

DHI enhancement as key-enabler to portfolio rejuvenation – part I

Examples from the Southern Permian Basin

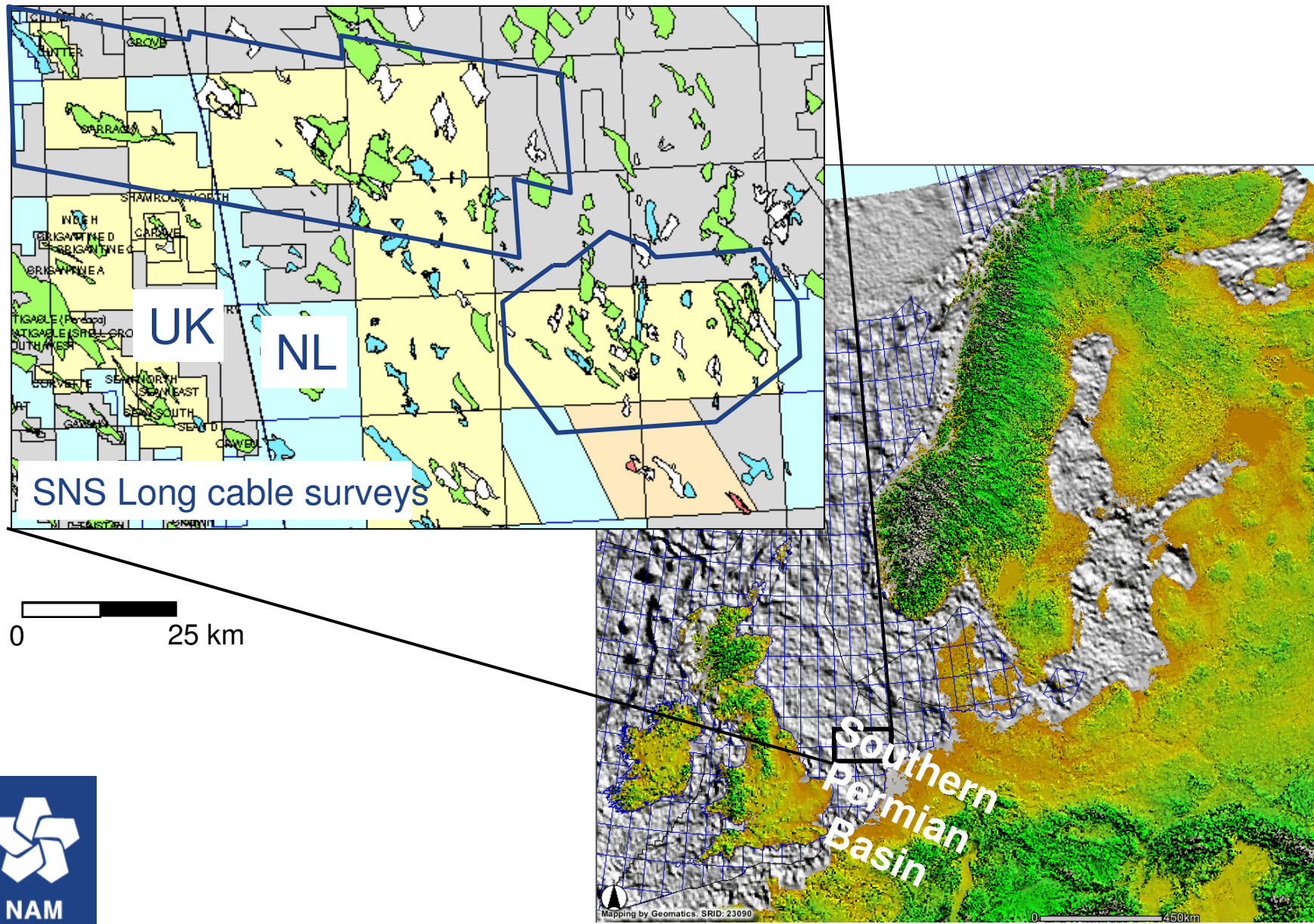
M. Brühl , R. van Spaendonck , W. van Lingen, R. Sneepe, R. van Boom, N. Yilo

