Fault Compartmentalization and its impact on storage project scale, offshore Corpus Christi

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Motivation

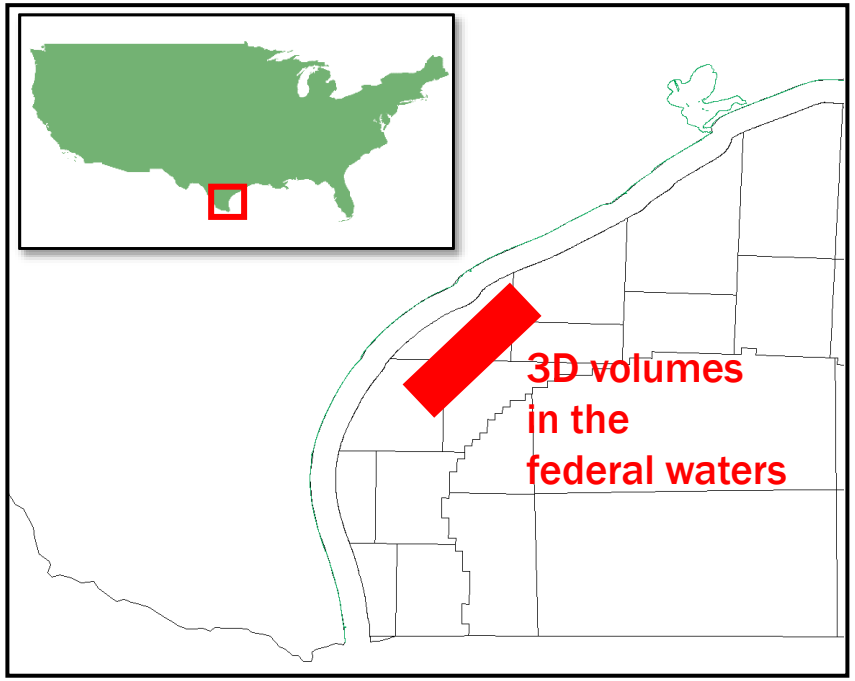
- Pressure buildup is the key limitation of storage capacity:

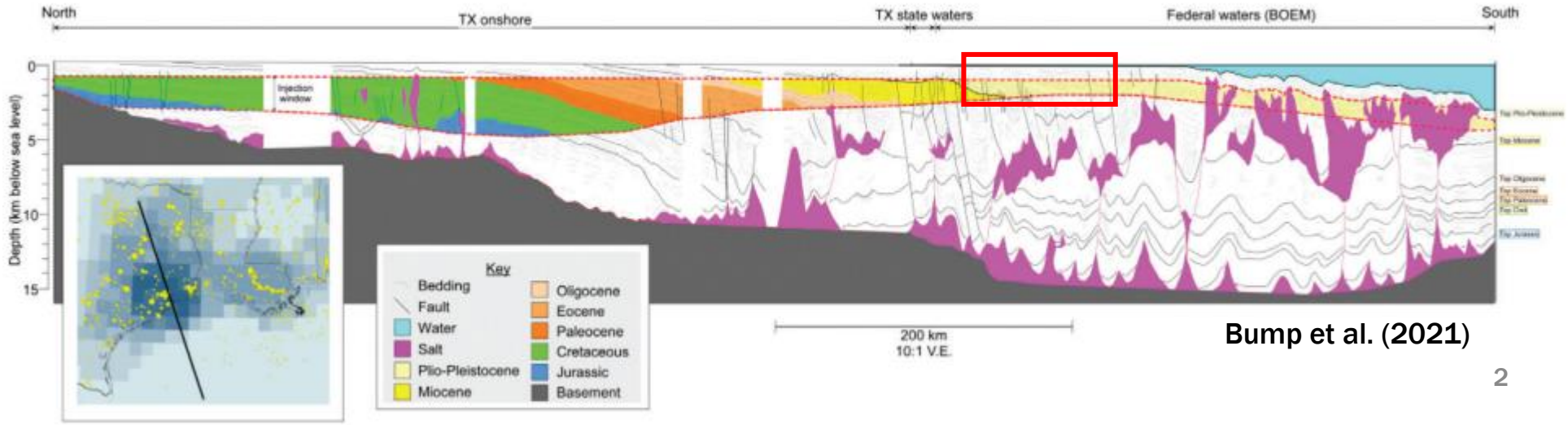
  Reservoir compartmentalization is a real constraint

- Gulf of Mexico is ideal for CO_2 sequestration but heavily faulted

- What are the distributions of the fault compartment sizes & their storage capacities?

  Realistic view of resource





Bump et al. (2021)

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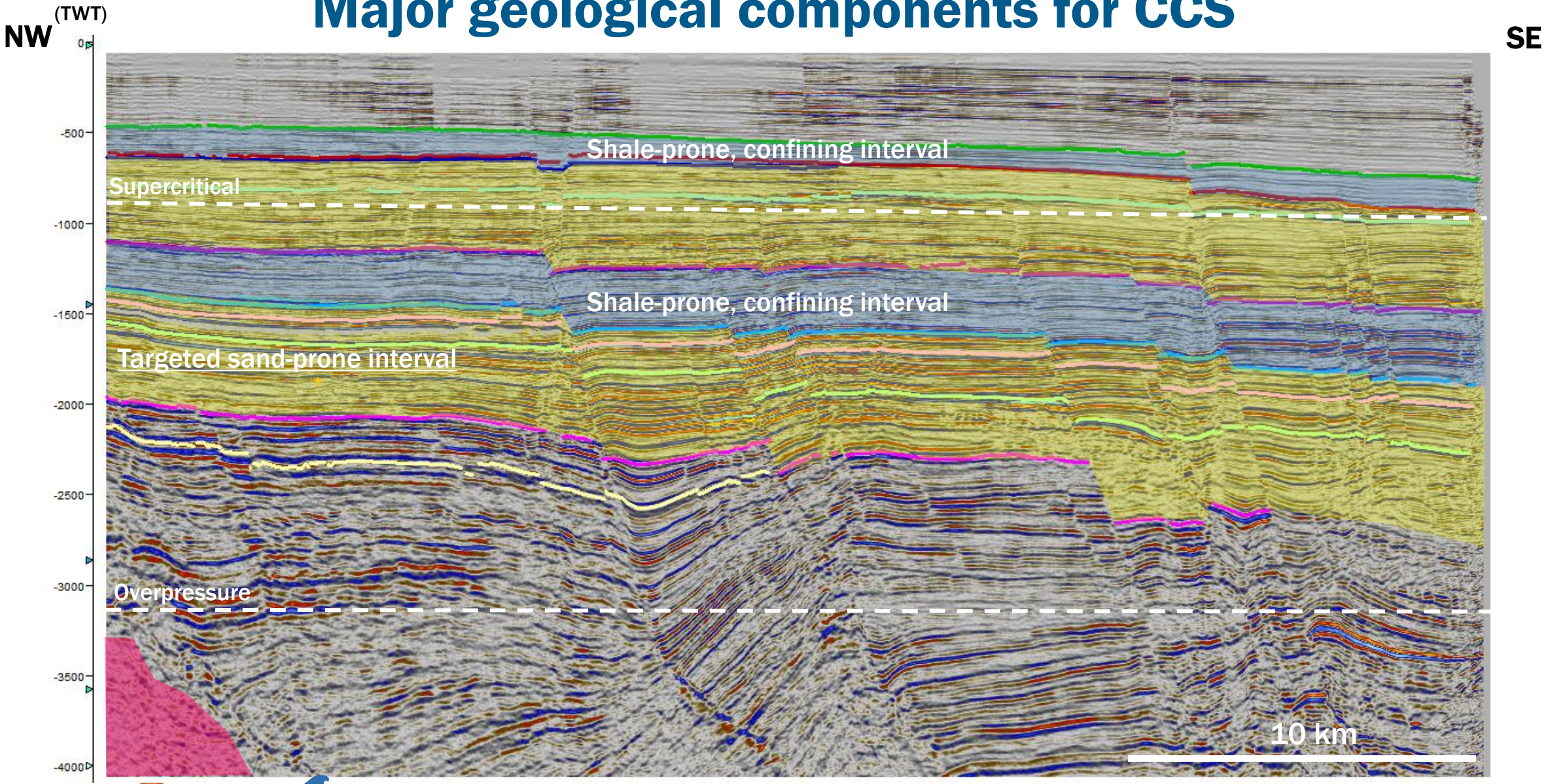
Major geological components for CCS



