

**MAY 18, 2022**



# **CARBON STORAGE POTENTIAL IN THE GOM**

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Geological Characterization of the Chandeleur Island 3D Seismic Survey Area, Offshore Louisiana

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# GCCC in collaboration with GBDS

- GBDS within UT Institute for Geophysics (UTIG)
- Gulf Basin Depositional Synthesis (GBDS) project is an industry-supported, comprehensive regional synthesis of Cenozoic and Mesozoic depositional evolution in the GoM.
- GBDS is contributing resources from its database to accomplish GoMCarb project objectives in Chandeleur Sound
- <https://ig.utexas.edu/energy/gbds>

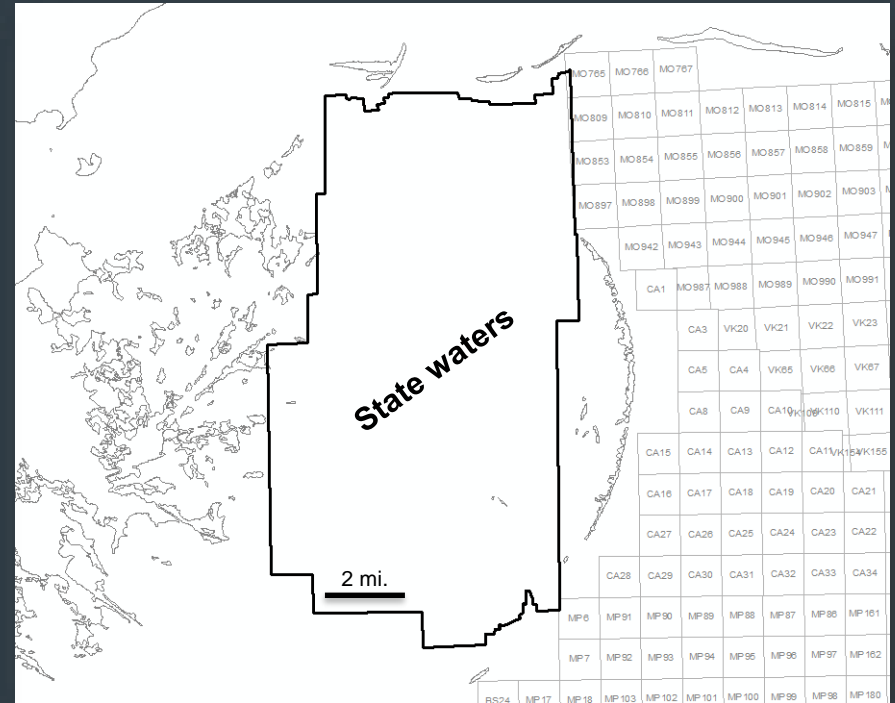
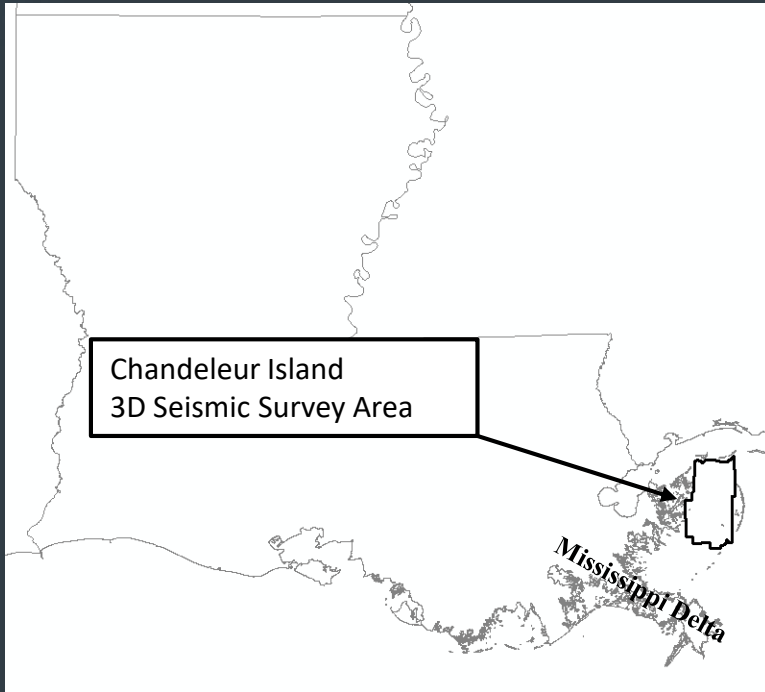
# Executive Summary

- Geological characterization built from scratch
- Highly iterative process
- Dynamic paleogeography and paleogeographic facies
- Upper Miocene and Middle Miocene have CCS potential
- Newly discovered Canyon in MM





# Location – Chandeleur Seismic Survey Area



# Difficulty with Data

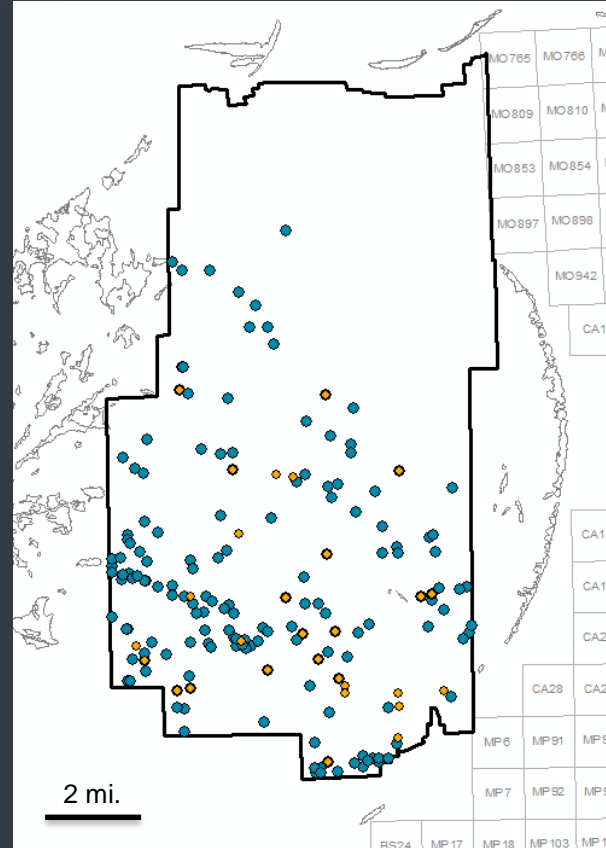
- No previous research/characterization in this survey area
- Vintage Data (1970's – 1990's)
- State vs. Federal data archiving standards
  - Organization & Submission requirements
- Data not spatially comprehensive
- Seismic volume in time, not depth
- Geological characterization built from scratch

# Well Distribution

- Blue & yellow = Drilled
- Yellow = Wells with Biostrat
- 170 total wells

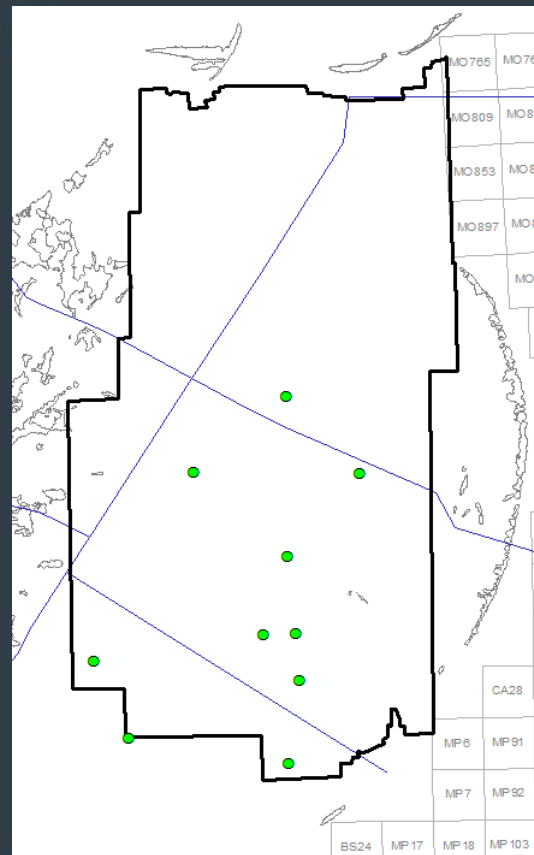
*\*No Commercial Production*

*\*Currently regarded as an open-boundary reservoir*



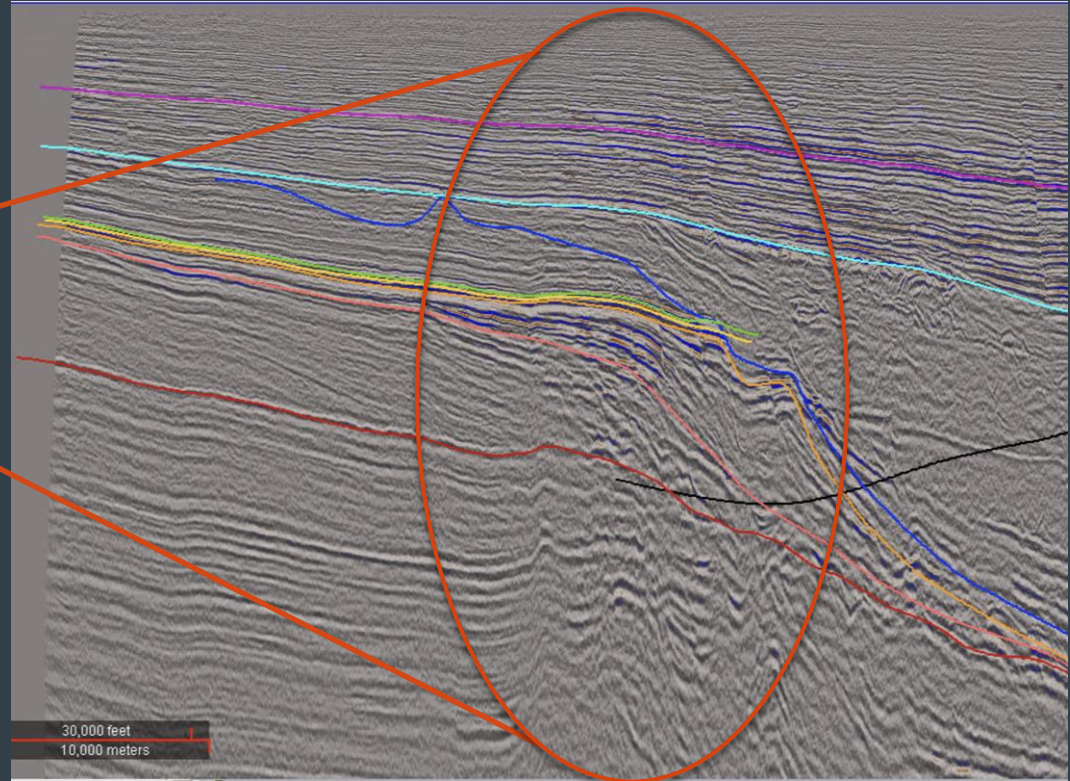
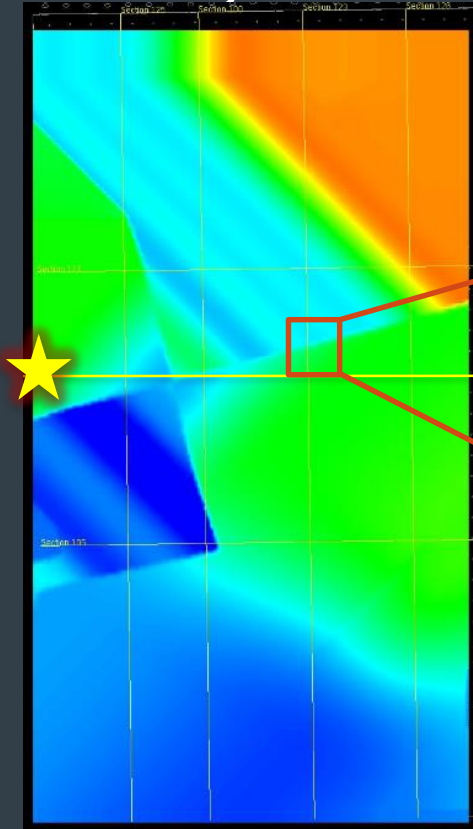
# Velocity Model v.1

- Done in-house at GBDS
- Insufficient log data available to create a precise VM
- Utilized interval velocity data from 3 ION GulfSPAN lines intersecting survey area & cross-referenced with (very limited) biostrat
- Distortions in VM across ION lines





