Offshore CO_2 Storage Resource Assessment of the Northern Gulf of Mexico (Upper Texas-Western Louisiana Coastal Areas)

“TXLA”

DE-FE0026083

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U.S. Department of Energy
National Energy Technology Laboratory
Mastering the Subsurface Through Technology Innovation, Partnerships and Collaboration:
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Presentation Outline

- **Goals and Objectives**
- **Technical Status**
- **Accomplishments to Date**
- **Lessons Learned**
- **Summary**
- **Acknowledgements**

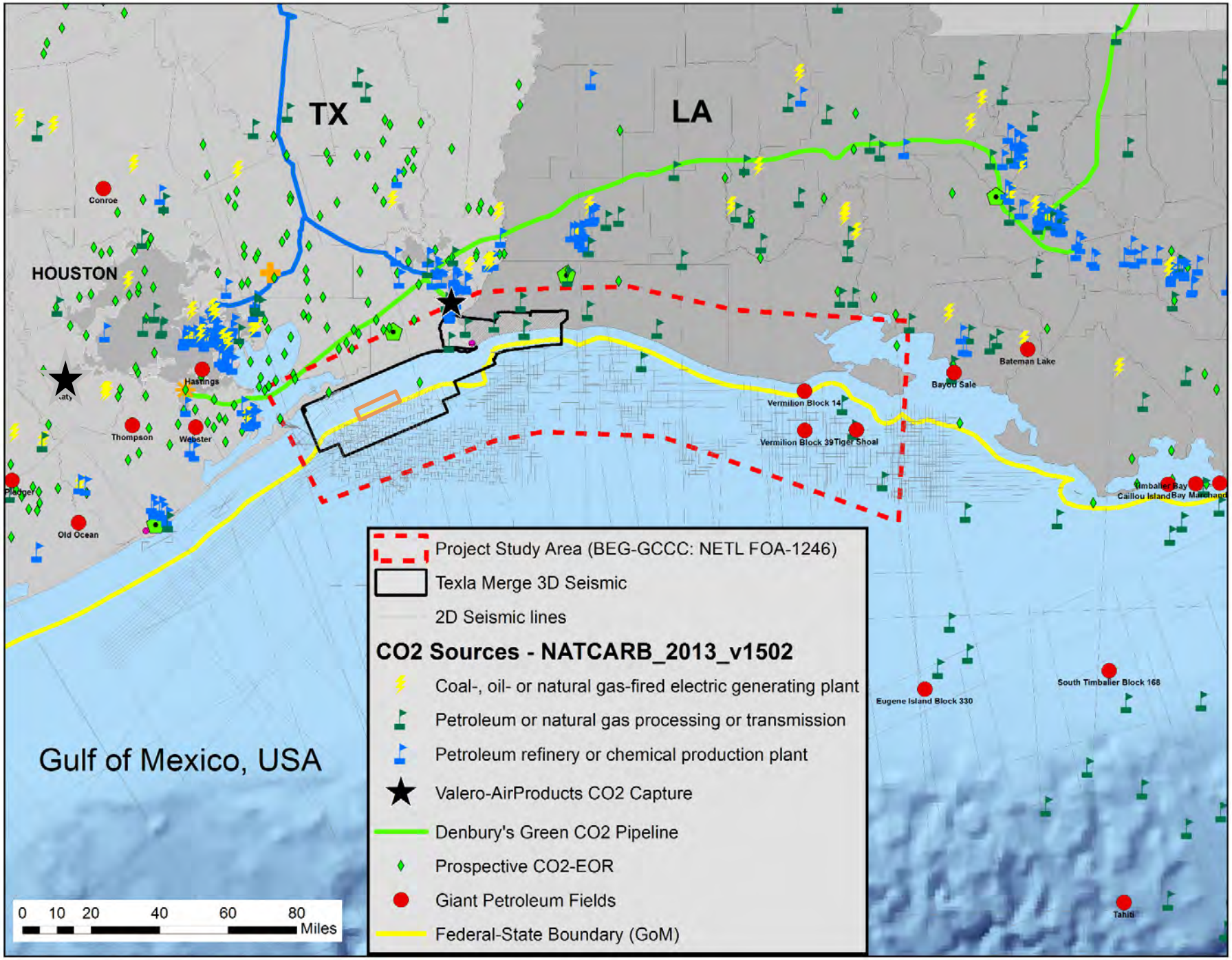
TXLA Goals & Objectives

Assess:

