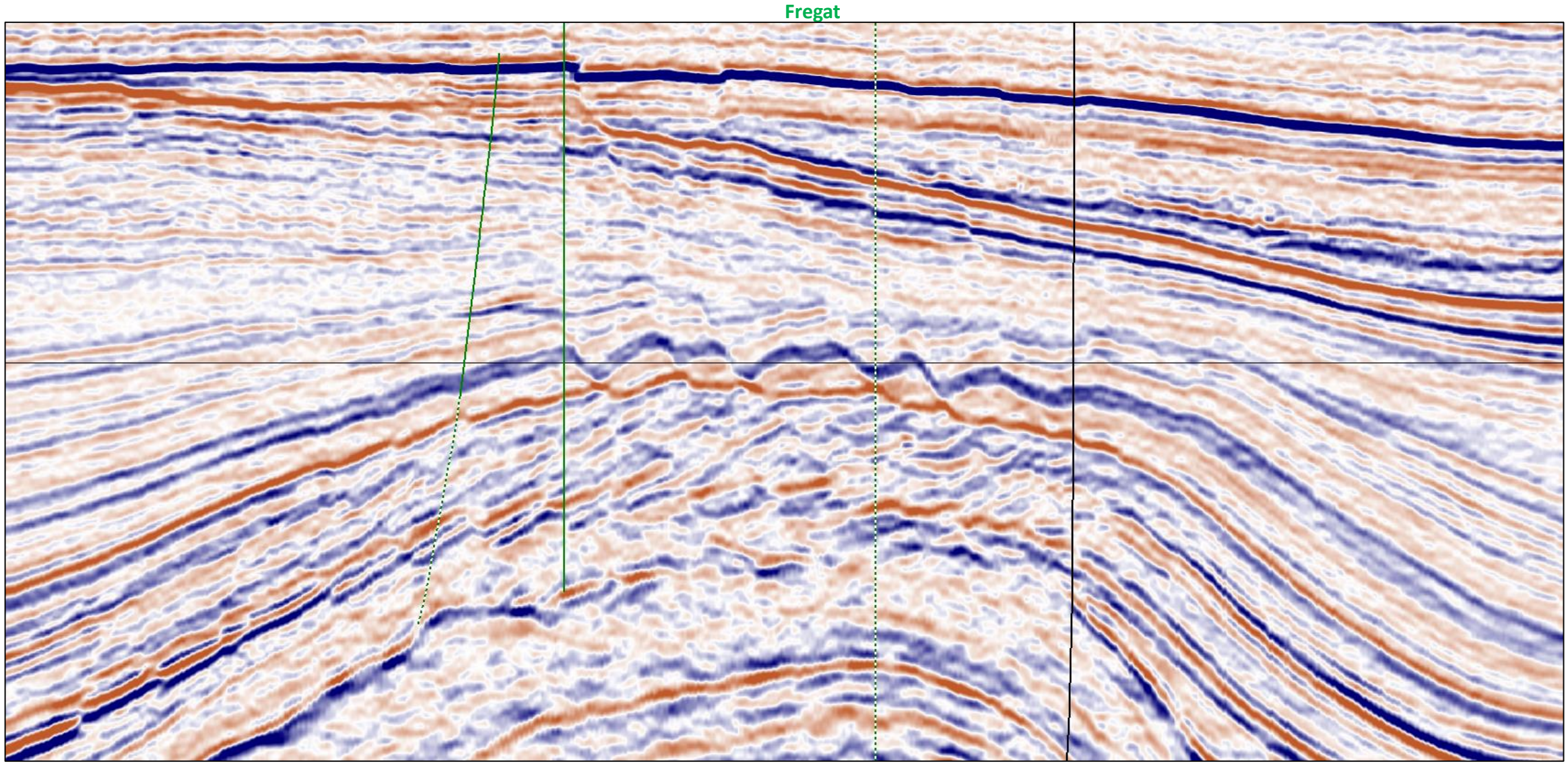
Example Well Tie … the best I've ever had …