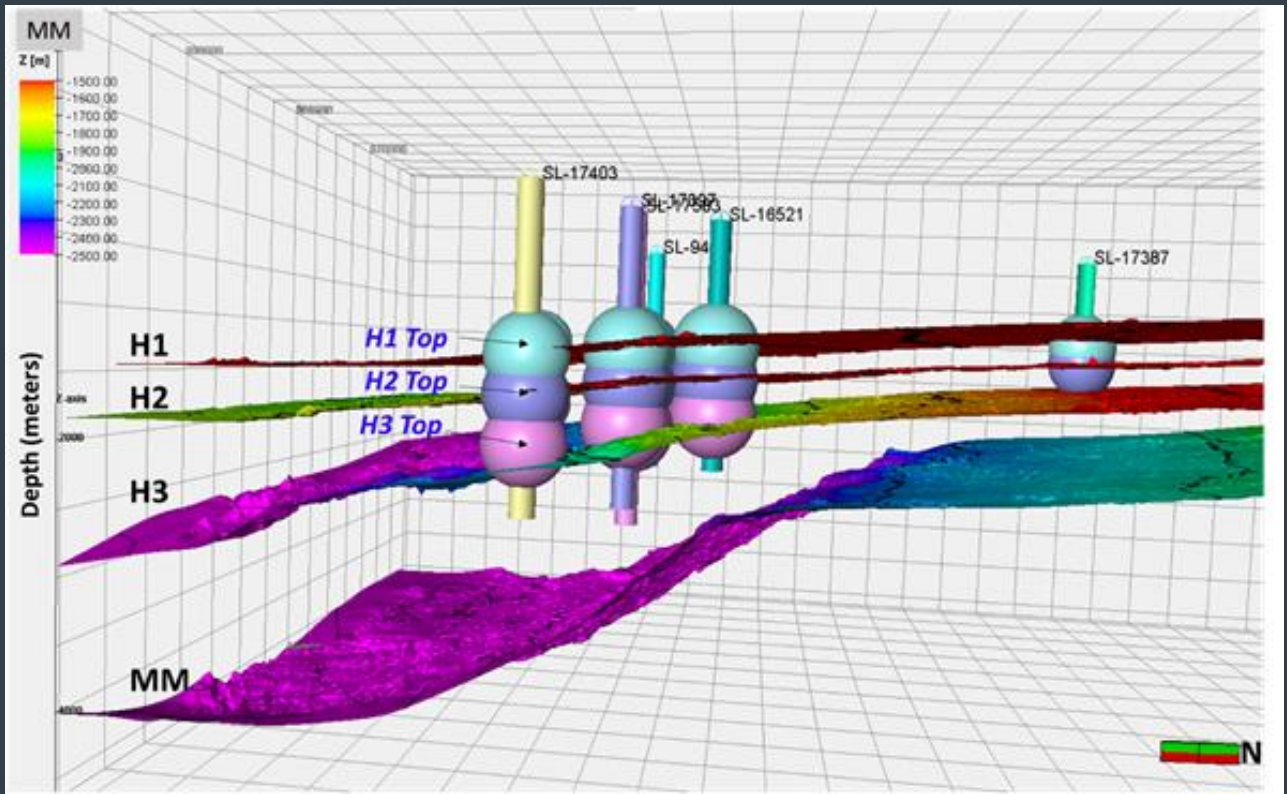
# Velocity Model Distortions



# Velocity Model v.2

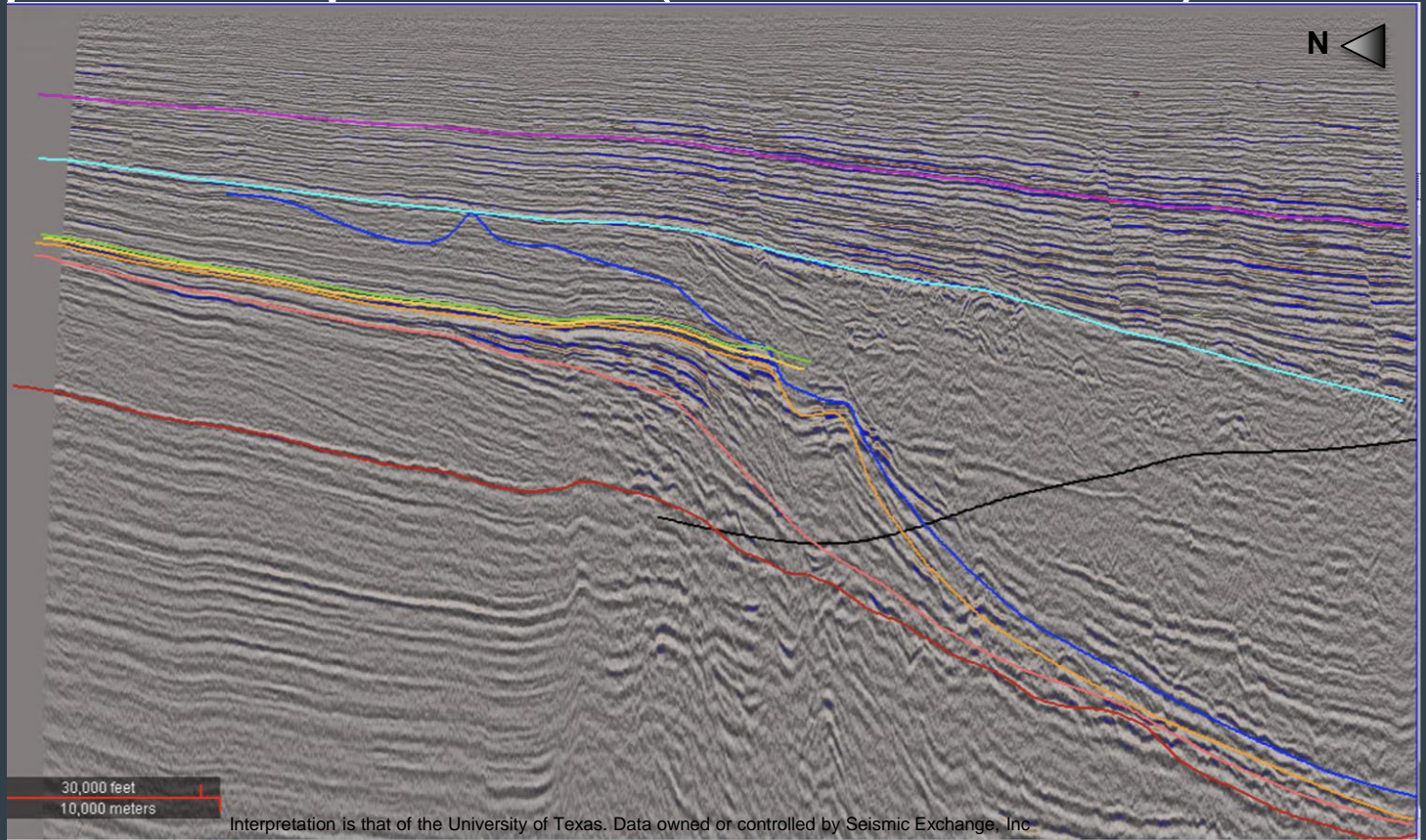
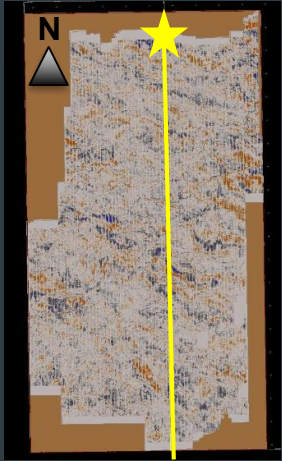
- Increased precision based on
  - Calibrated biostratigraphy & stratigraphic interpretation
  - 122 Digitized logs
  - Log surface picks & well correlation
  - In progress...So close!

# Velocity Model v.2 \*to date



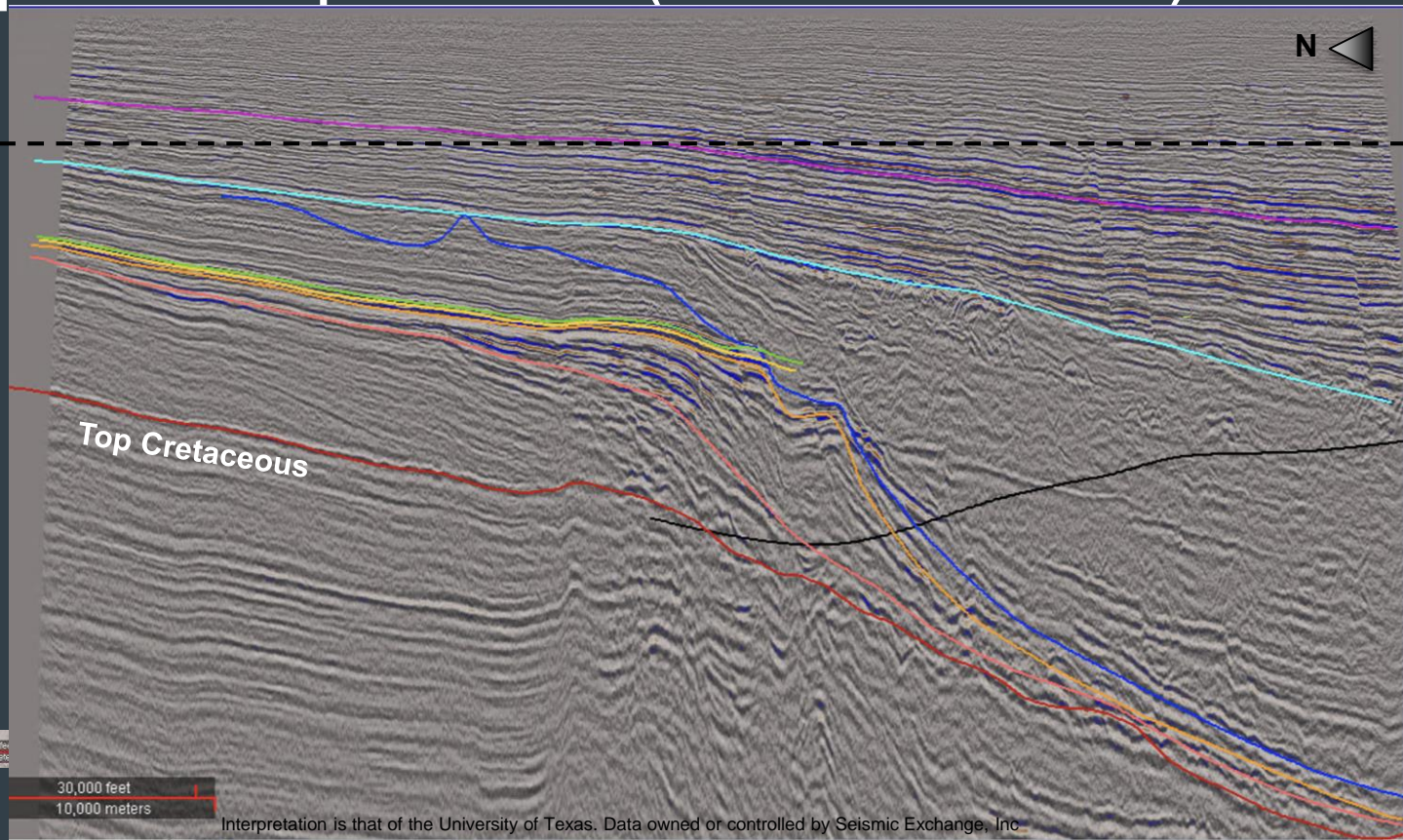
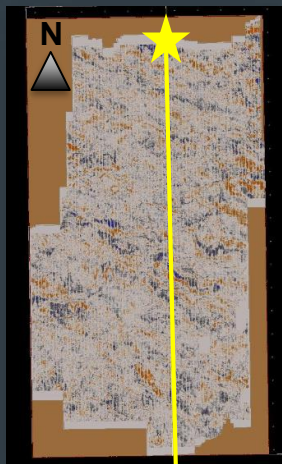