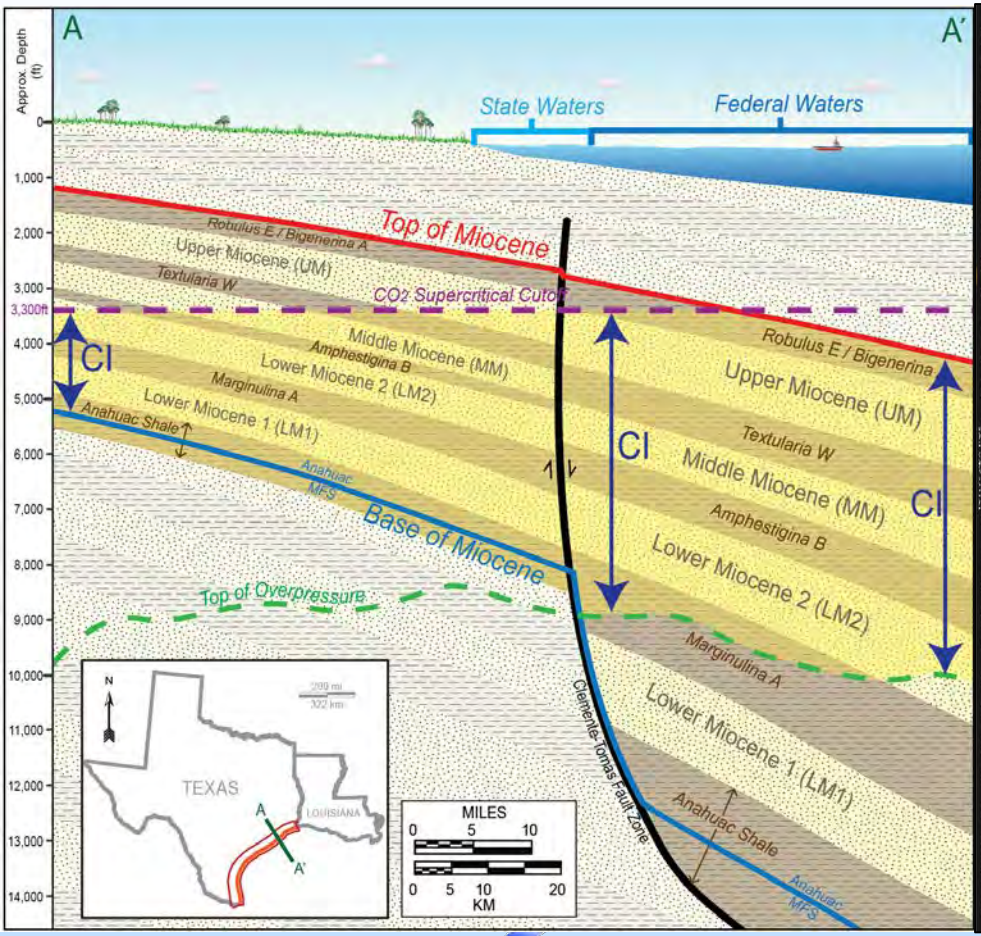
- Depleted oil & natural gas reservoirs' storage capacity
- Saline formations' ability to store nationally-significant amounts of anthropogenic CO_2
- Identify at least one 30 MT site

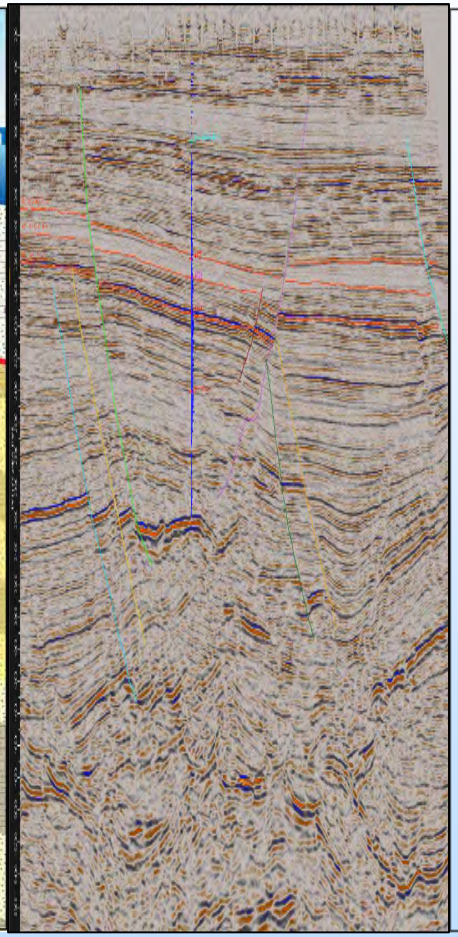
Technical Status

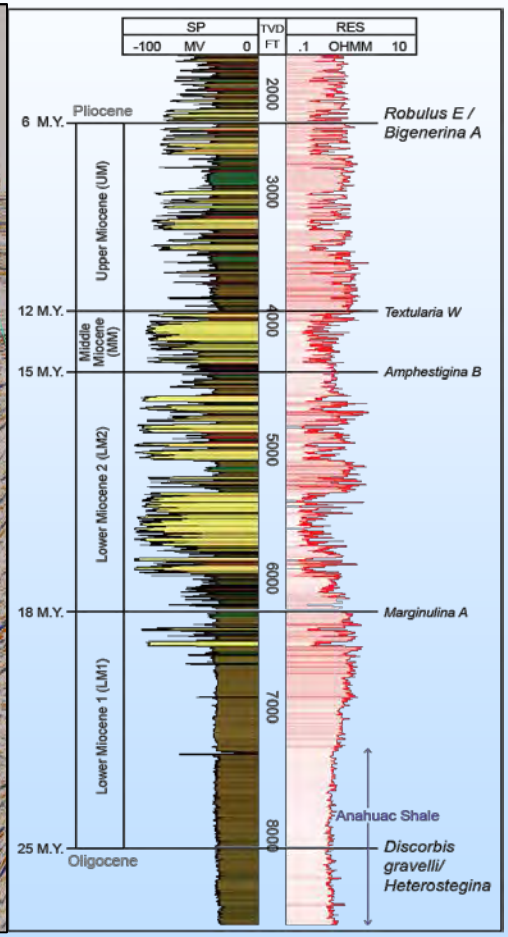
- **Project Overview**
- **Seismic Data**
  - **Extension**
  - **Interpretation**
- **Site Identification**
  - **Example – High Island 24L Field**


