

GRT & eGWM Migration reducing amplitude risk to get accurate elastic attributes

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Jagat Deo

MIGRATION definition

- **Generalised Radon Transform (GRT)**
 - This fully preserves amplitudes since it's a multi-arrival solution outputting data in the angle domain. Amplitudes at the incidence angle are proportional to the reflection coefficient and thus ideal for elastic work.
- **eGWM** (Guided Wave migration)
 - Fully supports amplitude integrity and produces higher quality inversions than from Kirchhoff. It outputs offset and angle gathers for velocity updating and Pre-Stack elastic inversion cost effectively. **1/30 compute cost of RTM.**

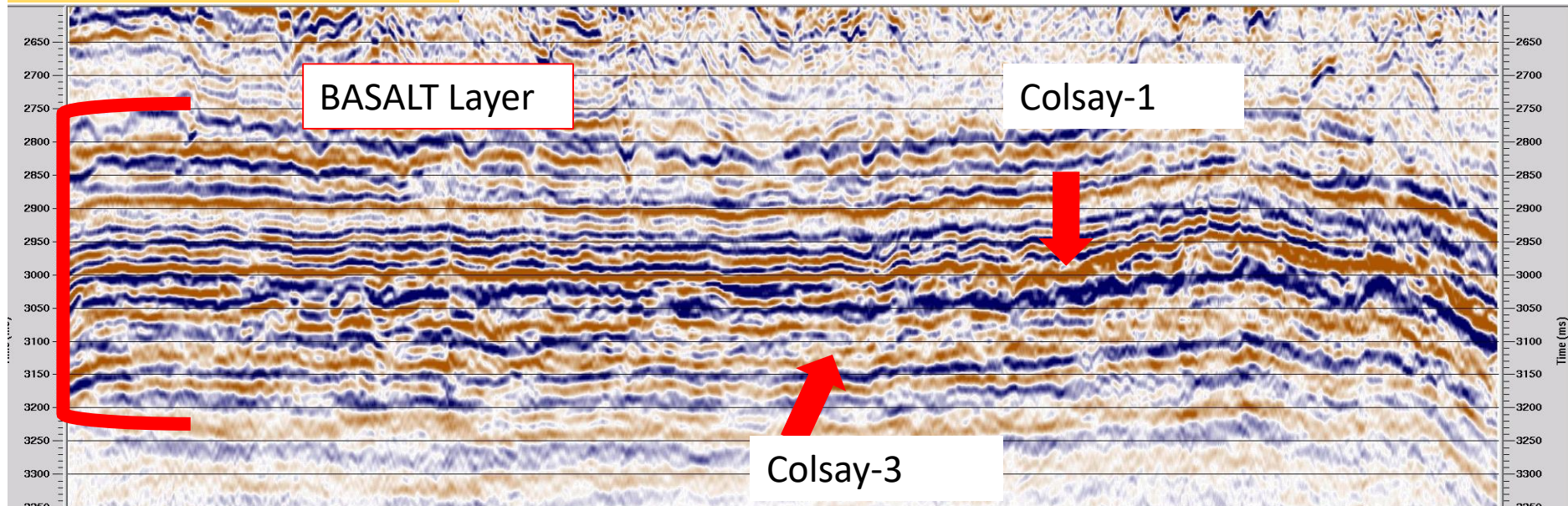
Rosebank Intra-Basalt Imaging

Legacy Streamer(1997) vs OBN (2016)

NOTE: Same velocity model is used as derived from the OBN

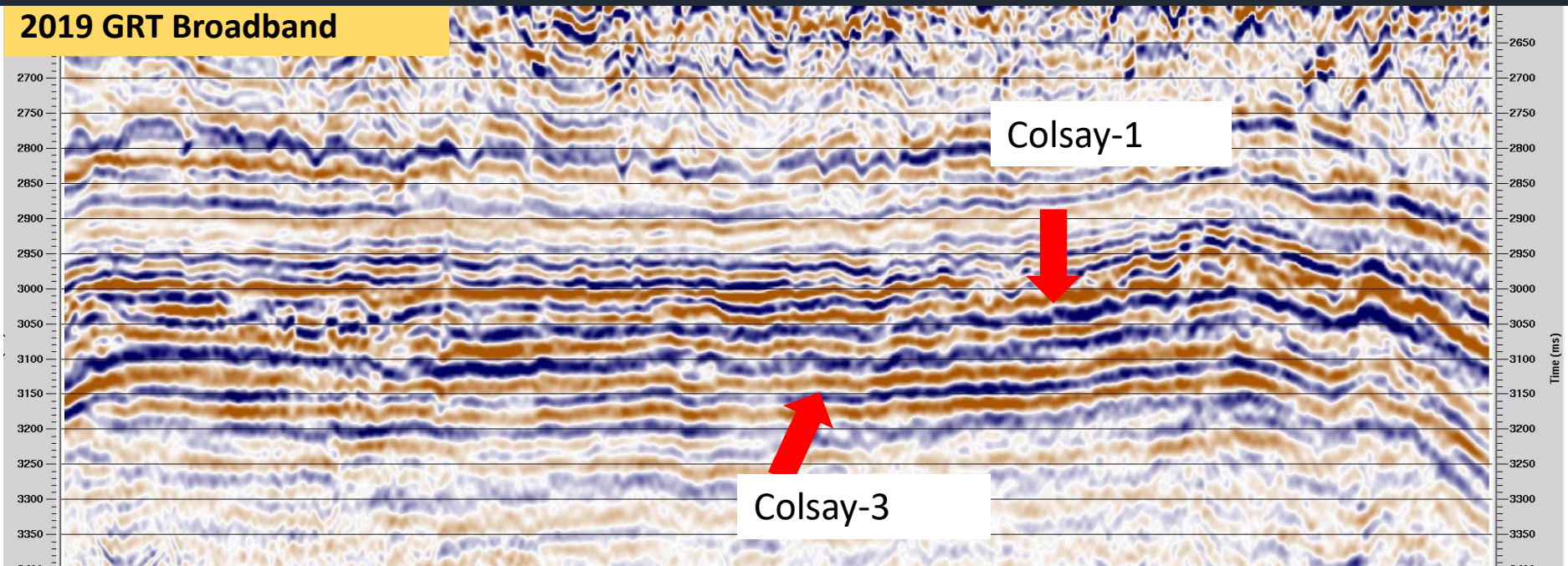
1. Legacy Kirchhoff vs GRT Streamer
2. OBN RTM