Old

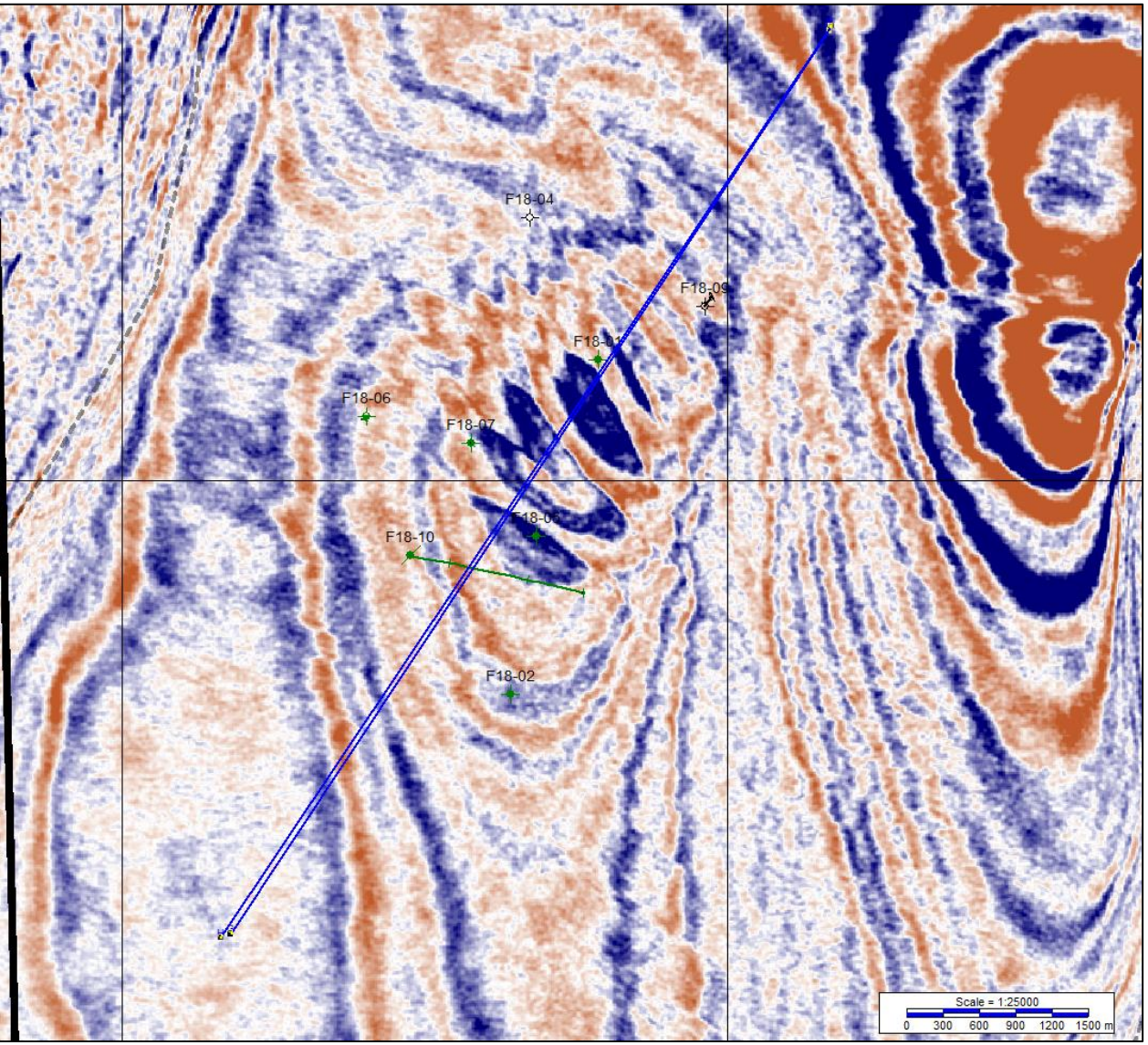


2015 PSDM

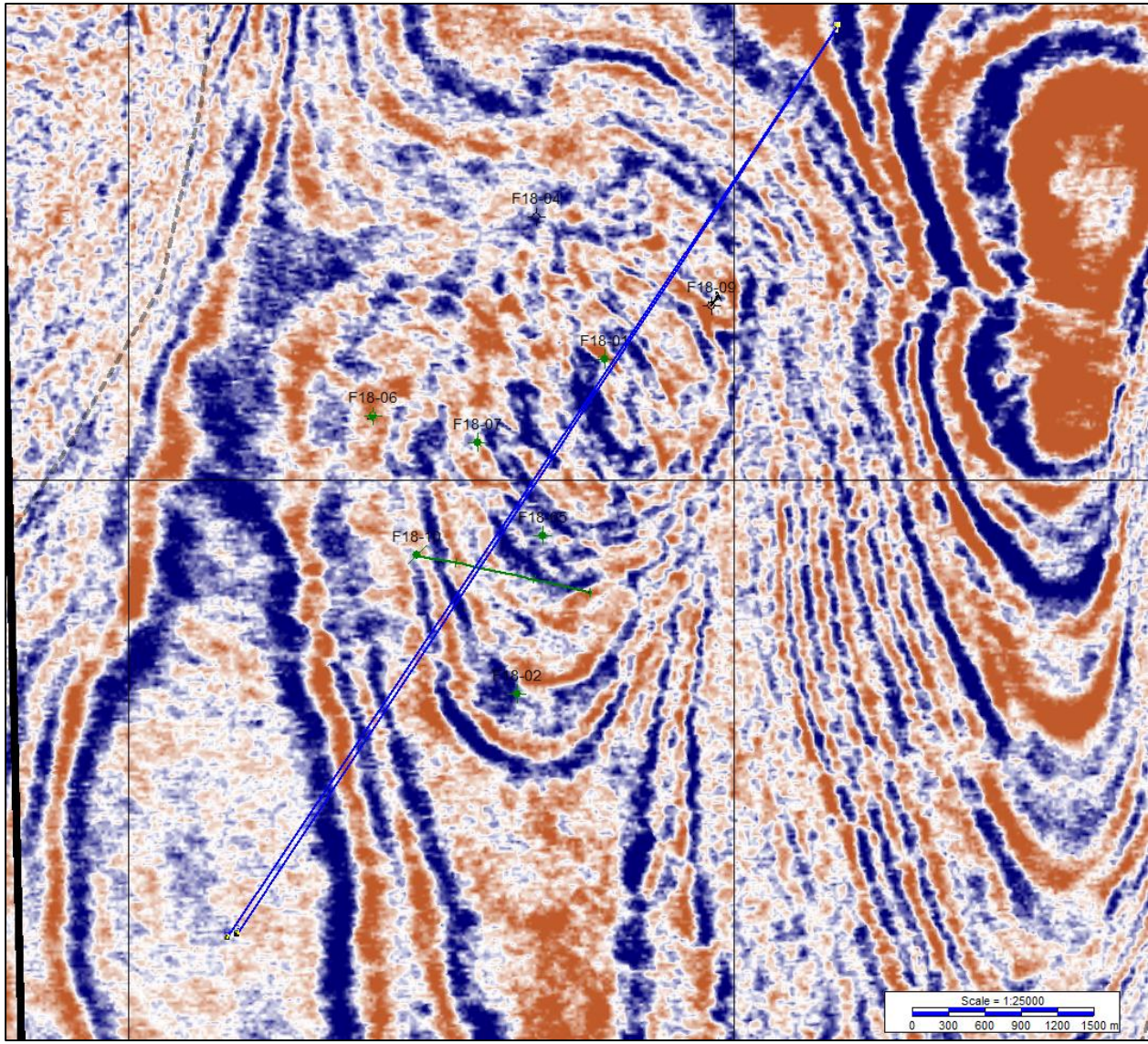