TX
LA
HOUSTON
Conroe
Hastings
Thompson
Webster
Pledger
Old Ocean
Bateman Lake
Bayou Sale
Vermilion Block 14
Vermilion Block 39
Tiger Shoal
Timbalier Bay
Caillou Island
Bay Marchand
Eugene Island Block 330
South Timbalier Block 168
Tahiti
Gulf of Mexico, USA
Project Study Area (BEG-GCCC: NETL FOA-1246)
Texla Merge 3D Seismic
2D Seismic lines
CO2 Sources - NATCARB_2013_v1502
Coal-, oil- or natural gas-fired electric generating plant
Petroleum or natural gas processing or transmission
Petroleum refinery or chemical production plant
Valero-AirProducts CO2 Capture
Denbury's Green CO2 Pipeline
Prospective CO2-EOR
Giant Petroleum Fields
Federal-State Boundary (GoM)
0 10 20 40 60 80
Miles

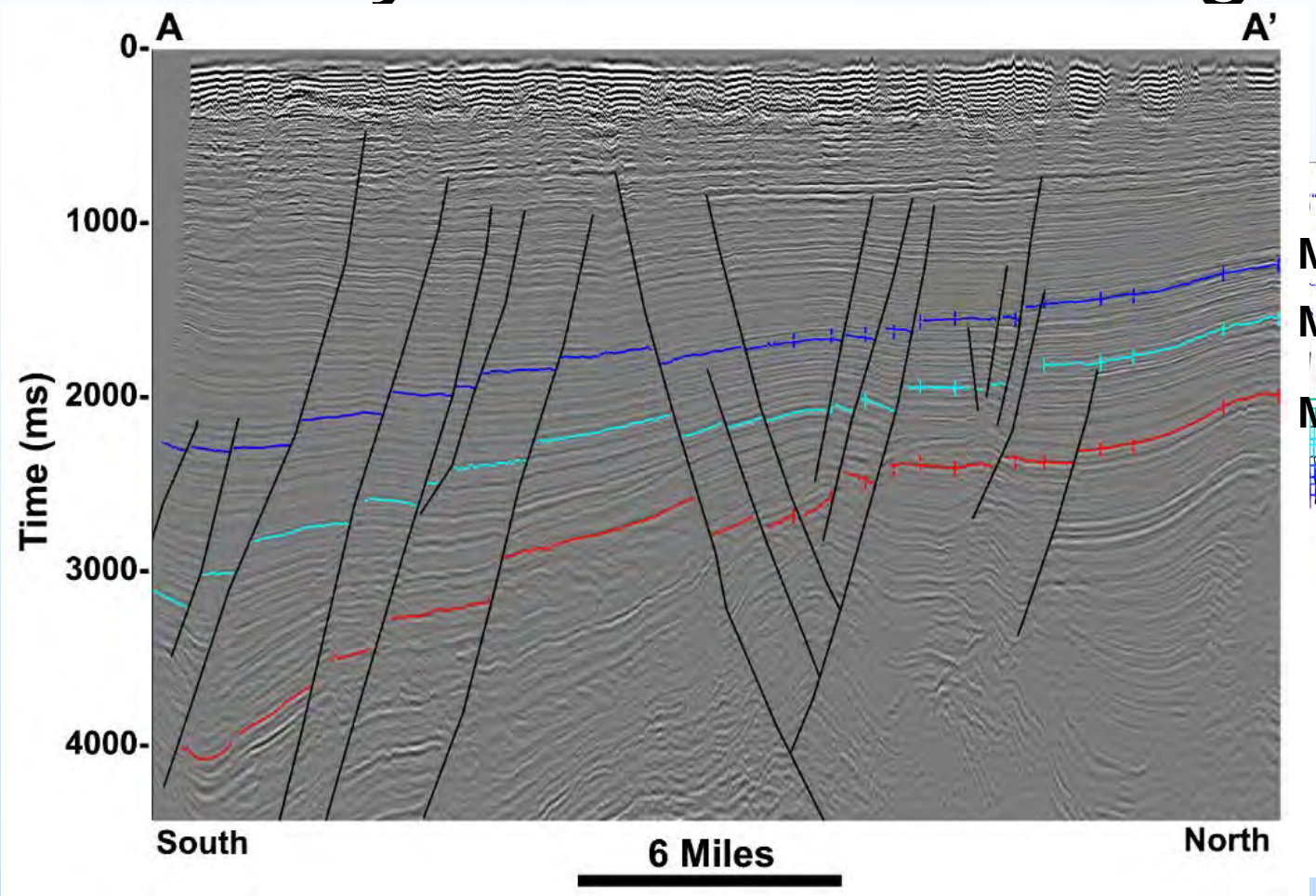
Conceptual Overview

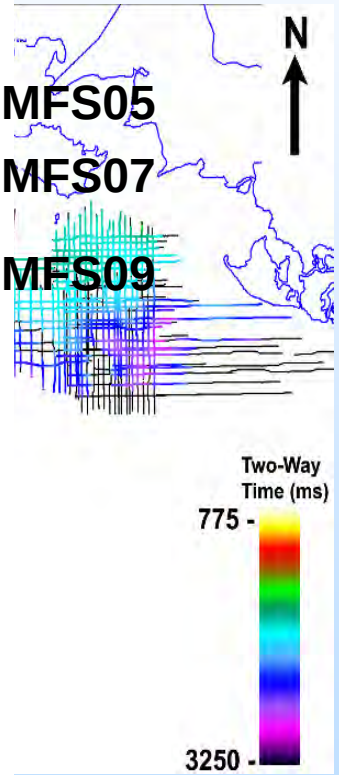


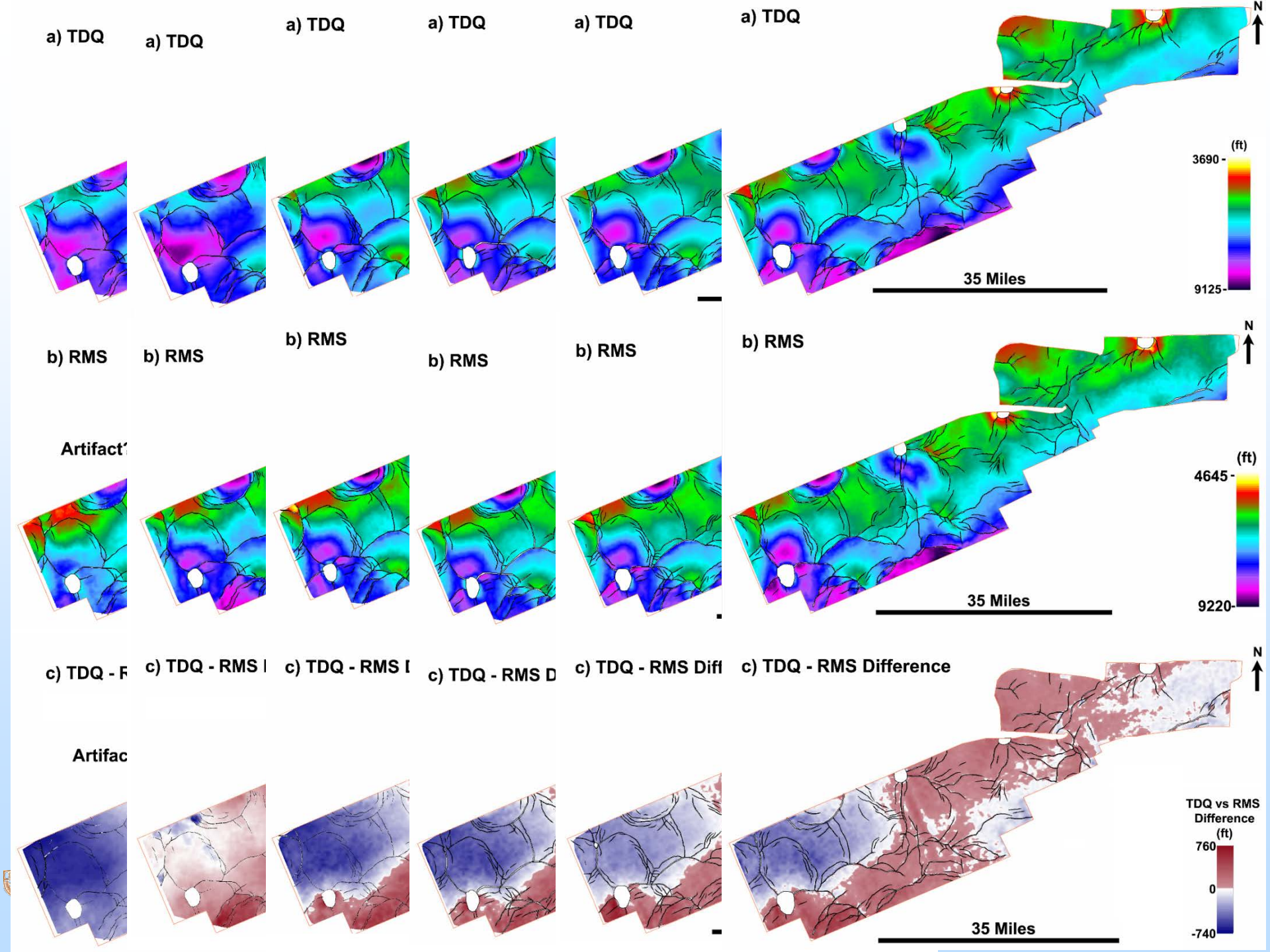