NAM

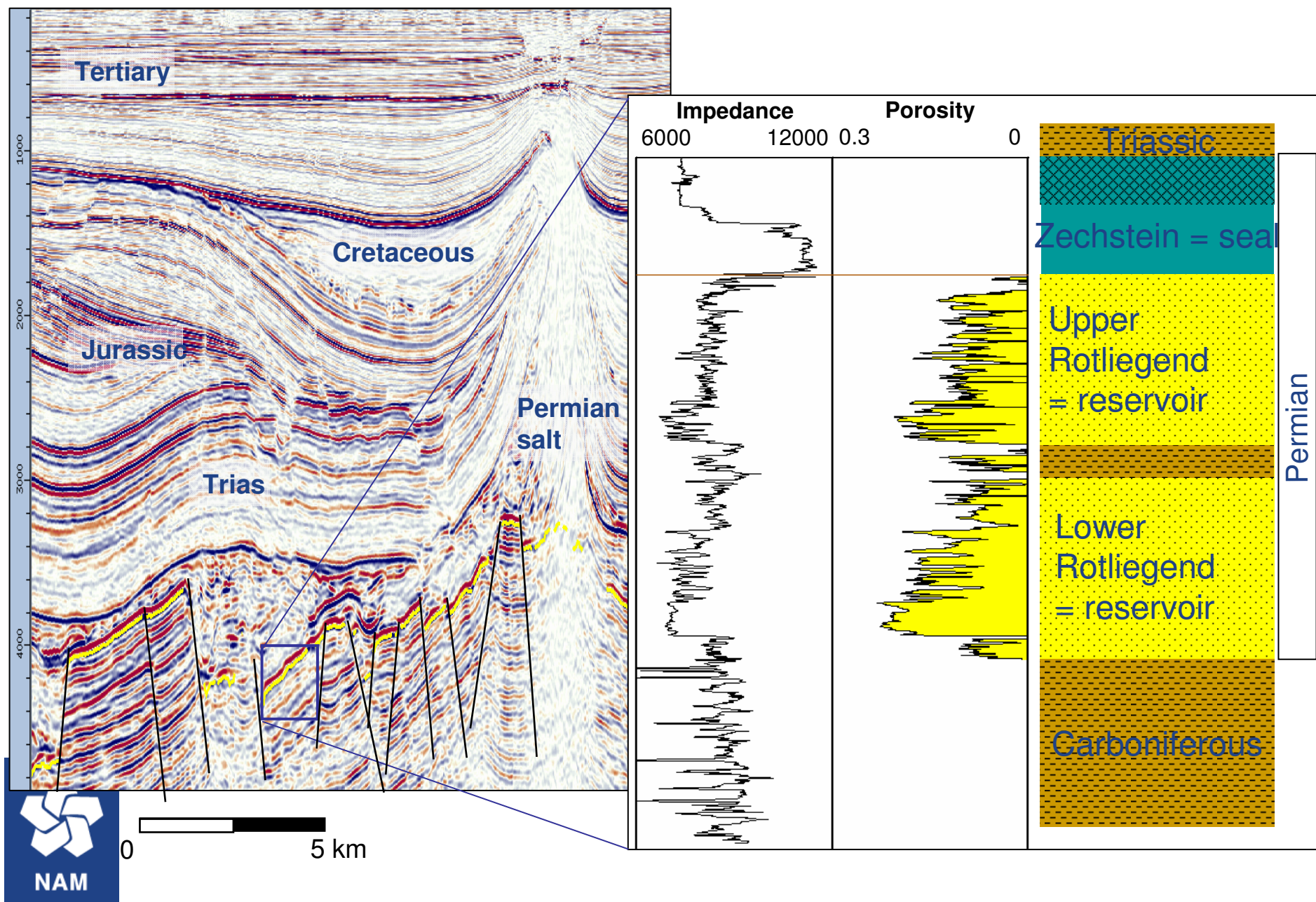
EBN-TNO workshop, January 2010



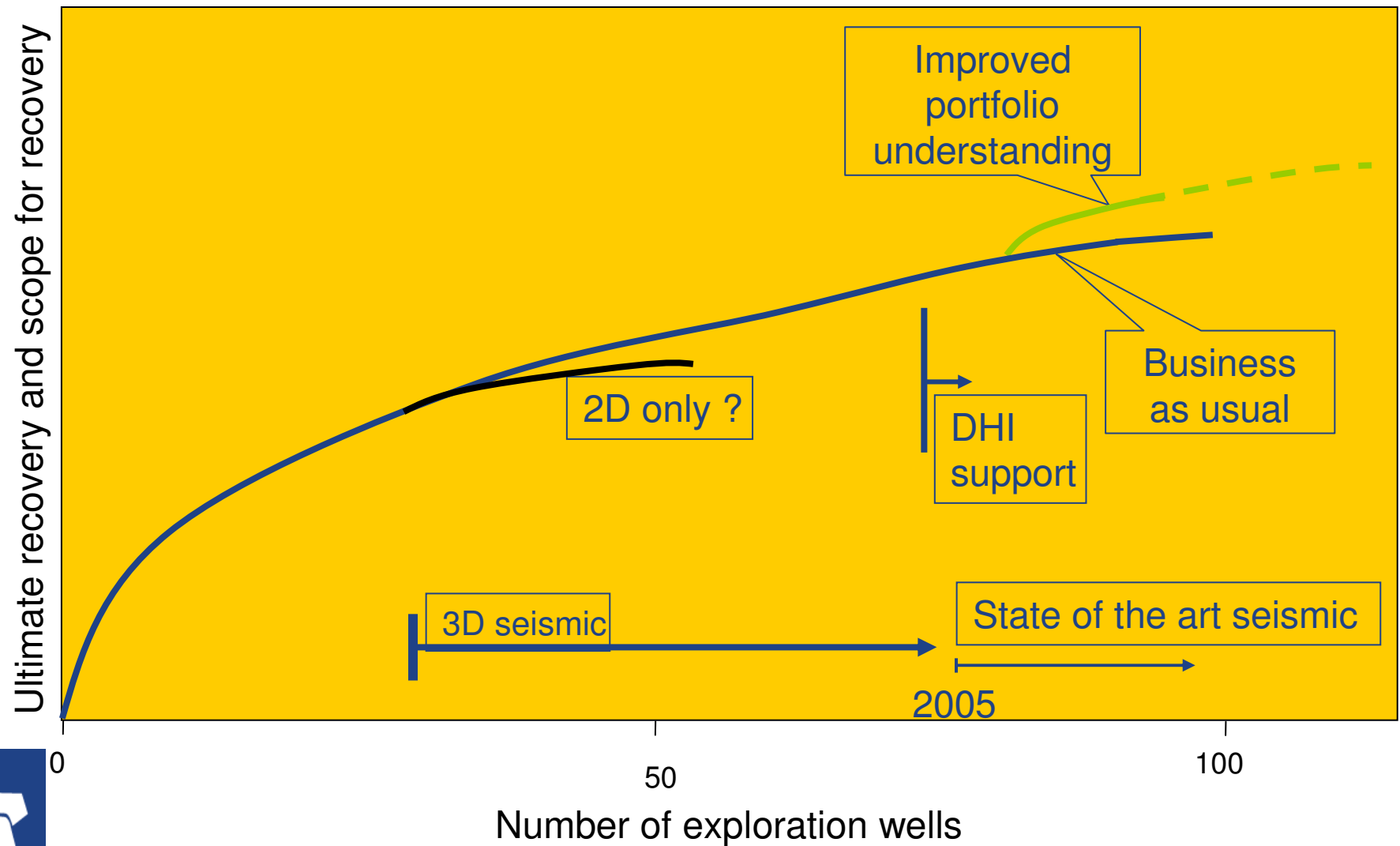
Location map



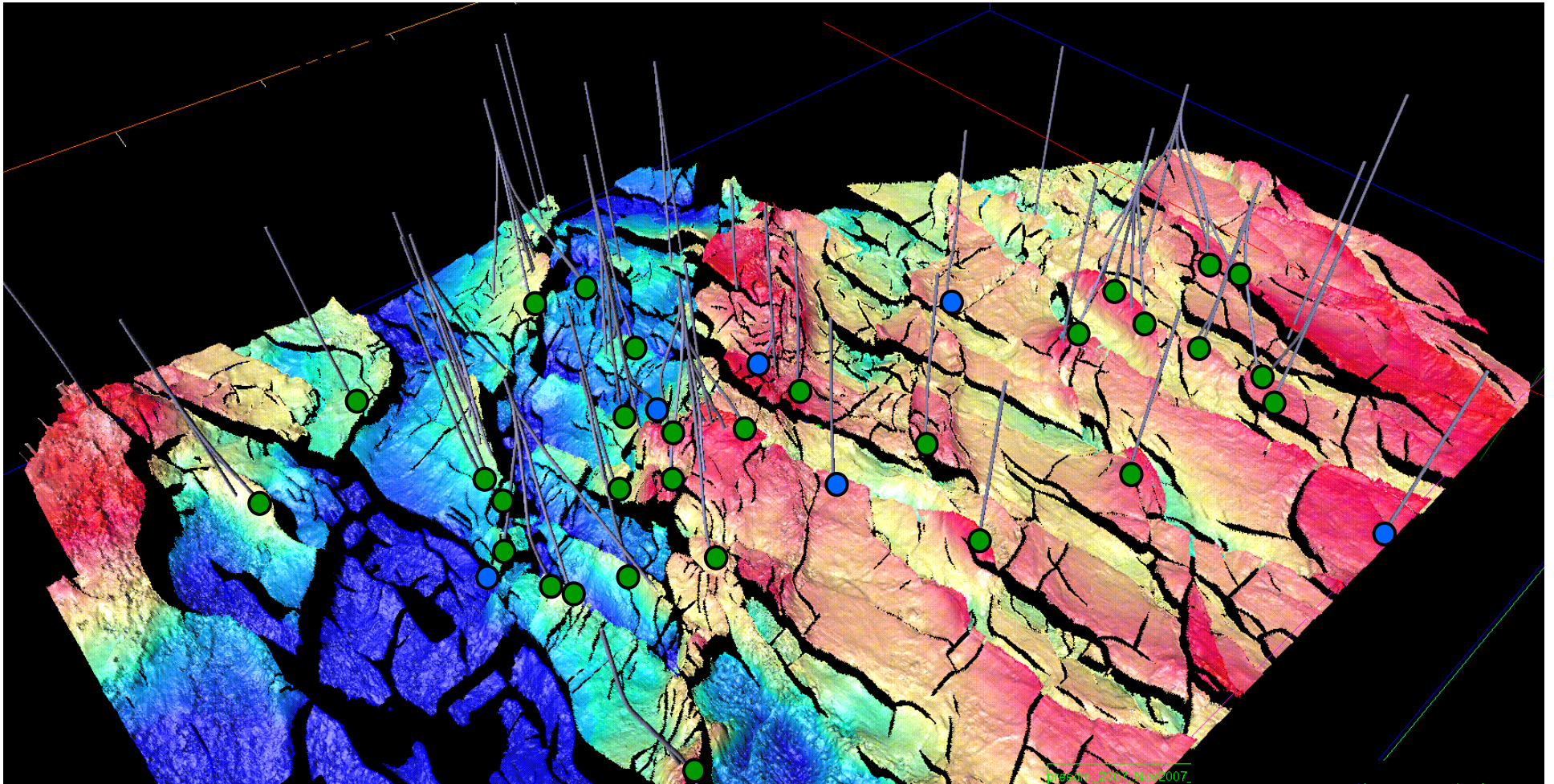
Rotliegend play



Area of interest: Creaming Curve - Rotliegend reservoir

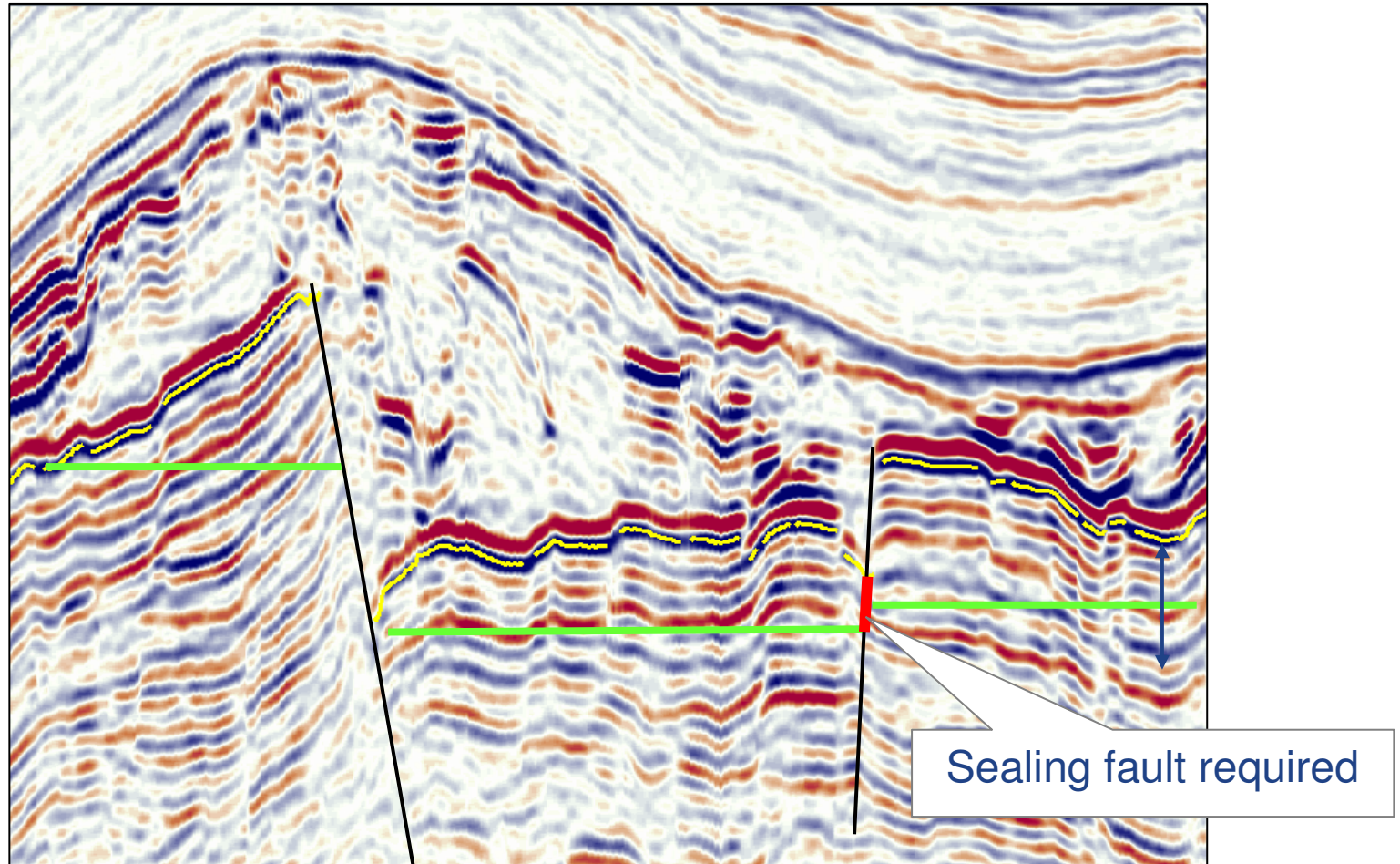


We have drilled the highs!....and successfully so

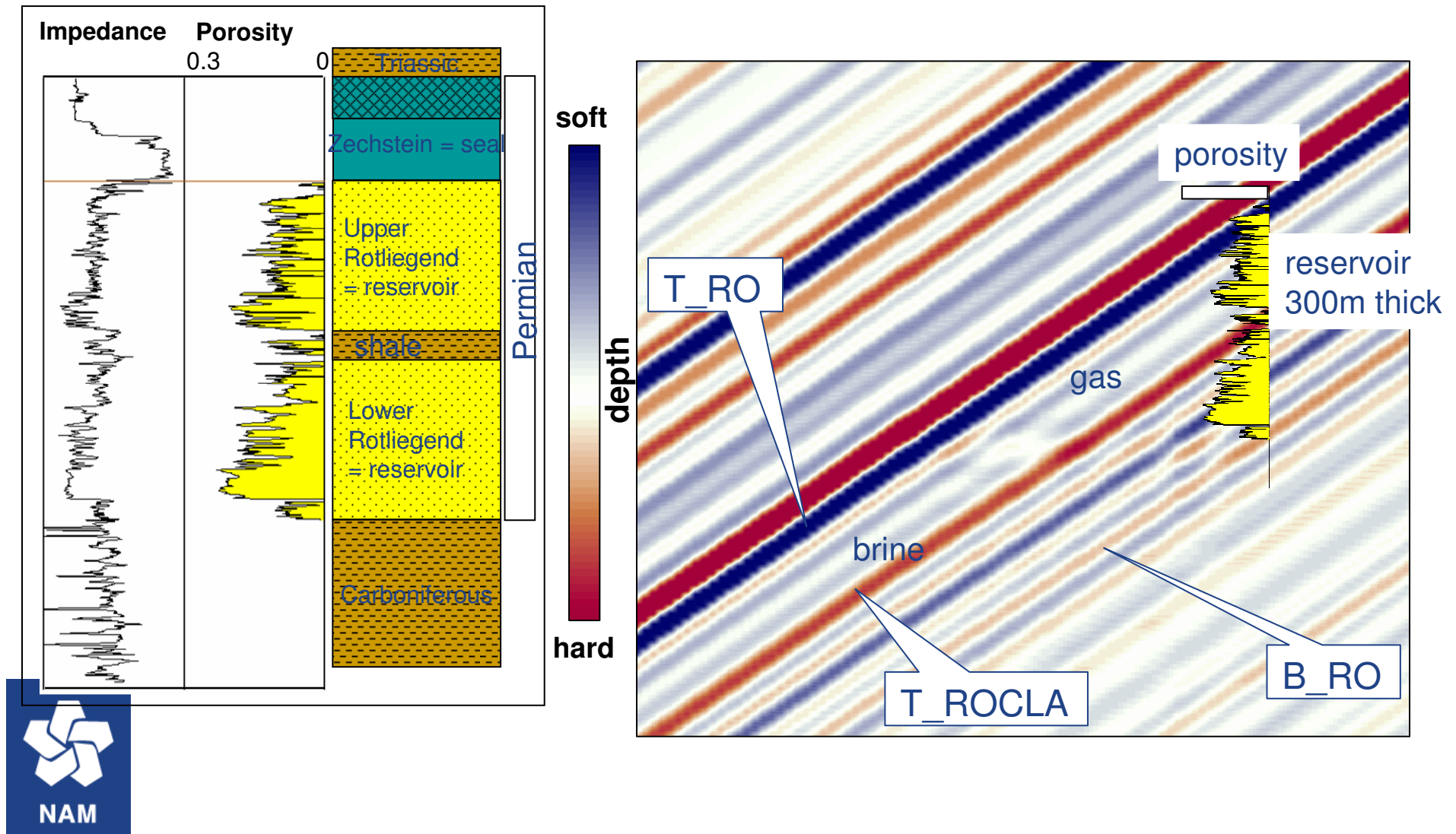


Top Rotliegendes depth map

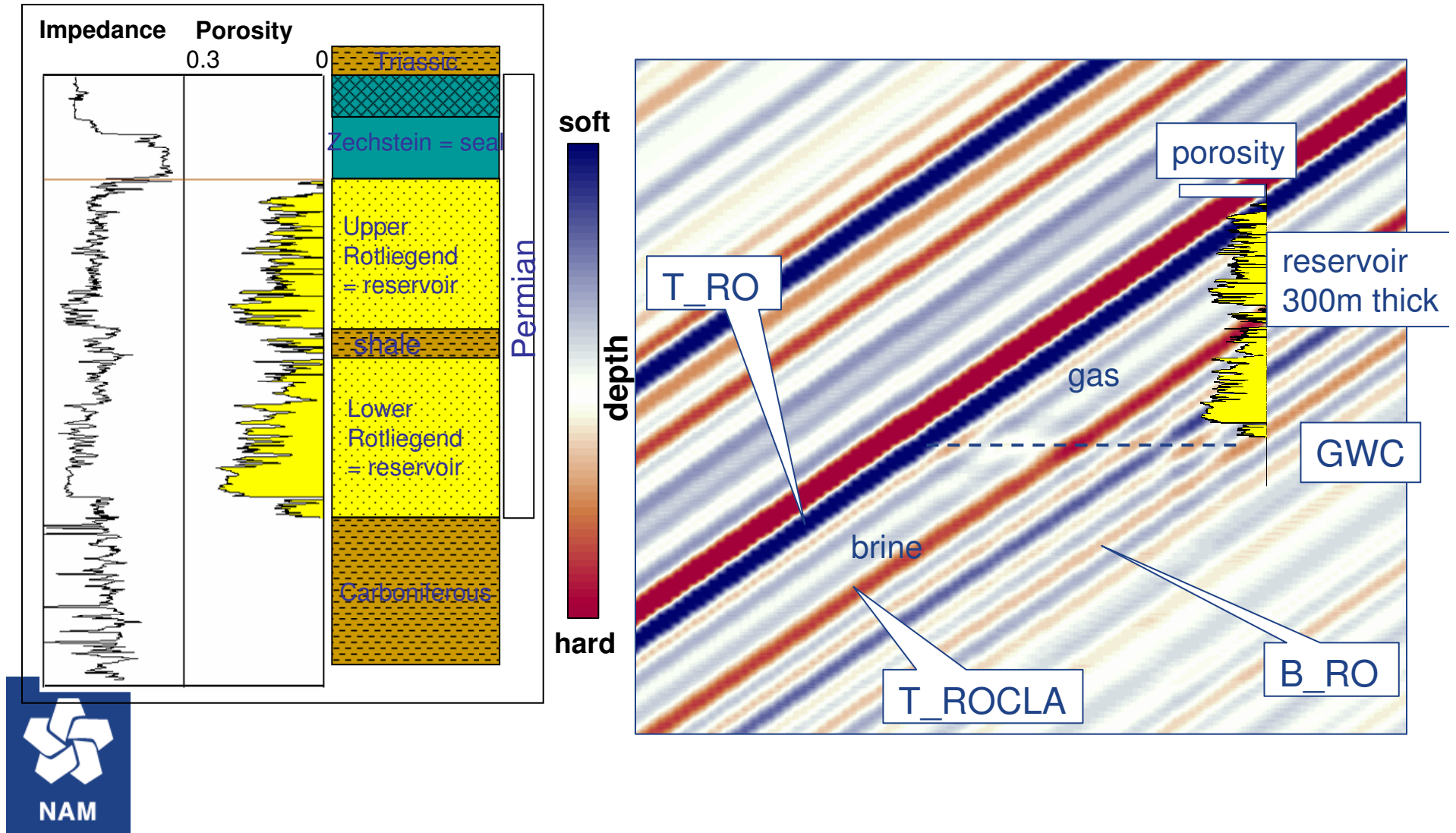
Fault Seal evidence



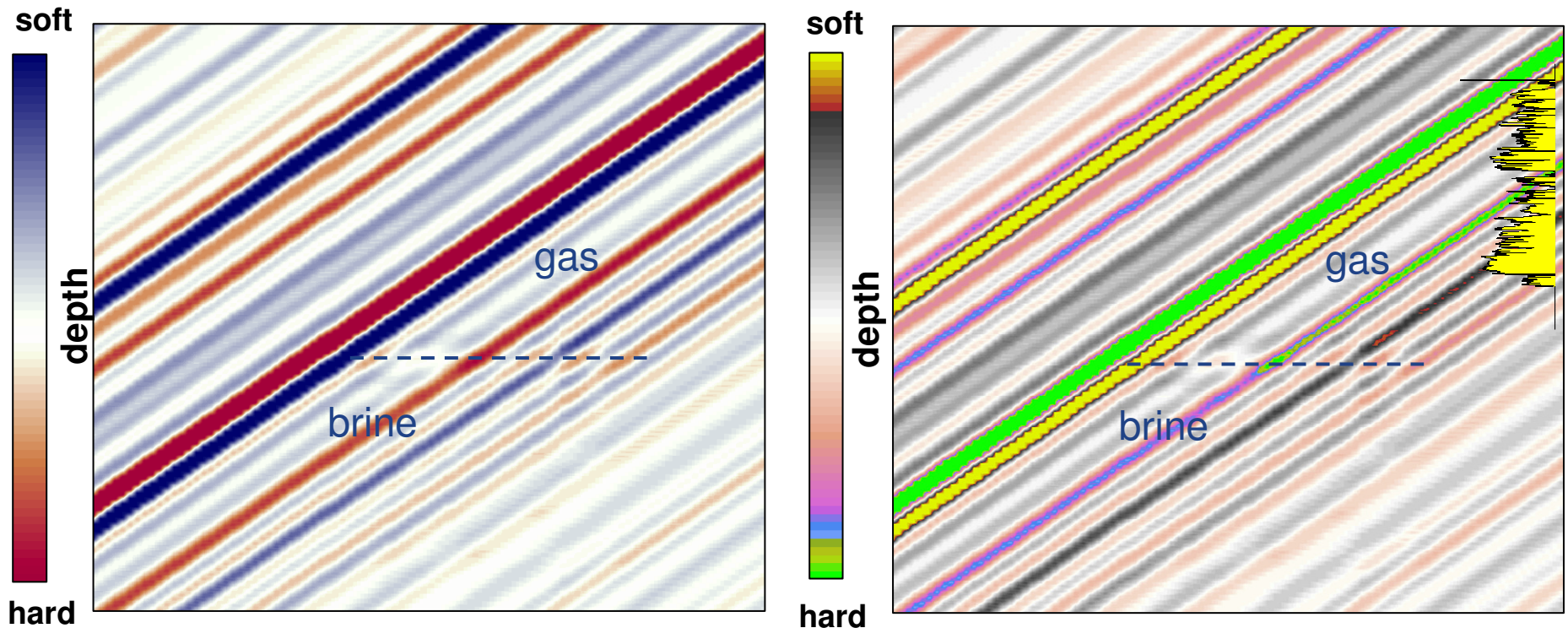
Seismic DHI: Seismic expression of gas bearing reservoir