Slice over Fregat

new

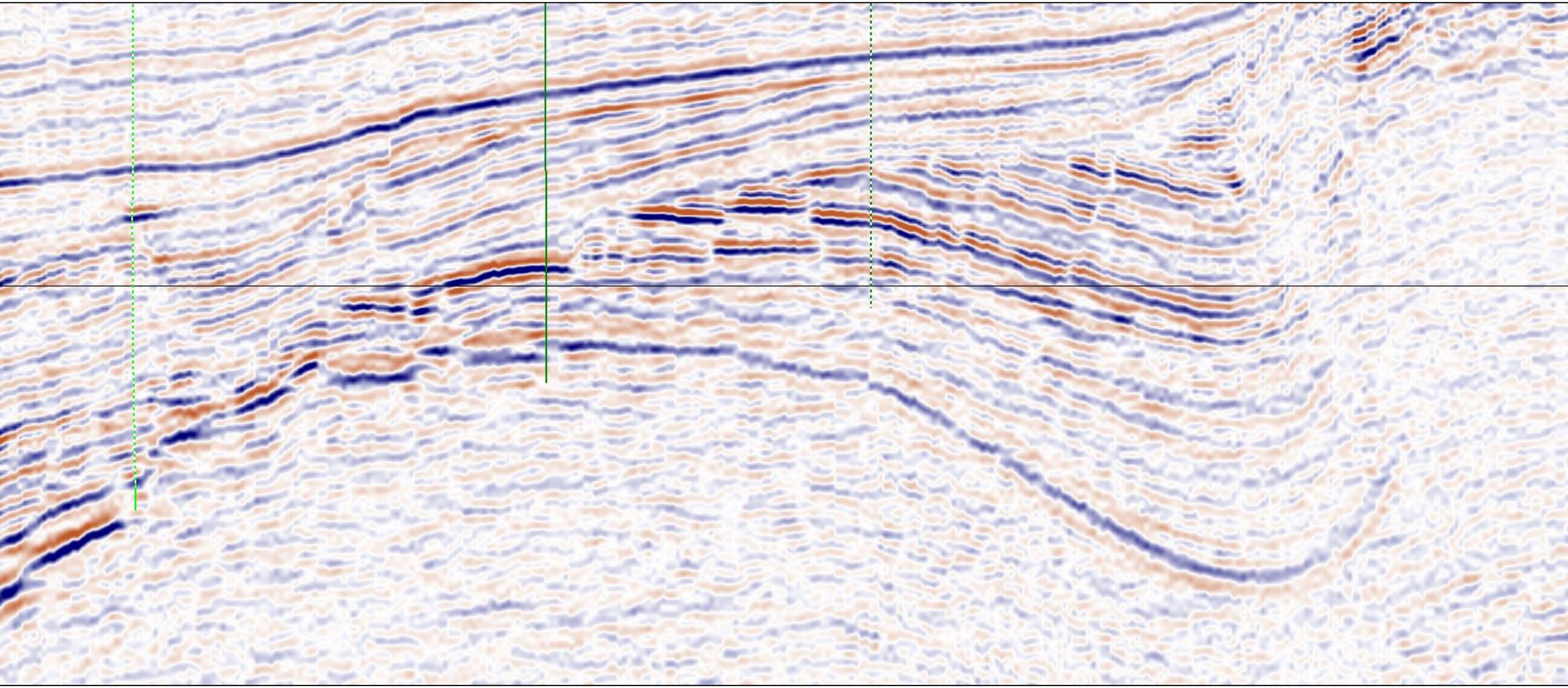


old