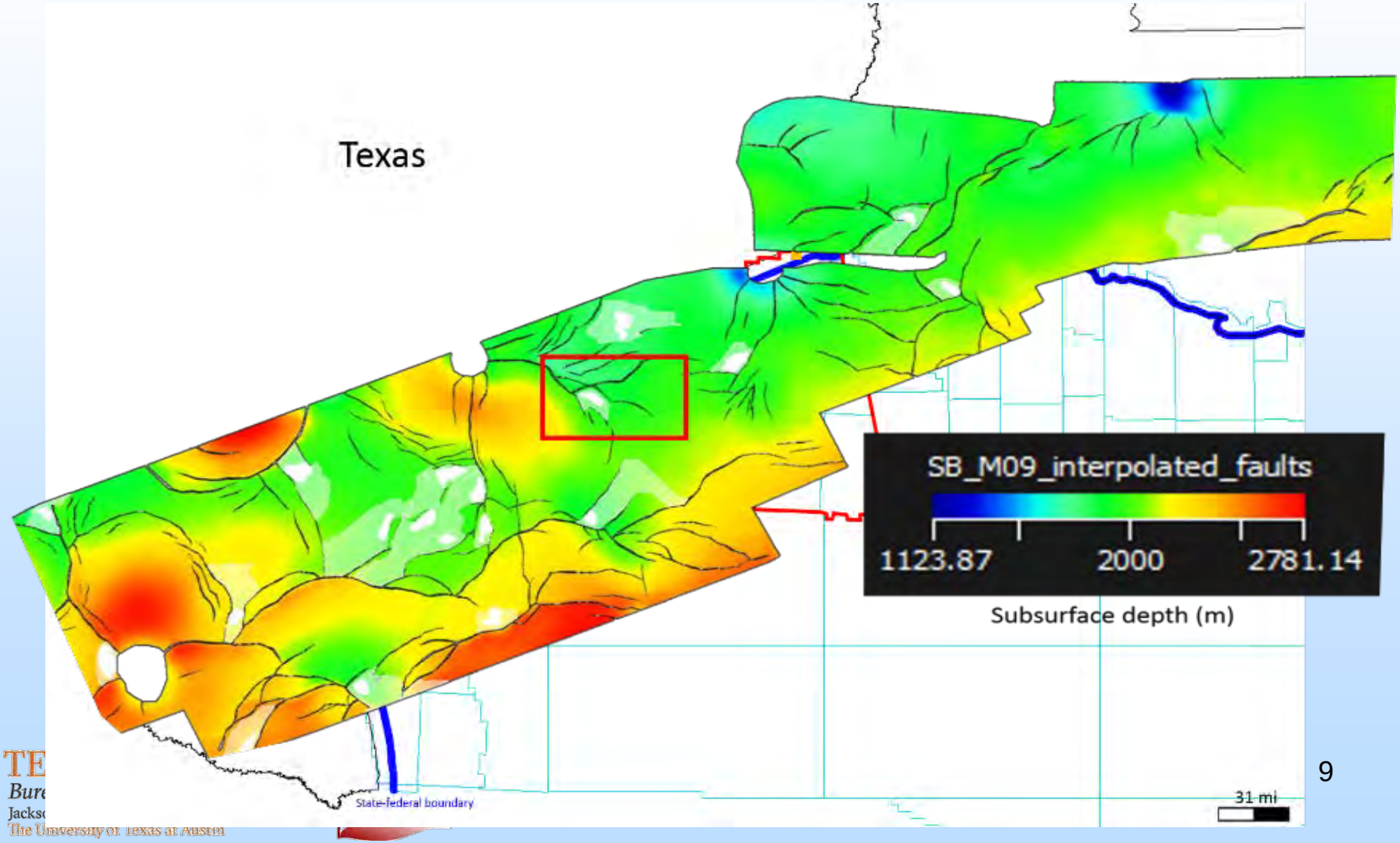
Extending Seismic Horizons Beyond “TexLa Merge” 3D






a) TDQ
a) TDQ
a) TDQ
a) TDQ
a) TDQ
a) TDQ
N
(ft)
3690
9125
35 Miles
b) RMS
b) RMS
b) RMS
b) RMS
b) RMS
b) RMS
Artifact
N
(ft)
4645
9220
35 Miles
c) TDQ - R
c) TDQ - RMS
c) TDQ - RMS
c) TDQ - RMS D
c) TDQ - RMS Diff
c) TDQ - RMS Difference
Artifac
N
TDQ vs RMS Difference (ft)
760
0
-740
35 Miles