Seismic DHI: Seismic expression of gas bearing reservoir



Visualising a subtle DHI



- DHI very subtle (brightening, subtle flat spot)
- AVO also subtle
- overburden complex

- + rock properties consistent
- + reservoir present and limited thickness variation only
- + DHI horizon consistent

The conventional DHI: Structurally conformable amplitudes?

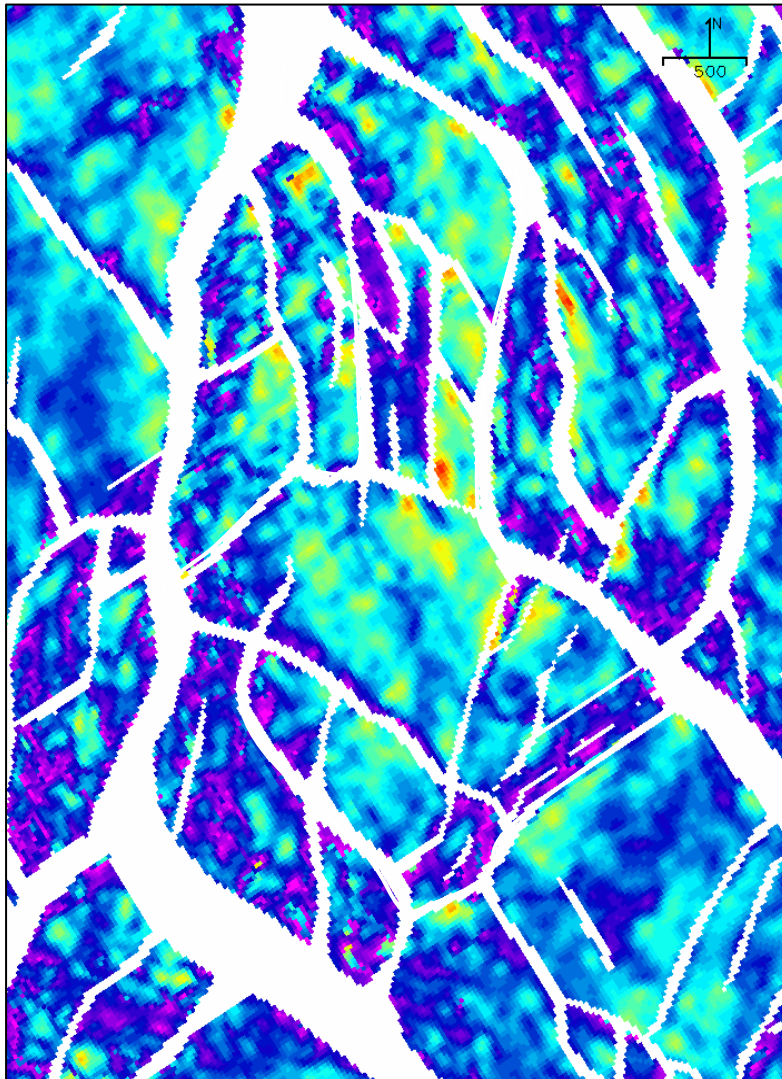
Deep/
Low
amplitude



shallow/
High
amplitude



T_ROCLA amplitude



T_ROCLA depth



The conventional DHI: Structurally conformable amplitudes?

