Thoughts and Observation on Interpreting Depth-Imaged Data in the Jurassic Norphlet Play, Deepwater Eastern Gulf of Mexico*

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Abstract

When working with depth-imaged data an interpreter must visualize how a depth migration velocity model affects focusing and positioning of reflections in final images and, consequently, interpretation of the geology contained in those images. The availability of several versions of depth imaging based on a single velocity model but with different migration algorithms requires an interpreter to decide which version provides the most accurate representation of the true geology. This is especially challenging in the Jurassic Norphlet play of the deepwater eastern Gulf of Mexico because of the depth of Norphlet targets, their proximity to salt, and their position immediately beneath high-velocity Smackover Limestone.

Reference Cited

Mancini, E.A., J. Obid, M. Badali, K. Liu, and W.C. Parcell, 2008, sequence-stratigraphic analysis of Jurassic and Cretaceous strata and petroleum exploration in the central and eastern Gulf coastal plain, United States: AAPG Bulletin, v. 92, p. 1655-1686.

Thoughts and observations on interpreting depth-imaged data in the Jurassic Norphlet play, deepwater eastern Gulf of Mexico

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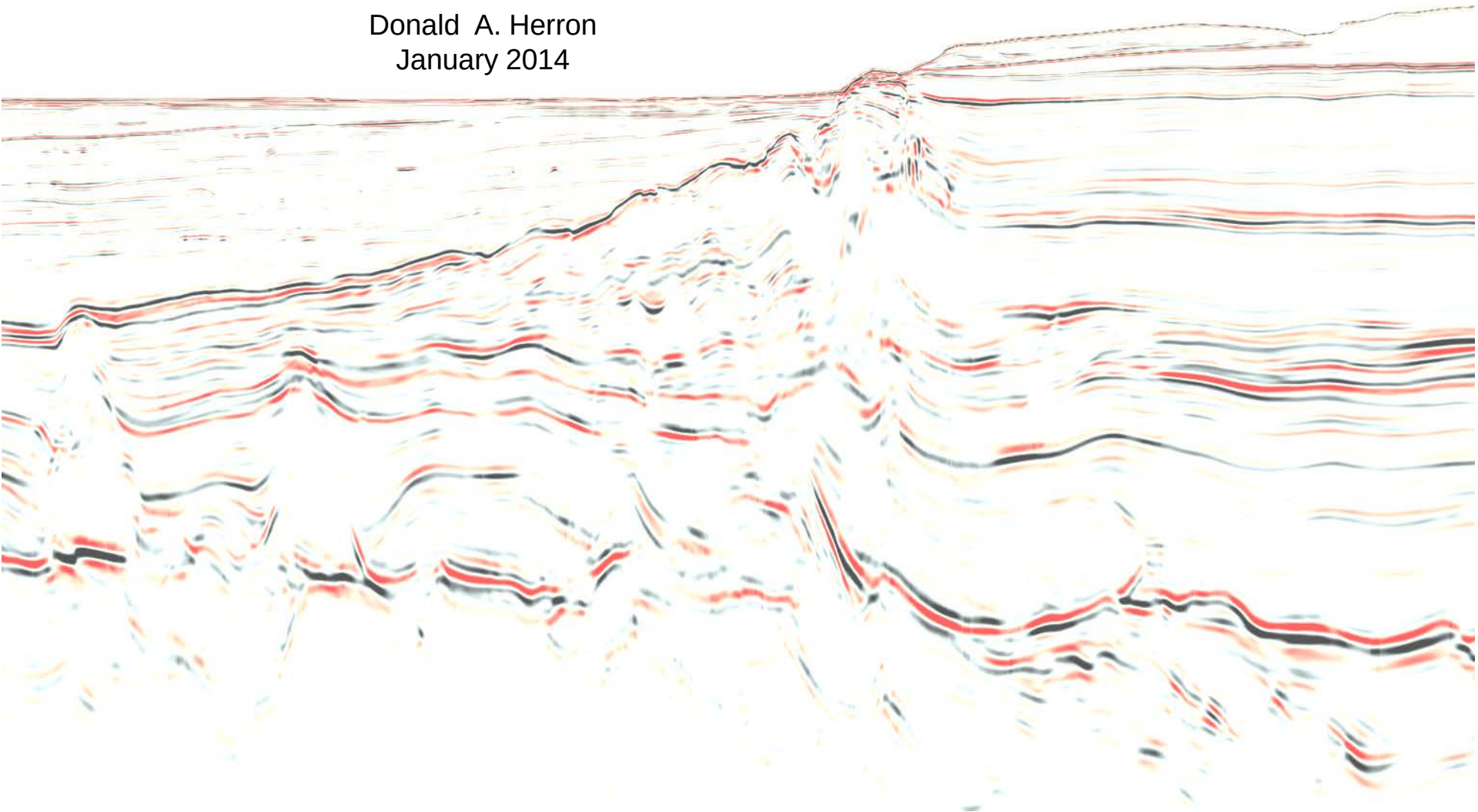
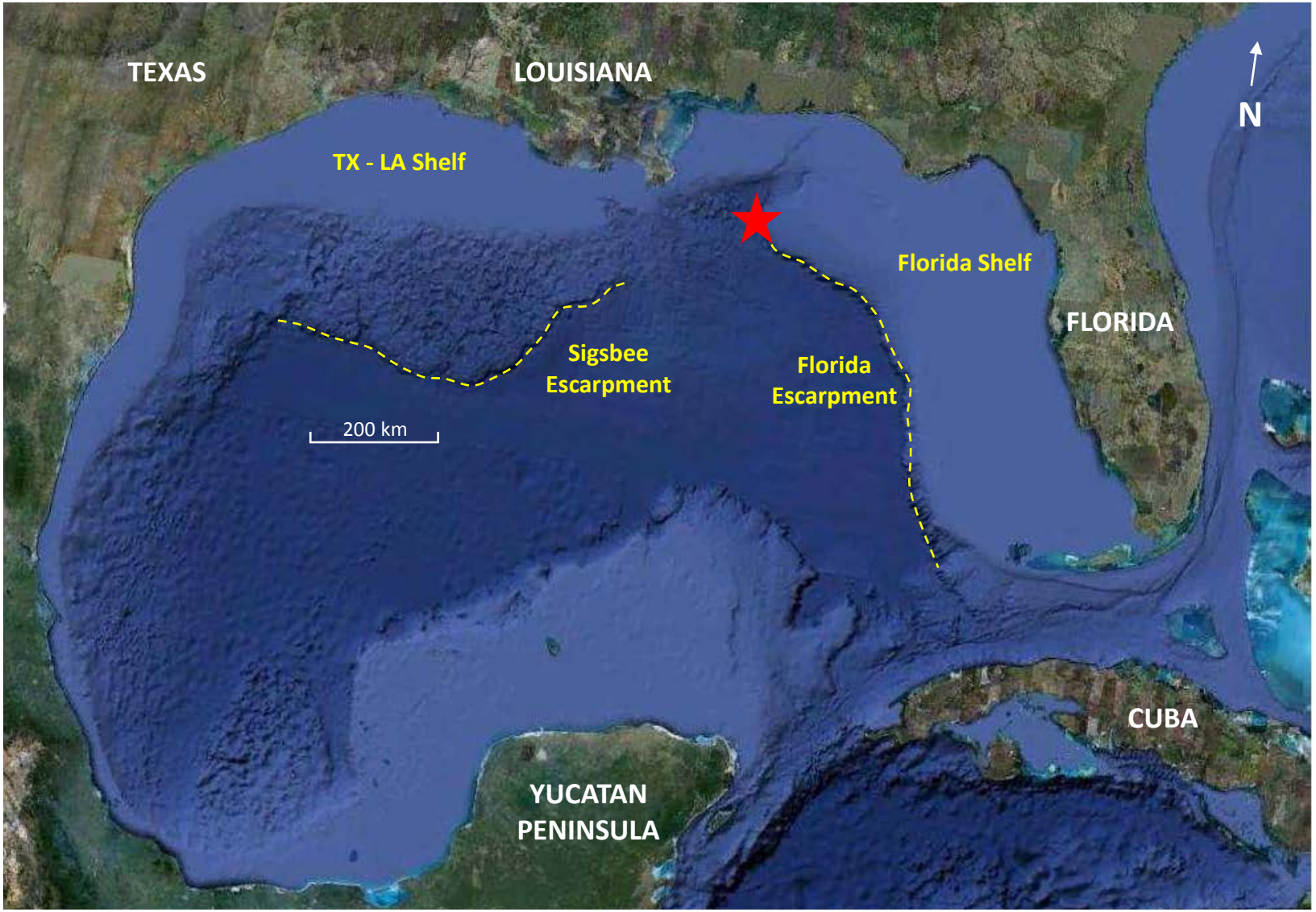
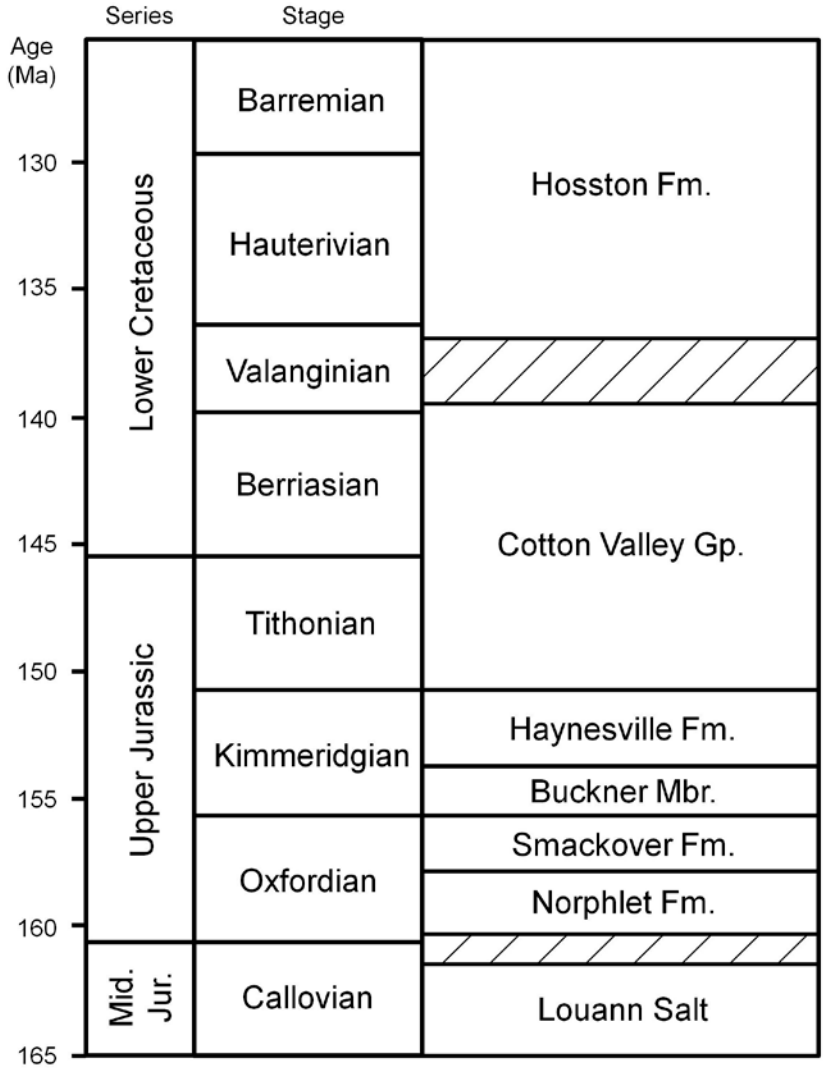