Prospecting – 30 MT Site
High Island 24L field

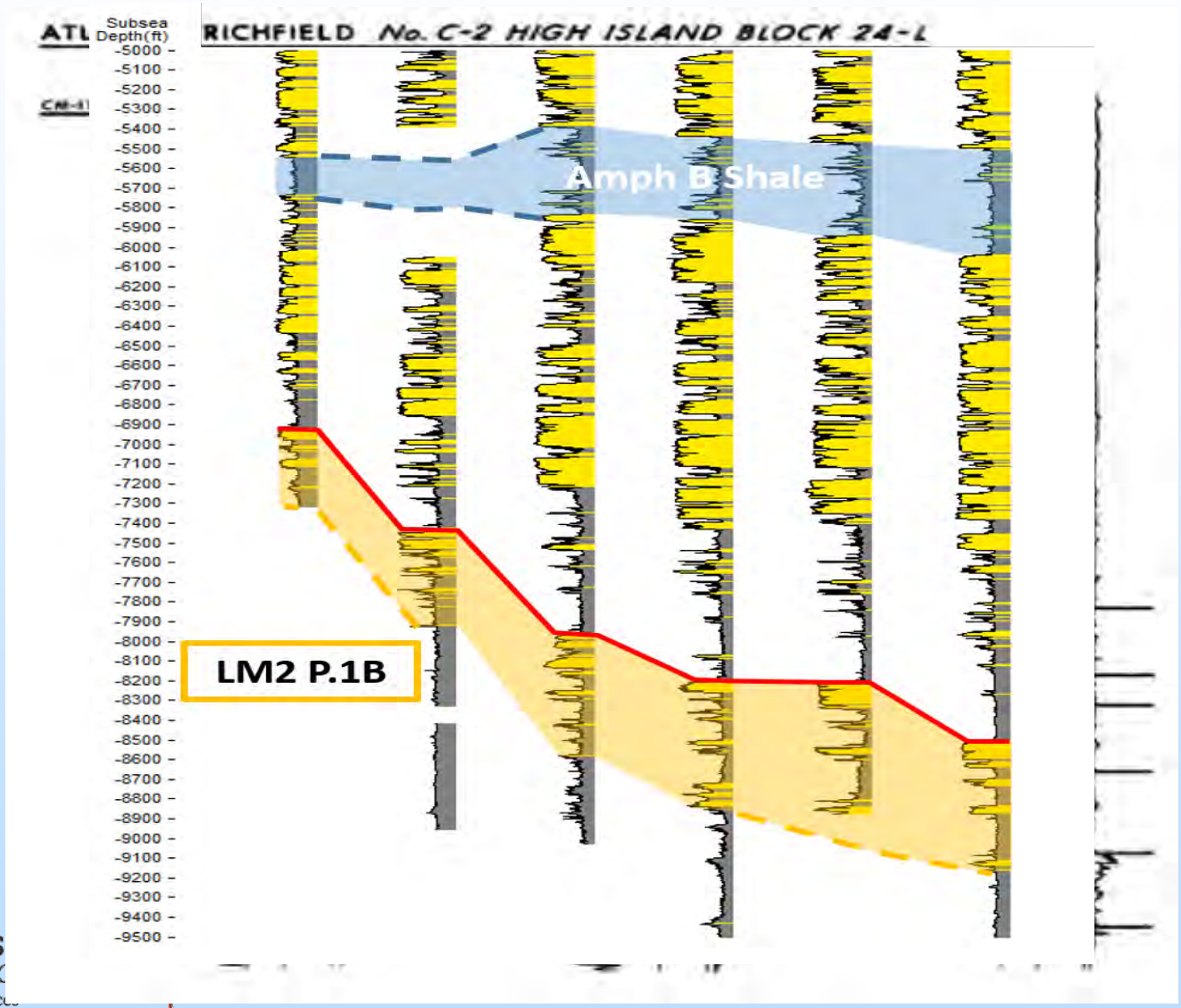


High Island 24L field

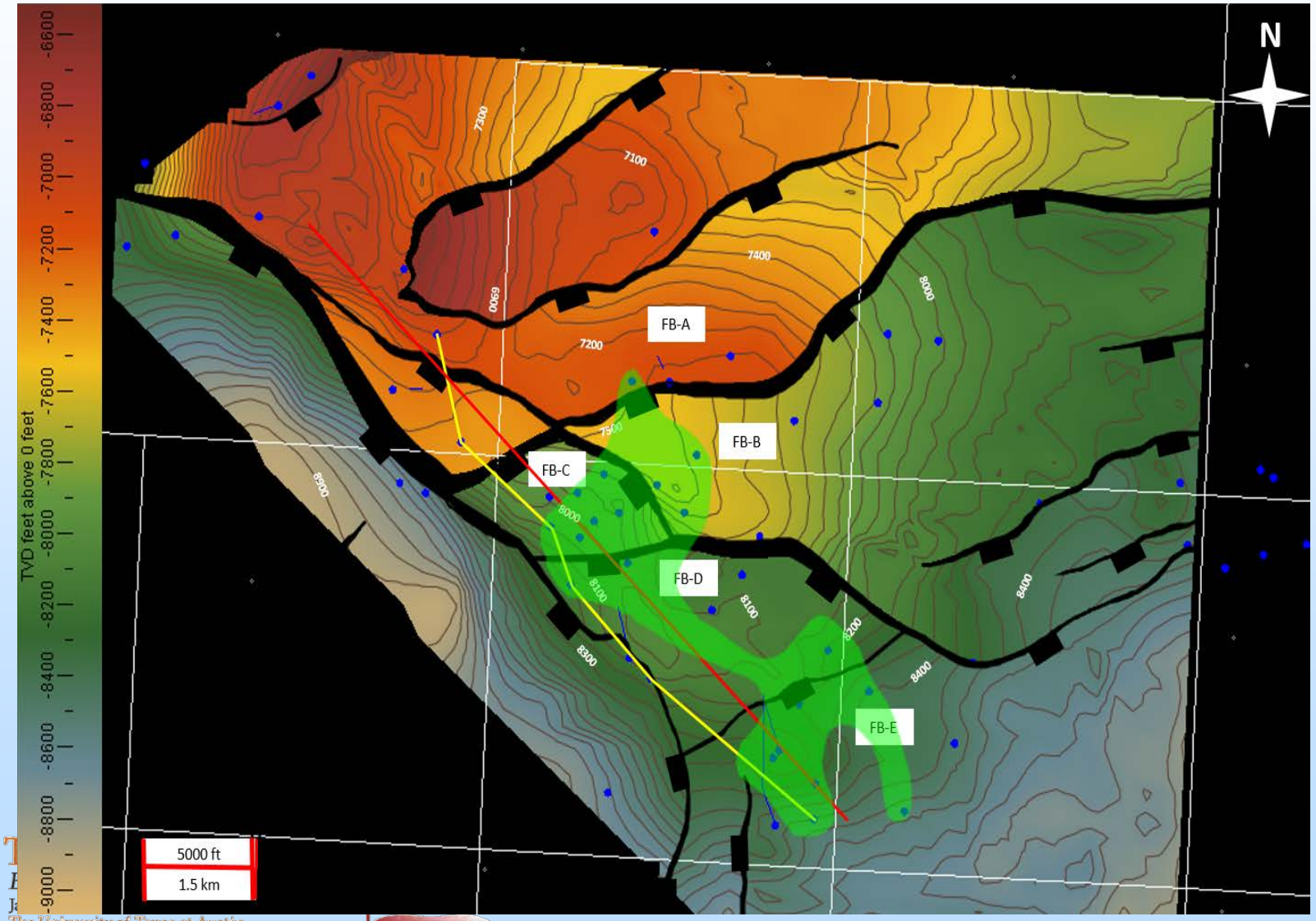
Play	Age	Resvervoir Depth (ft)	Area (acres)	Porosity	Cum Oil (Mbbl)	Cum Gas (MMcf)
MM4 R.1.	Lower Middle Miocene	5743	125	33.40%	397	85
LM4 P.4.	Upper Lower Miocene	7962	2299	30.70%	1490	13958
LM 2 P.1B	Middle Lower Miocene	9045	7020	31.7	2497	301196

(Seni, et al., 1997)

High Island 24L field



High Island 24L field



Green overlay from Fowler (1985)

Accomplishments to Date

- Correlated >2000 wells
- Interpreted 8 major seismic horizons
  - Sequence boundaries and maximum flooding surfaces
  - Converted seismic dataset and horizons to depth
- Analyzed Confining zone (micro & macro)
- Analyzed 500 wells' production data (22 fields)
  - Calculated equivalent mass of injected CO_2
- Local and regional outreach

Lessons Learned

- **Plenty of well data!**
  - **well logs, production data,**
- **Limited rock material (cores) for interval of interest**
  - **Two whole cores identified / analyzed**
- **More seismic data than originally anticipated**
  - **…and probably more released soon**
- **Unanticipated research difficulties**
  - **Key research staff member barred from project**
    - **Have been unable to find / hire replacement for final subtask**


• Will CO_2 storage
SOUTHERN STATES
ENERGY BOARD
Transcending Boundaries
ALABAMA
ARKANSAS