2007 3D Kirchhoff LEGACY



Reprocessing legacy streamer with high end code produce data similar to OBN 2016 survey >>>

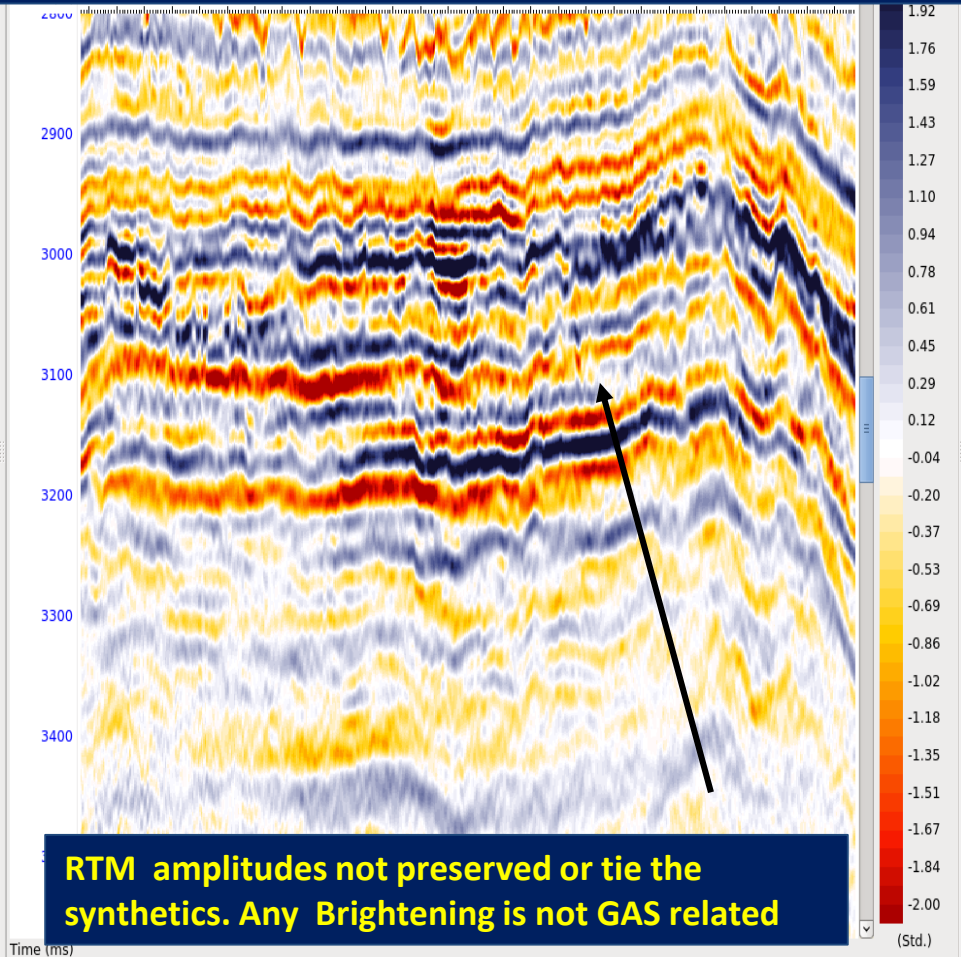
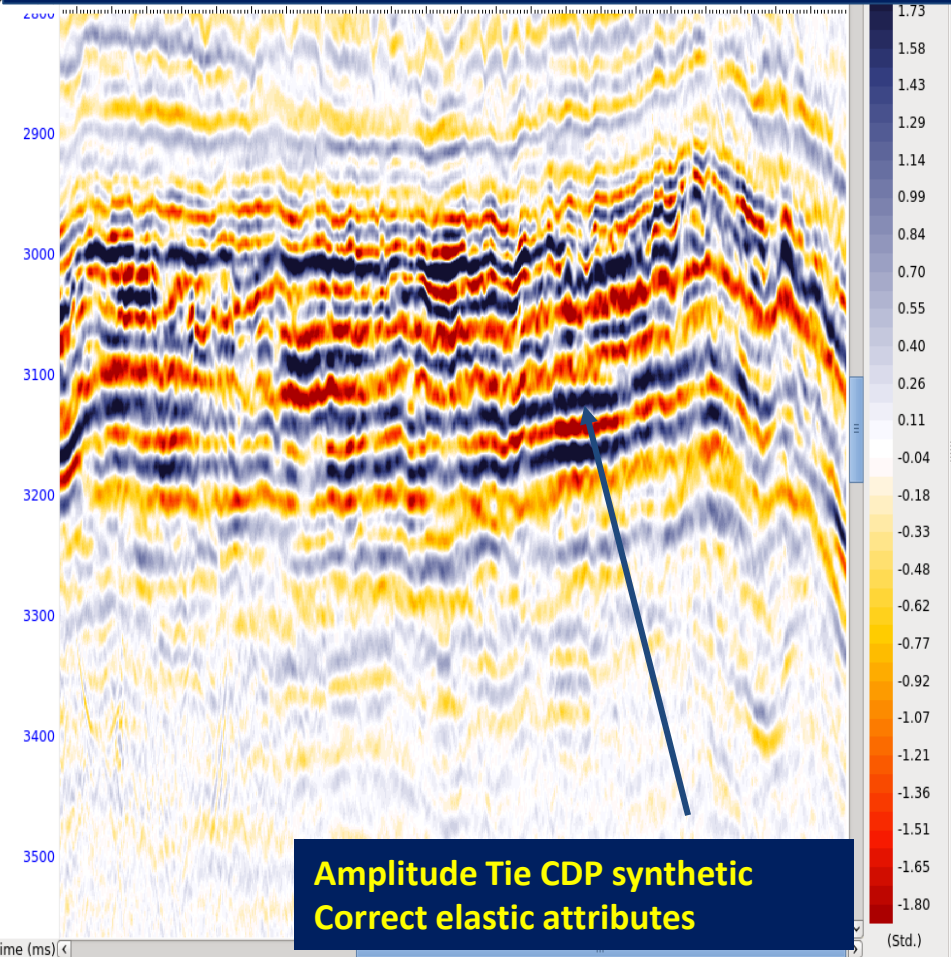
2019 GRT Broadband