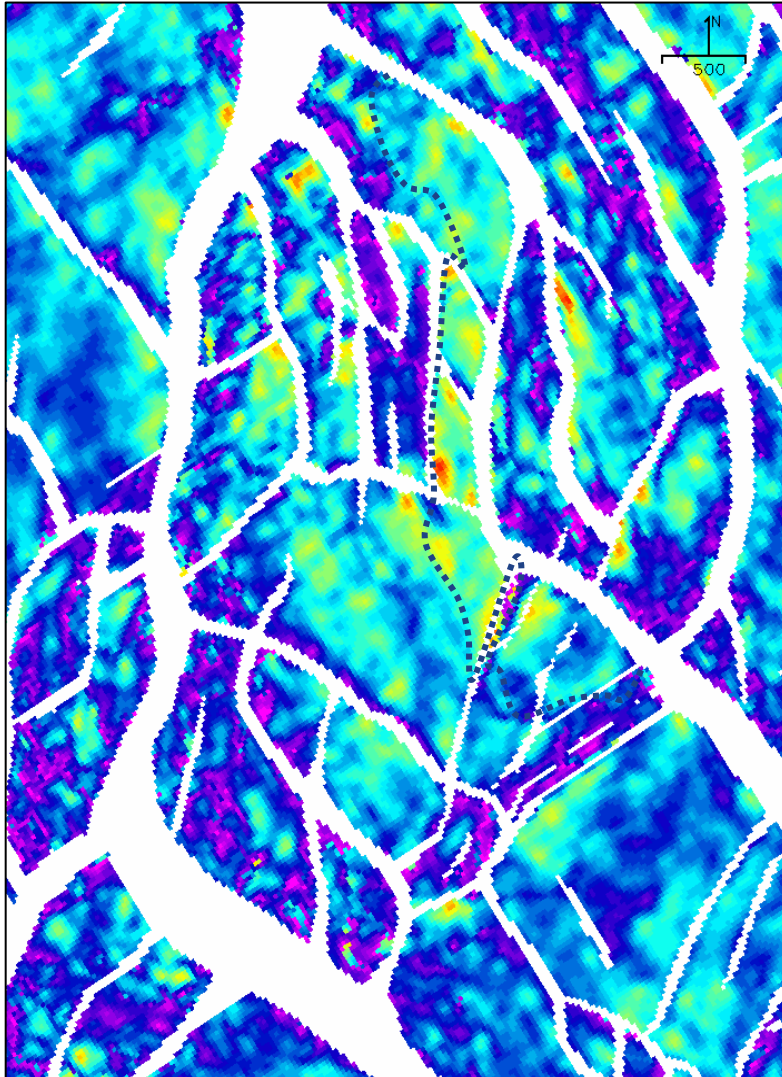
Deep/
Low
amplitude



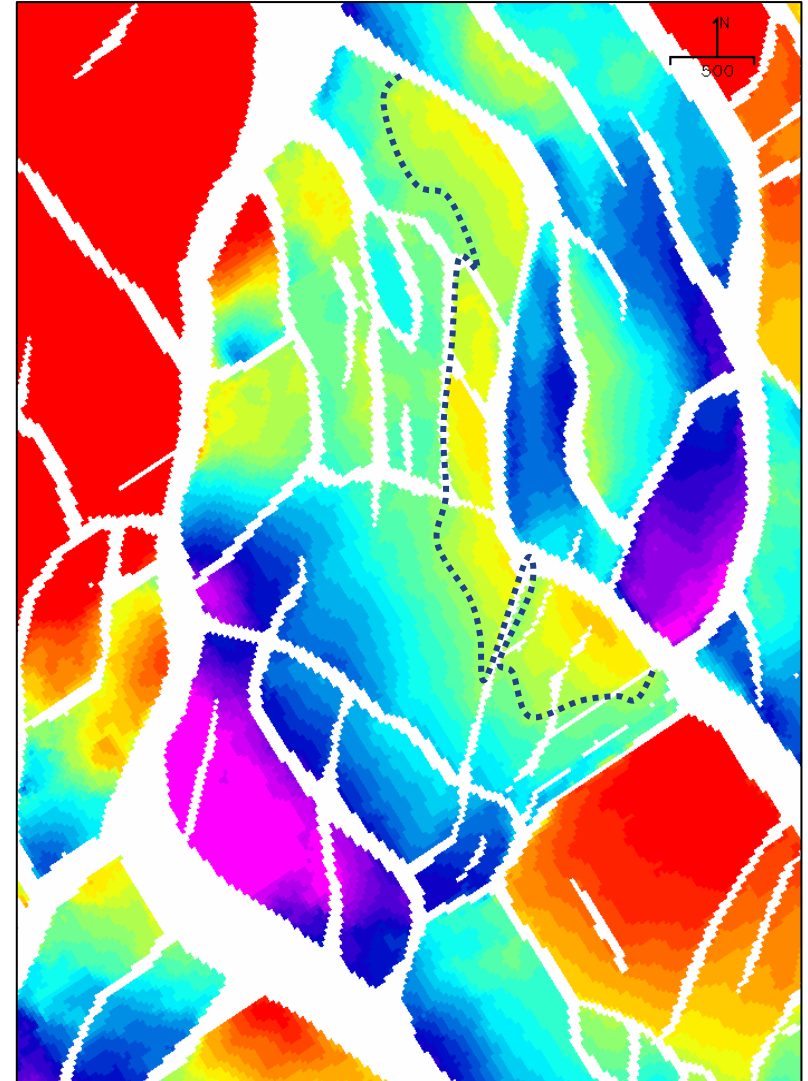
shallow/
High
amplitude



T_ROCLA amplitude

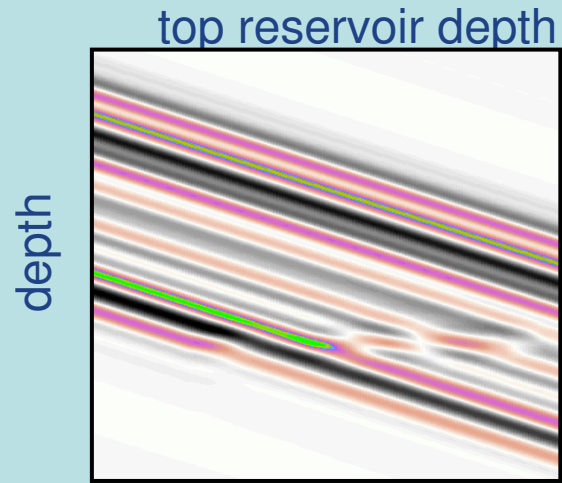


T_ROCLA depth

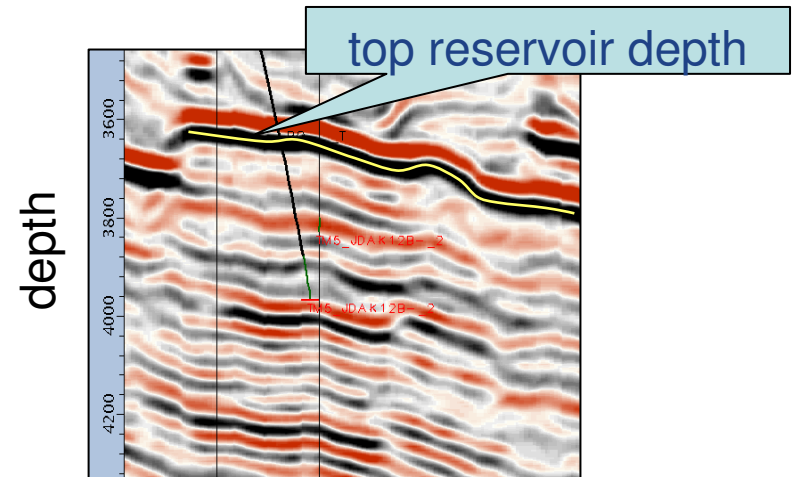
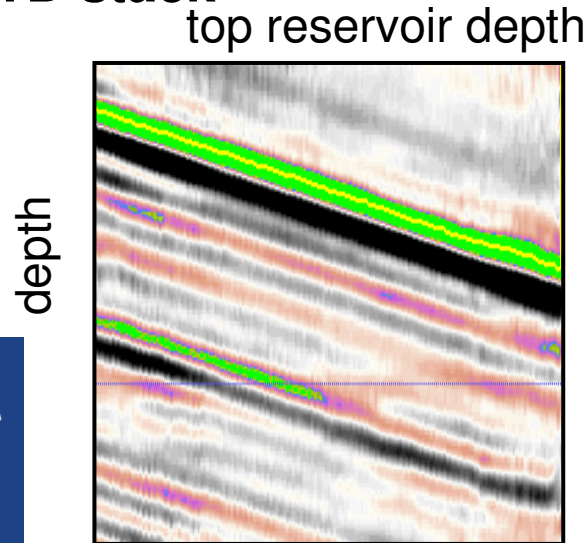