# Stratigraphic Interpretation (Biostrat based)



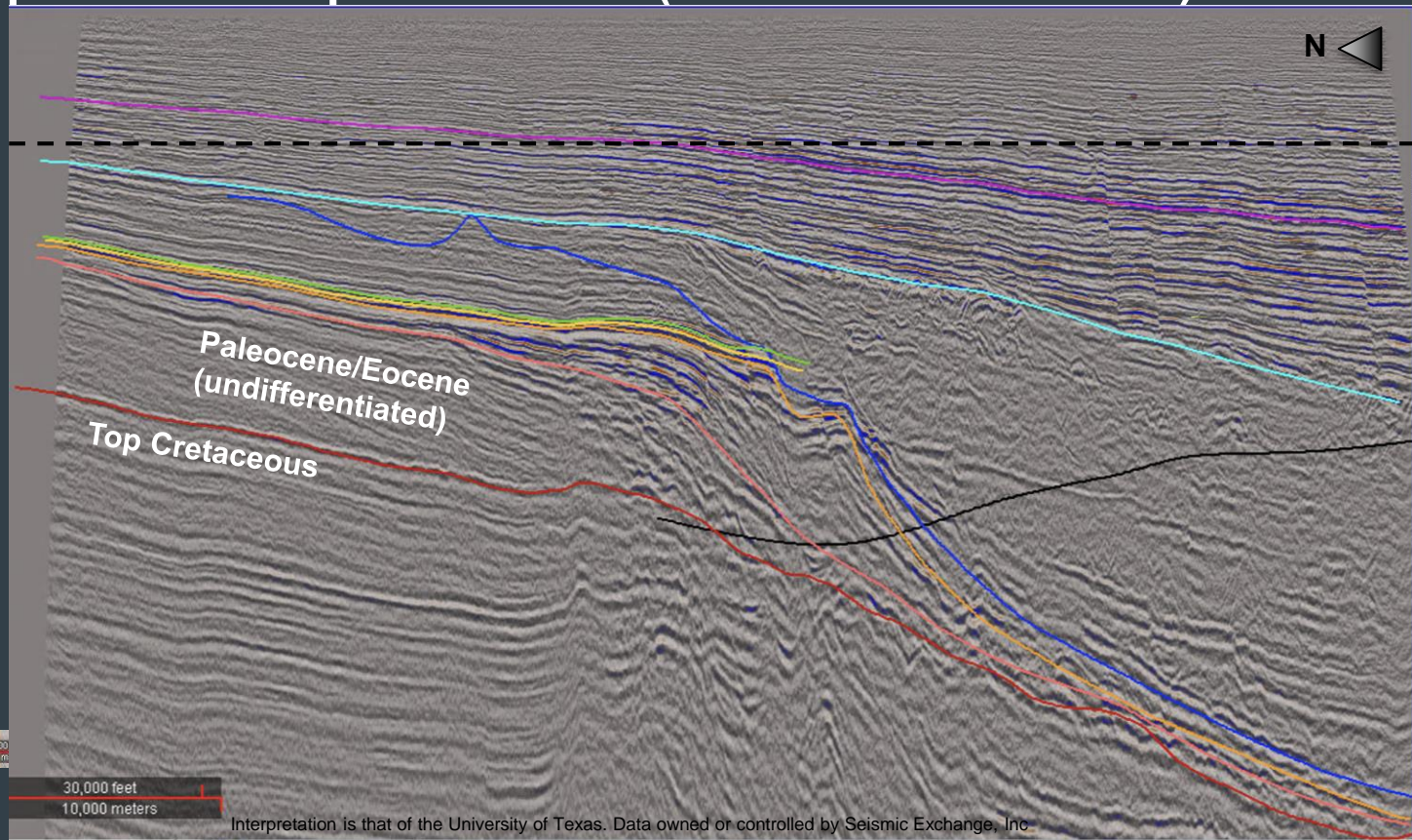
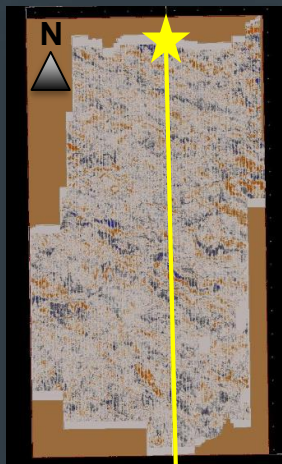


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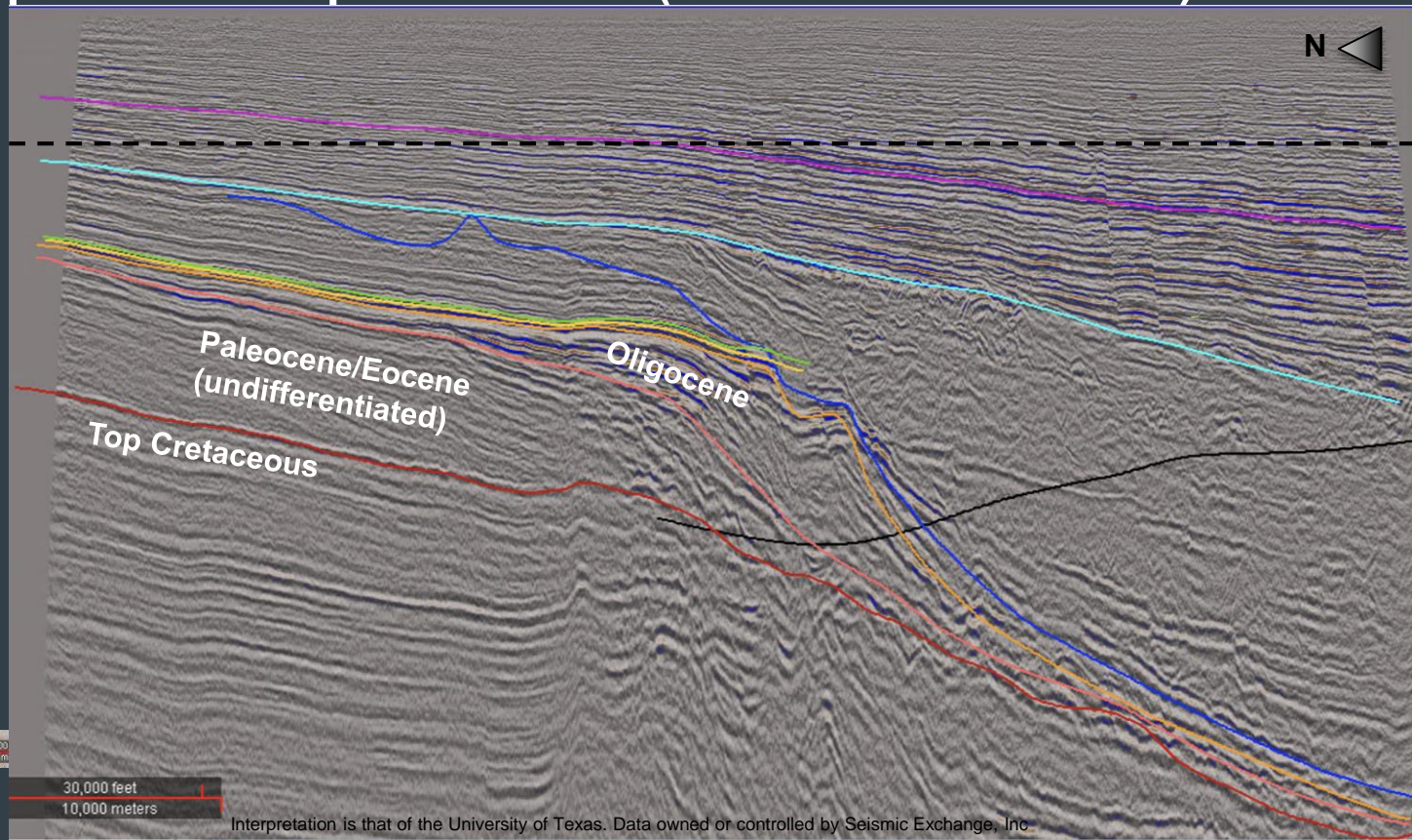
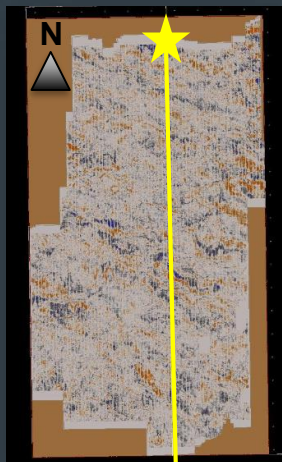


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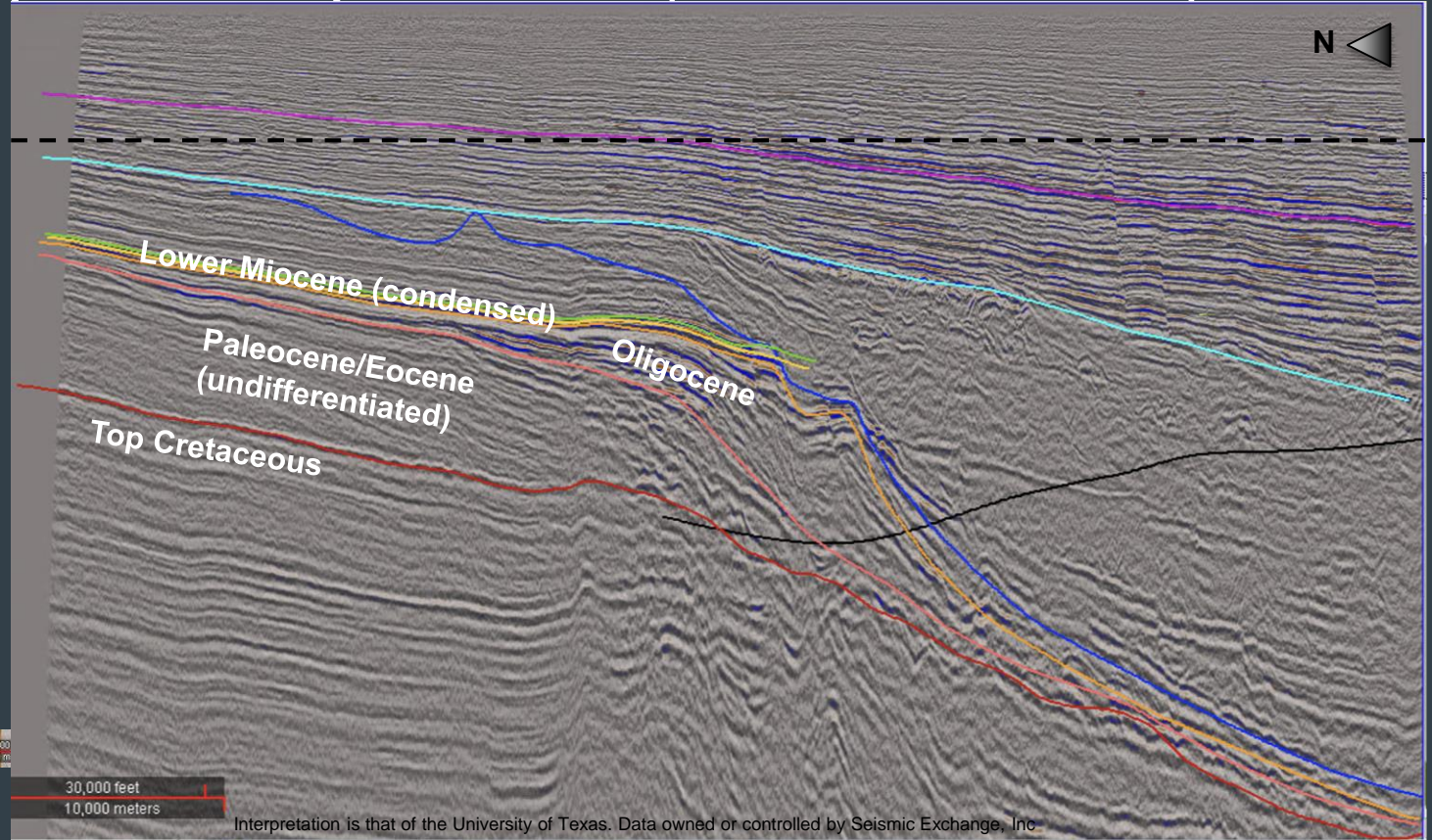
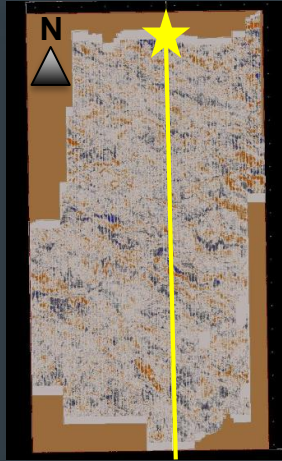