Thanks to PGS and TGS for permission
to show their data

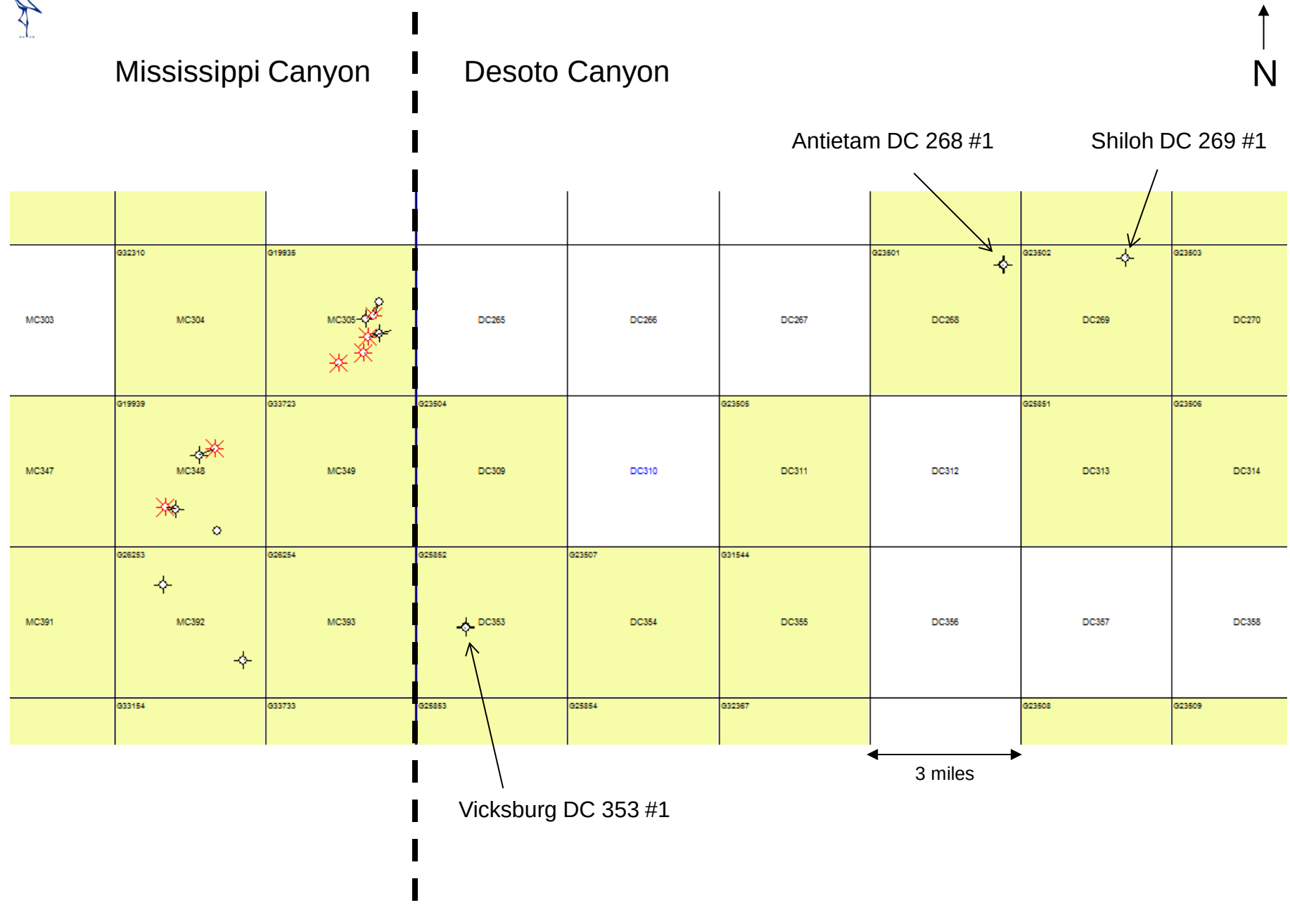
Gulf of Mexico location map



Chronostratigraphy for Jurassic and Lower Cretaceous strata in the eastern Gulf coast



(after Mancini et al., 2008)


Mississippi Canyon
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N
Antietam DC 268 #1
Shiloh DC 269 #1
MC303
MC304
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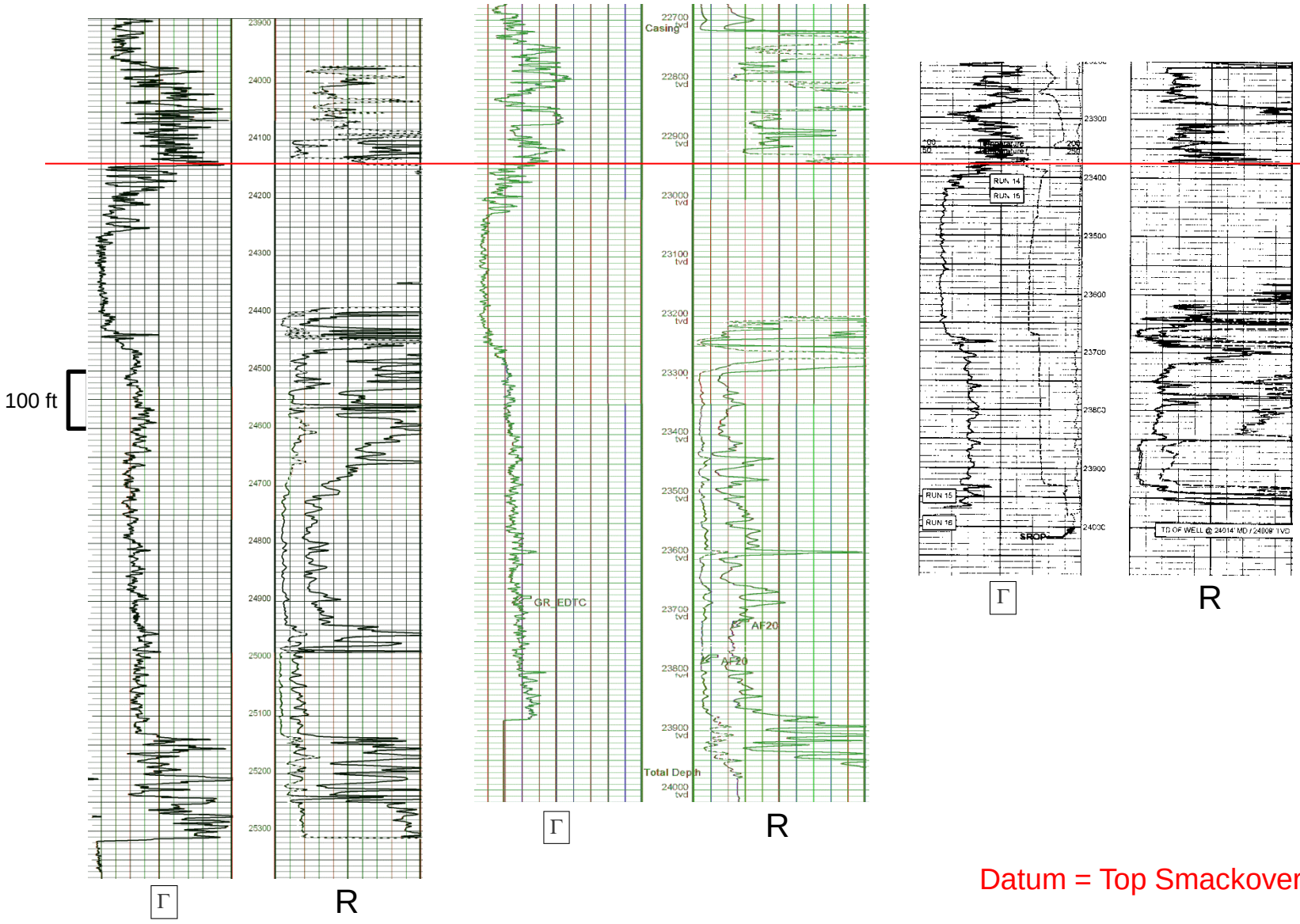
3 miles
Vicksburg DC 353 #1