From wedge model to **Common Top Depth stack**

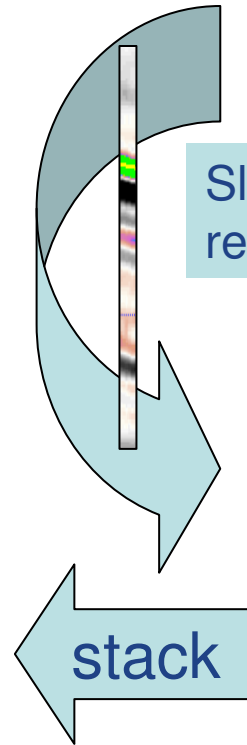
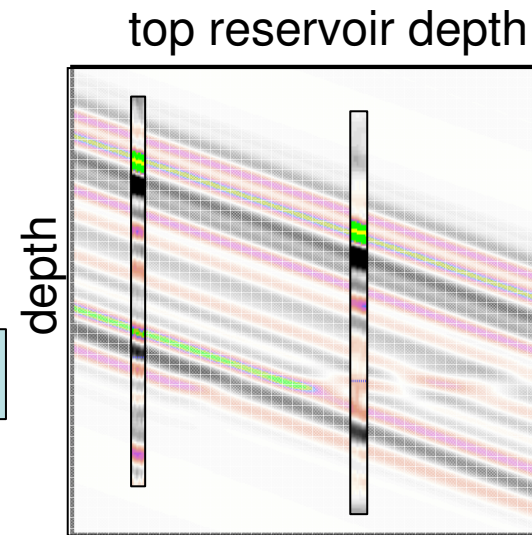
Wedge model



CTD stack

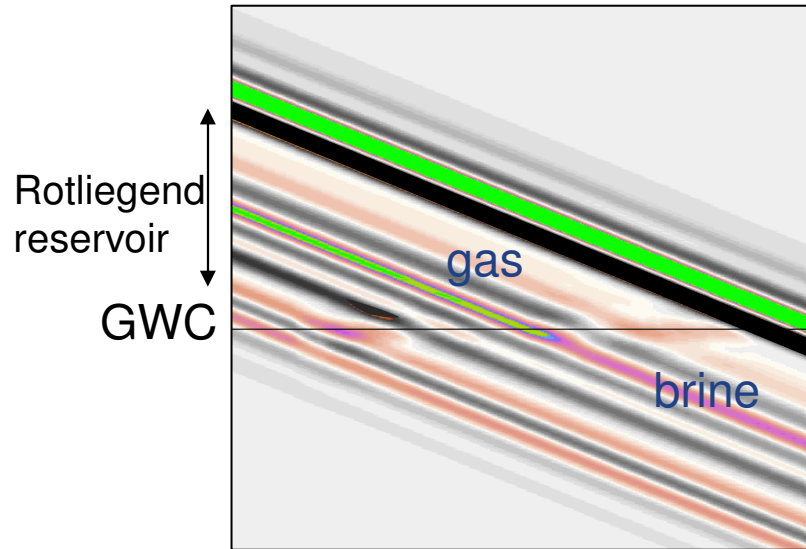


Slot trace according to top reservoir depth for a fault block

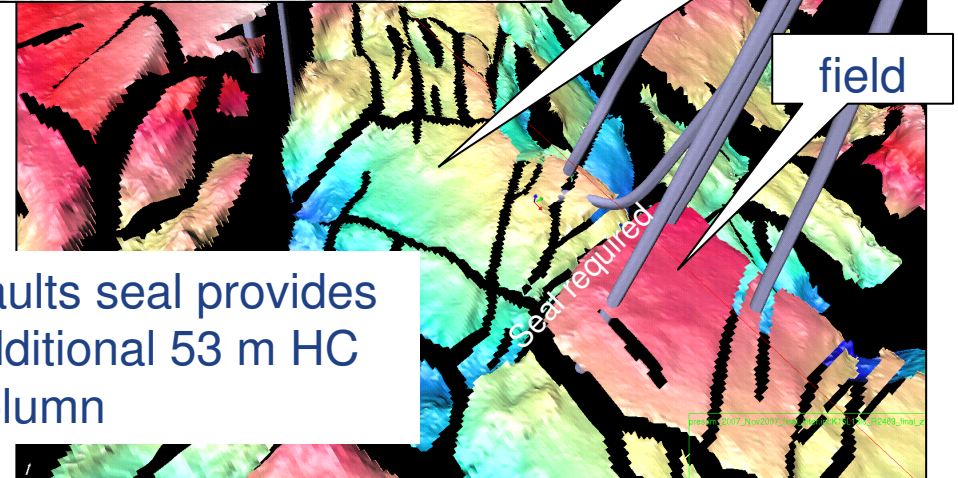
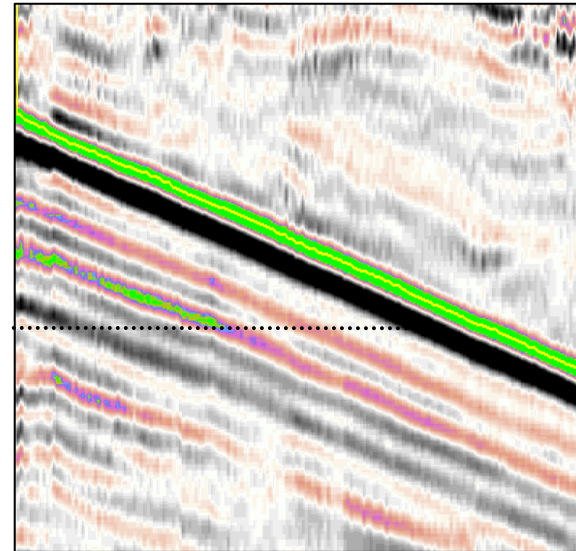


Deeper GWC than expected from dip closure: CTD stack quantifies faults seal

Modelled seismic response of GWC



CTD stack (actual seismic response)



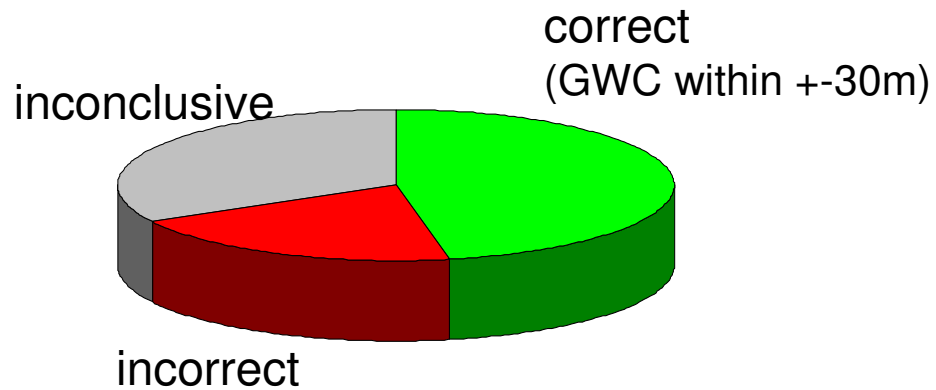
Every fault block a lead?