FLORIDA
GEORGIA
KENTUCKY
LOUISIANA
MARYLAND
MISSISSIPPI
MISSOURI
SOUTHERN STATES
ENERGY BOARD
Transcending Boundaries
Mary Sullivan
Dallas Dunlap

Project Summary

- Key Findings
  - Large amount of potential reservoir rock
    - Oil & Gas Fields
    - Saline
  - Confining zone adequate
    - Micro-scale: positive results
    - Macro-scale: seismic diffraction energy with HR3D
      - potential new tool
- Next Steps
  - Static storage capacity assessment
    - 3-4 Prospects (candidate sites)
  - Dynamic capacity assessment (EASiTool)

Acknowledgements

- Jerry Carr (NETL PM)
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- Alexander Klokov (geophysicist)
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Thank You

Appendix

Benefit to the Program

- **Goal (3) of the Carbon Storage Program**: "*Support industry's ability to predict CO_2 storage capacity in geologic formations to within ±30 percent*" by **assessing potential regional storage formations** in State and Federally regulated offshore areas of the United States.
- **Goal (4) of the Carbon Storage Program**: "*Develop Best Practice Manuals for monitoring, verification, accounting (MVA), and assessment; site screening, selection, and initial characterization; public outreach; well management activities; and risk analysis and simulation*" by **producing information that will be useful for inclusion** in DOE Best Practices Manuals.