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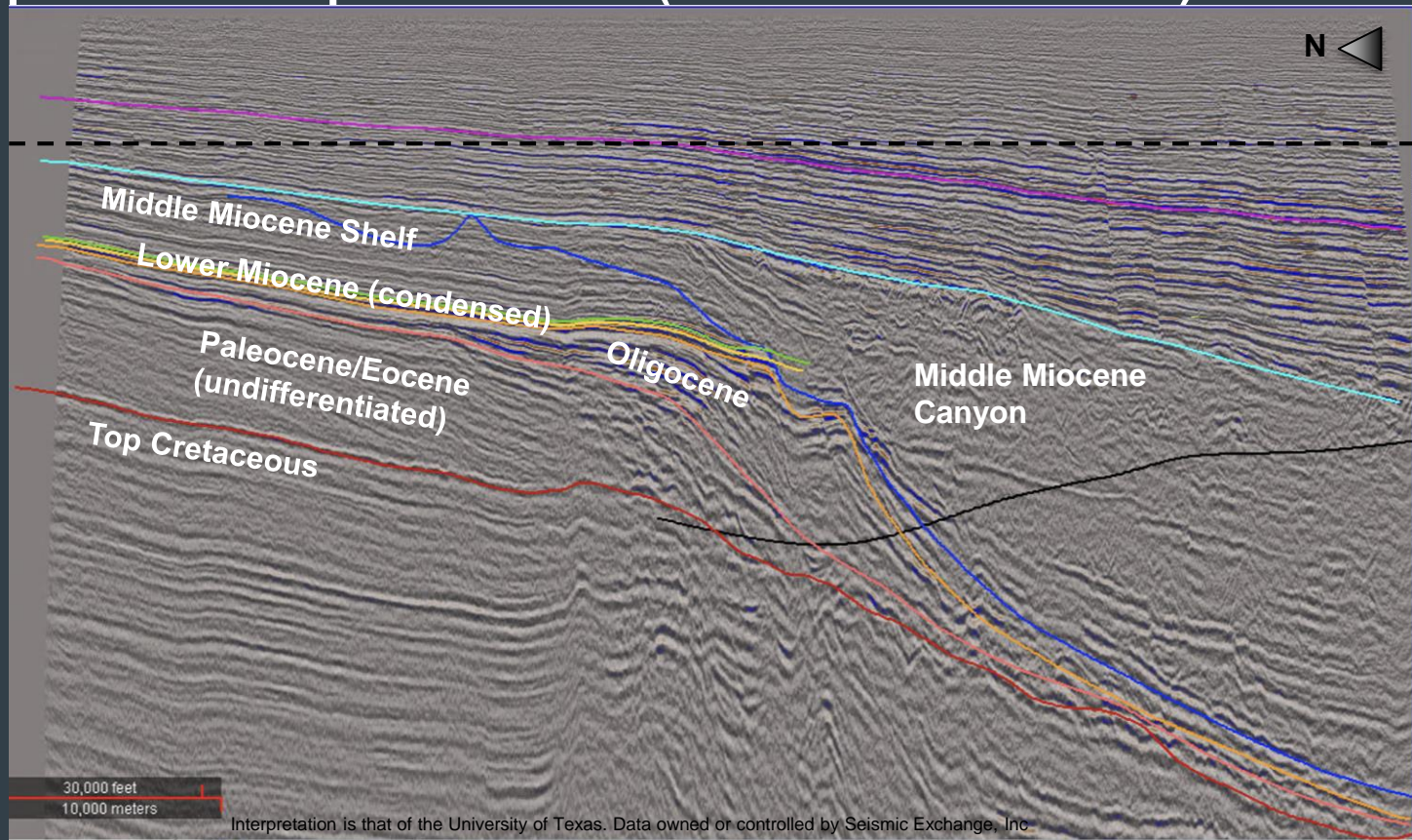
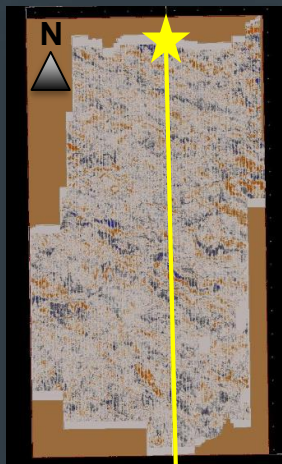


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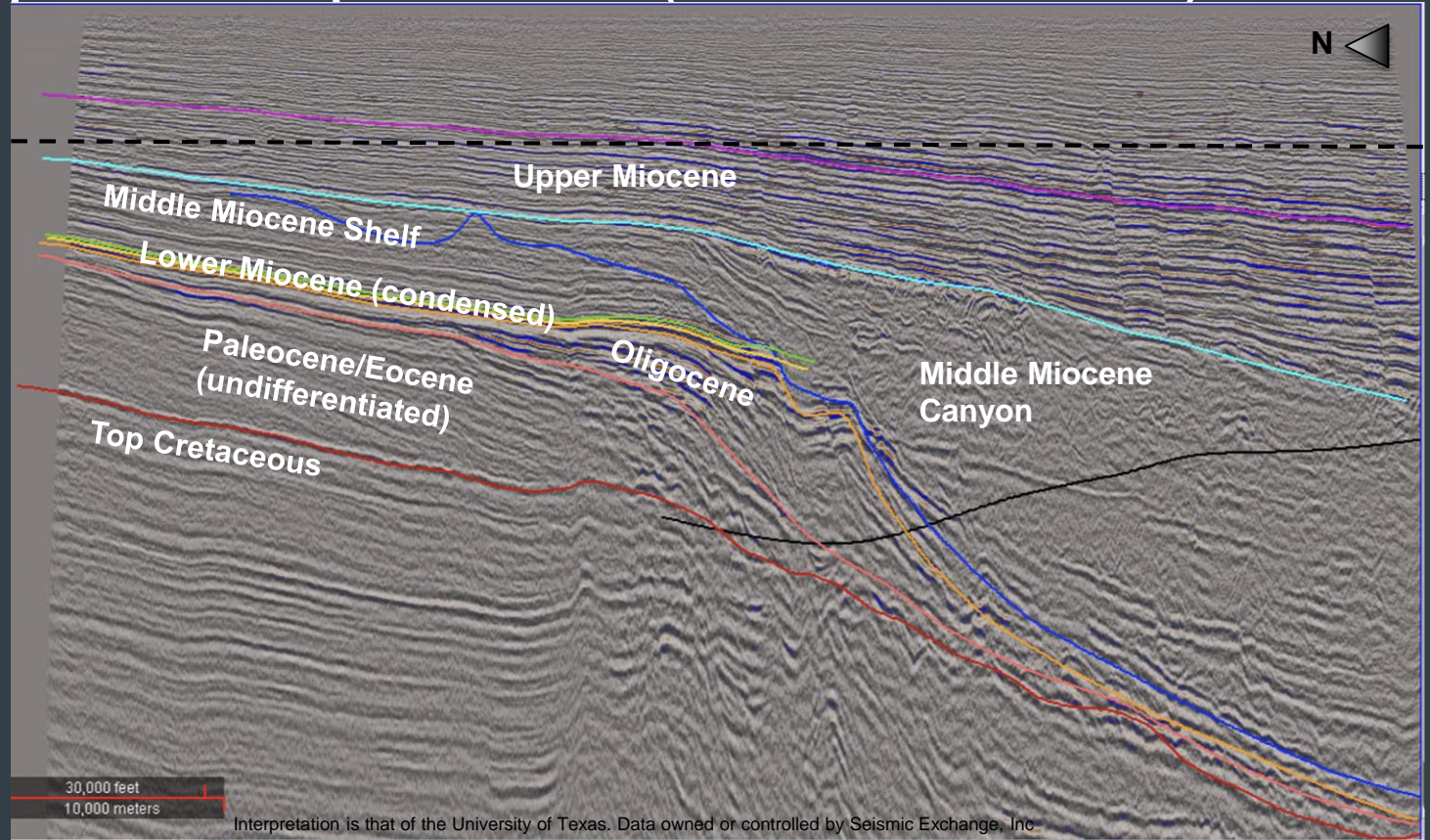
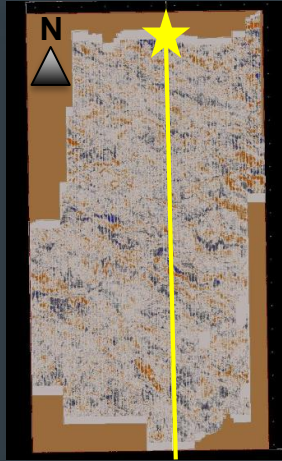


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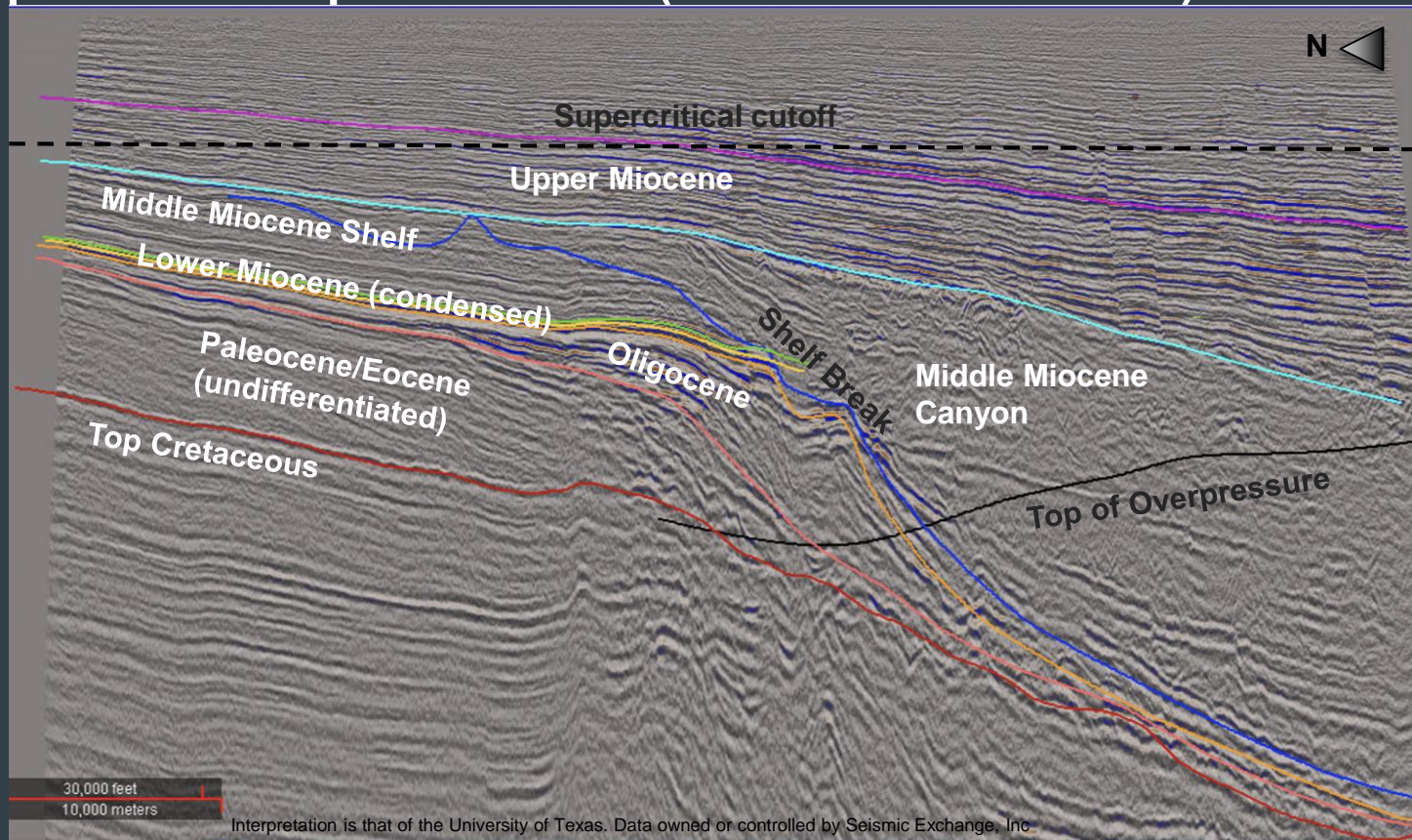
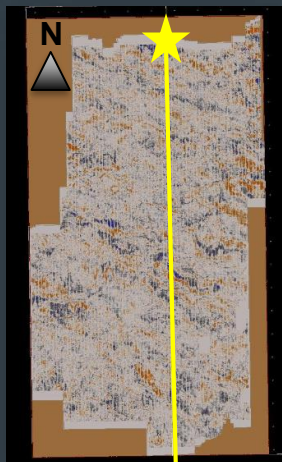


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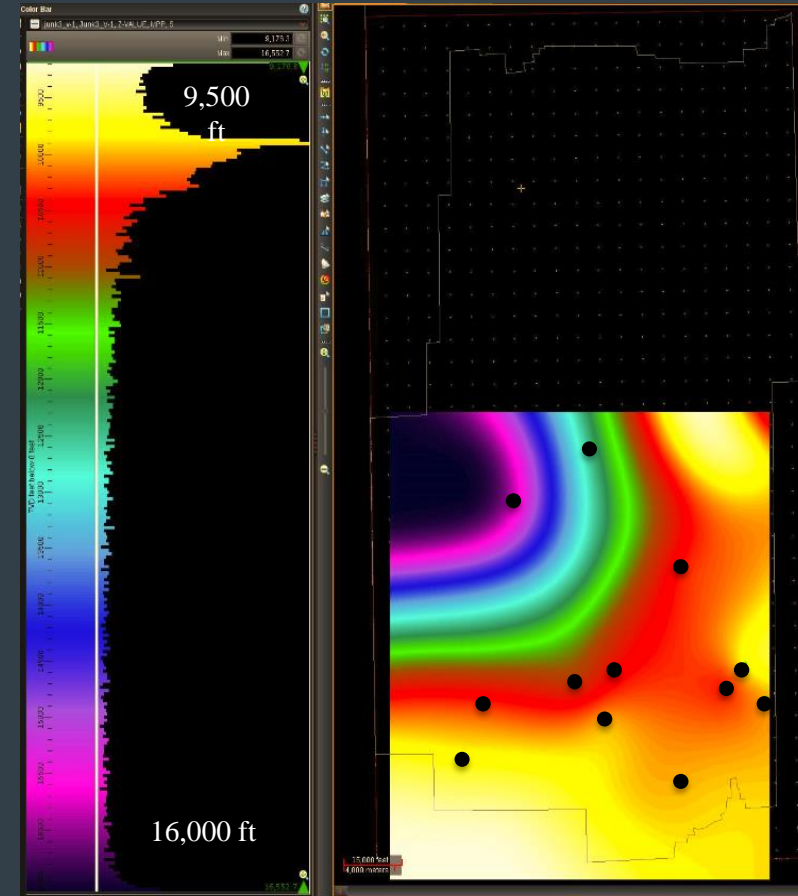