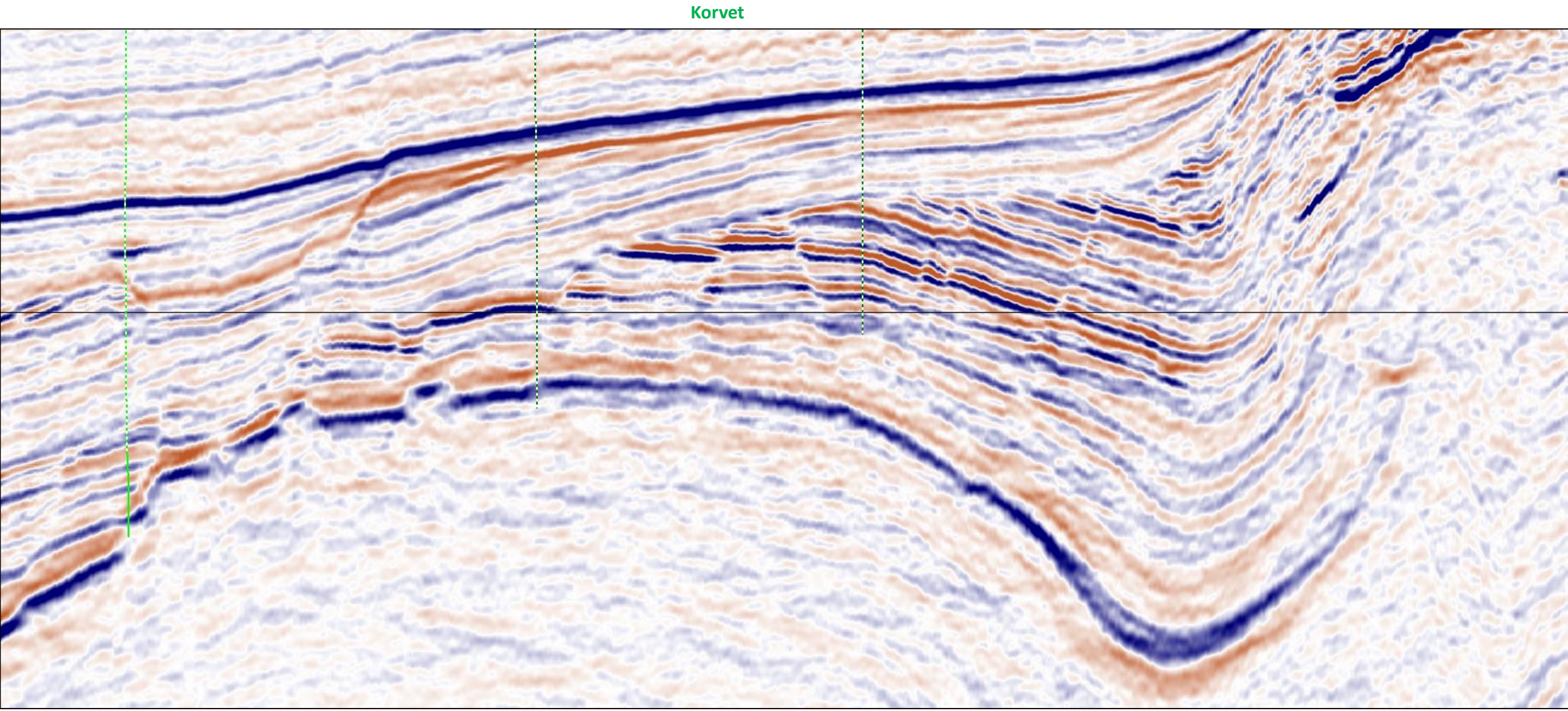


old

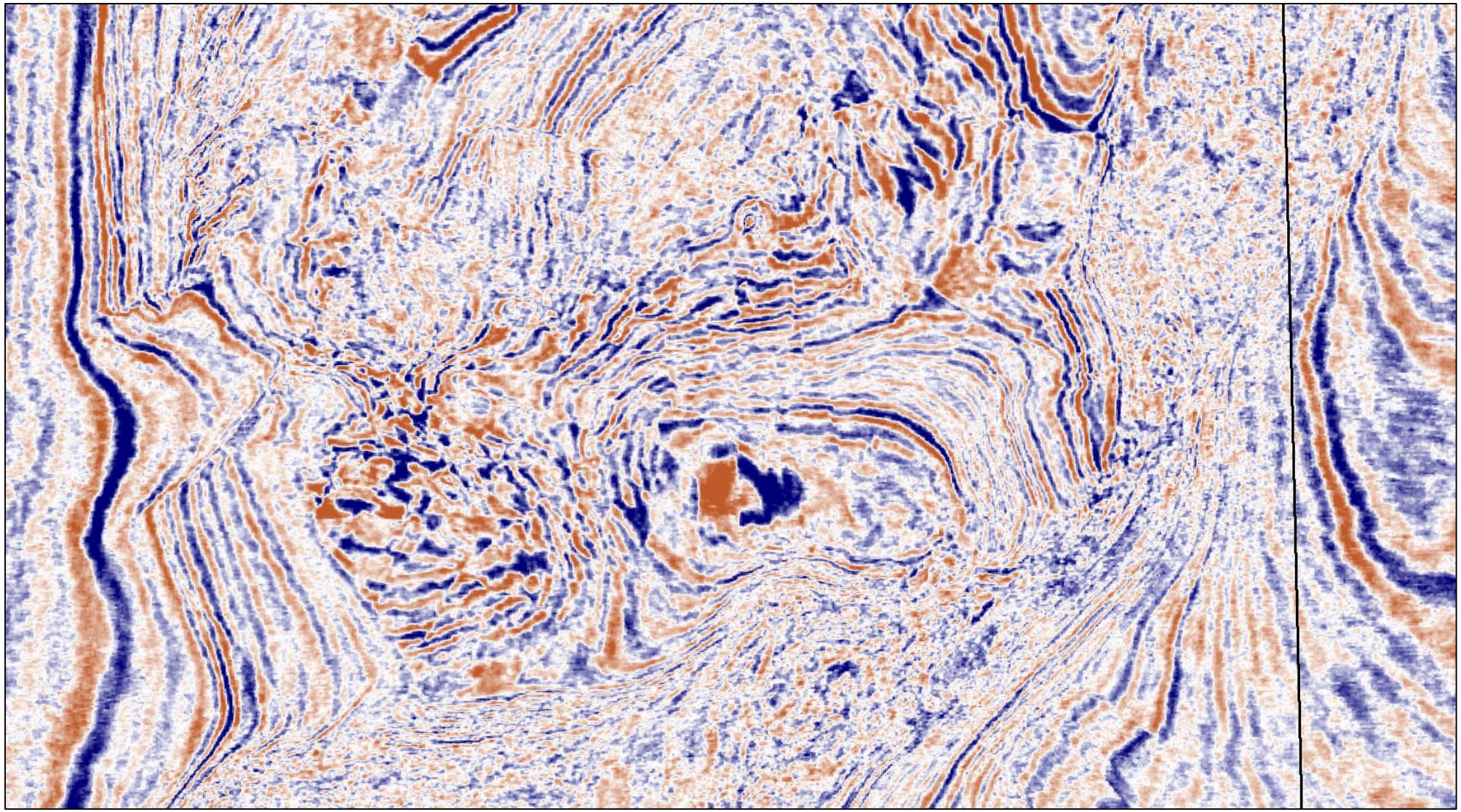