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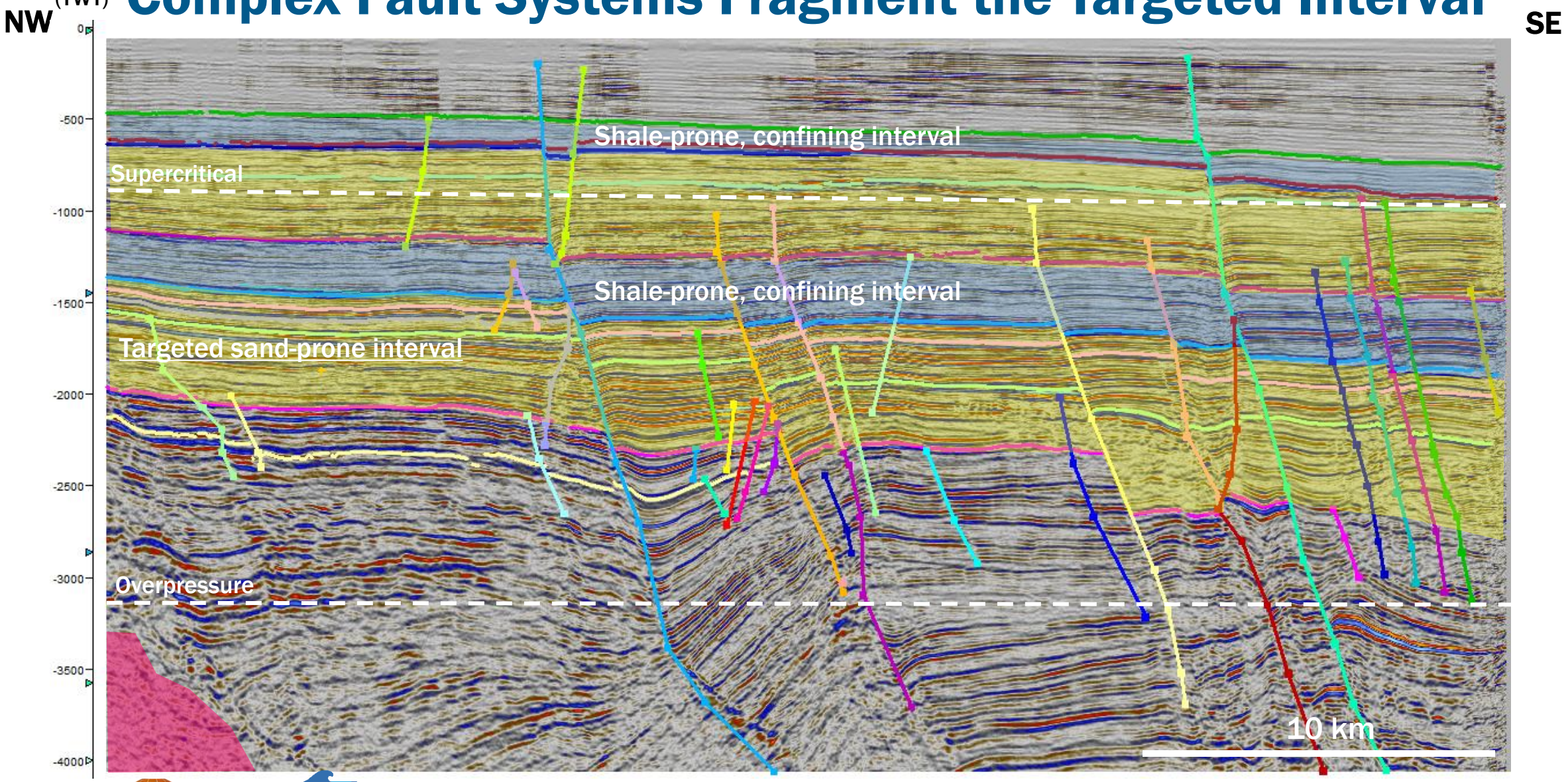
Delta system

Shale

Diapir

Complex Fault Systems Fragment the Targeted Interval

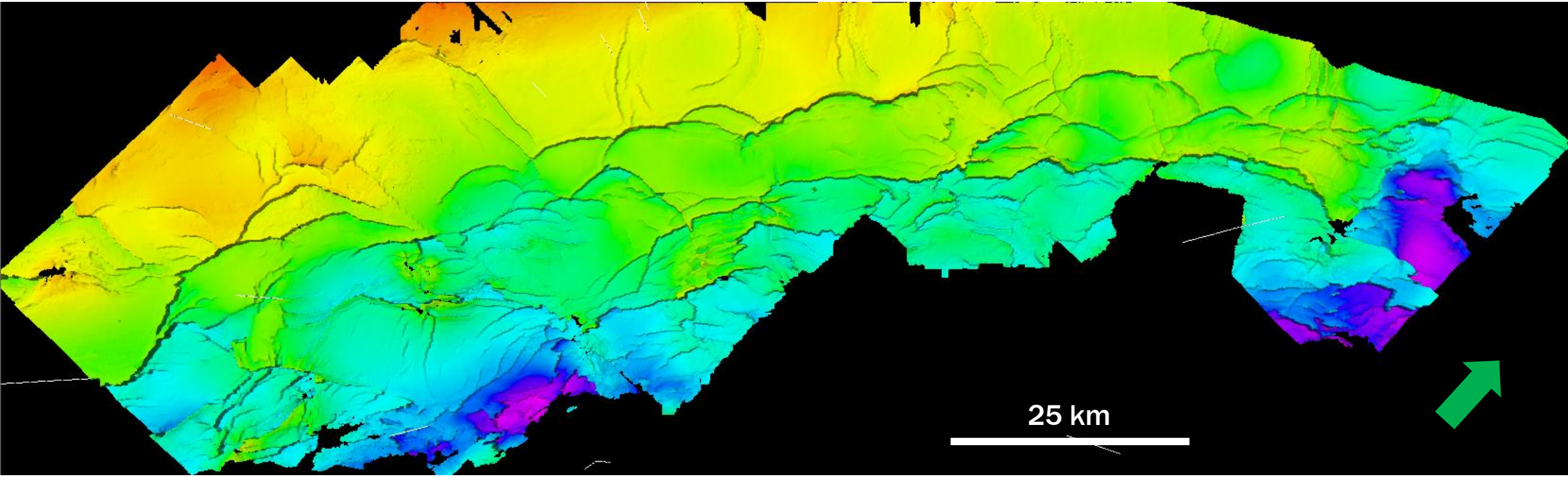


Delta system

Shale

Diapir

Fault Compartments in the offshore Corpus Christi



- Major fault trends dividing the area are oriented along the shelf strike
- Fault compartments “step down” and become more fragmented seawards
- A couple of sizable compartments despite the heavy faulting