# Stratigraphic Interpretation (Biostrat based)



# Top of Overpressure

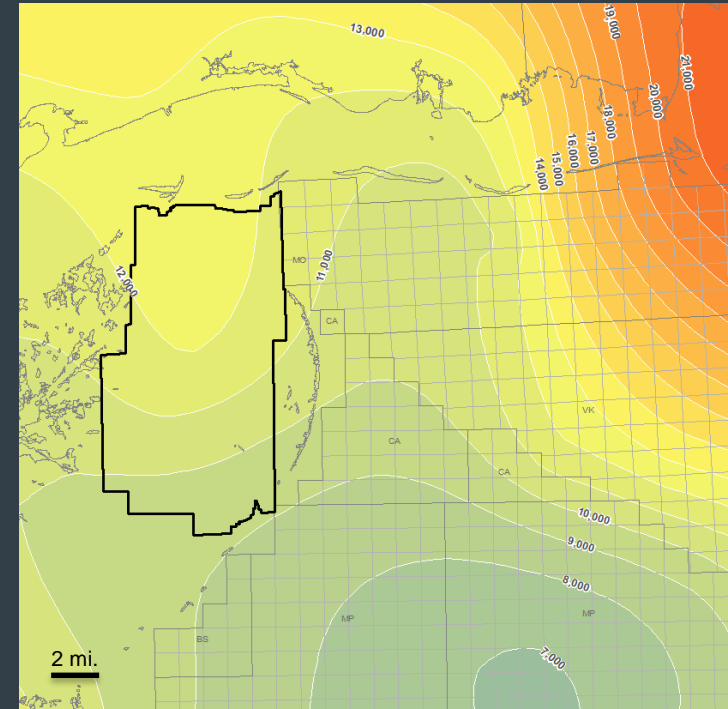
- Top of Overpressure = 0.70 psi/ft
  - $P = MW / c_2$  (Burke et al., 2012)
- 170 total wells
  - 48 wells w/o logs
  - 122 wells w/ logs
  - *12 total wells reached overpressure*





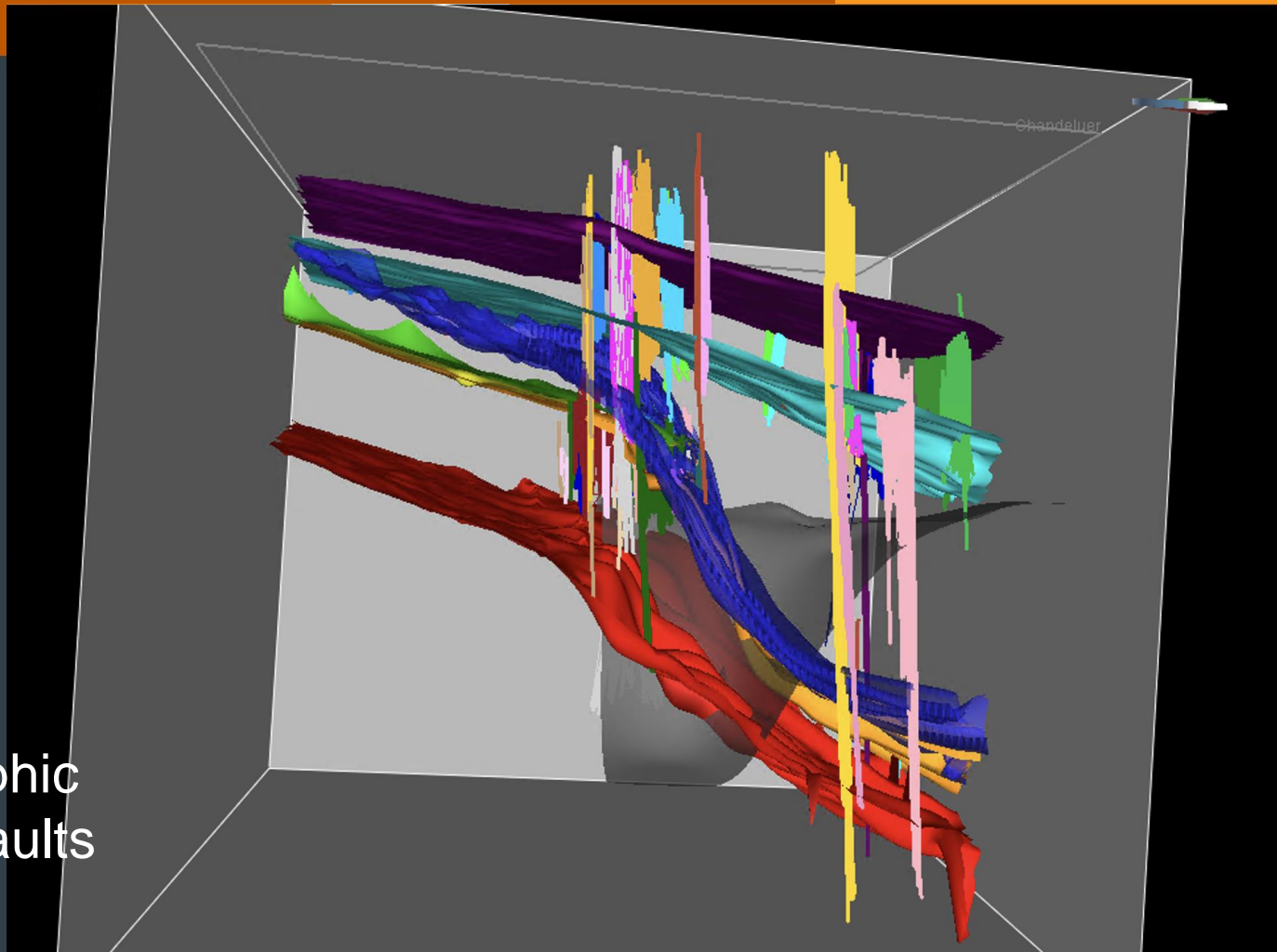
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Regional distribution of depth contours of the 0.70 psi/ft pressure gradient surface in the Chandeleur region (Burke et al., 2012)

# Working Stratigraphic Interpretation w/ faults



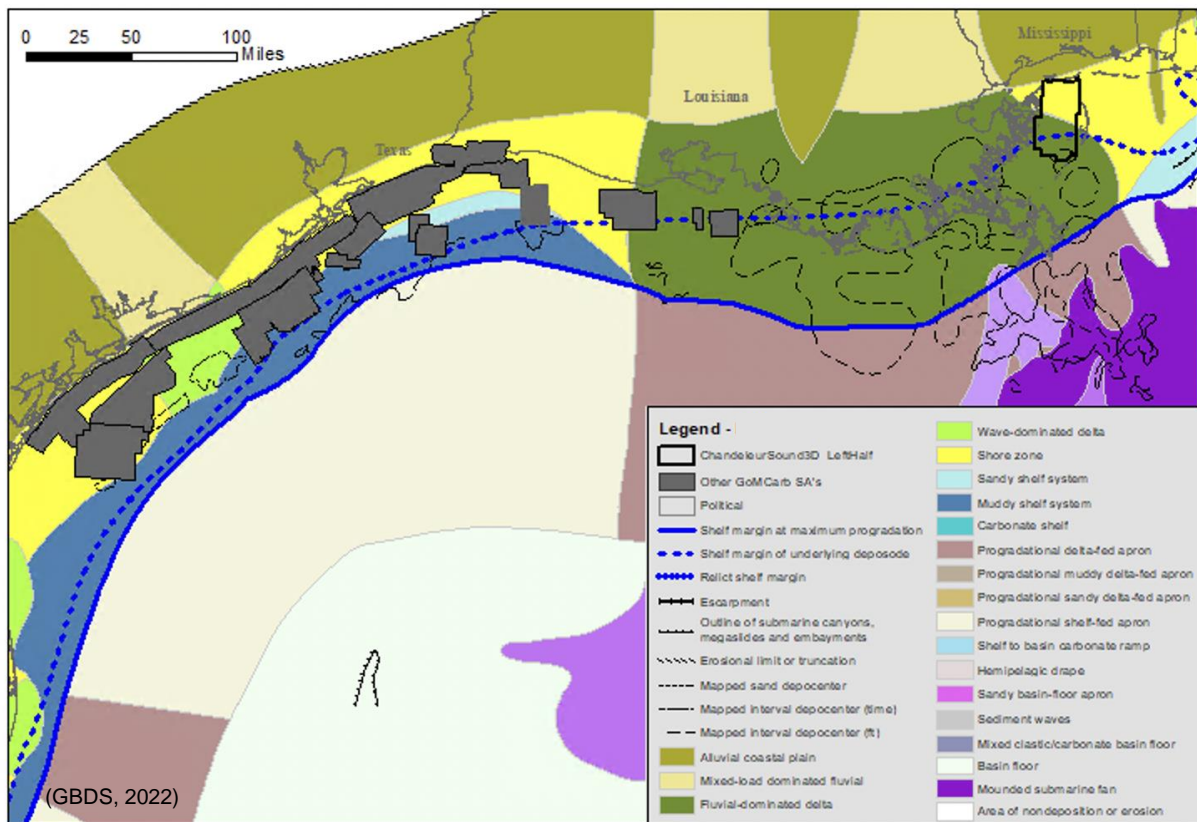
# Basic Cenozoic Paleogeography of AOI's

• Upper Miocene	alt. sand/silt/shale; channelization
• Middle Miocene Shelf	alt. sand/silt/shale; channelization
• Mid Miocene Canyon	sand/silt, highly heterogeneous
• Lower Miocene	condensed carbonate-to sand on shelf; truncated in basin by canyon
• Oligocene	muddy-to-carbonate
• Paleocene-Eocene	condensed muddy shelf, starved basin
• Top Cretaceous	carbonate shelf

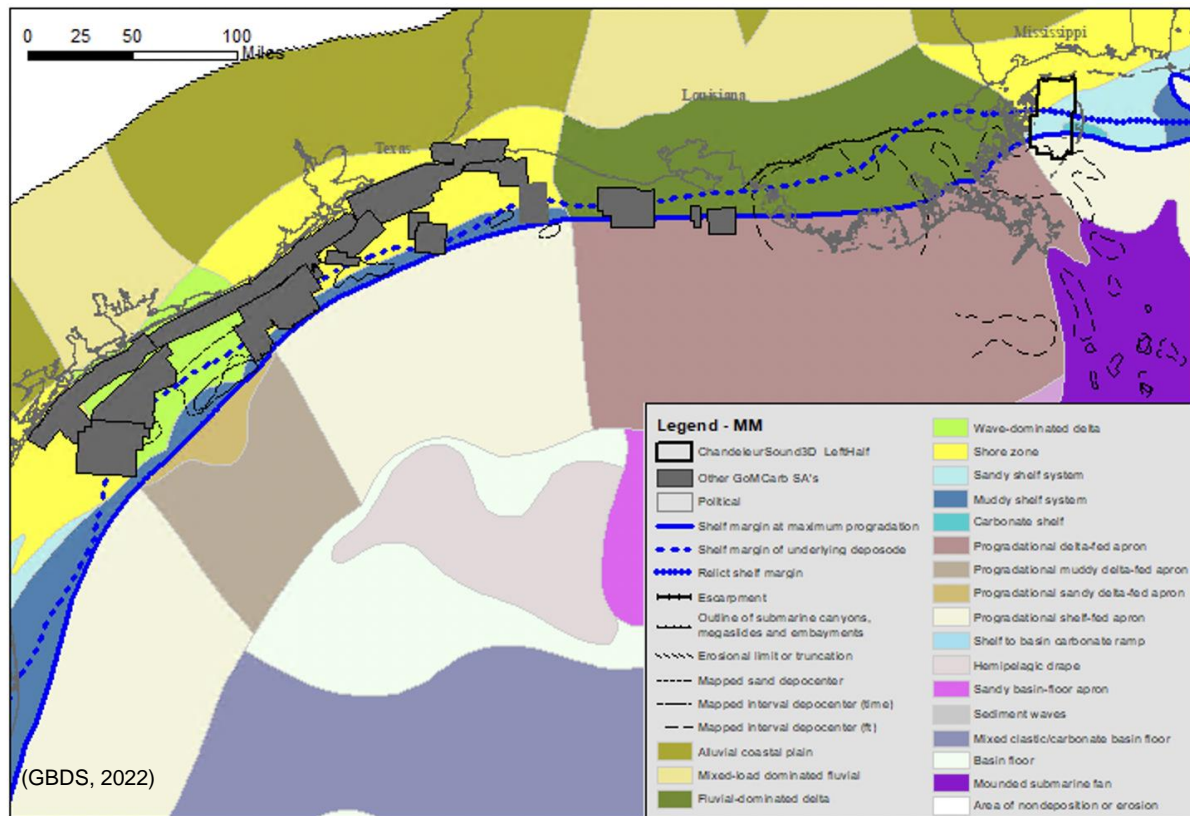
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• Paleocene-Eocene	condensed muddy shelf; starved basin
• Top Cretaceous	carbonate shelf