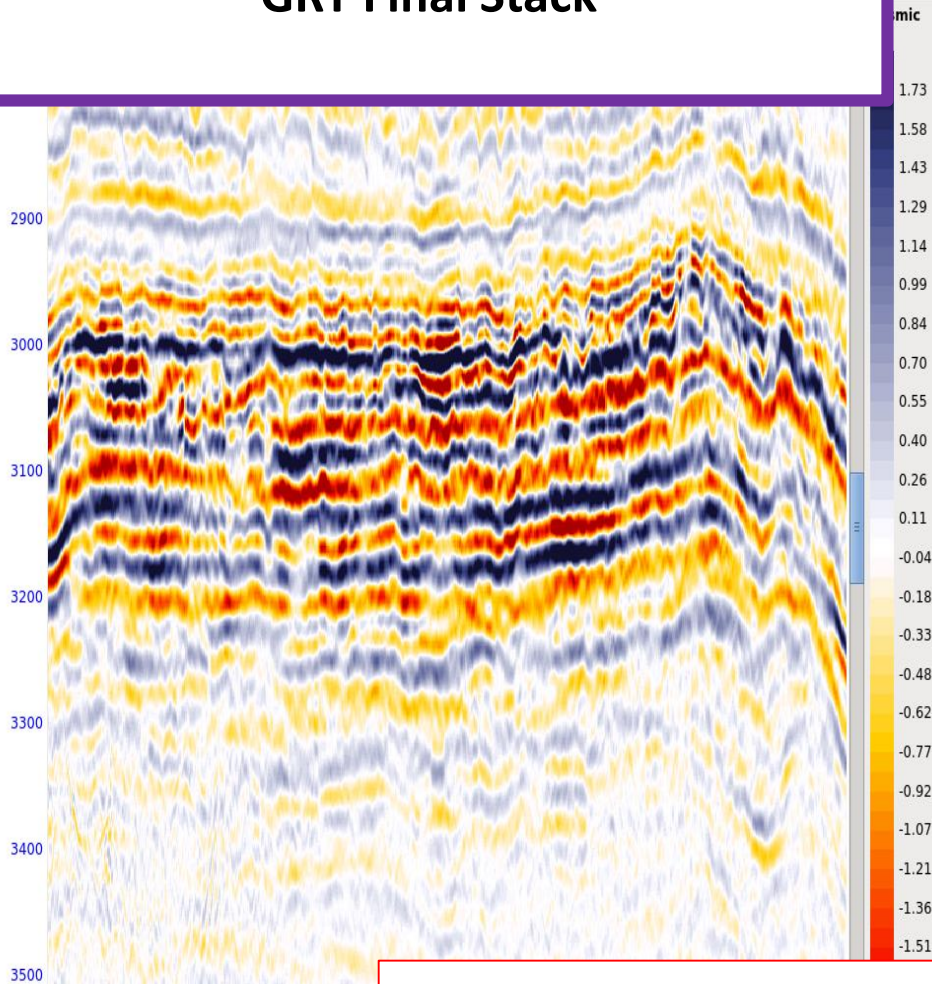
GRT Final Stack in Time

OBN RTM(50Hz) Stack in Time

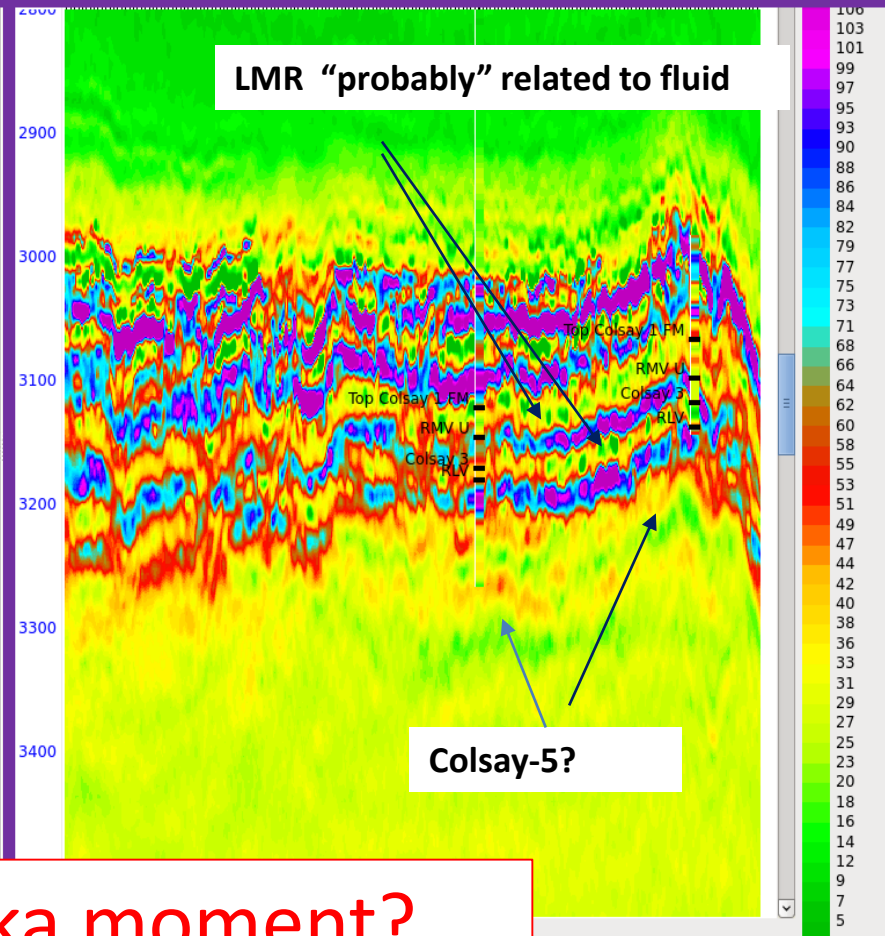
GRT migration high resolution – Angle gathers for accurate elastic fields >>