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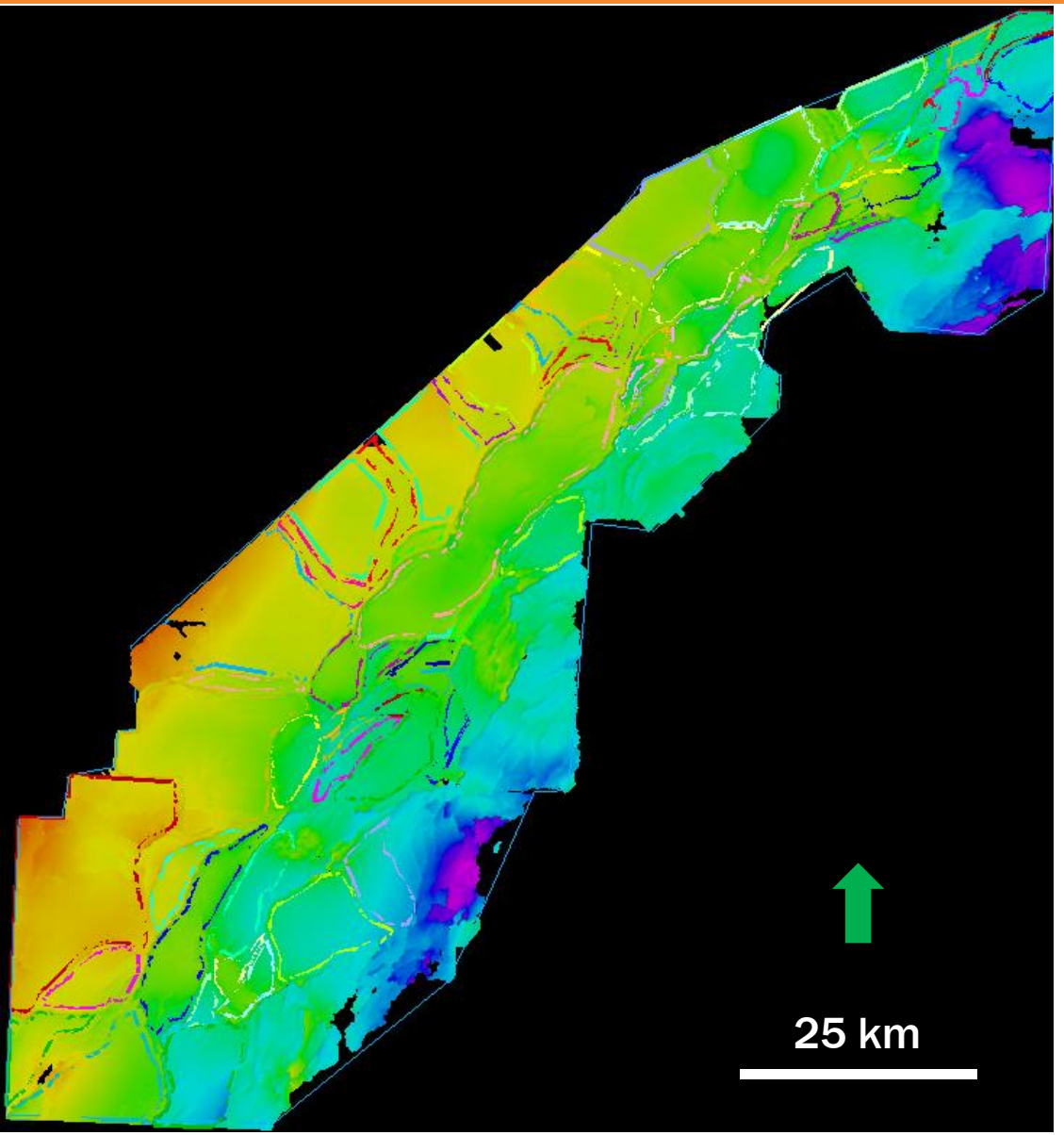
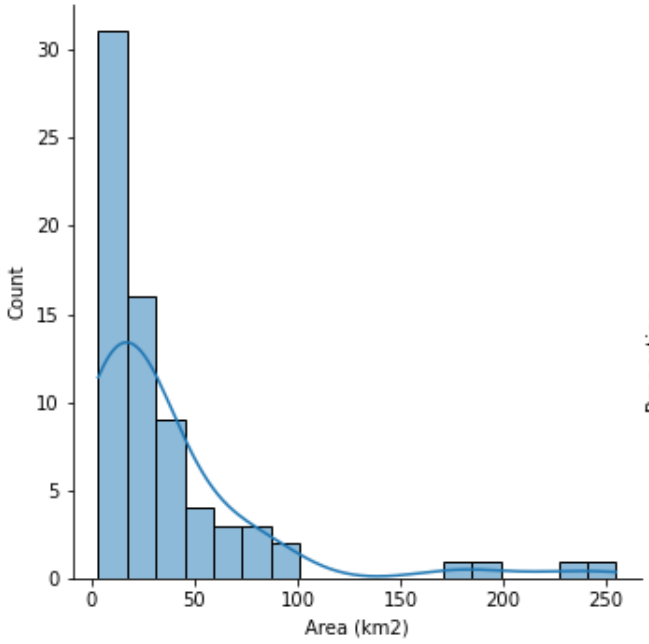
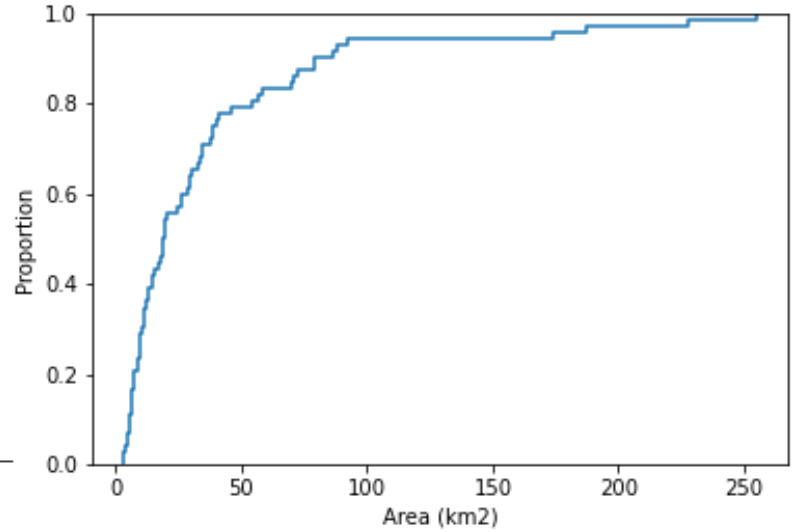


Size of the Fault Compartments





- Mapped compartments cover ~ 60% of the area

P 50: ~ 25 km²

P 90: > 100 km²
(4 big compartments)

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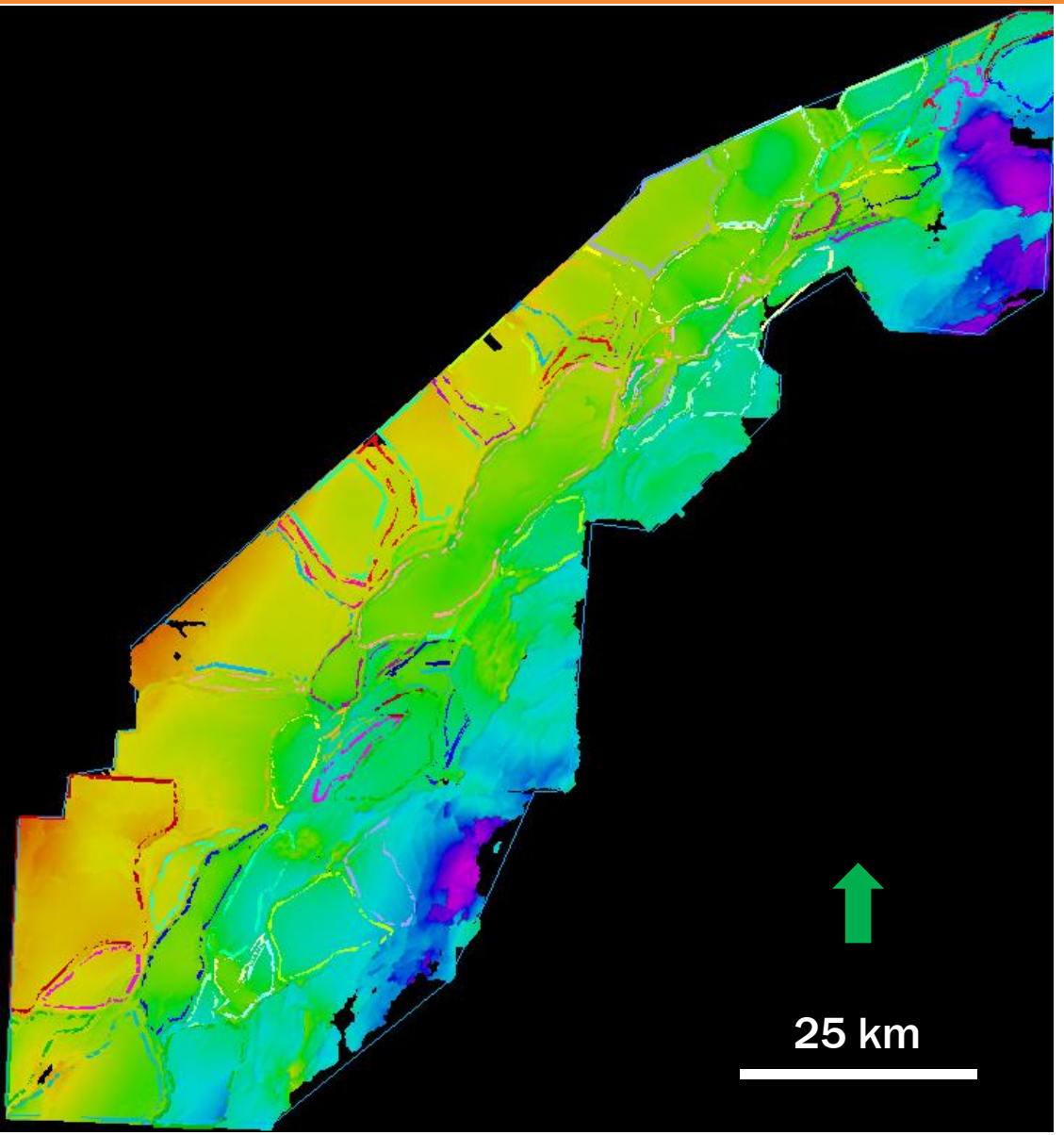
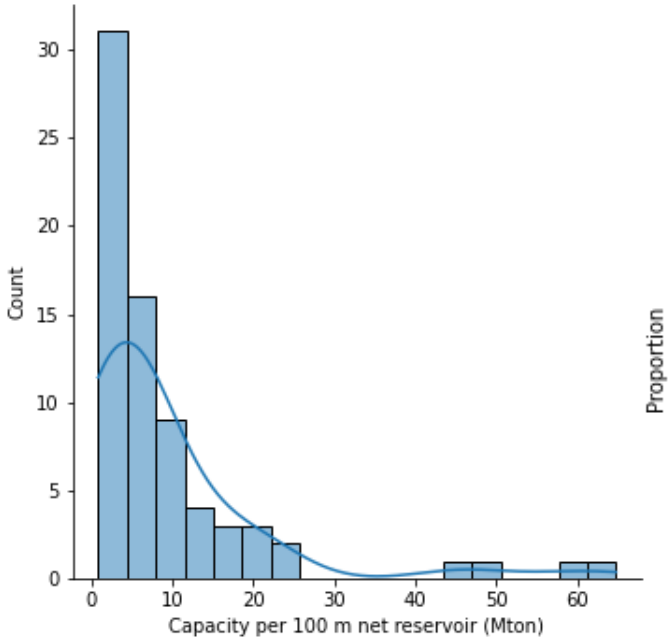
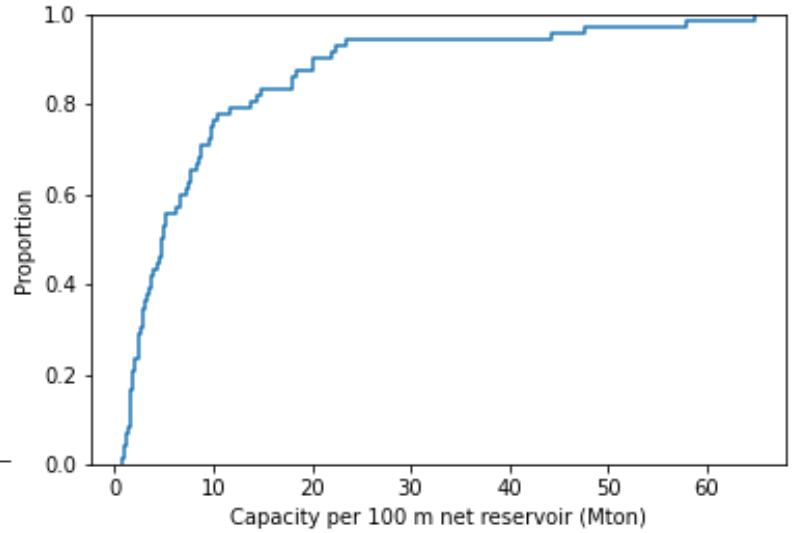