### Texas and Louisiana Gulf Coast Paleogeography and Facies Features of the Upper Miocene (UM)

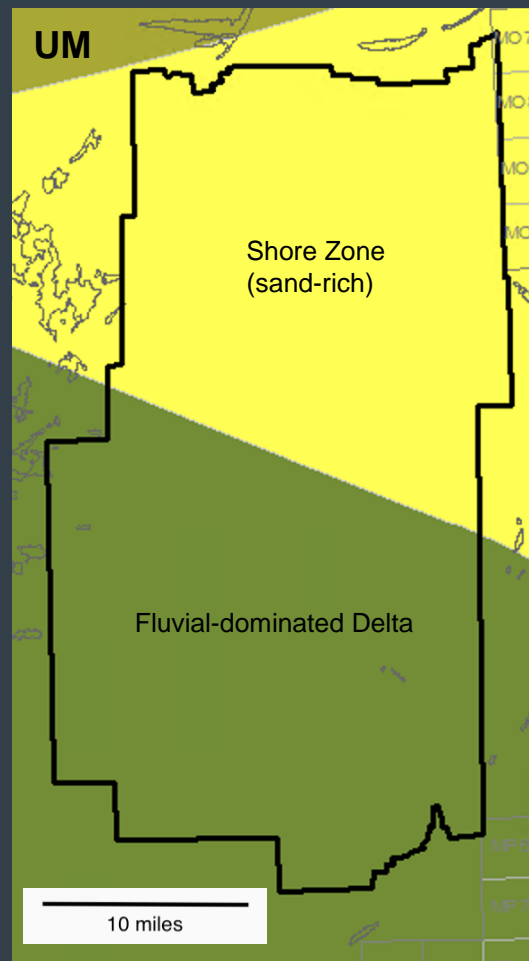
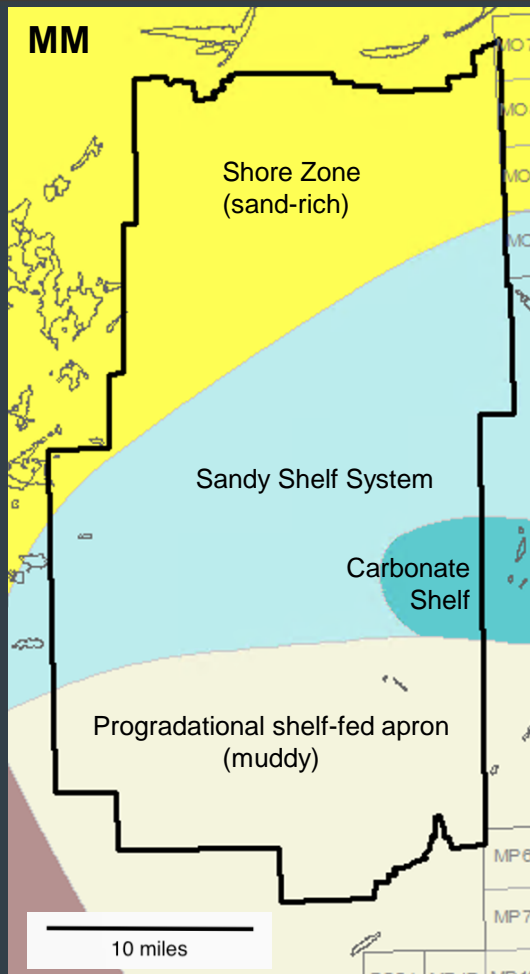


### Texas and Louisiana Gulf Coast Paleogeography and Facies Features of the Middle Miocene (MM)

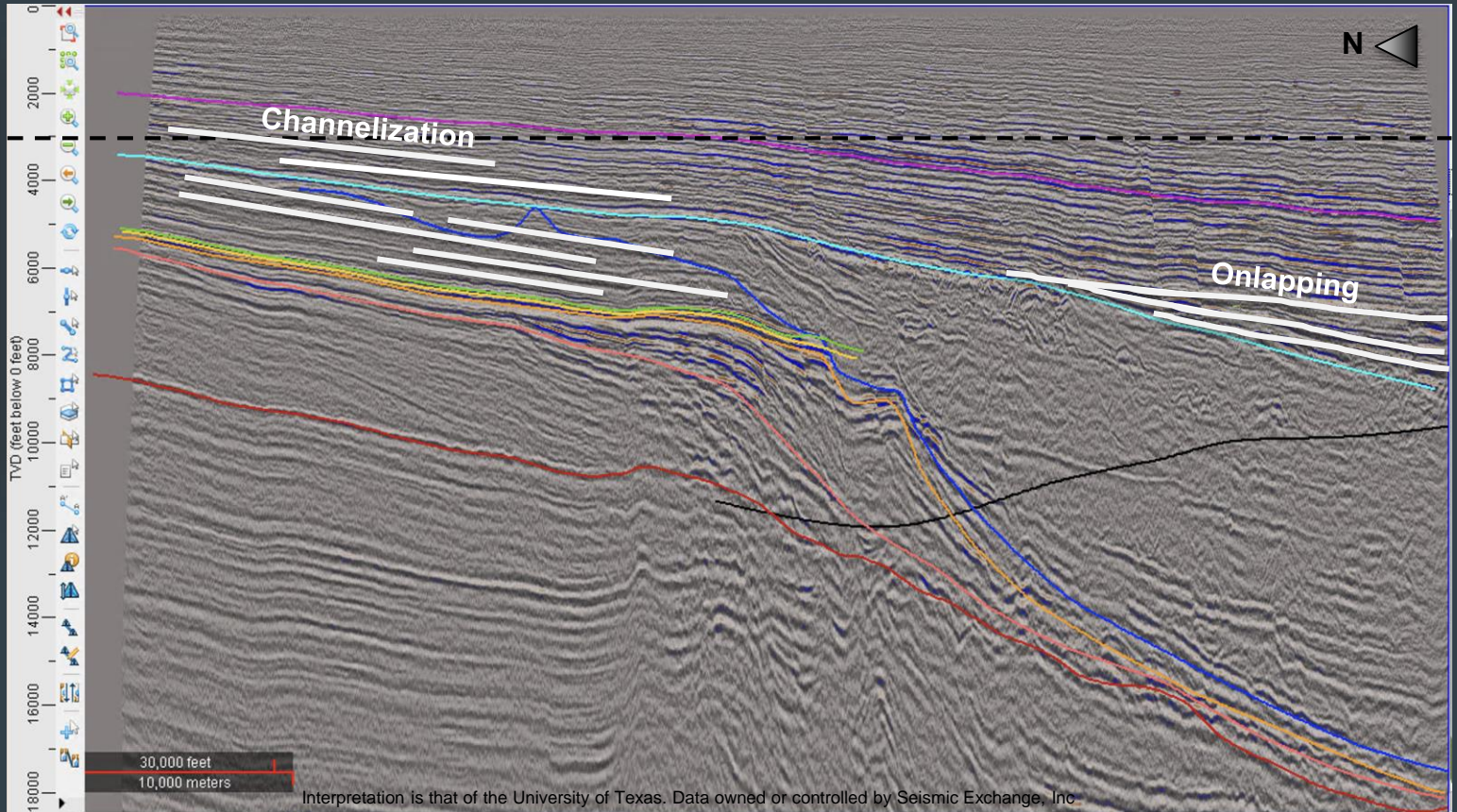
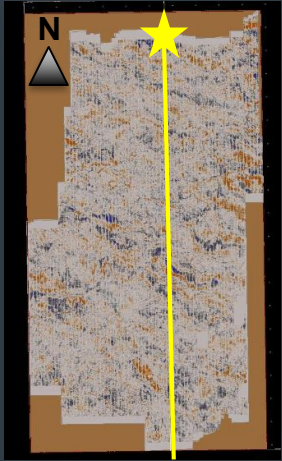




# MM & UM Paleogeography

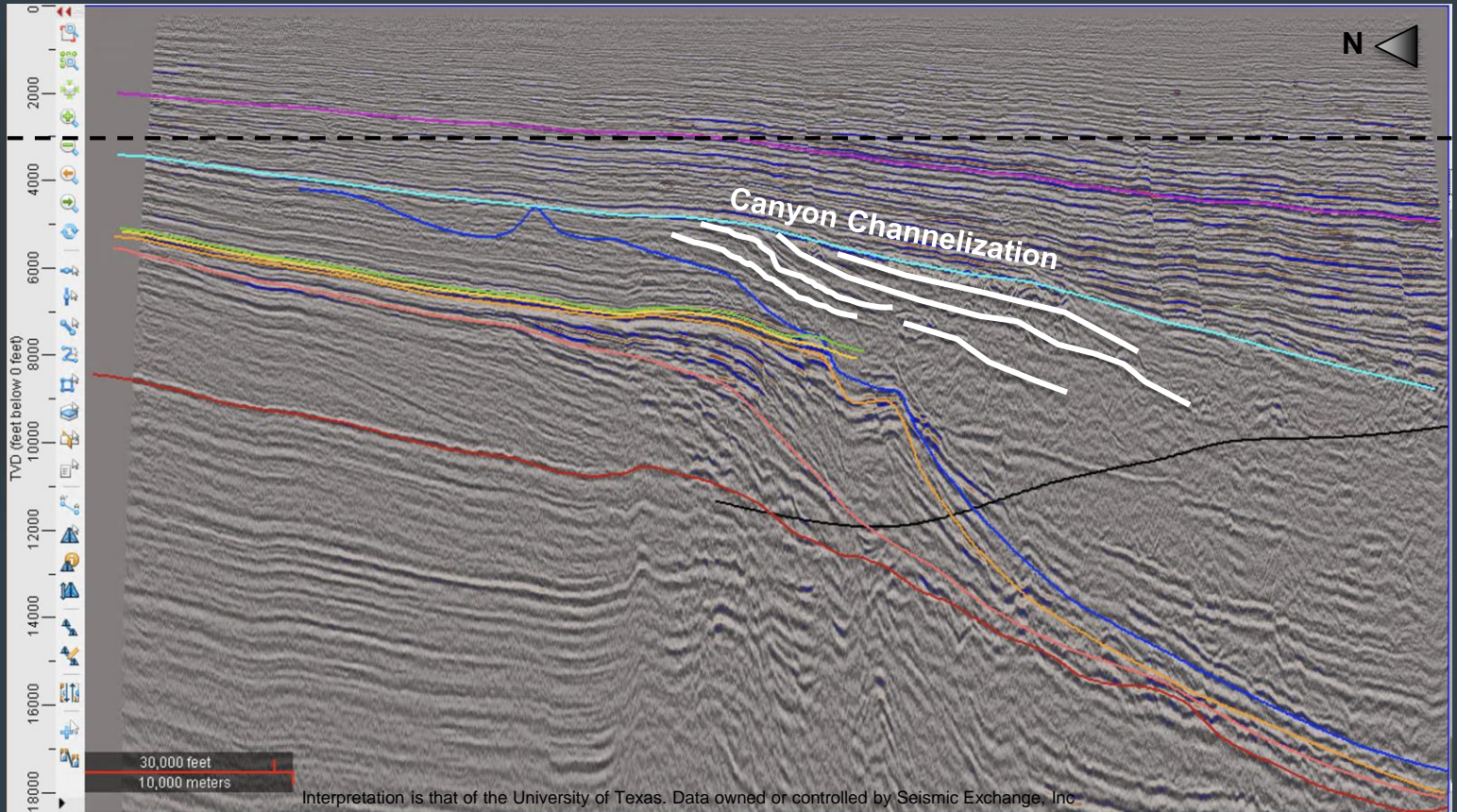
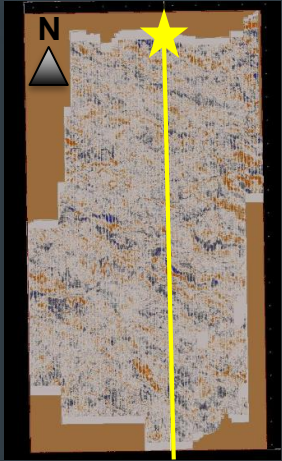