GRT Final Stack

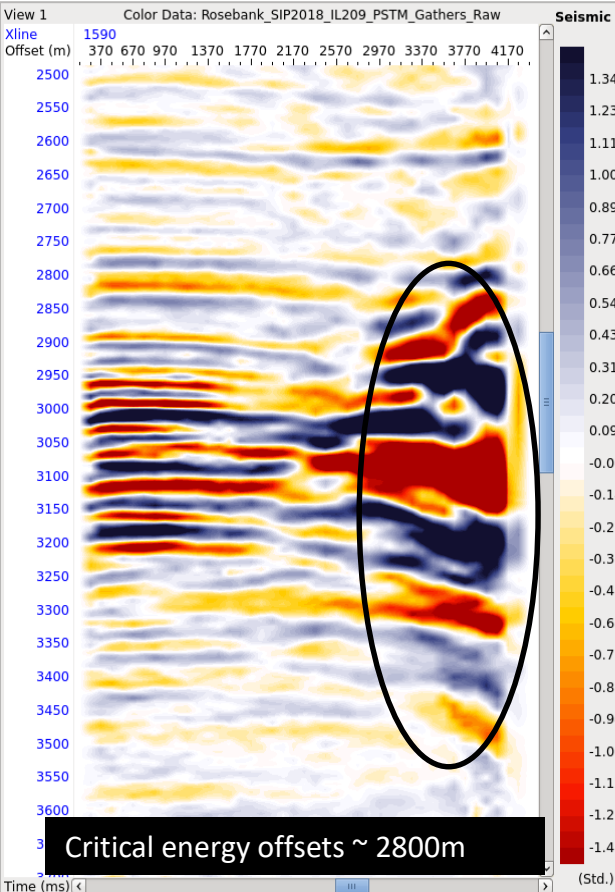


Lambda-Rho from Three GRT angle stacks + InvQ



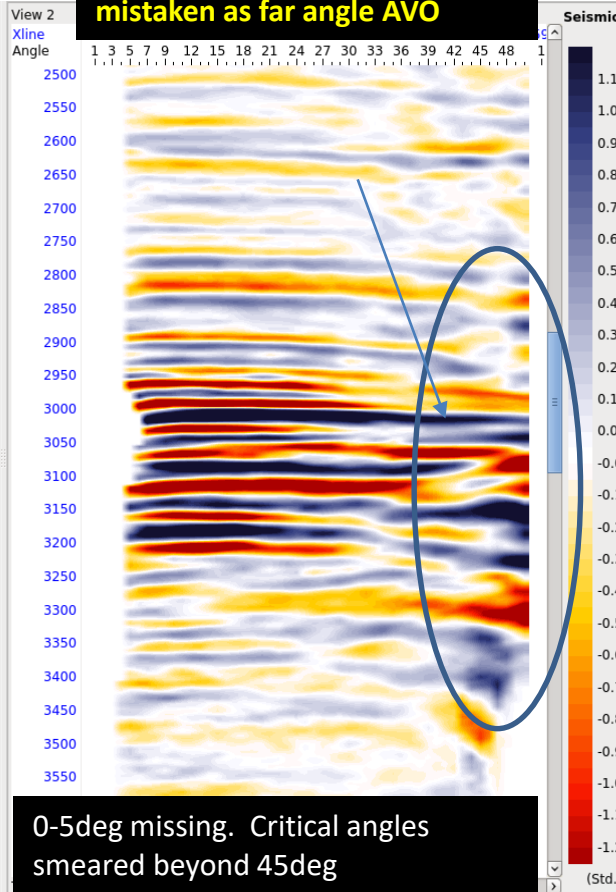
Is this a Eureka moment?

Kirchhoff Gathers (offset)



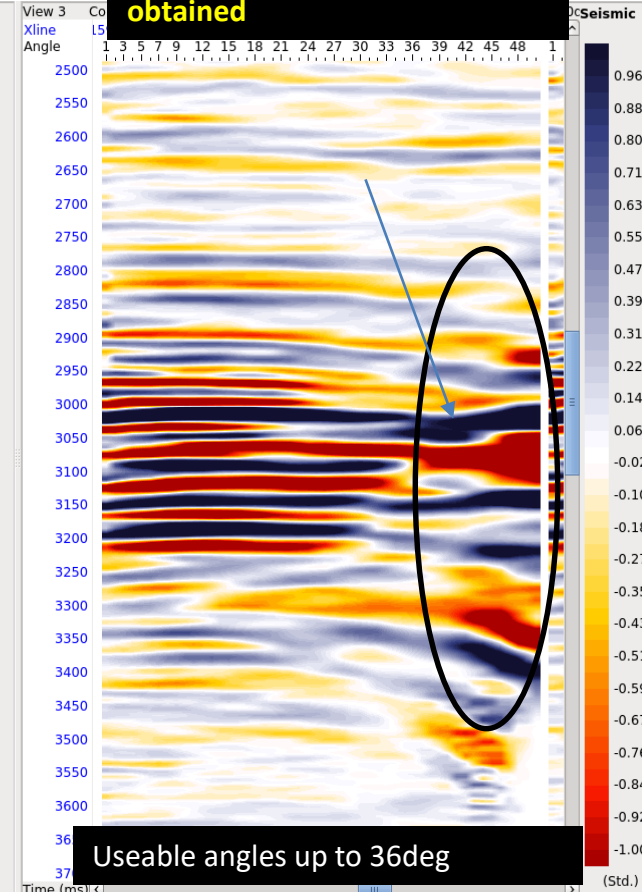
Kirchhoff Gathers Angles

Residual critical energy is at the wrong angle and is often mistaken as far angle AVO