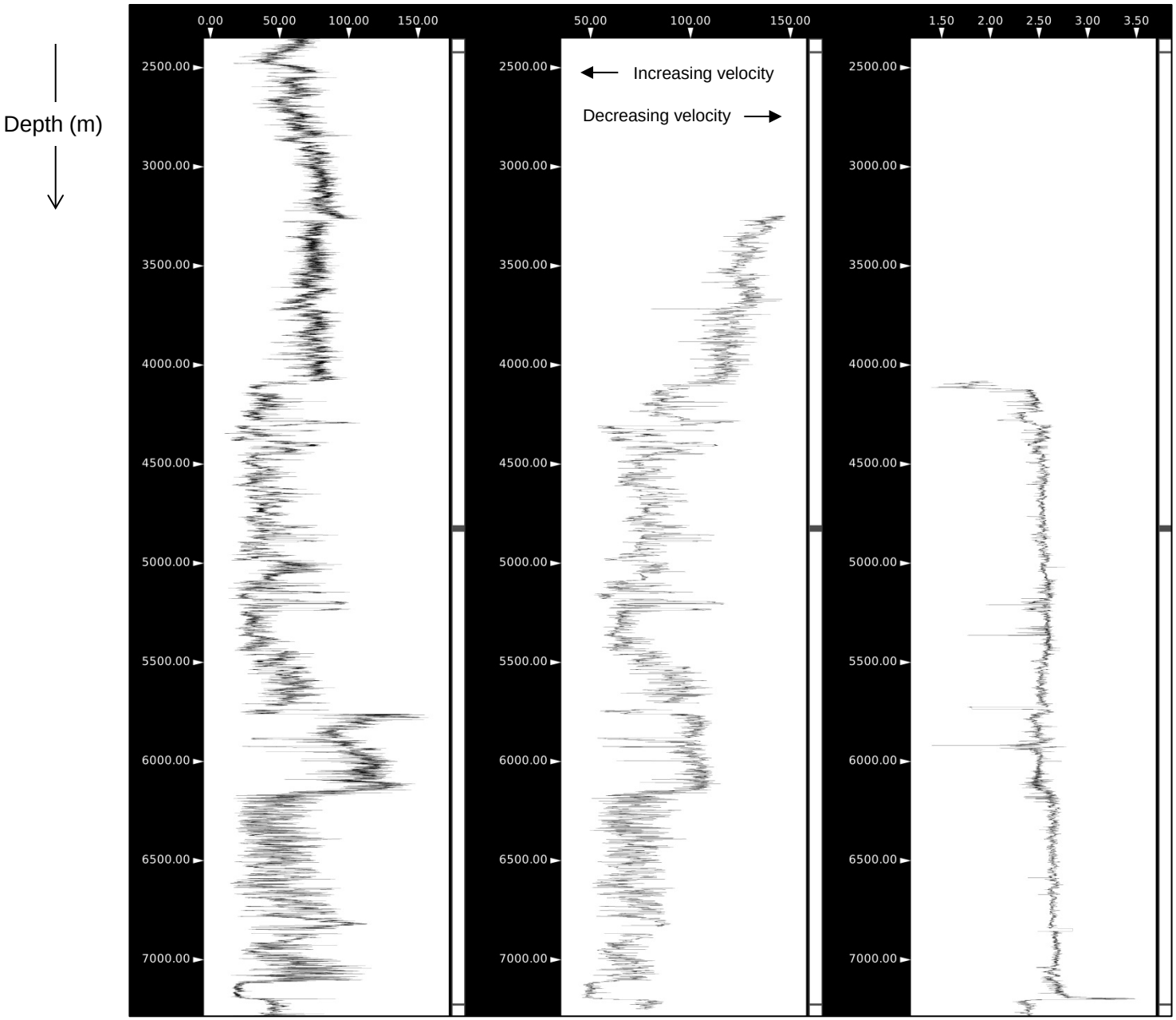
DC 353 #1
Vicksburg

DC 268 #1
Antietam

DC 269 #1
Shiloh



Datum = Top Smackover



DC 269 #1
"Shiloh"