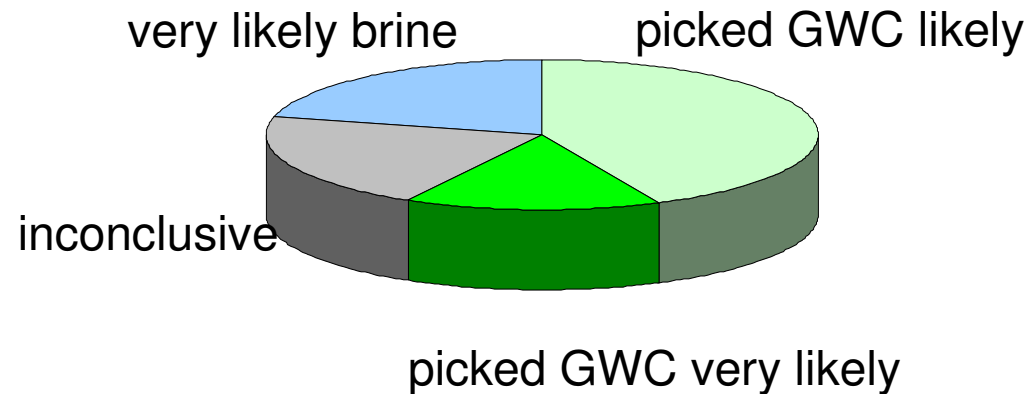
DHI evaluation: vintage data

**existing wells
(blind test)**

**CTD stacks
vintage seismic**

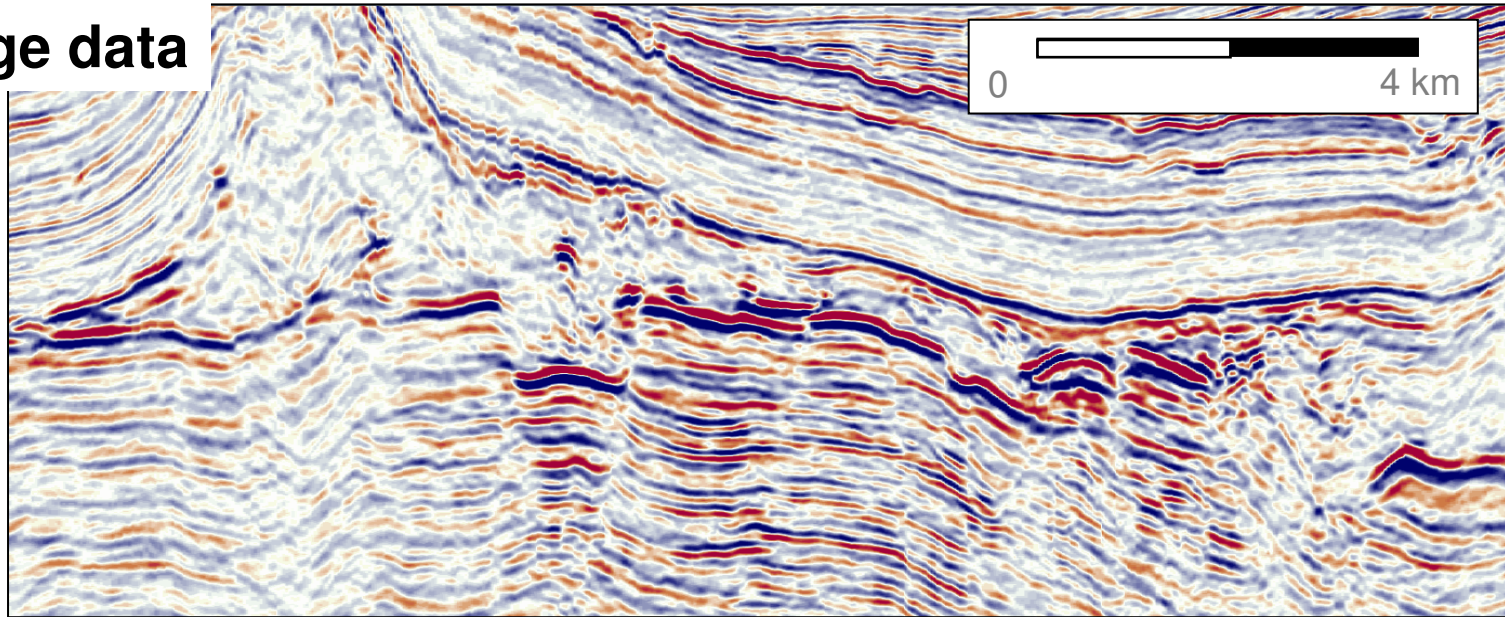


prospects

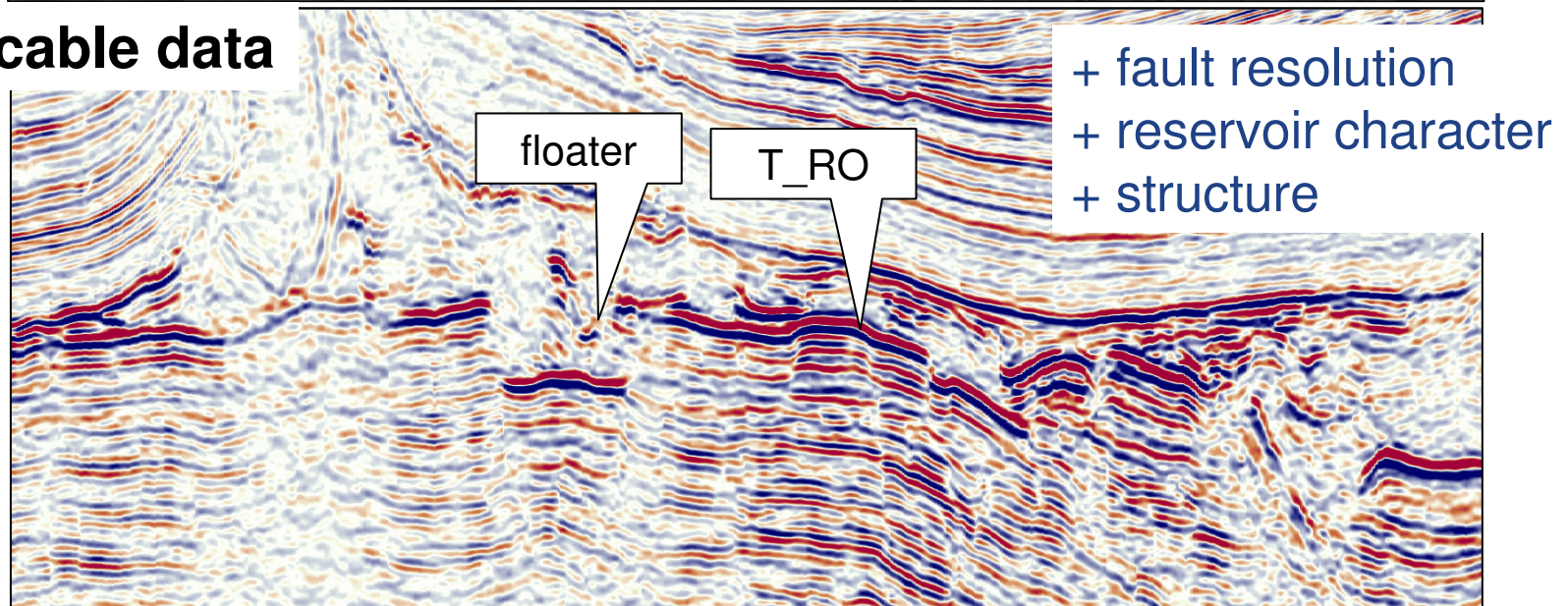


Long cable seismic data delivers improved imaging

vintage data



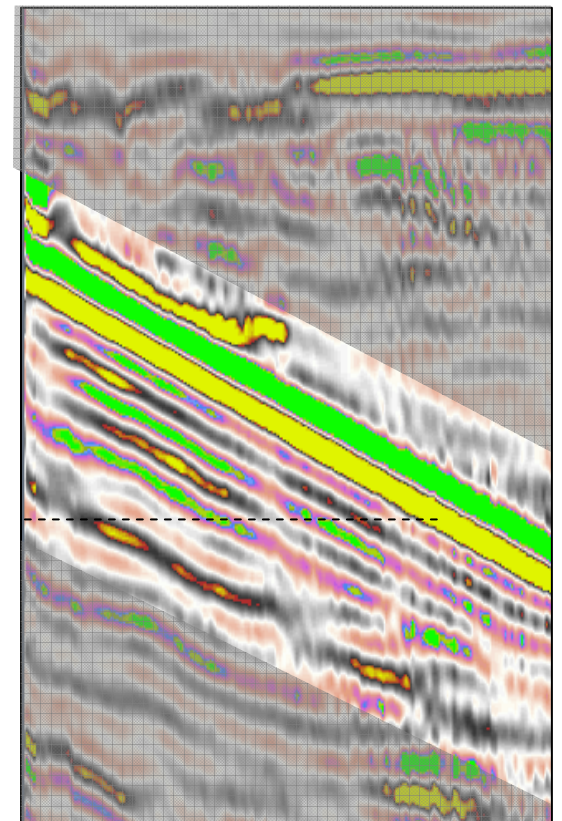
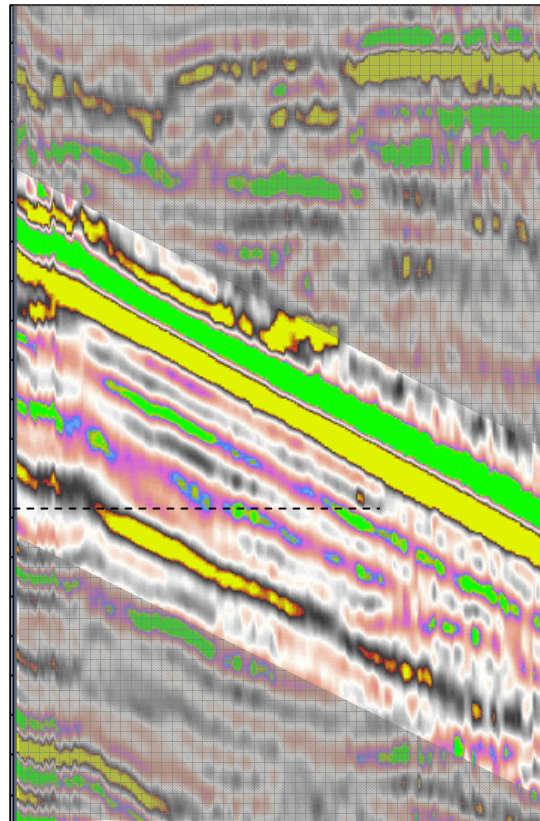
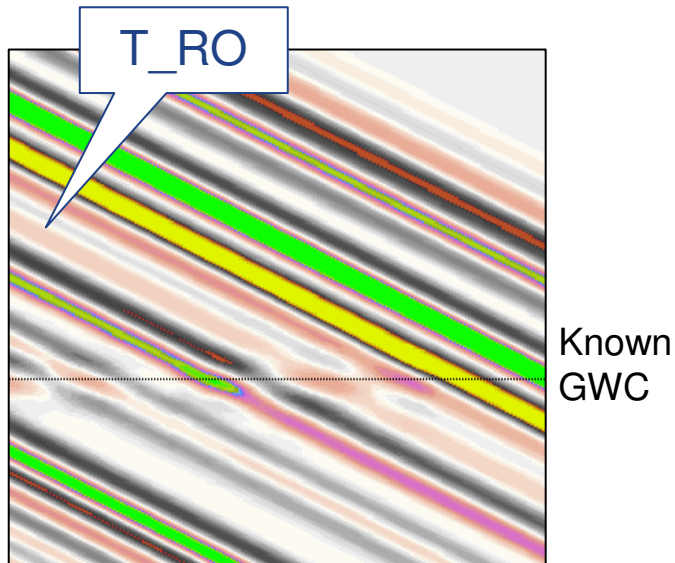
long cable data



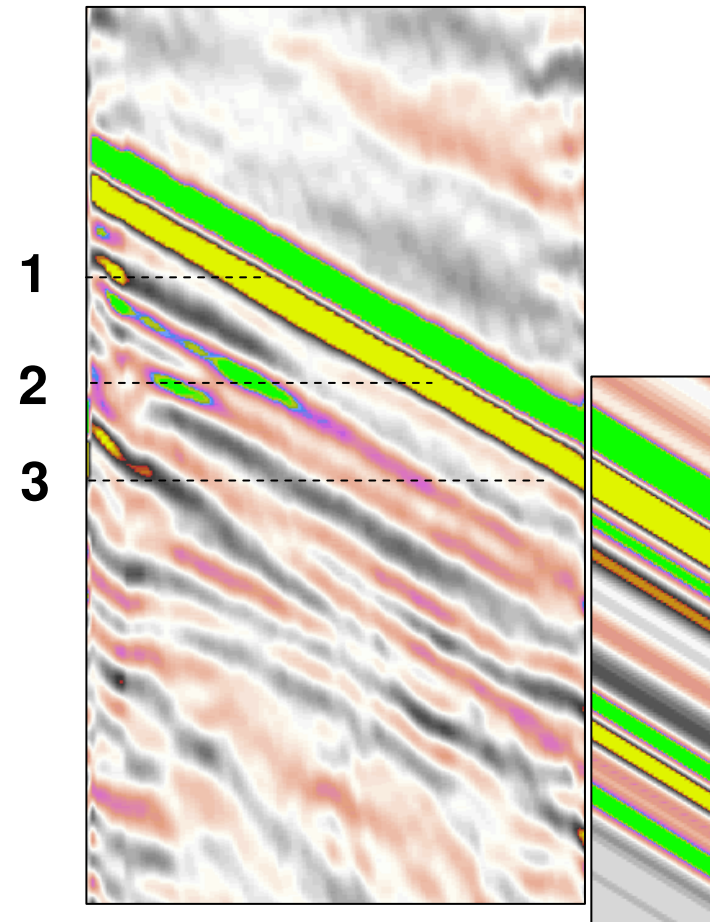
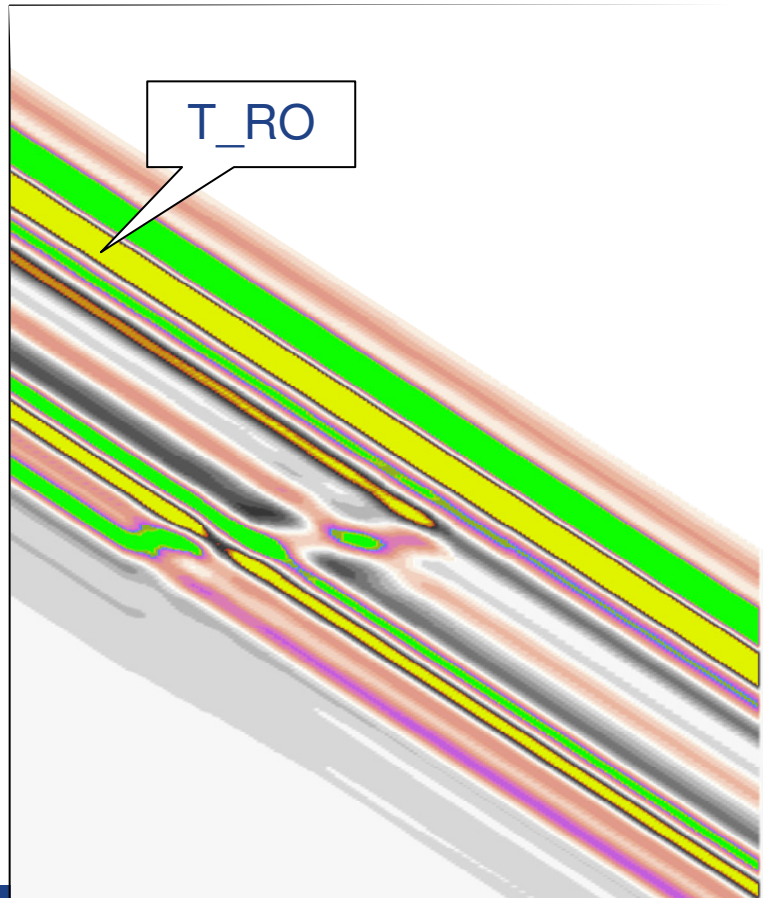
....improved CTD stacks