# Storage Opportunities: UM & MM



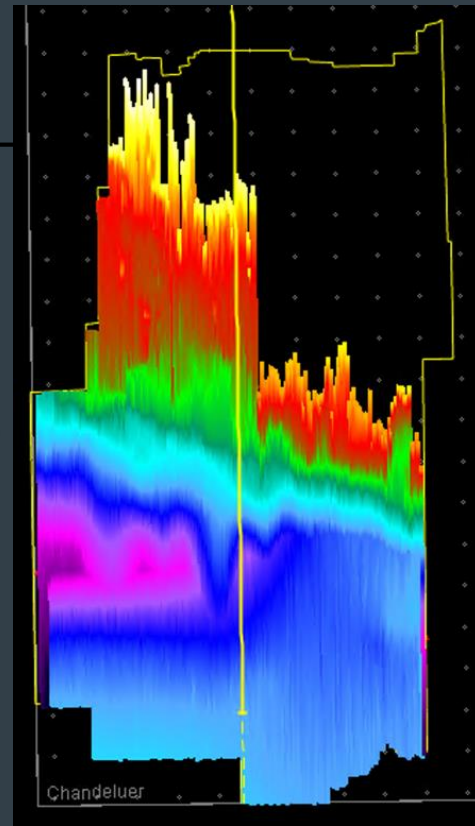
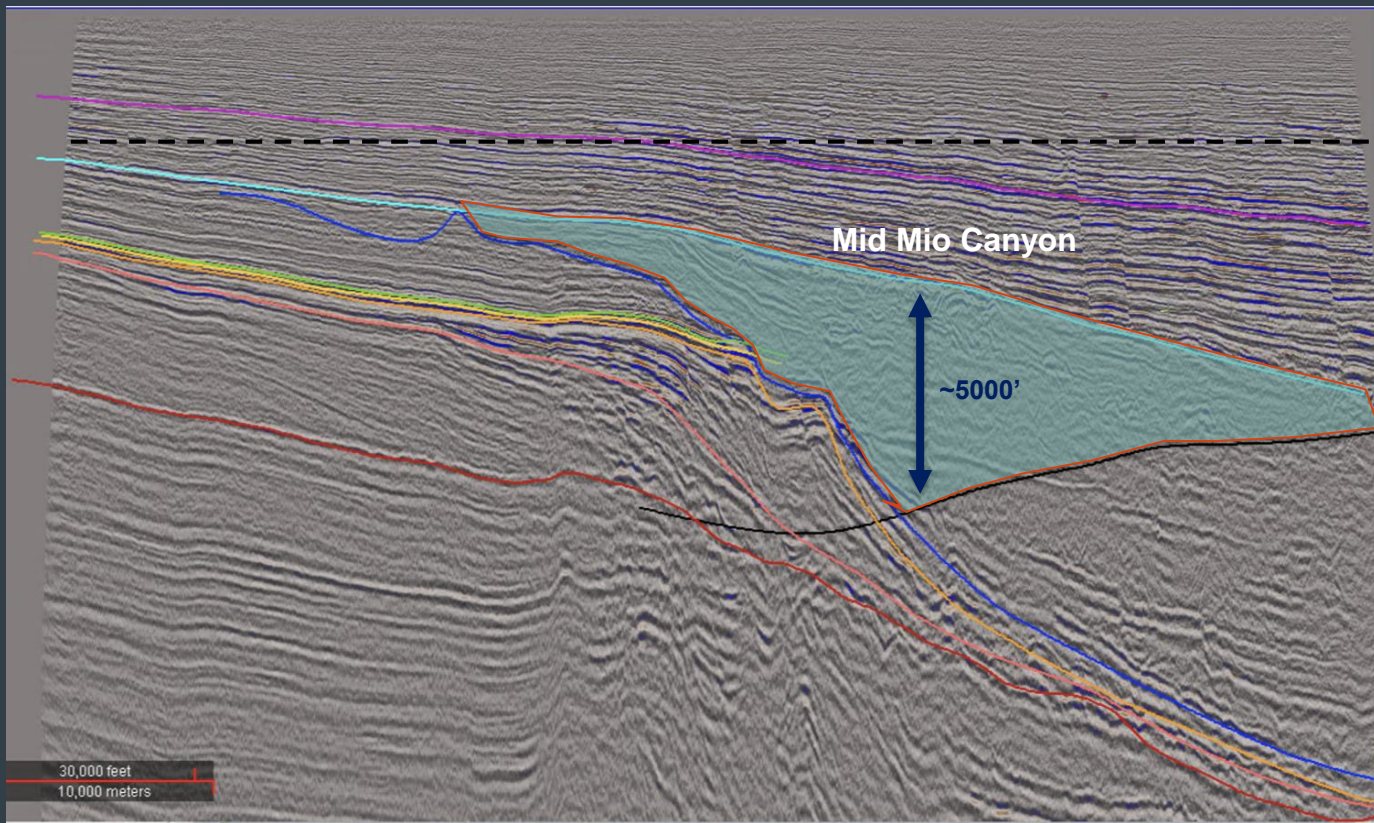


# Storage Opportunities: Middle Miocene Canyon

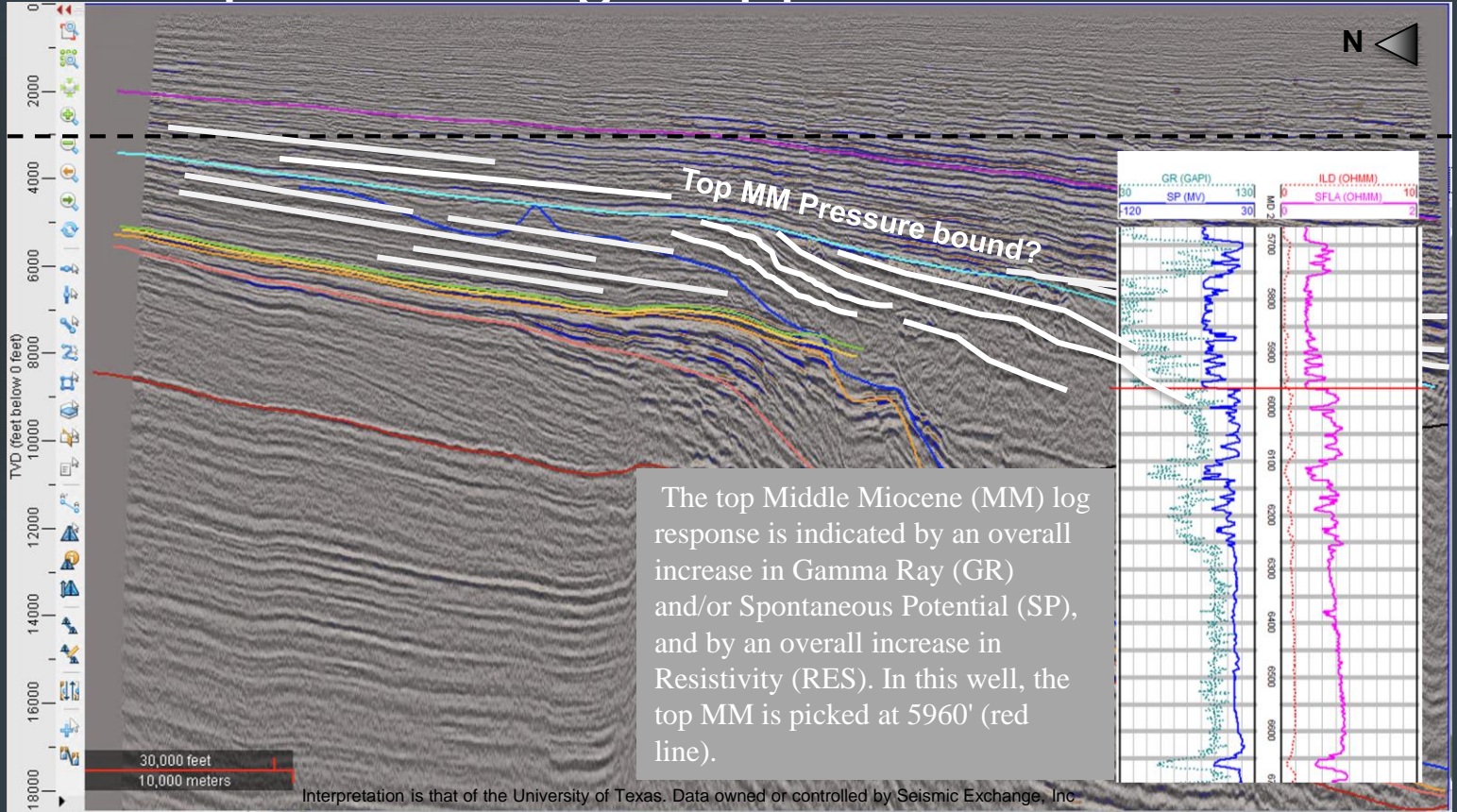
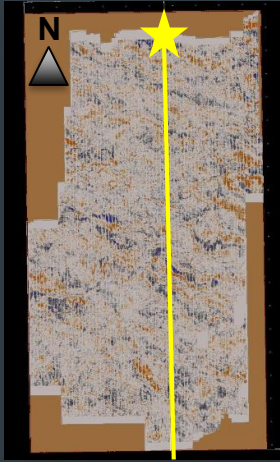




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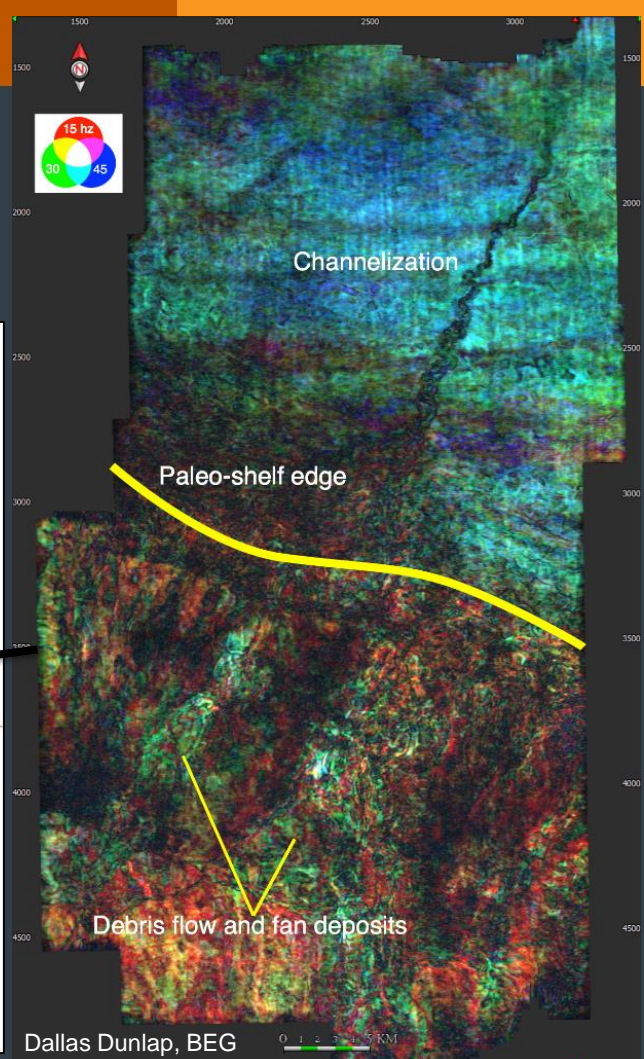
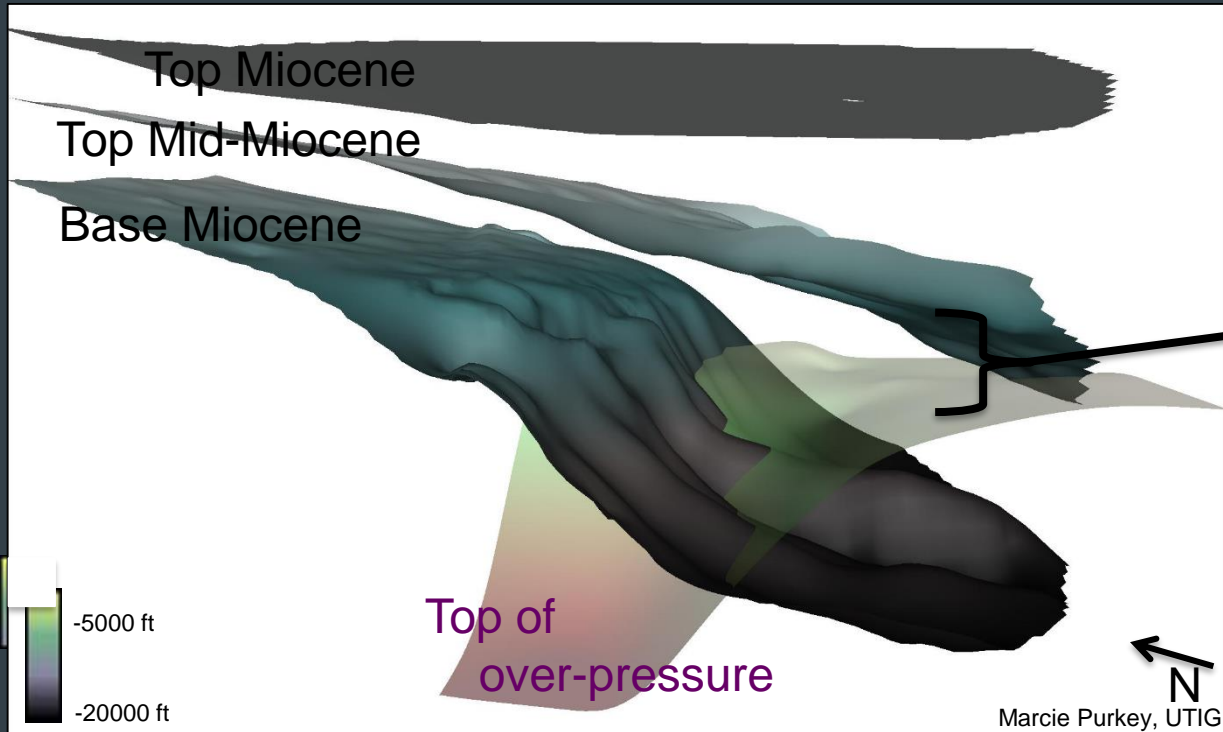
# Potential Traps & Storage Opportunities