Korvet



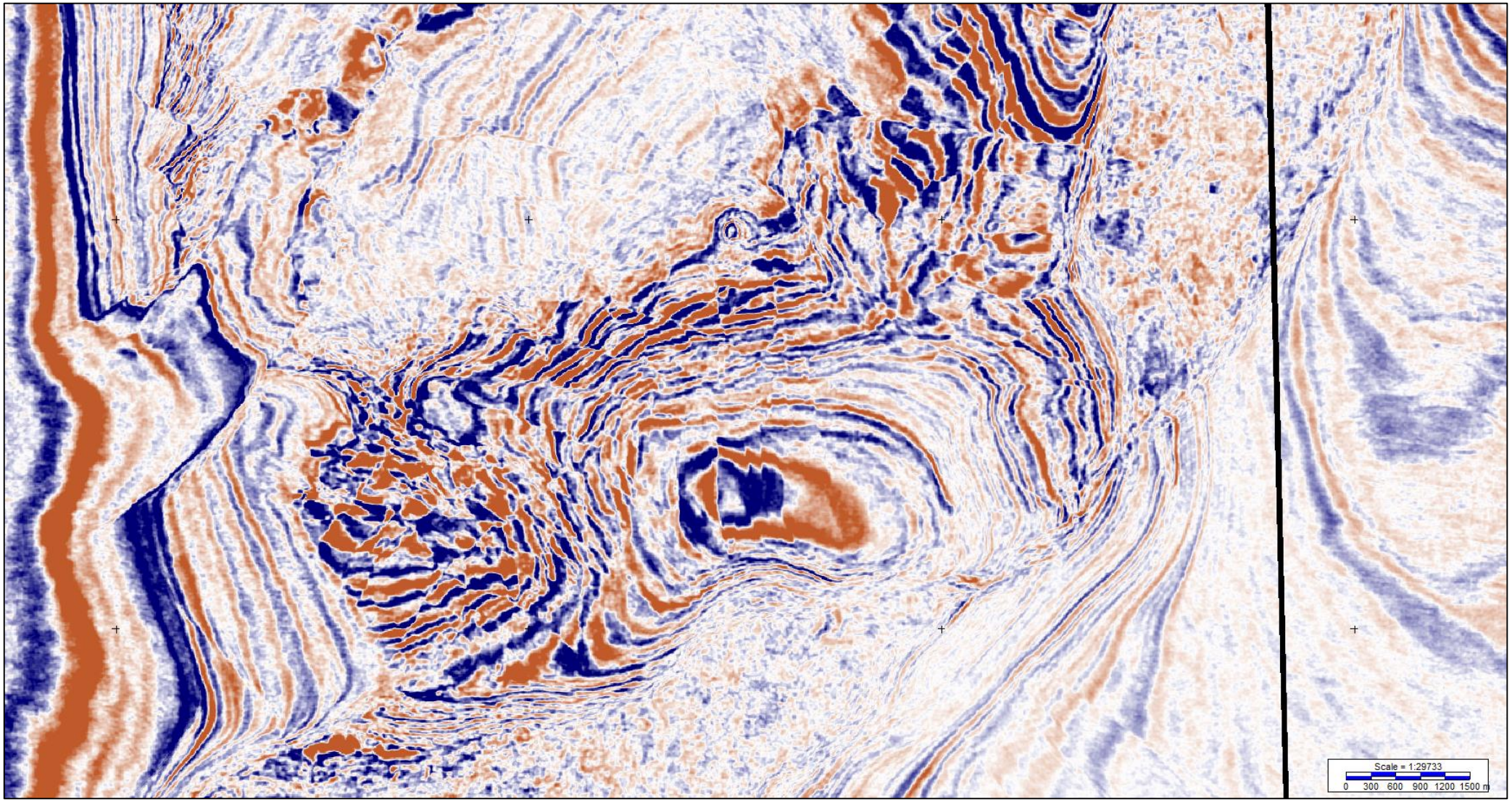
2015 PSDM



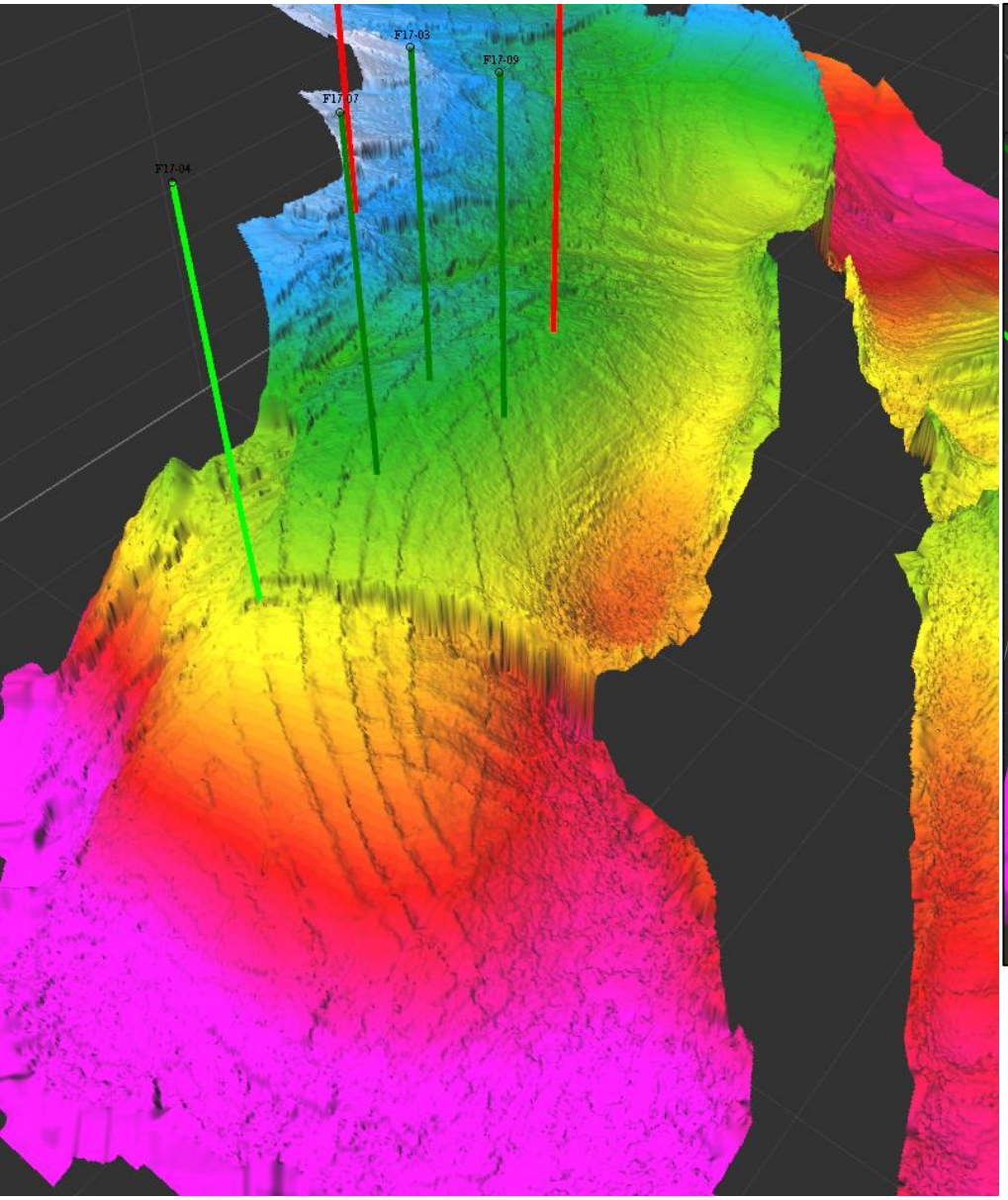