Pre-stack Time Migration

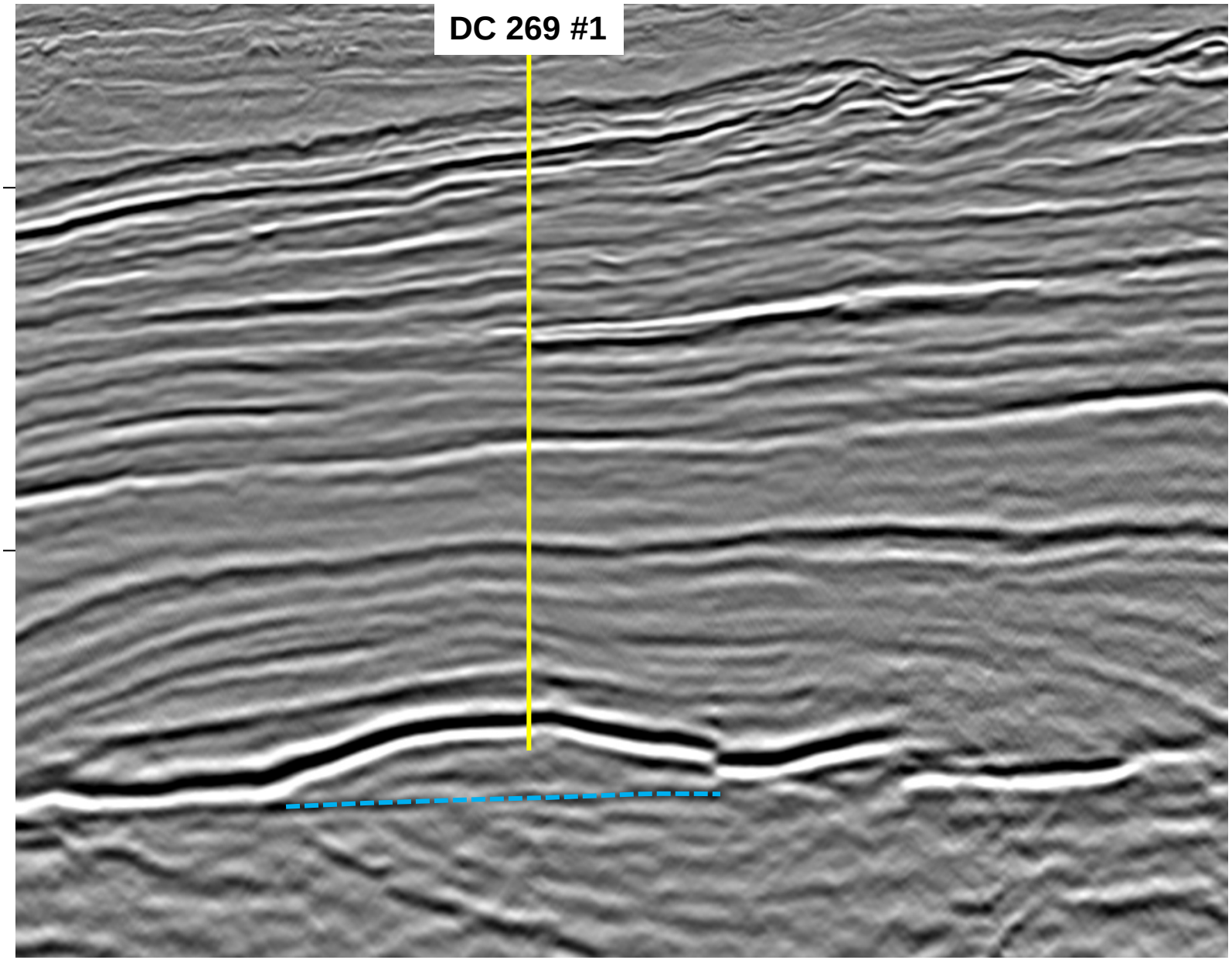
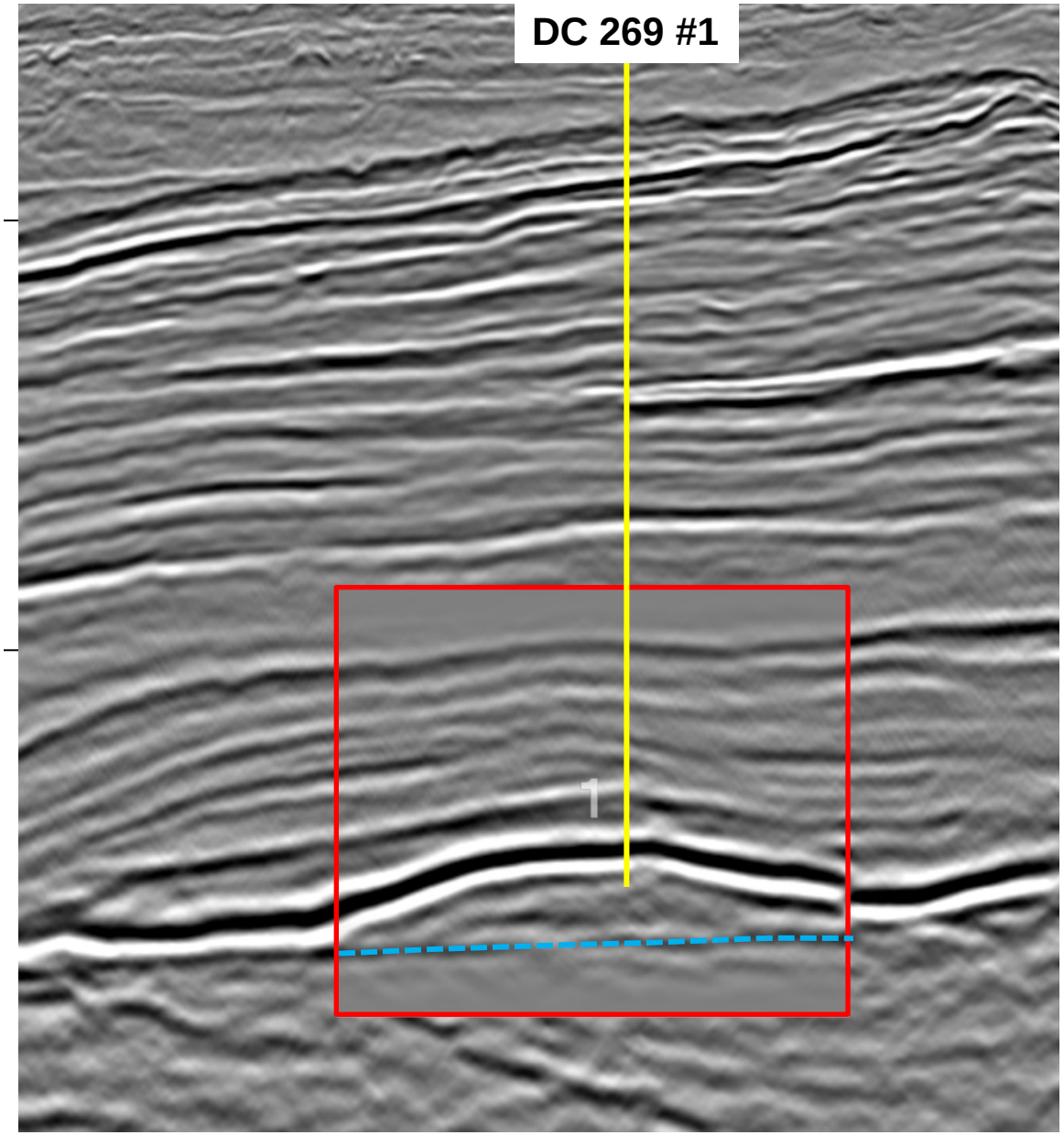
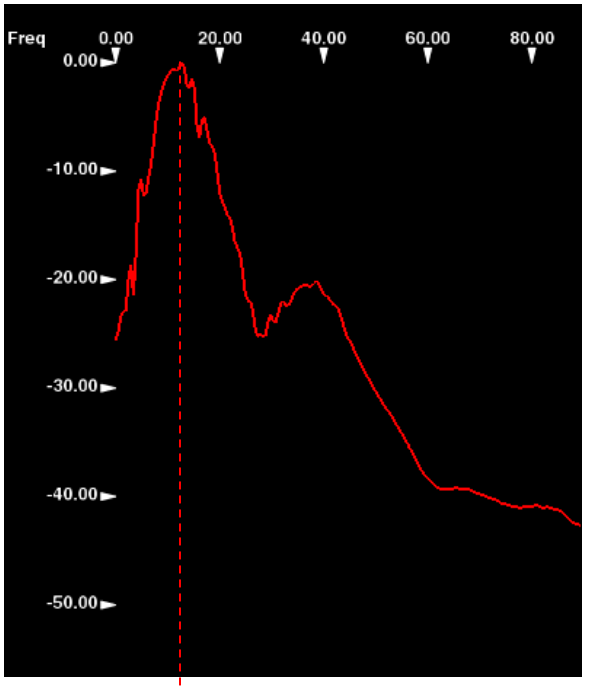