Storage Capacity per 100 m Net Reservoir





Given: 25% porosity, 200 mD permeability, at ~2 km depth

P 50: ~ 8 Mton

P 90: > 20 Mton
(4 big compartments)

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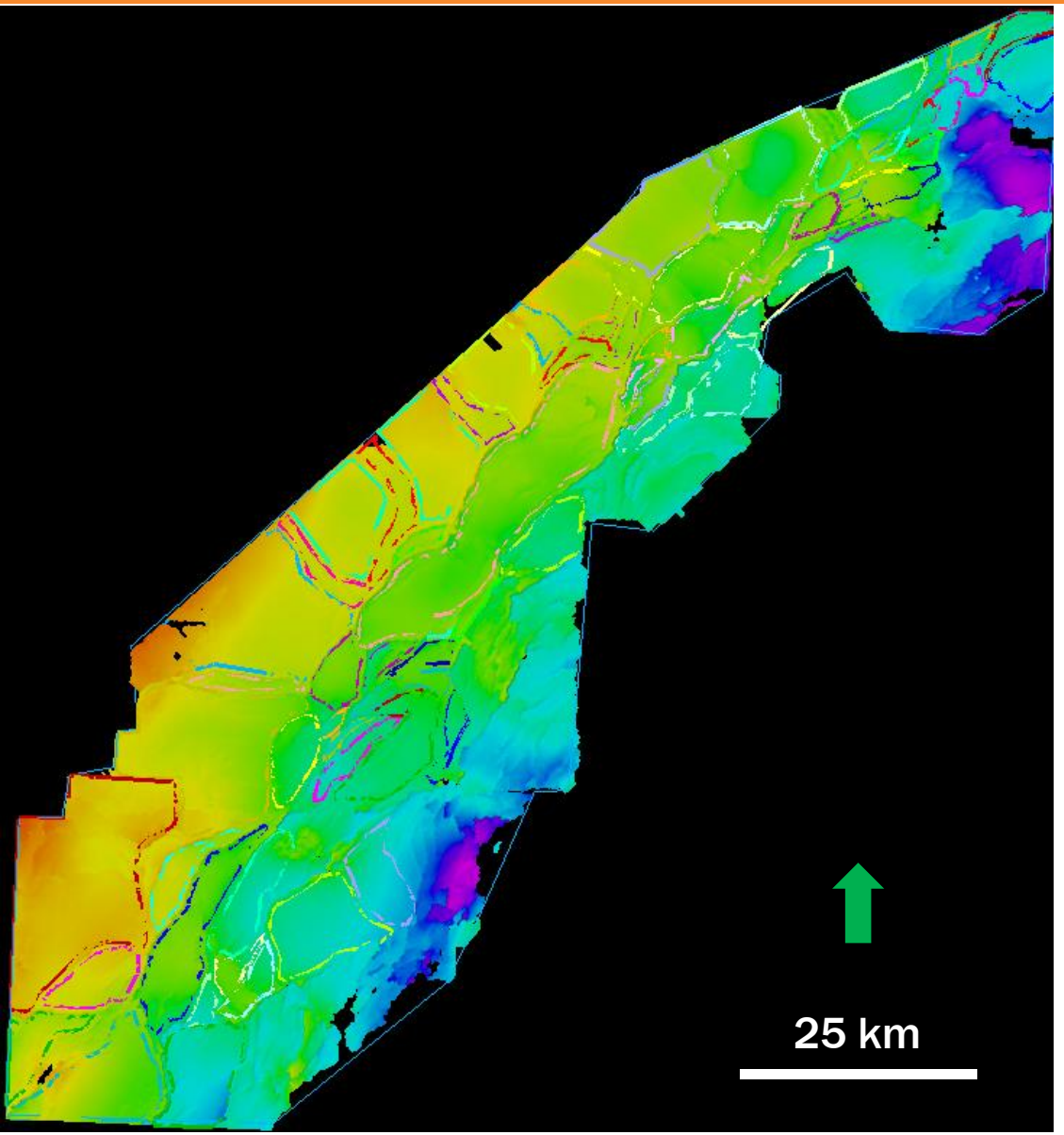
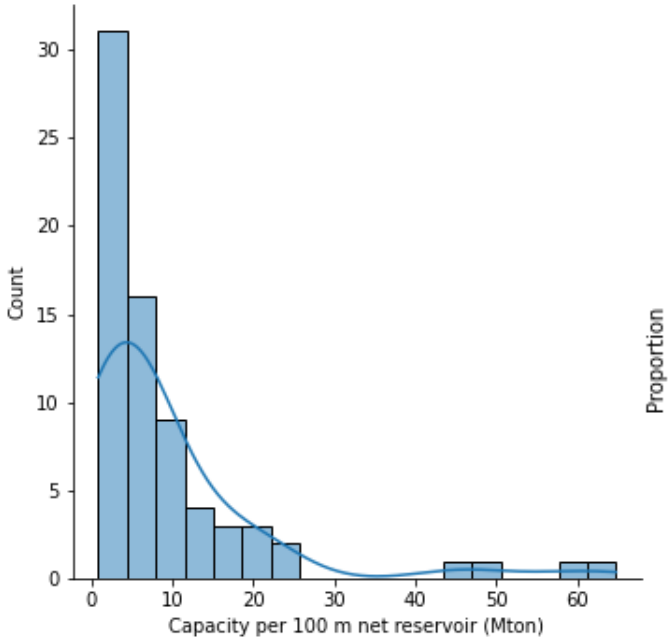
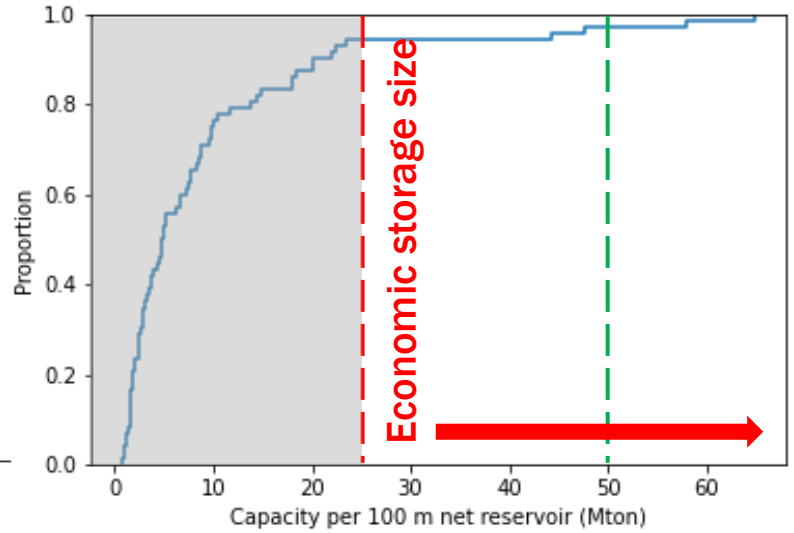