Vintage data

Long cable data

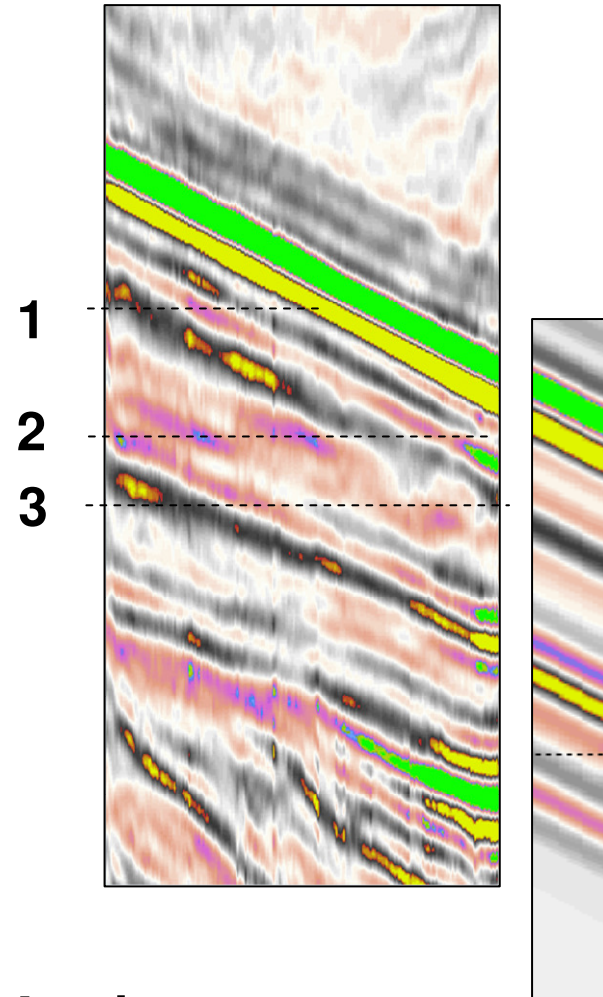
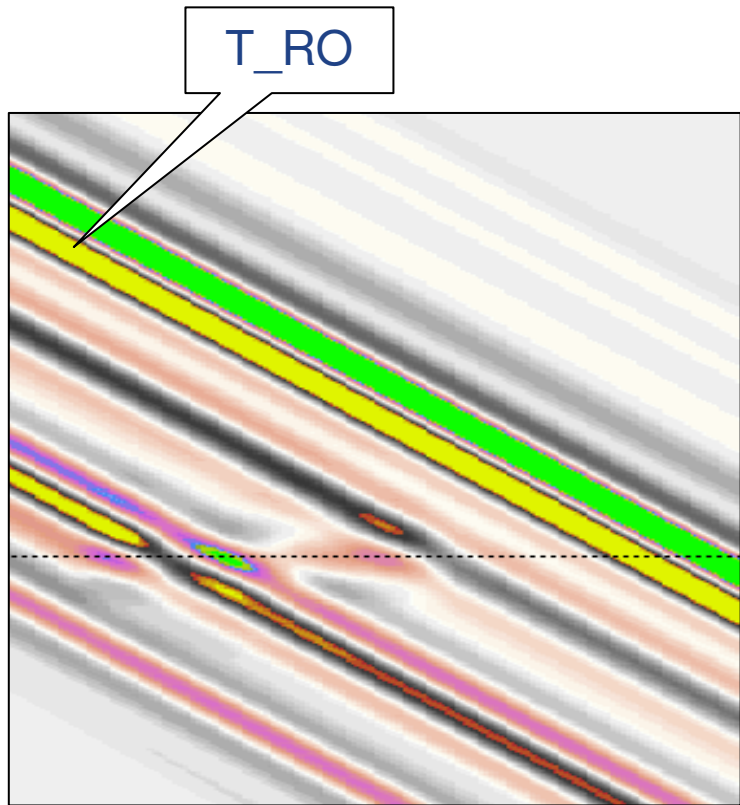


....towards becoming a CTD stack interpretation expert



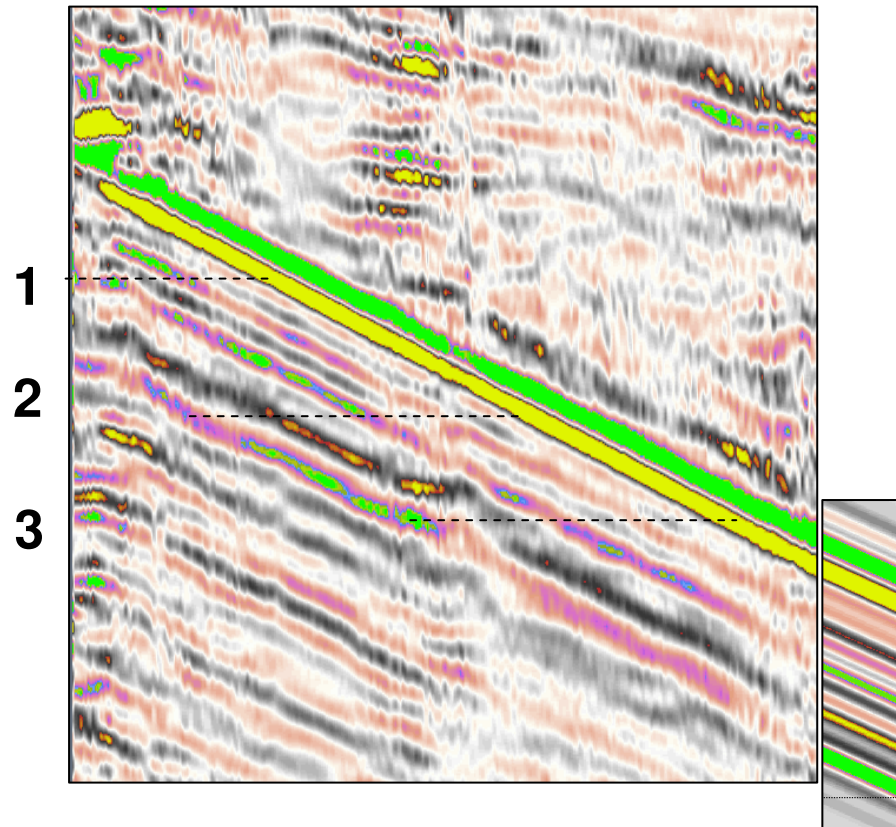
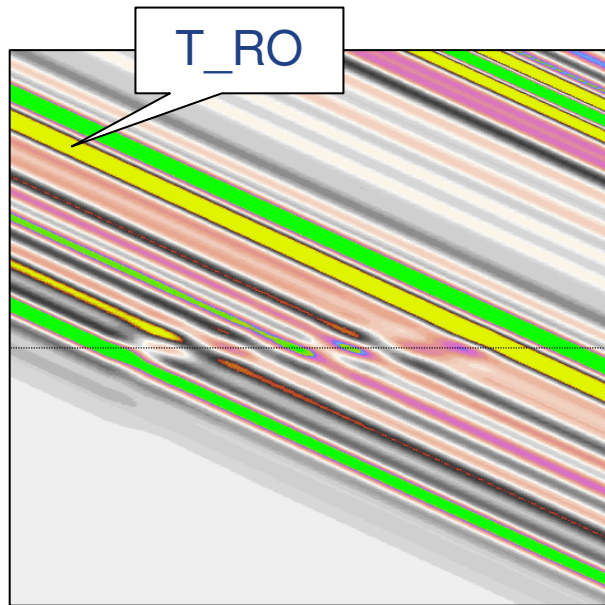
4 = dry
5 = inconclusive