GRT Gathers Angles

Critical energy is at the correct angle and accurate AVO is now obtained



Kirchhoff has RISK of FALSE AVO

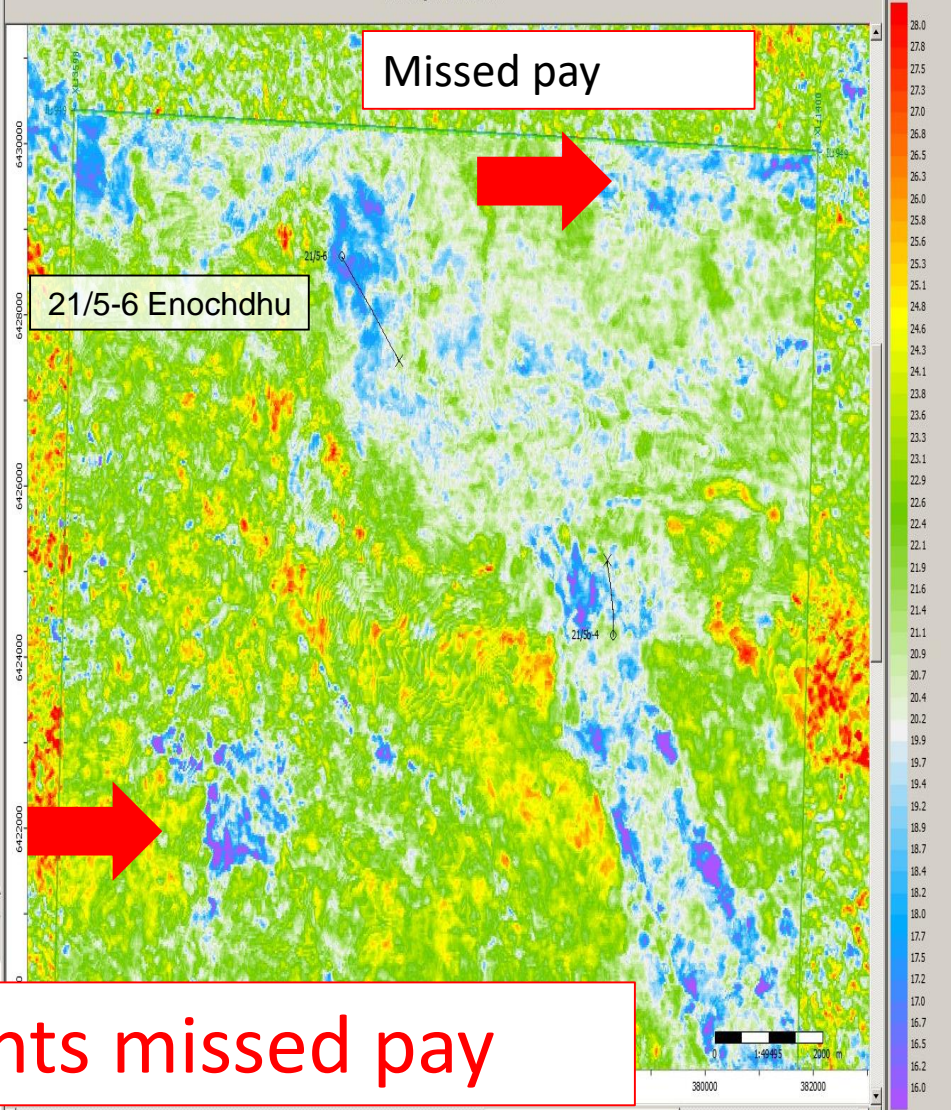
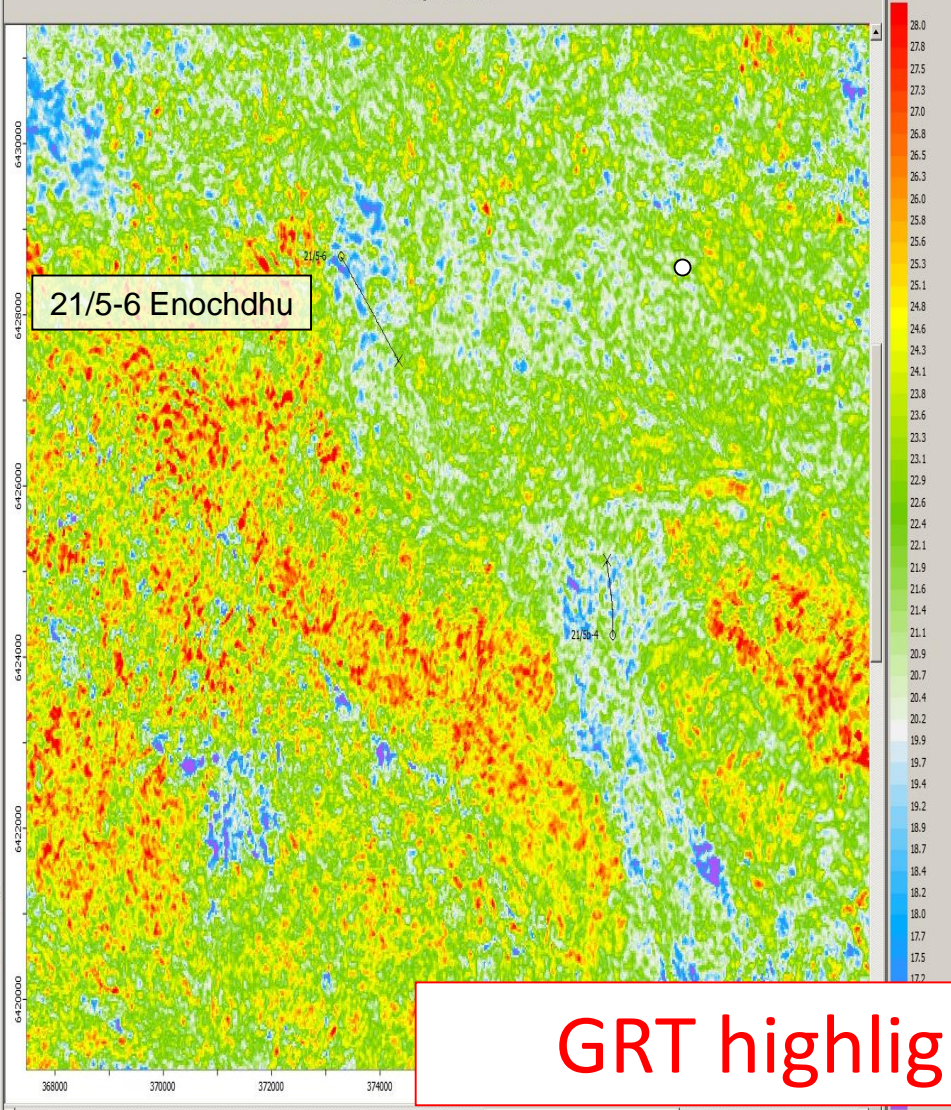
EnochDu & Finlaggan Block 21/5

21/5-6 Enochdhu: Lambda-Rho Kirchhoff

21/5-6 Enochdhu: Lambda-Rho GRT

PSTM-FORTIES-LR-Enochdhu
Raw Amplitude at 140_Top-Forties_v0a_TWT_grid_xyz+24ms_smooth_mean
with a window of 20 ms below
and showing the Arithmetic Mean.

GRT-FORTIES-LR-Enochdhu
Raw Amplitude at 140_Top-Forties_v0a_TWT_grid_xyz+24ms_smooth_mean
with a window of 20 ms below
and showing the Arithmetic Mean.