Economic Storages per 100 m Net Reservoir





Given: 25% porosity, 200 mD permeability, at ~2 km depth

- Only 4 big compartments qualify as industrial-scale storage

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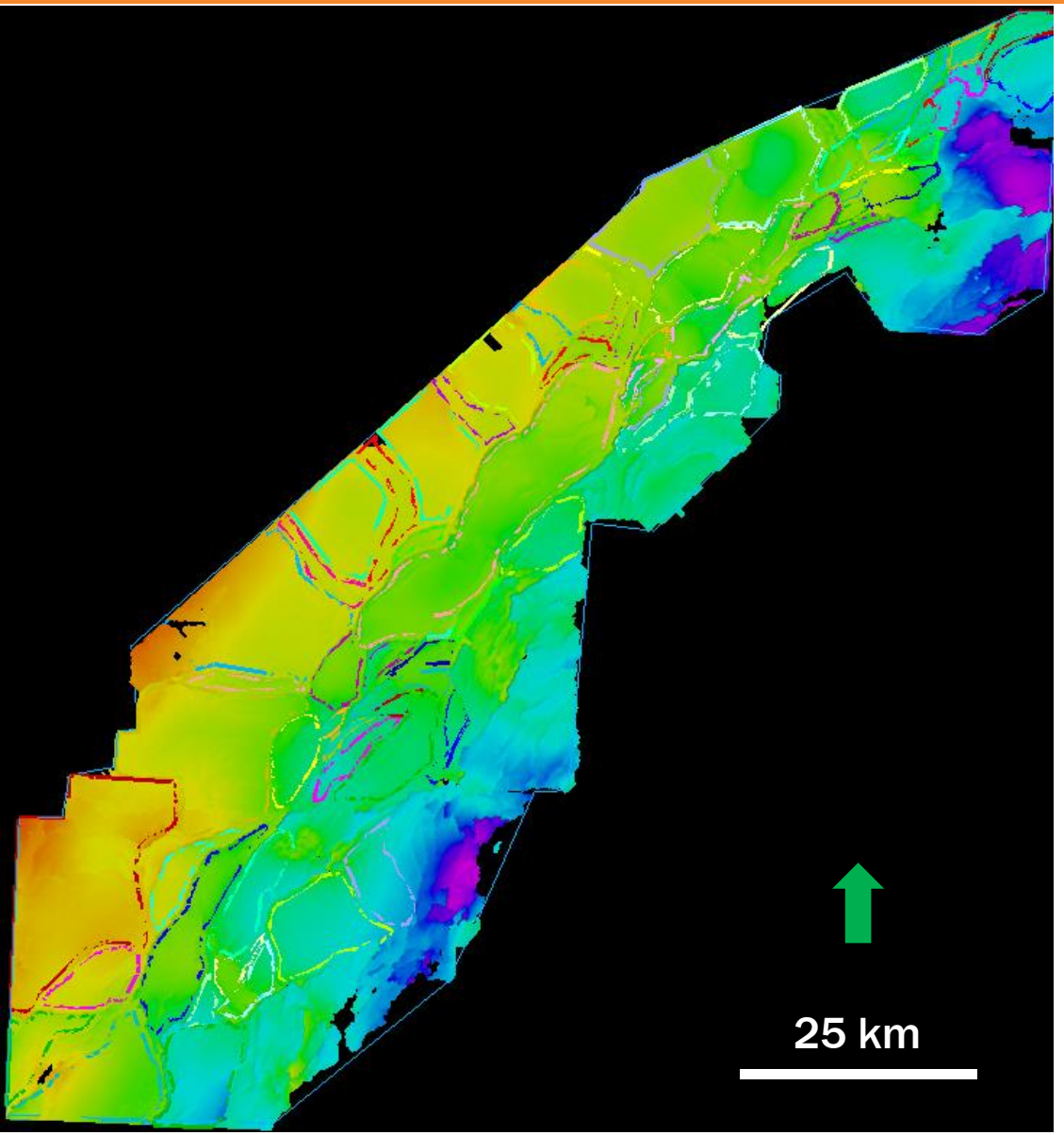
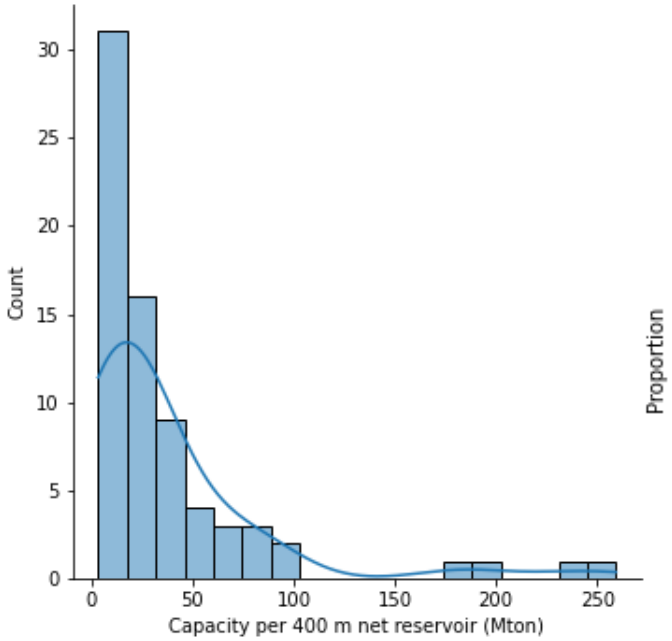
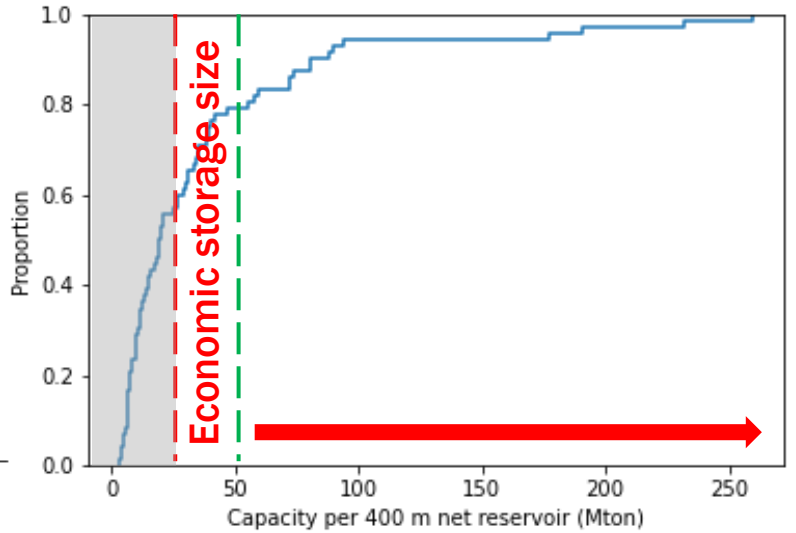


Economic Storages per 400 m Net Reservoir

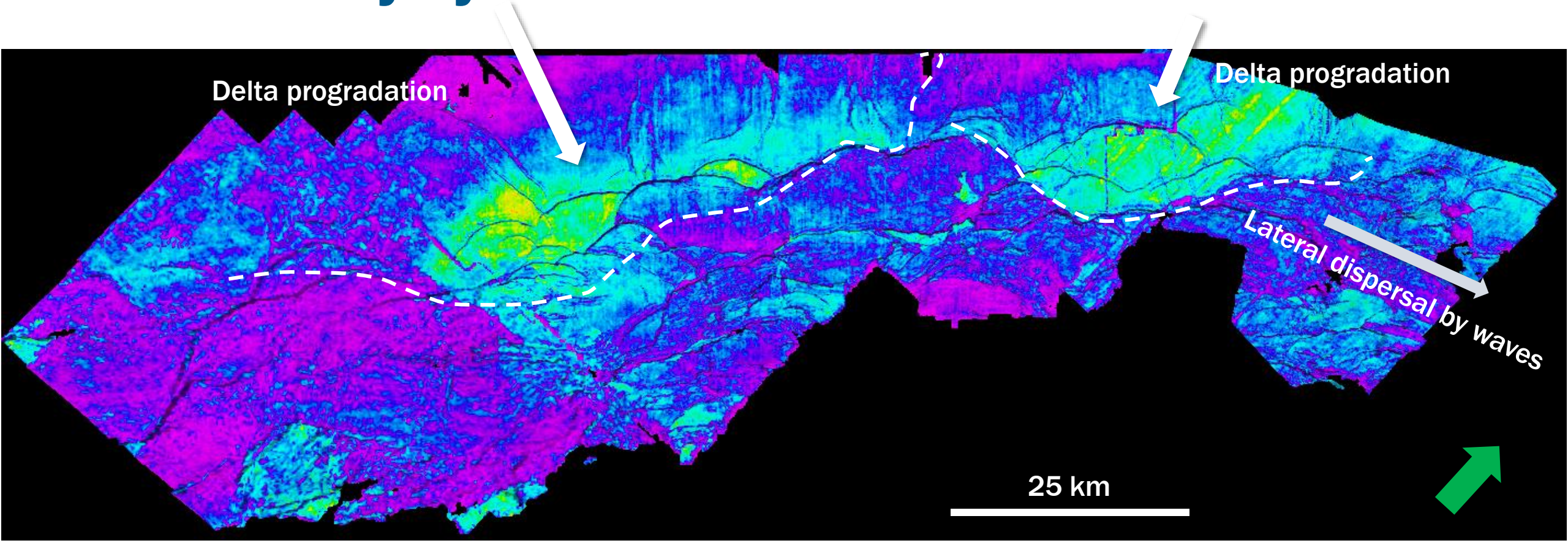




Given: 25% porosity, 200 mD permeability, at ~2 km depth

- 40% of the compartments are practical

Sedimentary systems constrain reservoir distribution



- RMS map of top Lower Miocene showing locations of two deltas and sand distributions
- Understanding the paleogeography & sedimentary system is key