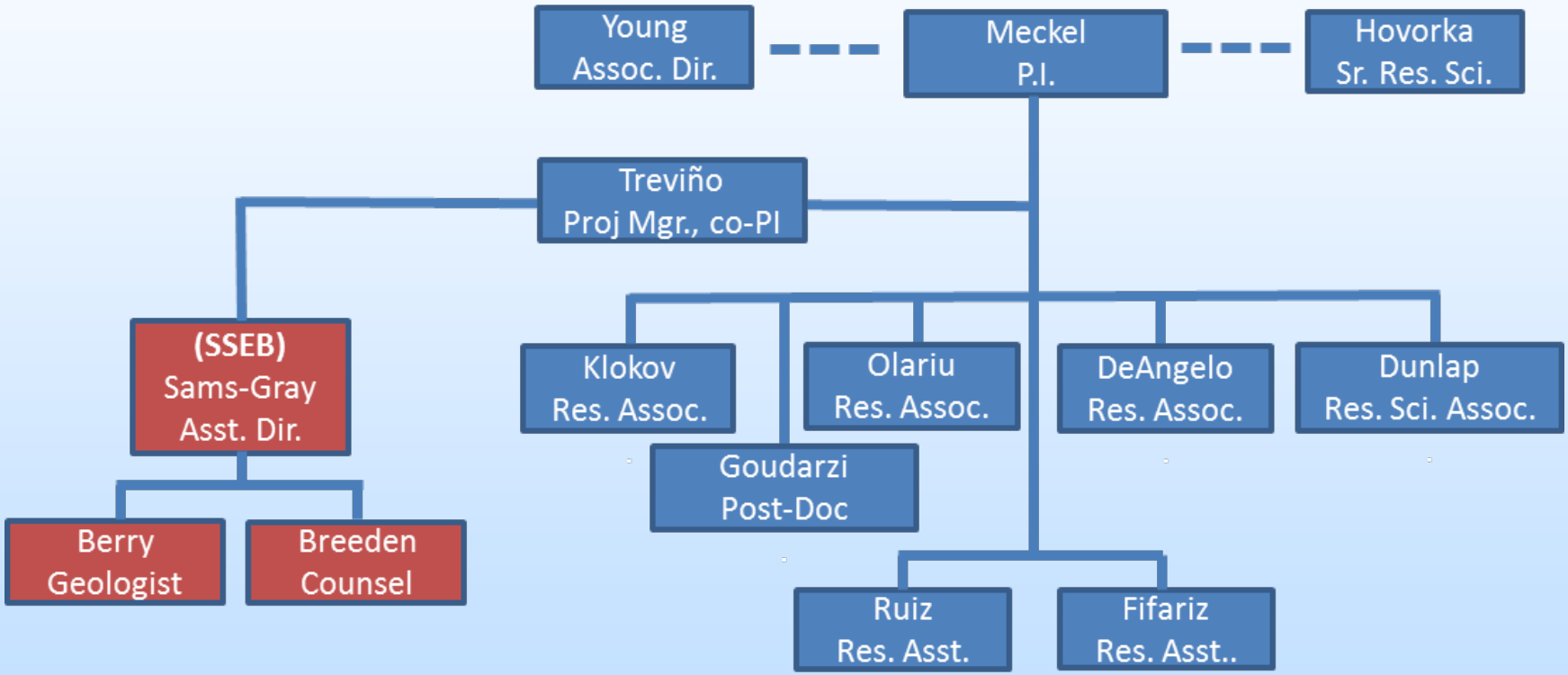
- BENEFITS STATEMENT: The methodology being developed is the assessment of offshore CO_2 storage resources in depleted hydrocarbon field settings or saline aquifers for offshore CO_2 storage applications. This approach will improve the current understanding of CO_2 storage potential for a large area of the Gulf of Mexico adjacent to significant industrial emissions sources. This projects supports Goals 3 & 4 of the Carbon Storage Program Plan by assessing potential regional storage formations in state and/or federally regulated portions of the Gulf of Mexico. The study will also produce information that will be useful for inclusion in DOE Best Practices Manuals, thus supporting Goal 4.

Project Overview

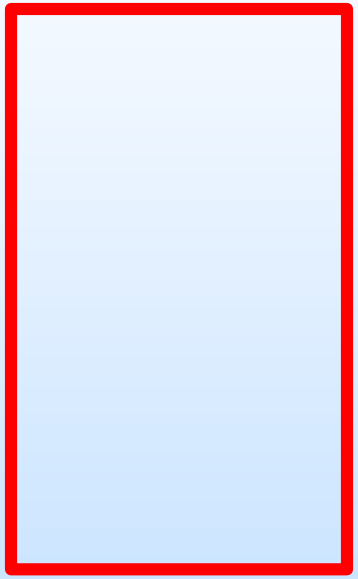
Goals and Objectives

- The objective of this study is to conduct an offshore carbon storage resource assessment of the Gulf of Mexico, Texas – Louisiana study area. This will be completed by:
  - Assessing the CO_2 storage **capacity of depleted oil and natural gas reservoirs utilizing existing data** (well logs, records and sample descriptions from existing or plugged/abandoned wells, available seismic surveys, existing core samples, and other available geologic and laboratory data) from **historical hydrocarbon industry activities in the heavily explored portions of the inner continental shelf** portions of the Texas and Louisiana Gulf of Mexico coastal areas; and
  - Assessing the ability and capacity of **saline formations** in the region to safely and permanently store nationally-significant amounts of anthropogenic CO_2 using existing data. Additionally, **the study will identify at least one specific site with potential to store at least 30 million tons of CO_2 which could be considered further for a commercial or integrated demonstration project in the future**.
  - The project will also **engage the public and other stakeholders** for the region through outreach activities to apprise them of the study objectives and results.

Organization Chart



Gantt Chart



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