Old Korvet slice

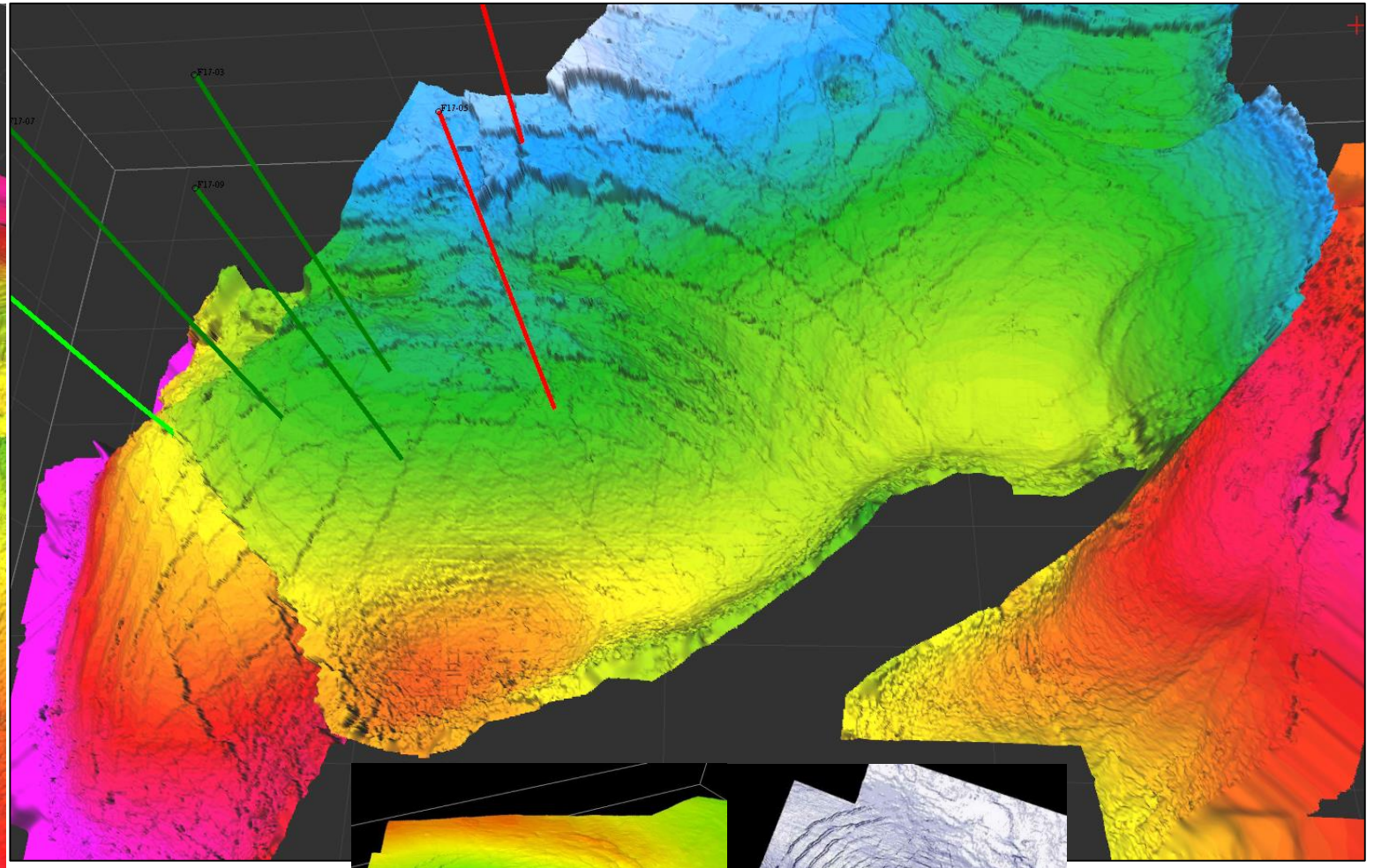


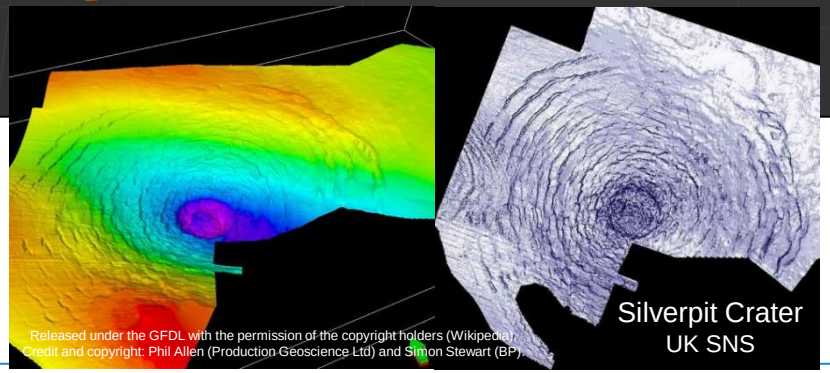
2105 PSDM Korvet slice



3D Structure at reveals subtle fault detail not recognized before







Improved salt flank image

old

Kirchoff

Beam