Image courtesy of PGS/TGS

Pre-stack Time Migration



Amplitude spectrum



~13 Hz

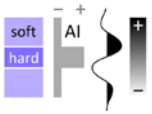
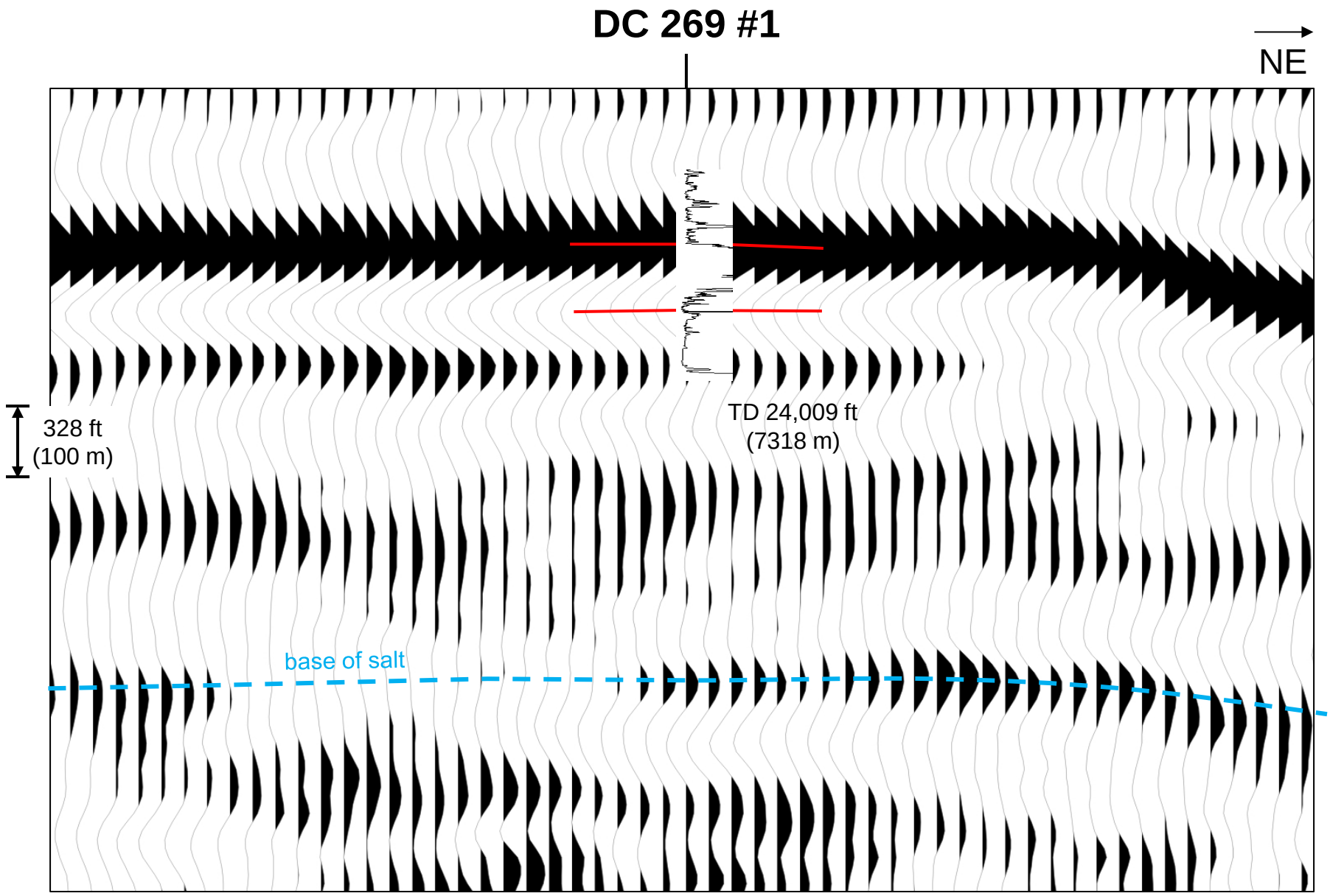
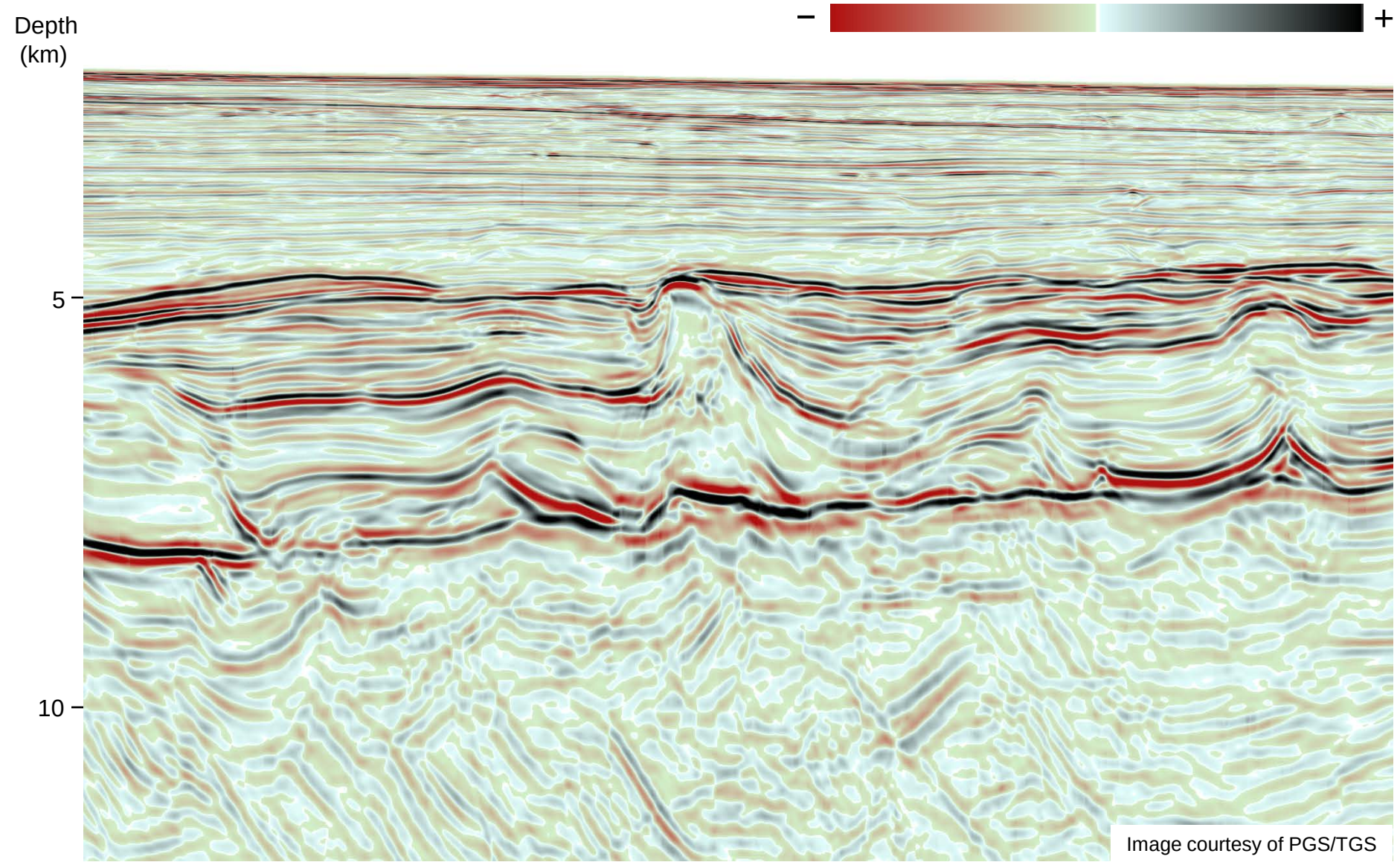