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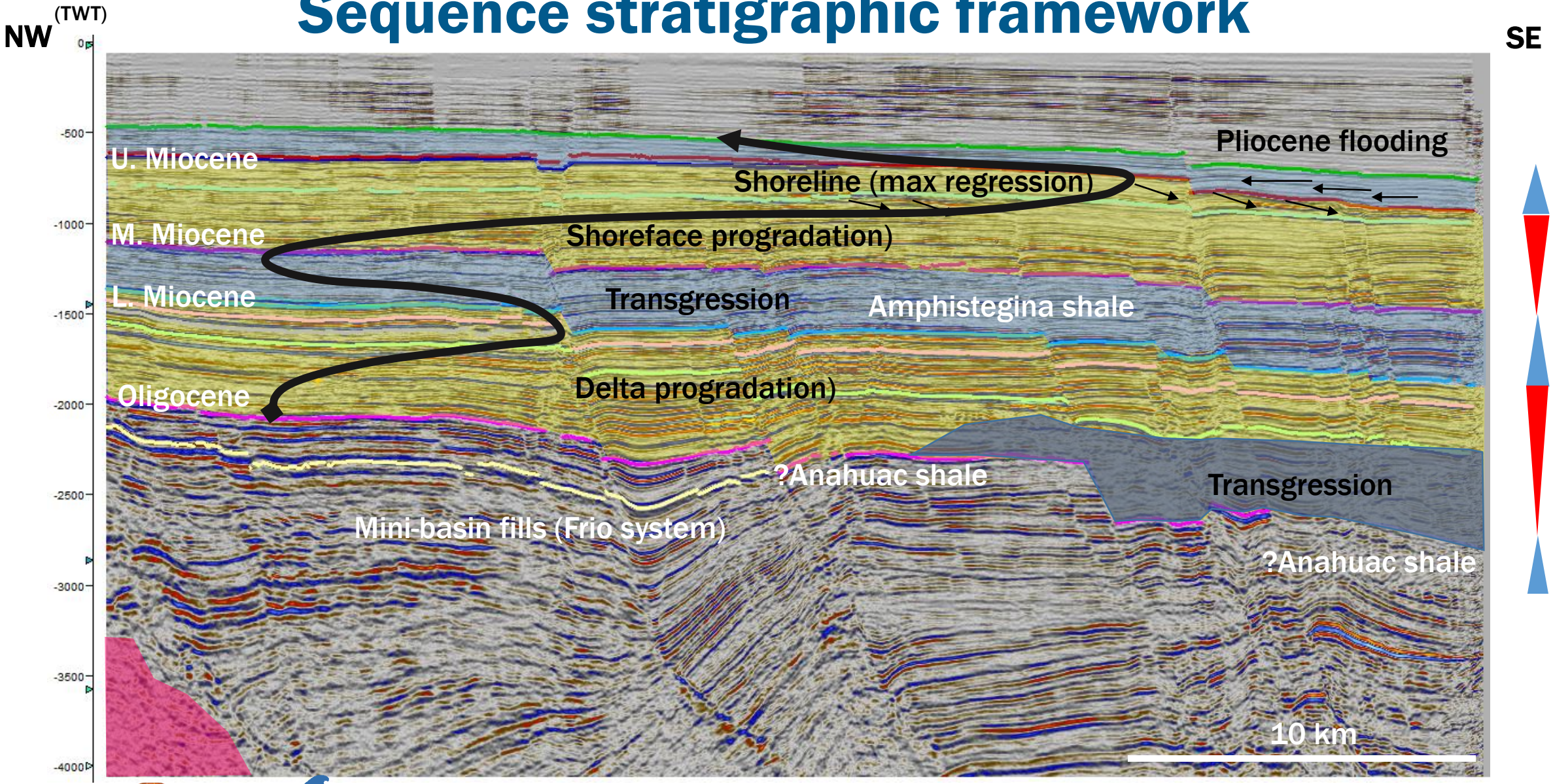
Sequence stratigraphic framework