# Storage Opportunities: Fluvial Channelization

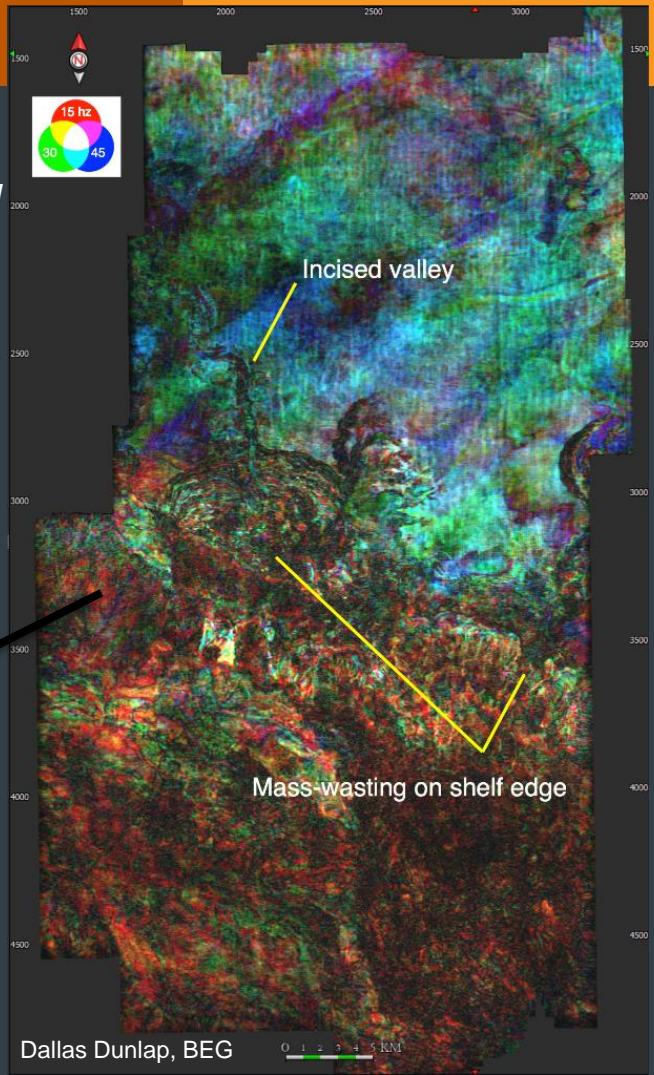
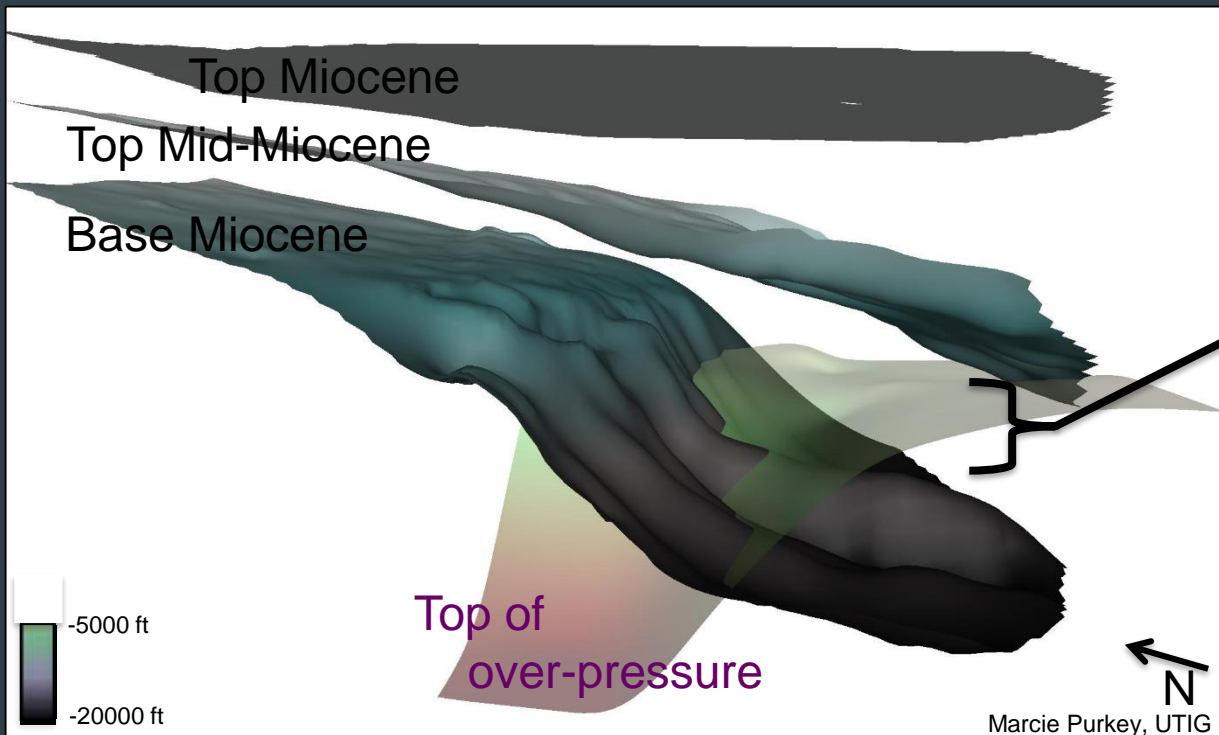
*Paleoscan spectral  
frequency stratal  
slices*





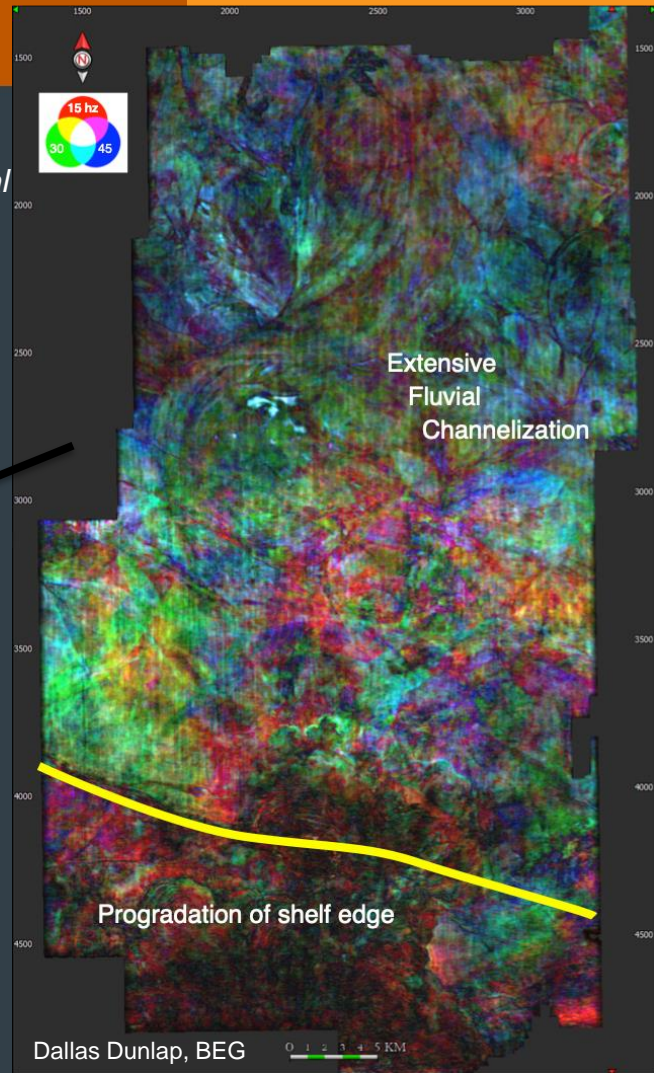
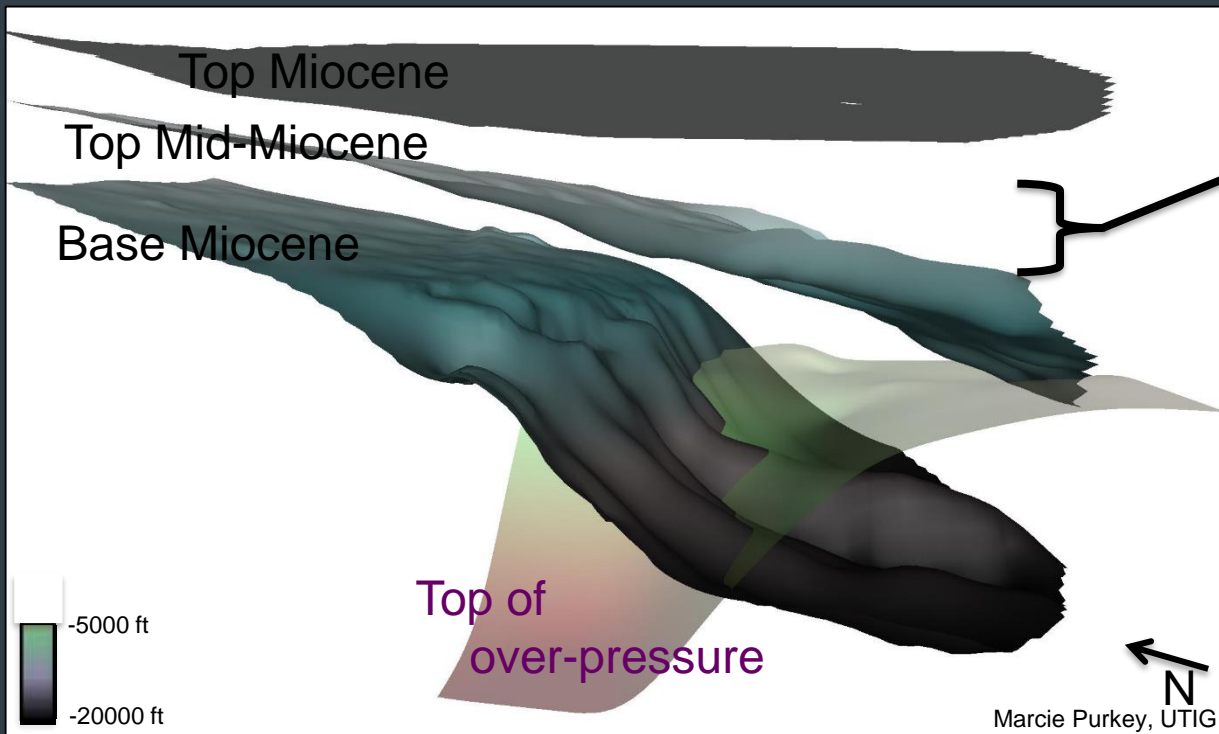
# Storage Opportunities: Canyon Fill

*Paleoscan spectral  
frequency stratal  
slices*



# Storage Opportunities: Fluvial Channelization

*Paleoscan spectral  
frequency stratal  
slices*



# Well Control through AOI's

• Upper Miocene	19 wells
• Middle Miocene Shelf	6
• Mid Miocene Canyon	99
• Lower Mio/Oligocene	11
• Top Cretaceous	10

# Student Research

## *summer 2022*

- Build Chandeleur reservoir model
  - Analyze existing data to determine main sand fairways w/in reservoir section
  - Stratal slicing to estimate %section of sand-rich vs. mud-rich in MM & UM
  - Calculate porosity & permeability
- Simulate CO<sub>2</sub> flow in Chandeleur reservoir model



# Summary & Next steps

- Biostratigraphy is the foundation of Cenozoic geological interpretation in Chandeleur Sound
- Storage potential in UM & MM
- Refine & apply new velocity model & QC interpretation
- Apply new calculations, estimations & modeling of AOI's to enhance our understanding of the Chandeleur 3D SA and its CCS potential

# Acknowledgements

- The University of Texas at Austin, Bureau of Economic Geology, acknowledges support of this research project by Landmark Graphics Corporation via the Landmark University Grant Program.
- Thanks to SEI for permission to use and share interpretations of seismic data.

Thank you.