Image courtesy of PGS/TGS

Pre-stack Depth Migration

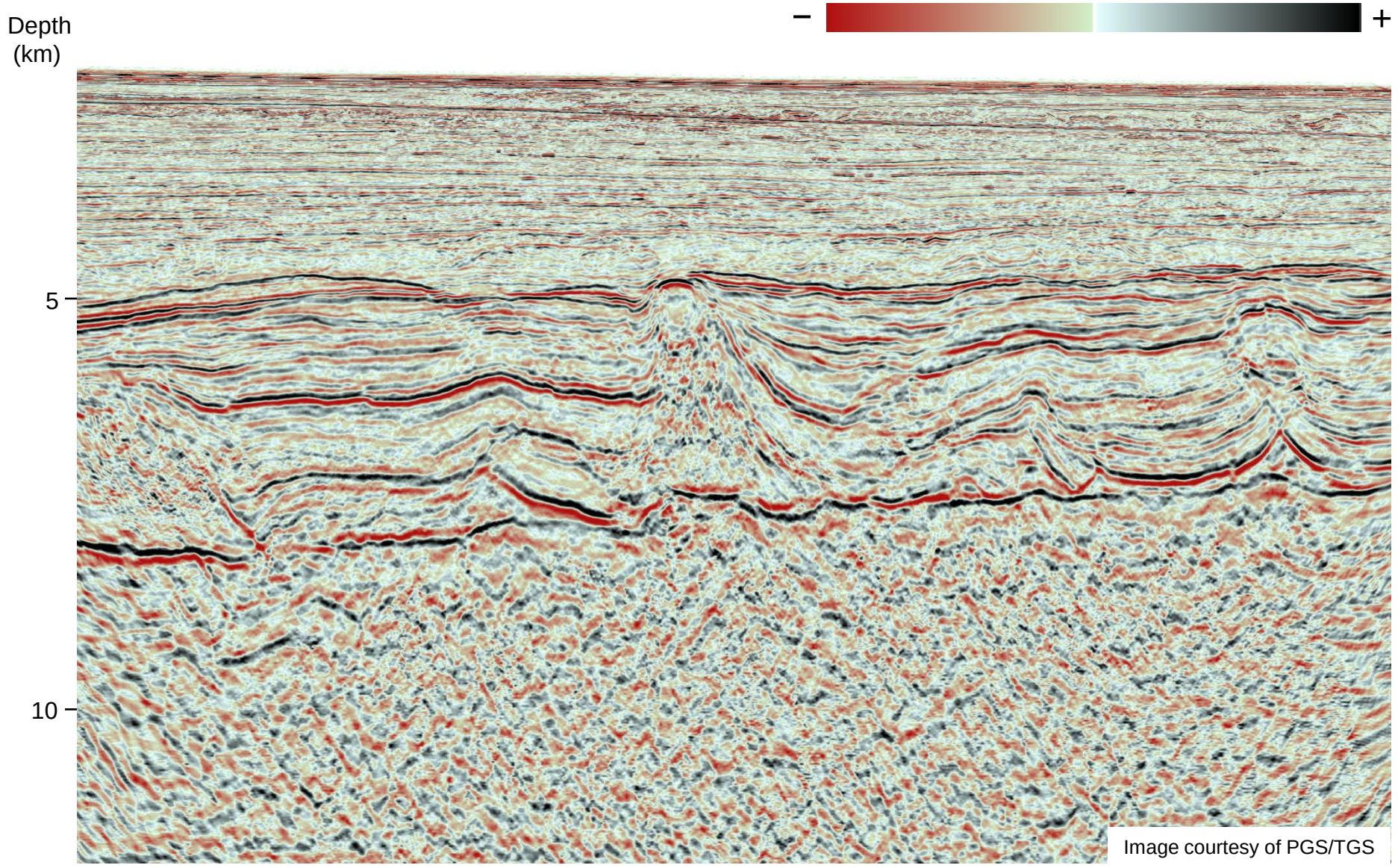


3D Beam Pre-stack Depth Migration (PSDM)