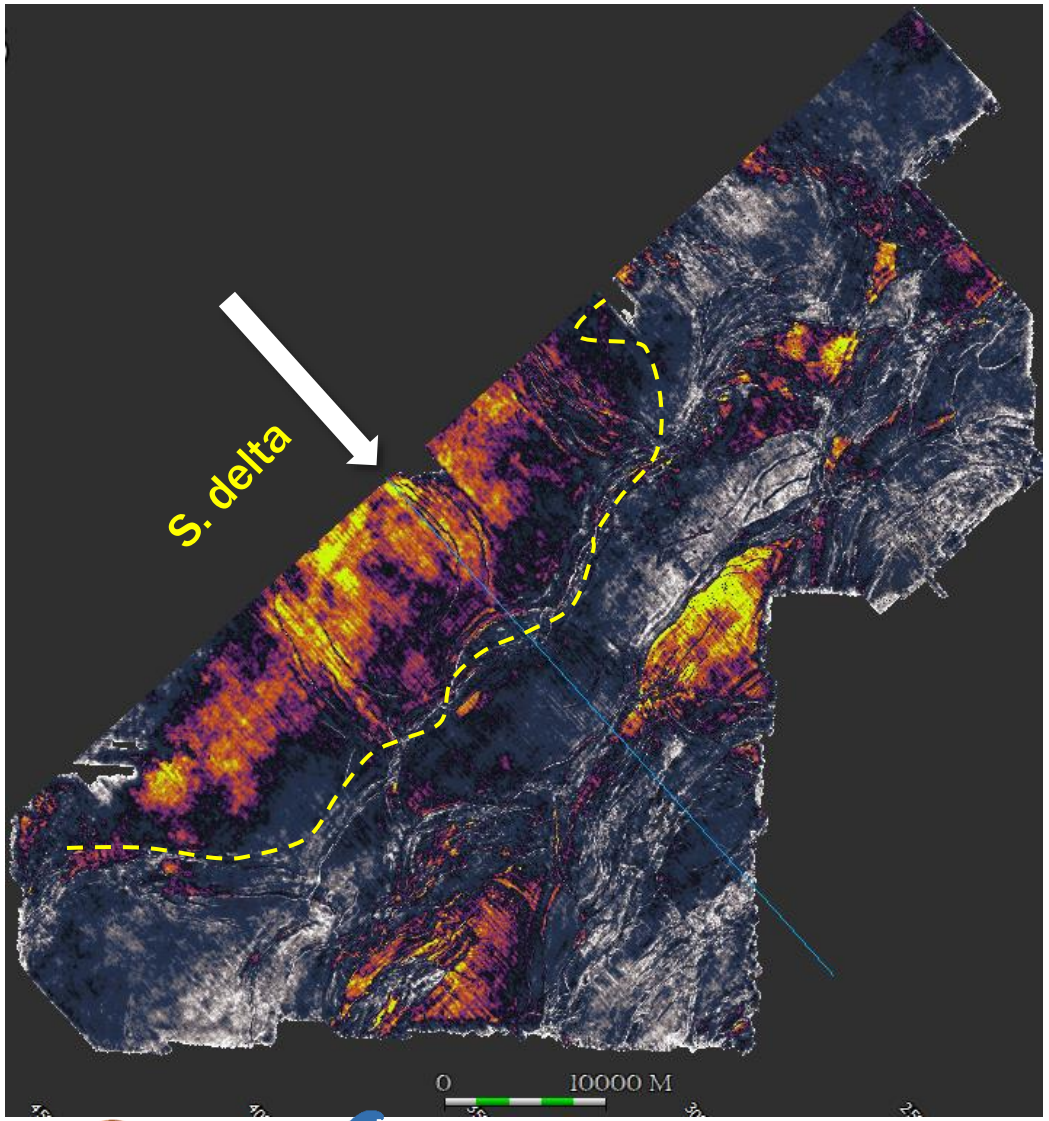


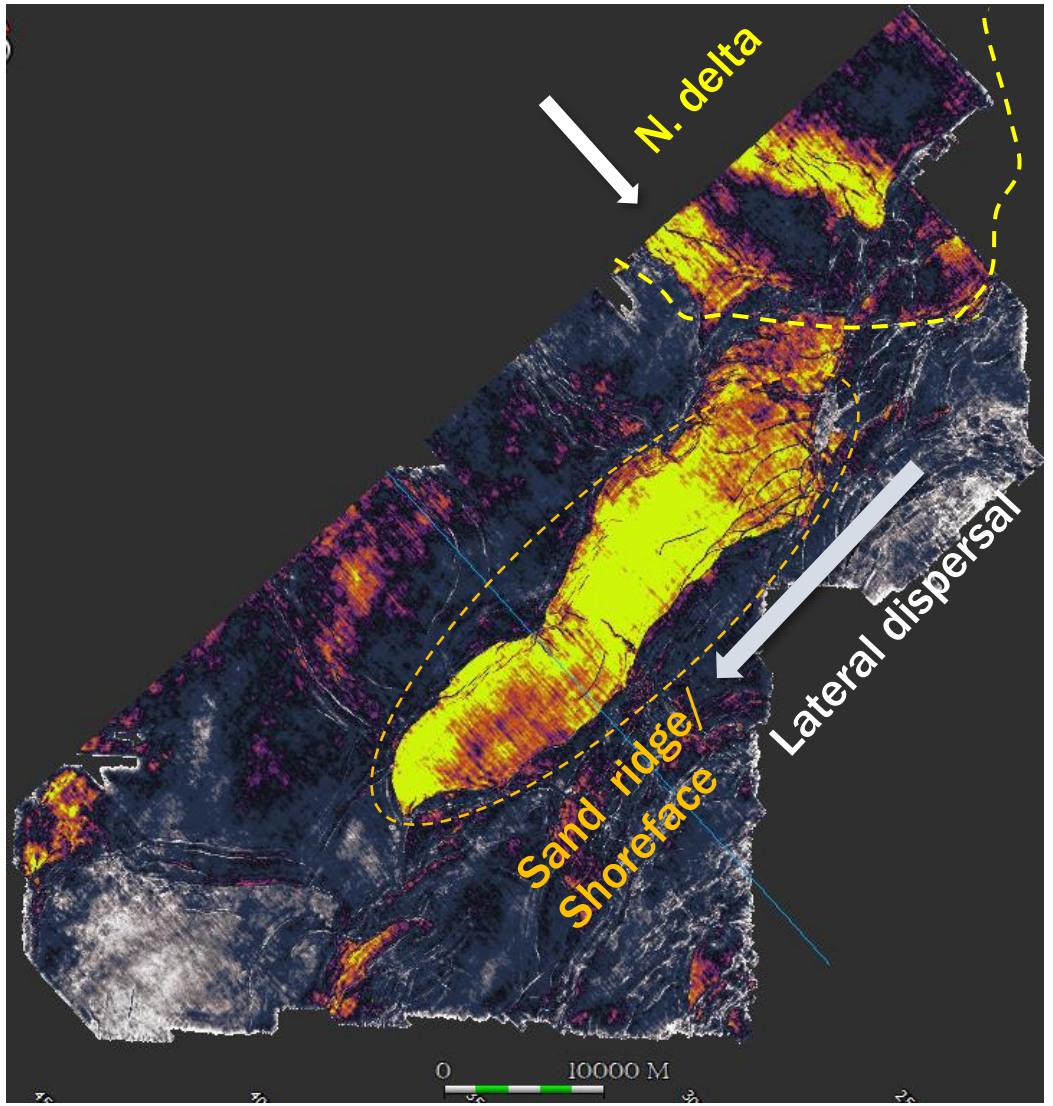
Delta/shoreface system

Shale

Diapir

Lower Miocene delta system





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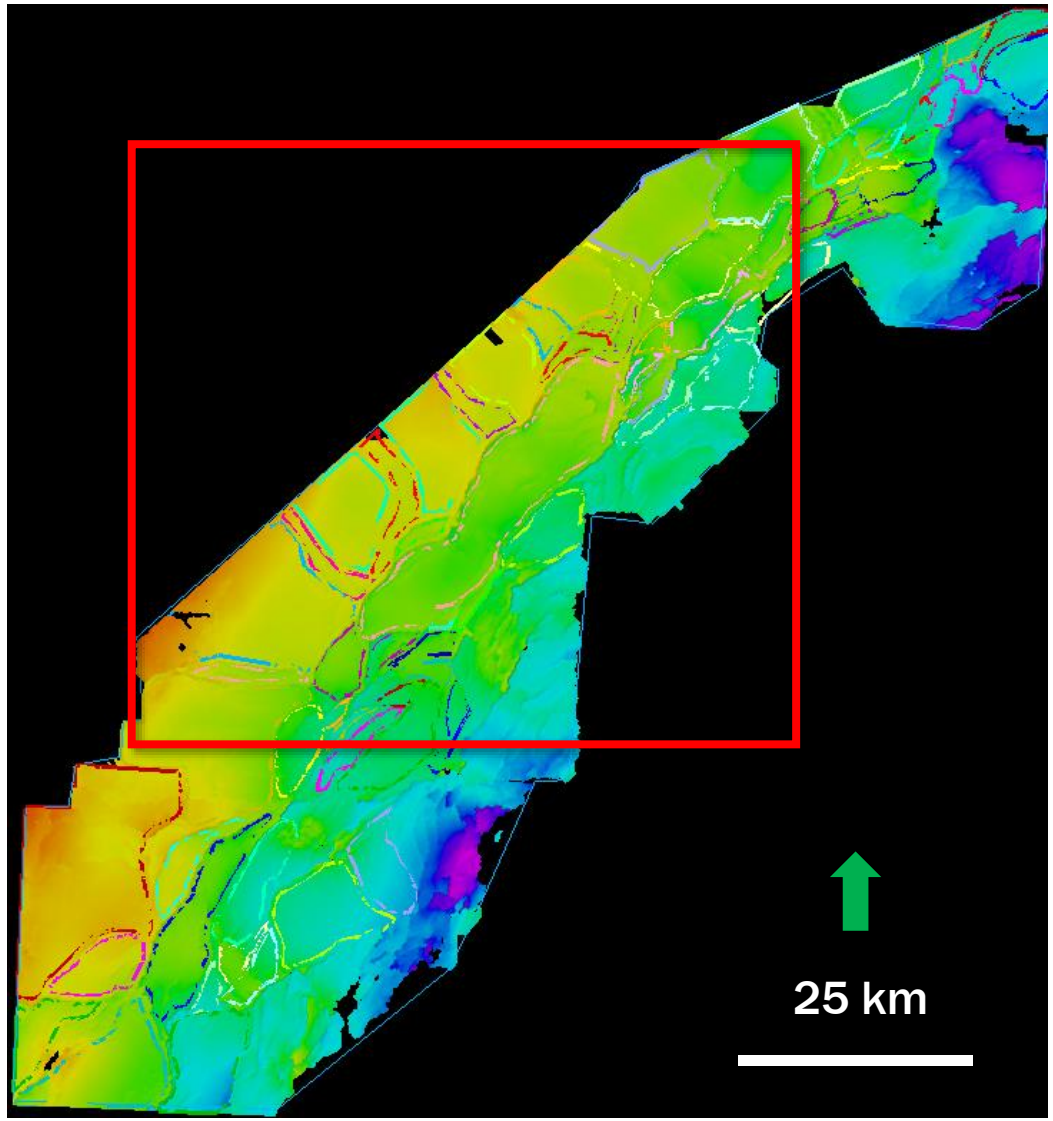