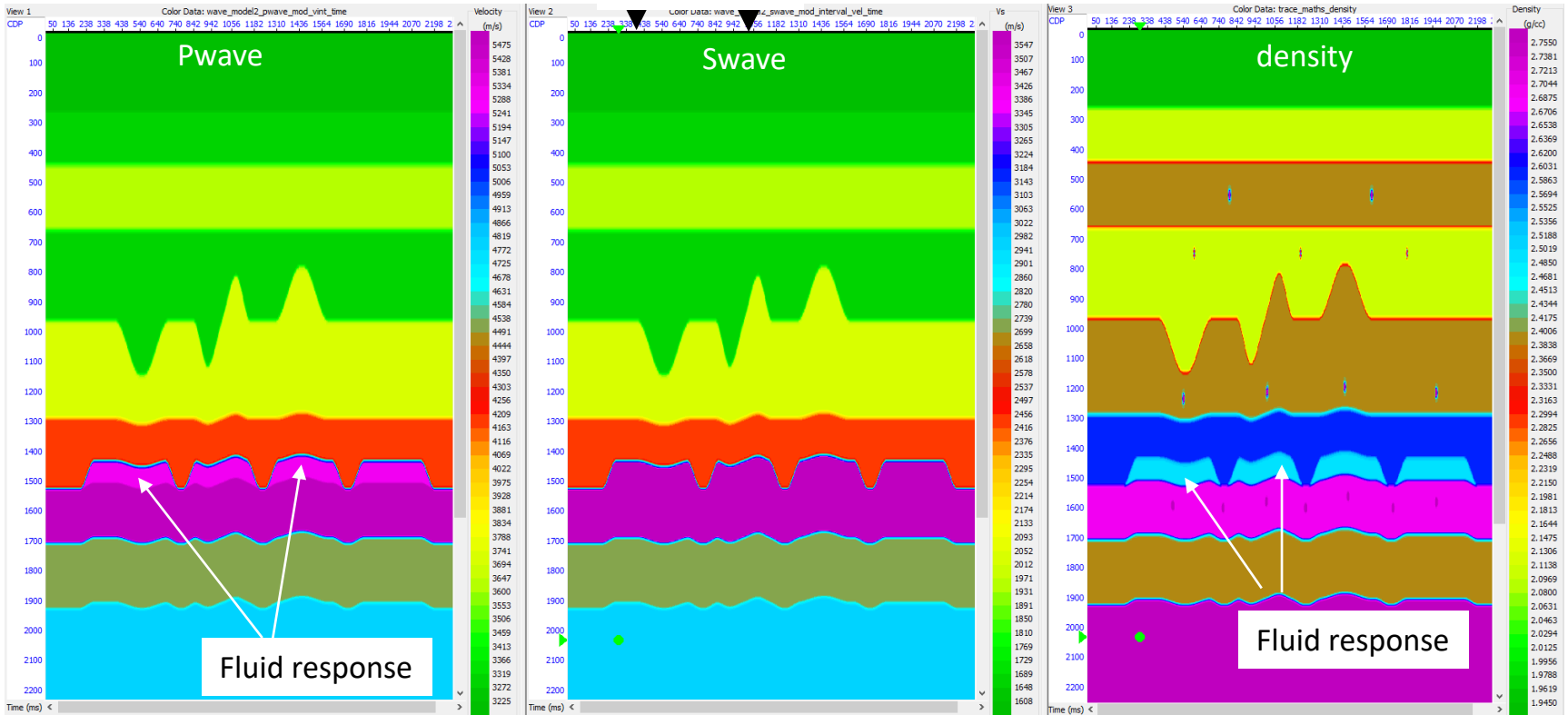
GRT highlights missed pay

eGWM

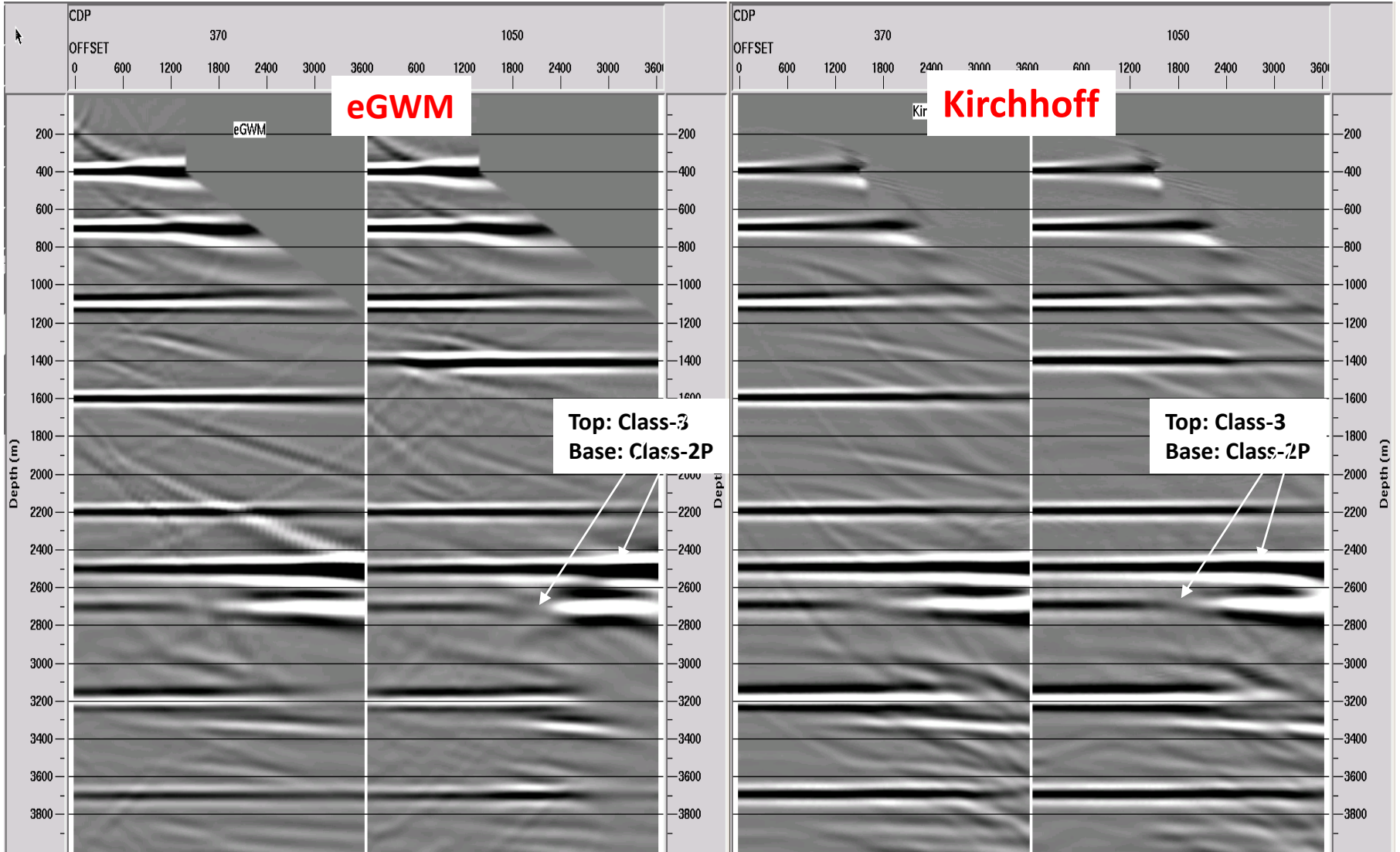
One-Way wave equation using guided waves