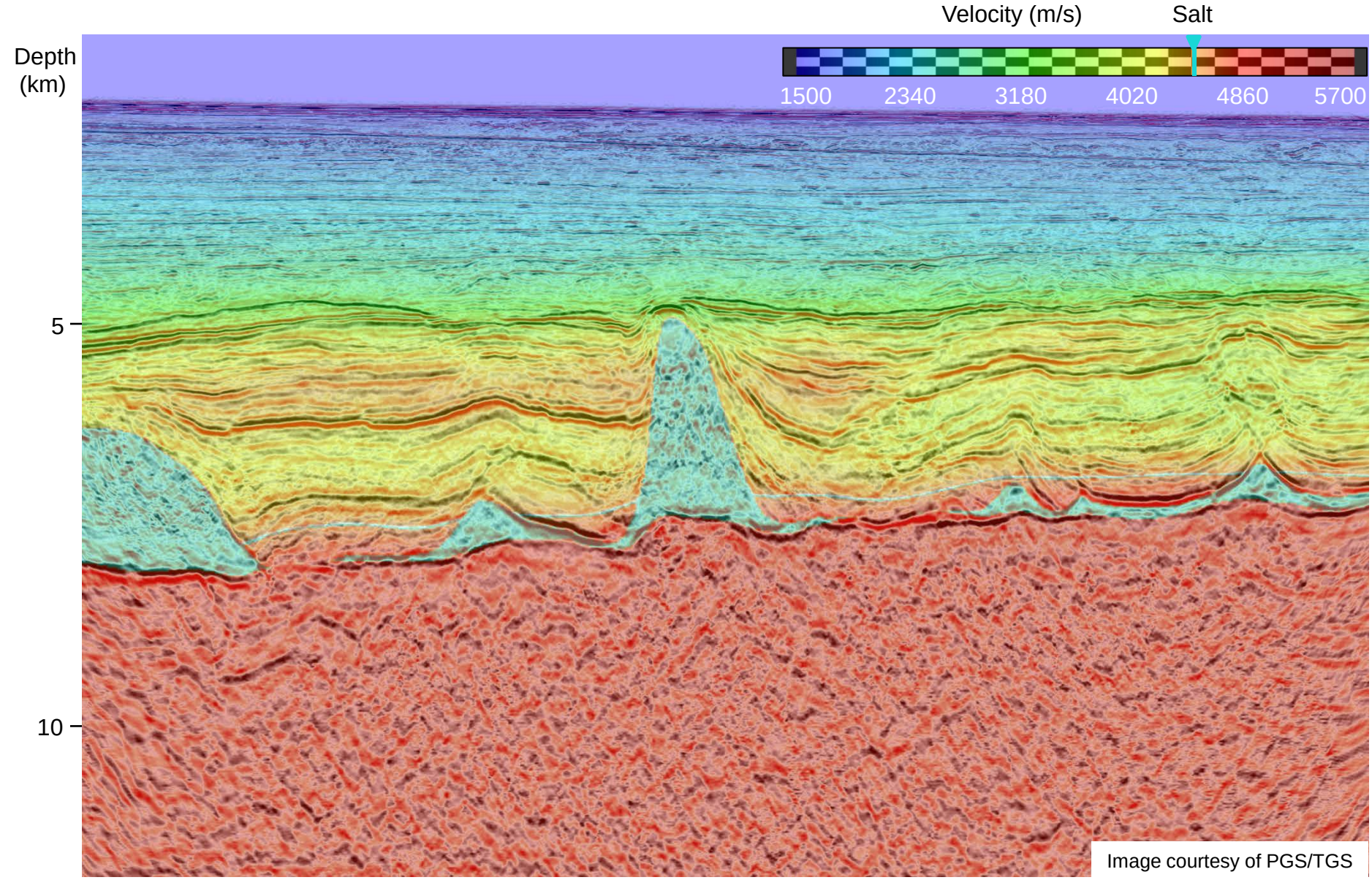
Vertical exaggeration ~ 2

3D Kirchhoff Pre-stack Depth Migration (PSDM)



Vertical exaggeration ~ 2

3D Kirchhoff Pre-stack Depth Migration (PSDM)



Vertical exaggeration ~ 2

Kirchhoff PSDM

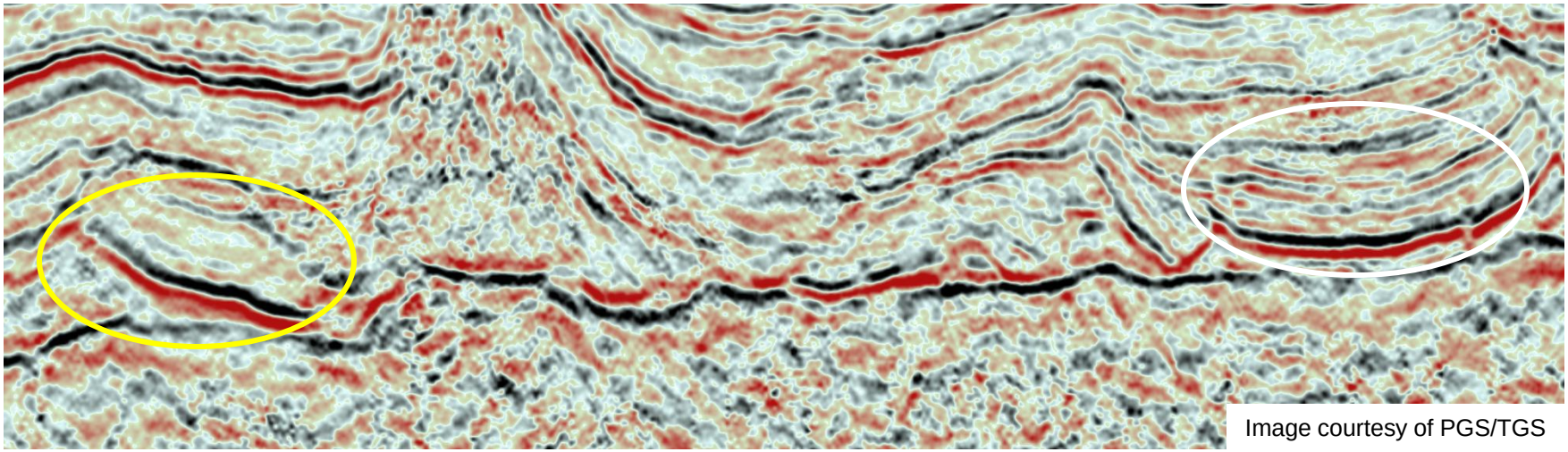


Image courtesy of PGS/TGS

Beam PSDM

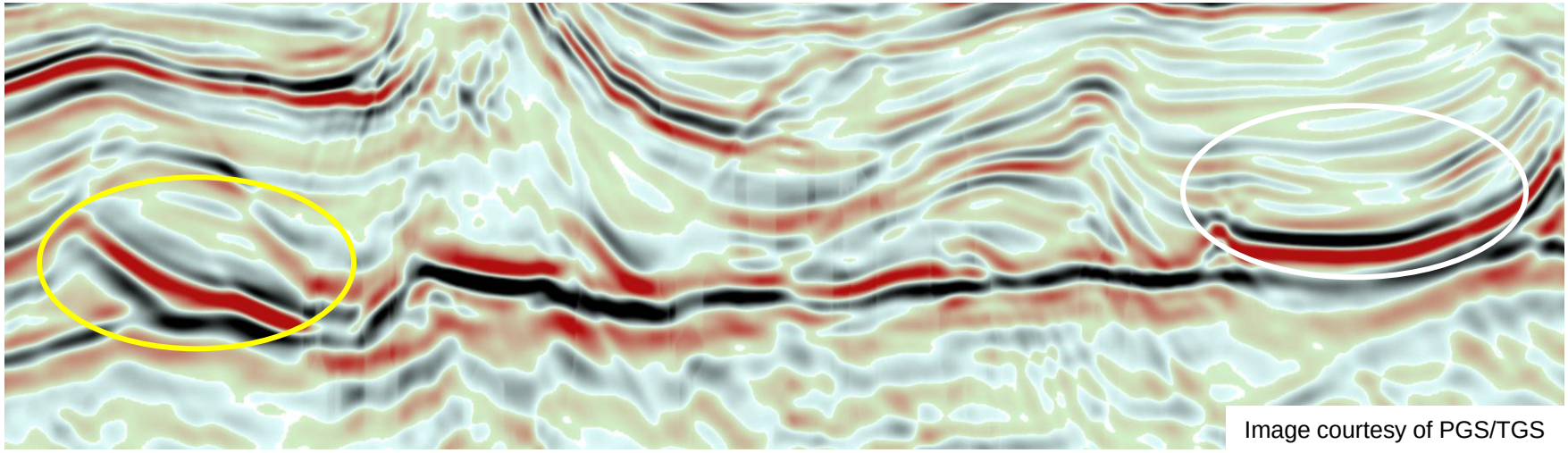


Image courtesy of PGS/TGS

Conclusions

In many instances the thickness and internal structure of the Norphlet interval at its target depth in the deepwater eastern Gulf of Mexico cannot be seismically resolved.

Details of interpretation of depth-imaged data depend on both the migration algorithm used and the accuracy of the depth migration velocity model.

Having several different depth-migrated data sets to work with complicates an interpreter’s decision-making process.