....towards becoming a CTD stack interpretation expert



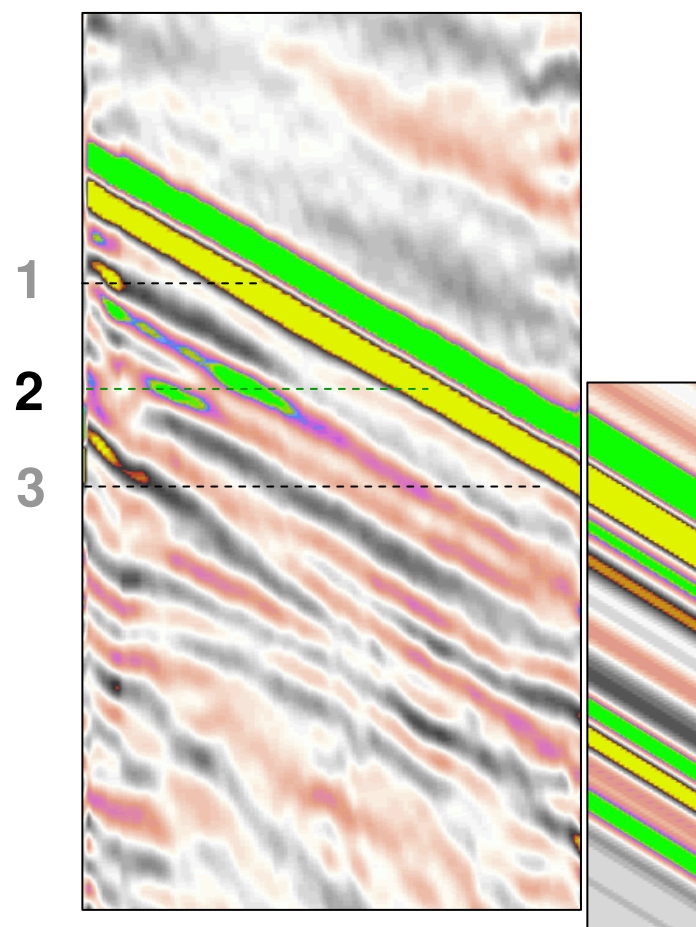
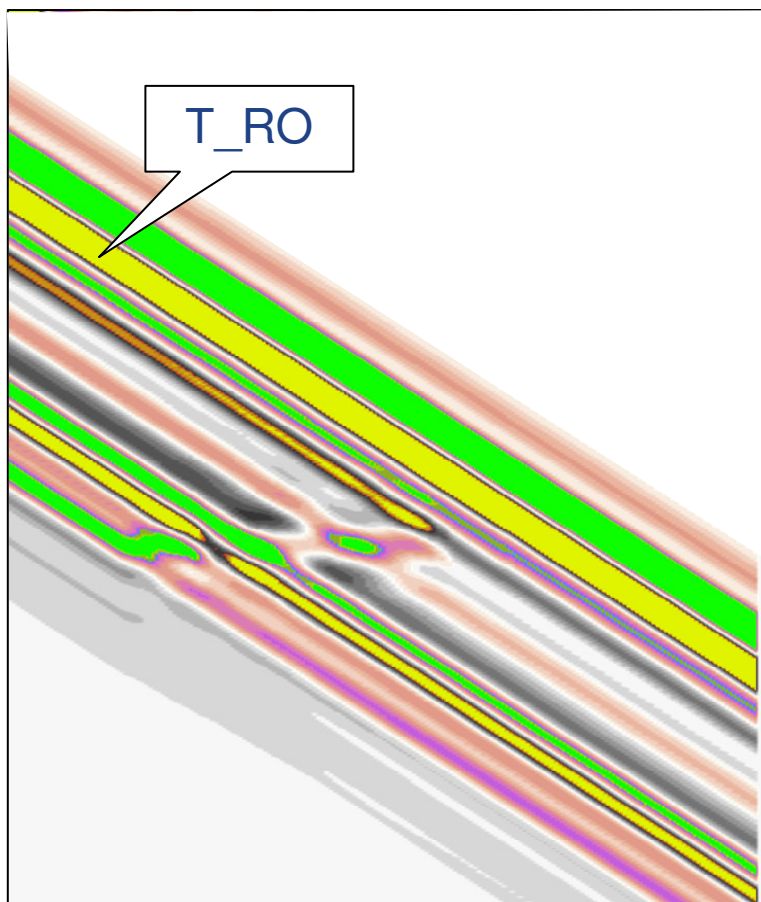
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....towards becoming a CTD stack interpretation expert



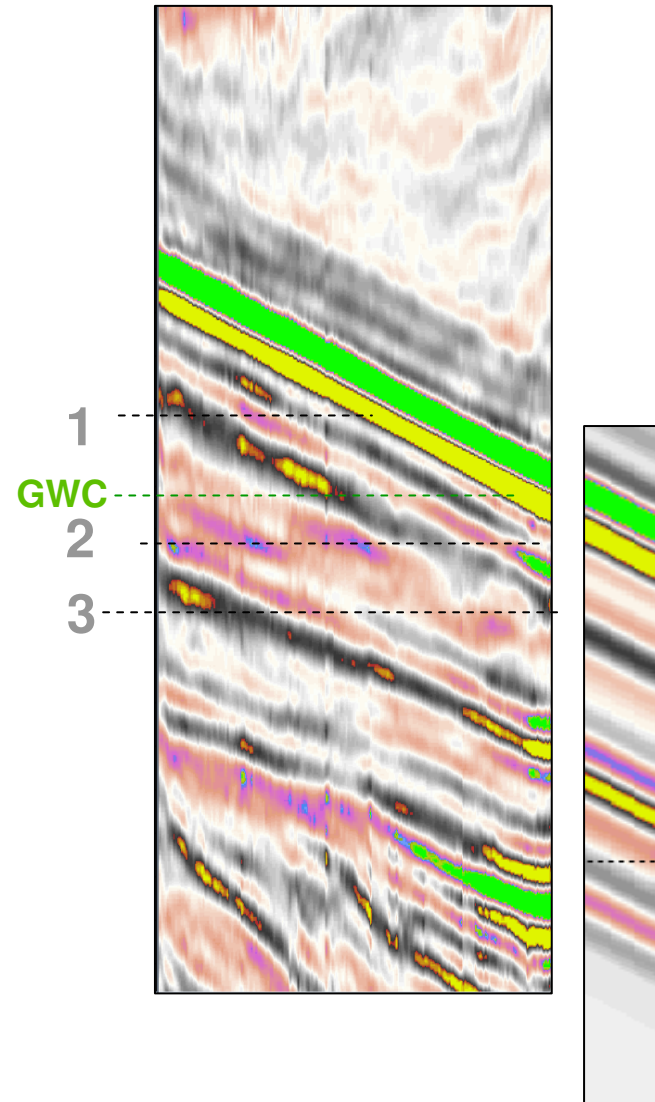
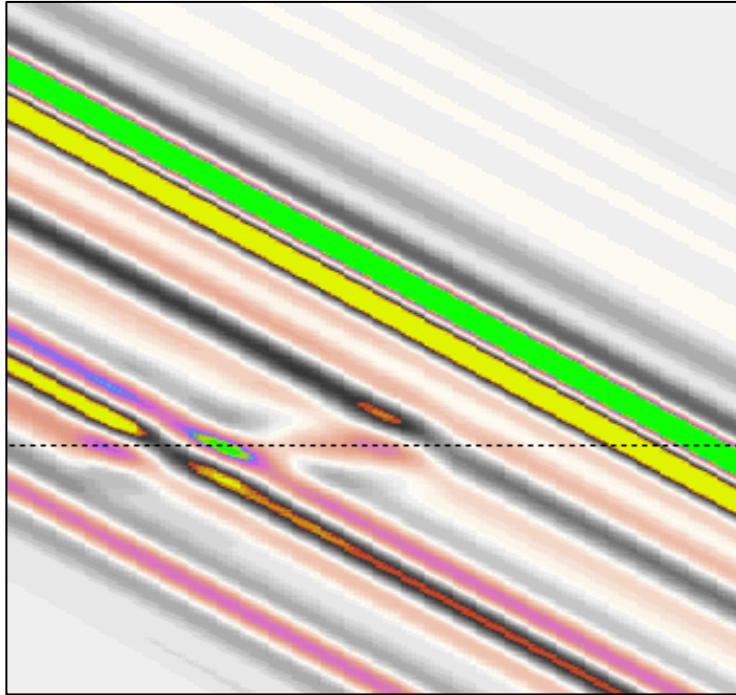
4 = dry
5 = inconclusive

....the high confidence case



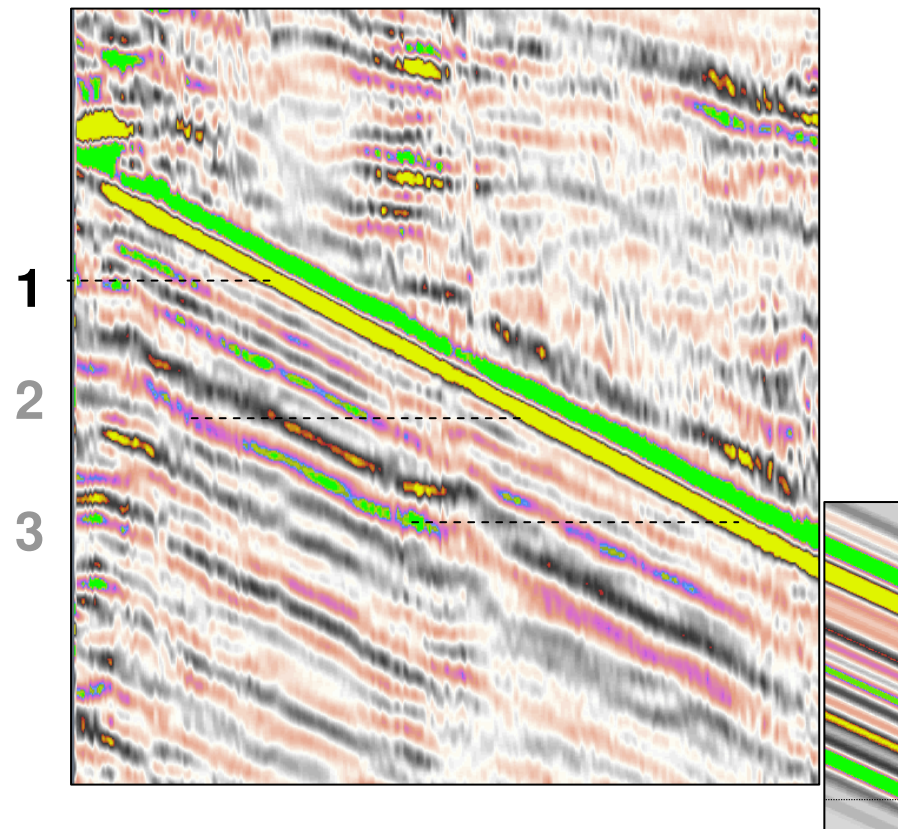
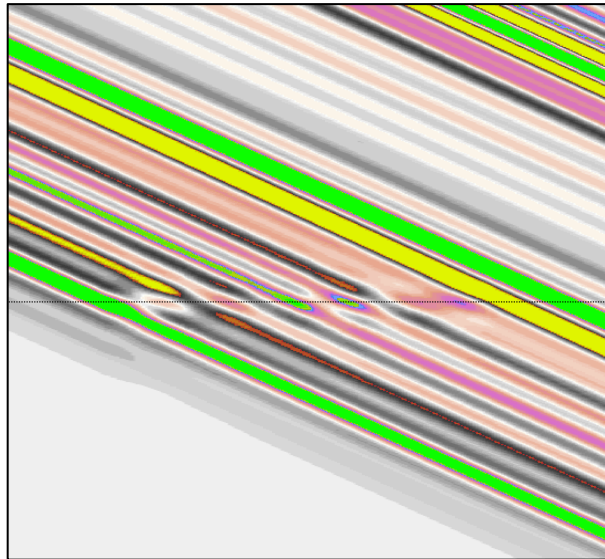
4 = dry
5 = inconclusive

....the high confidence residual gas case



4 = dry
5 = inconclusive

....the multiple choice case



4 = dry
5 = inconclusive

Conclusion

- Discoveries in SPB hint at significant HC volumes relying on fault seal
- State of the art seismic, improved imaging and underlying velocity model lead to
 - improved fault & reservoir definition
 - upgrade of the CTD stack quality
 -but multiples are a strong challenge
 -residual gas may lead to false DHI
- Integration is key: CTD stacks often enable visualisation of DHIs in SPB but no silver bullet.....

..... part 2