Elastic wavefields to generate synthetic shots

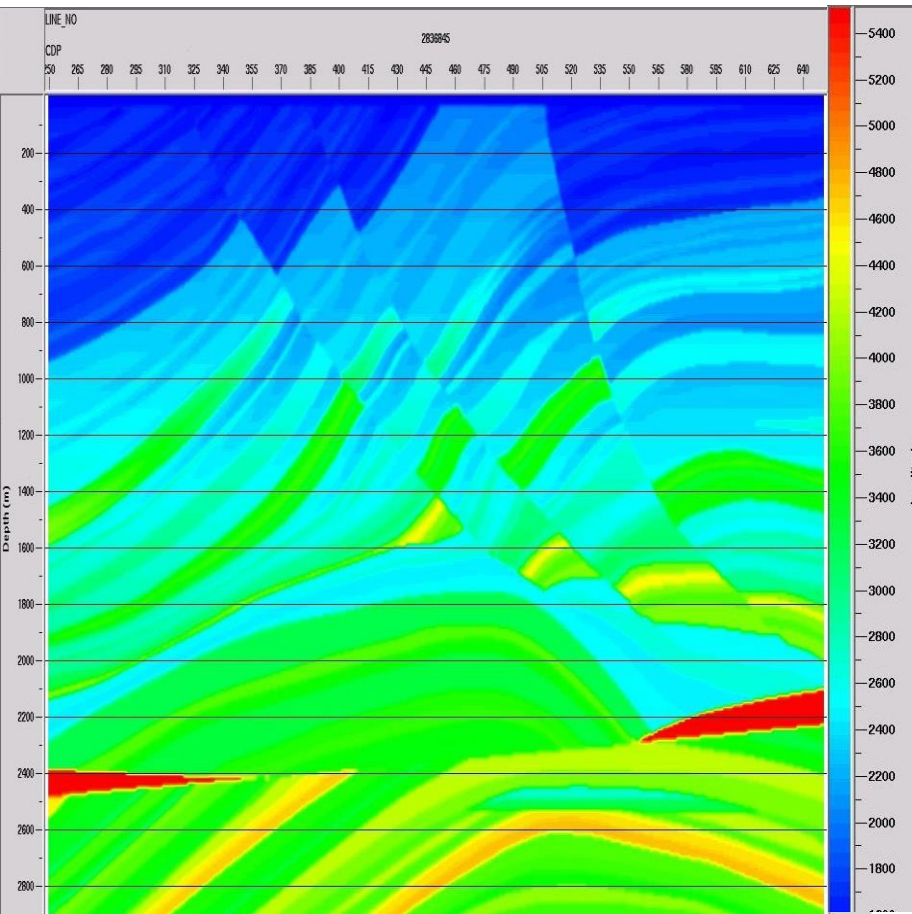
Gather locations



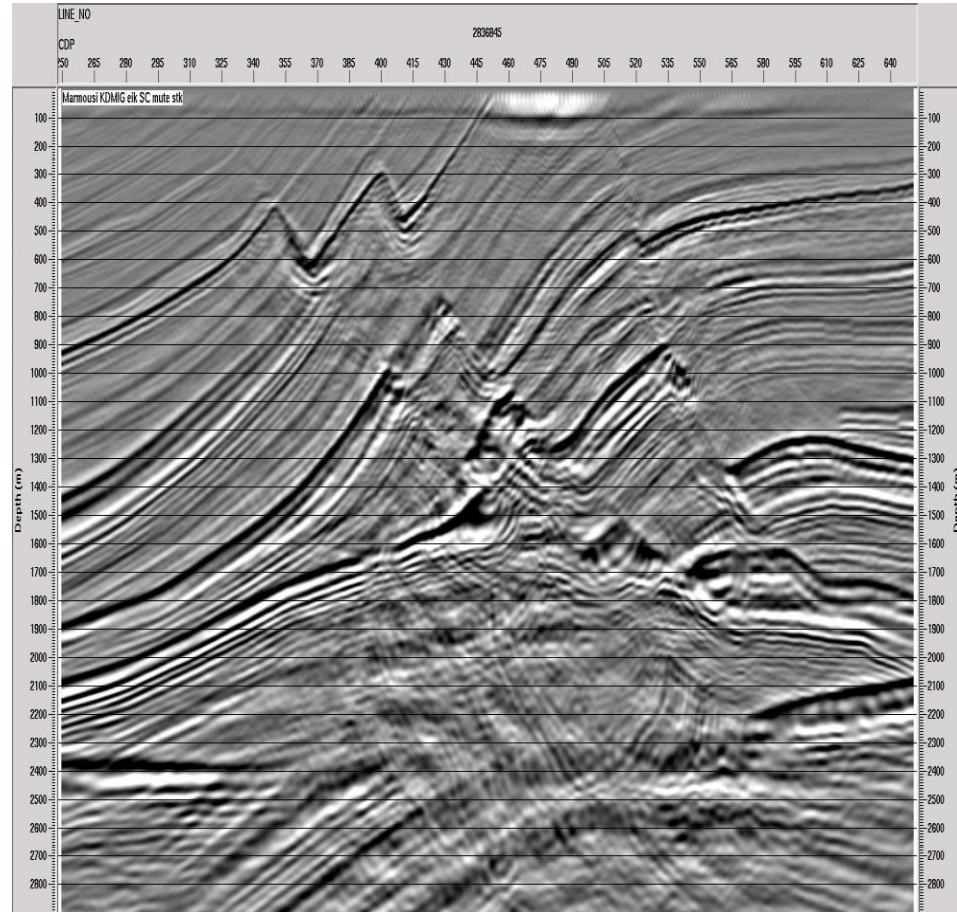
eGWM (TS Imaging) vs Kirchhoff offset gathers in depth



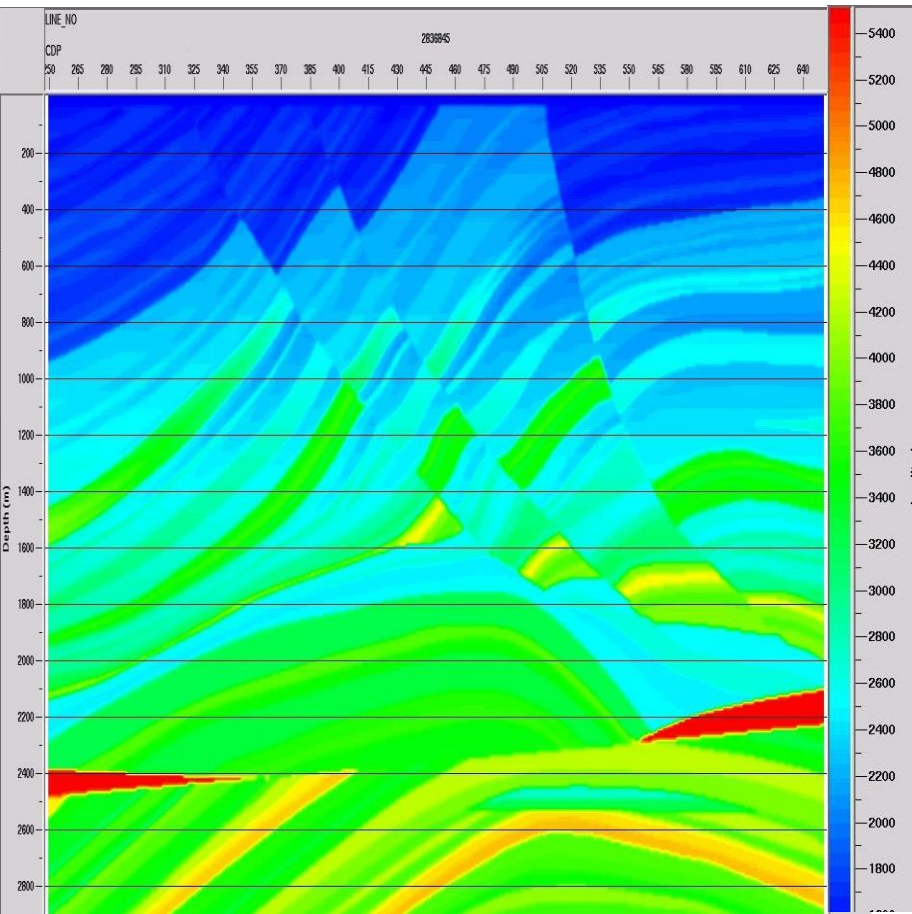
Marmousi Velocity Model



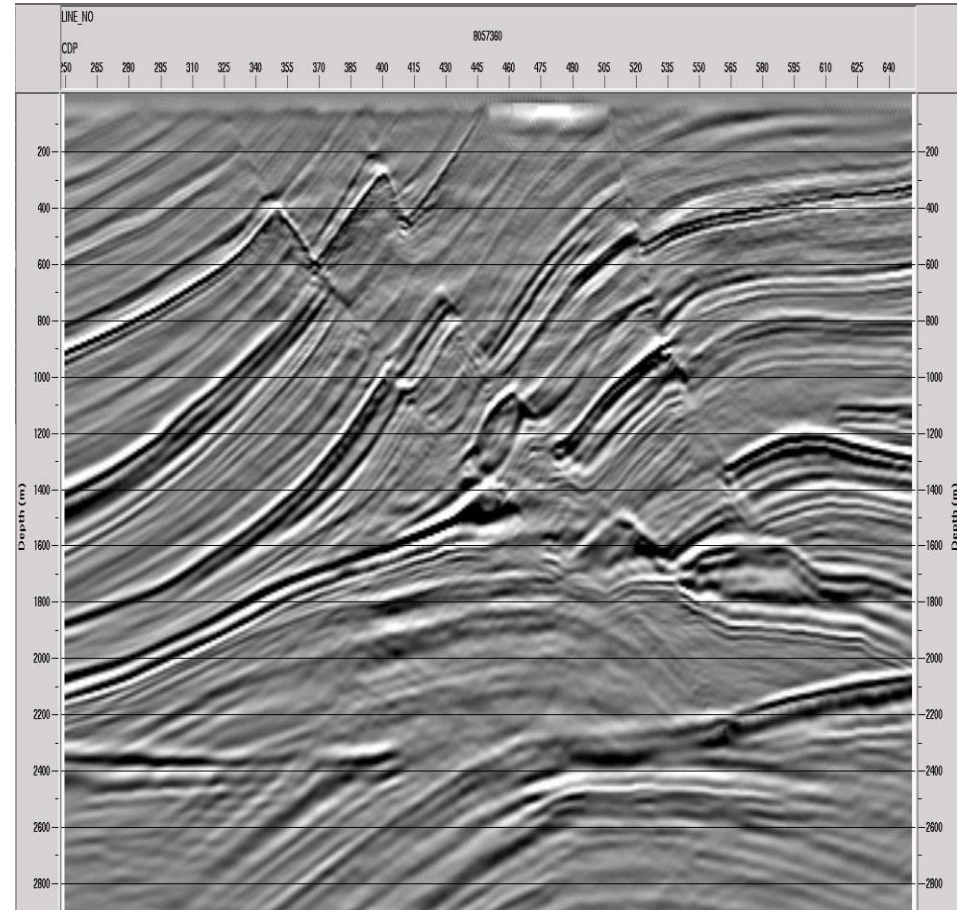
Marmousi: Kirchhoff (Cannot handle complexity FWI models)



Marmousi Velocity Model



Marmousi: eGWM No Mute
Energy in Evanescent zone is
not in the image)



Remarks

- Applying advanced algorithms on legacy data (Broadband – ePEG – **GRT**) has extracted possible fluid signature for the first time in the Rosebank Coltsay sands! Derisking future Sub-Basalt Imaging plays. **GRT is preferred over Kirchhoff.**
- **eGWM** is a new low cost effective alternative for one-way wave equation solution and outputs gathers for inversion. Attenuates noise in the imaging condition. **eGWM has several advantages over RTM.**

Acknowledgments

- Zennor Petroleum UK Ltd
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