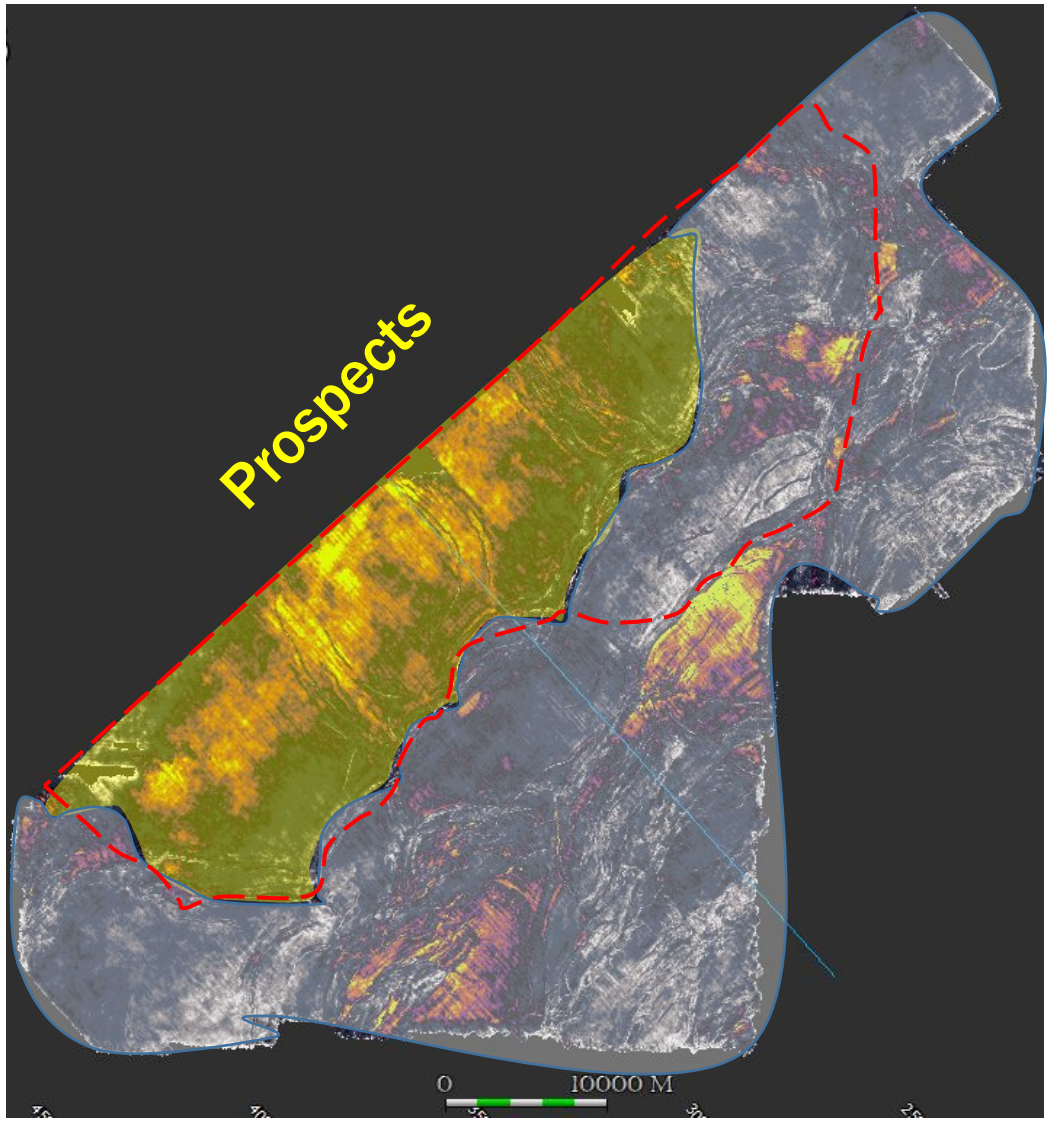

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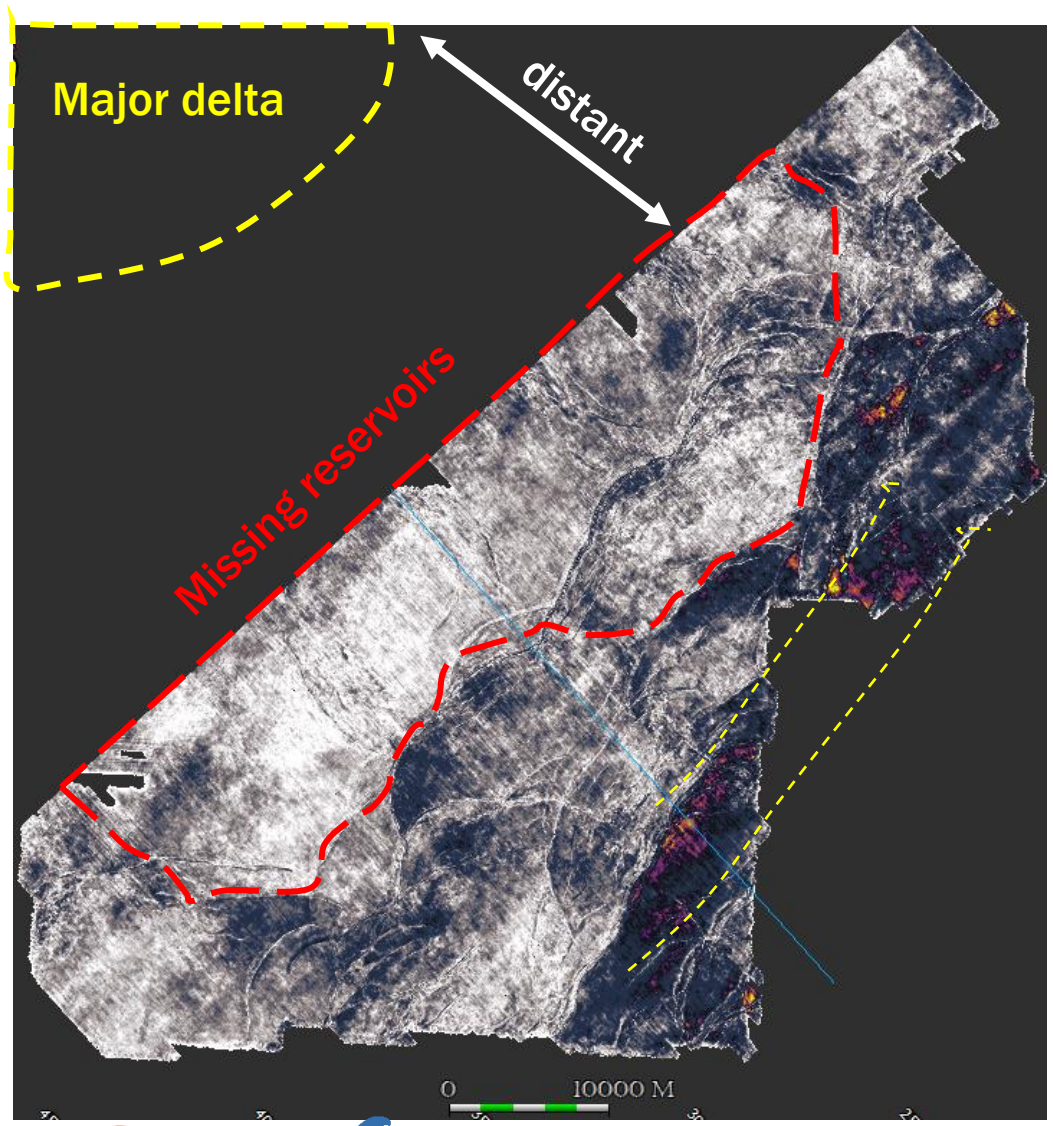
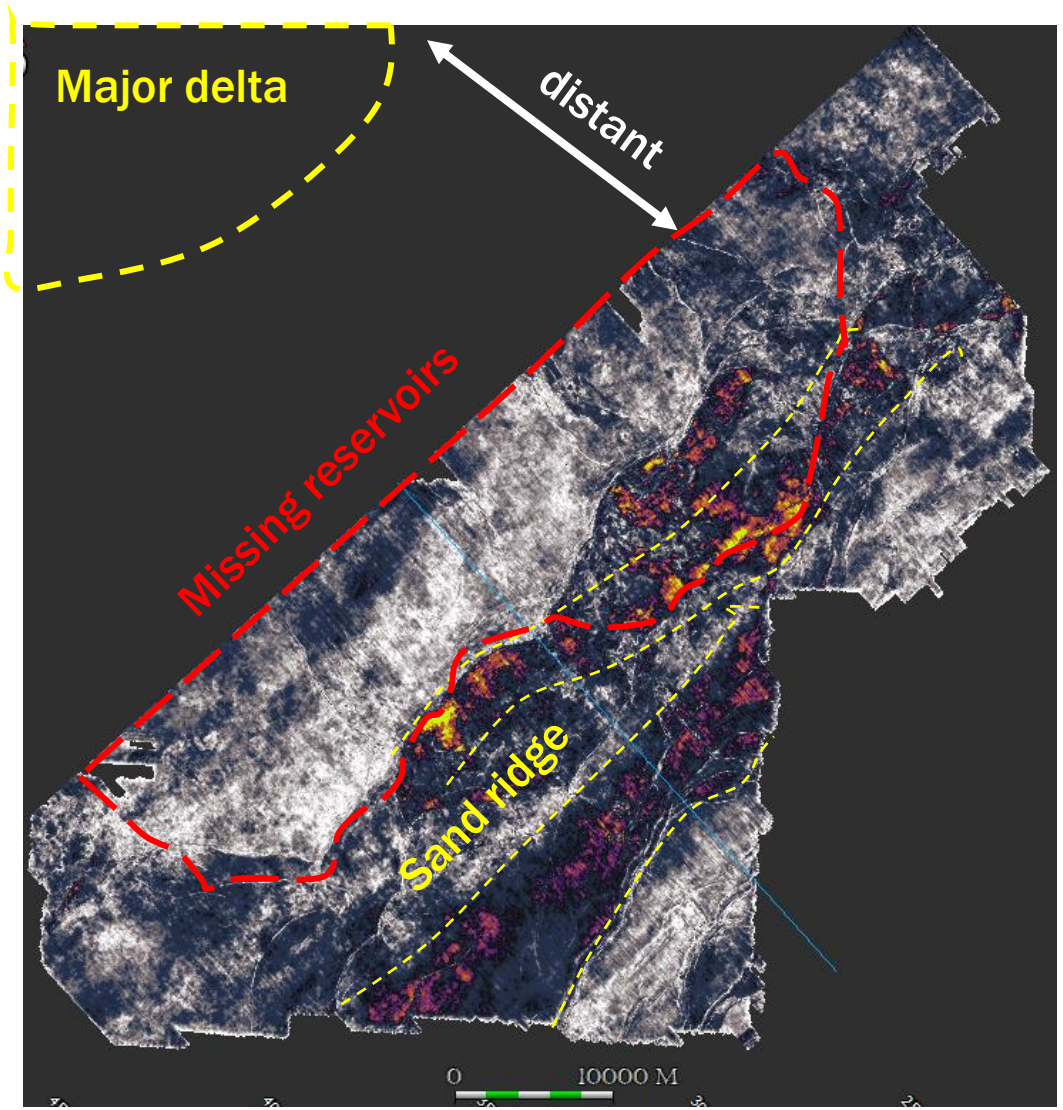
Middle Miocene flooding & backstepping





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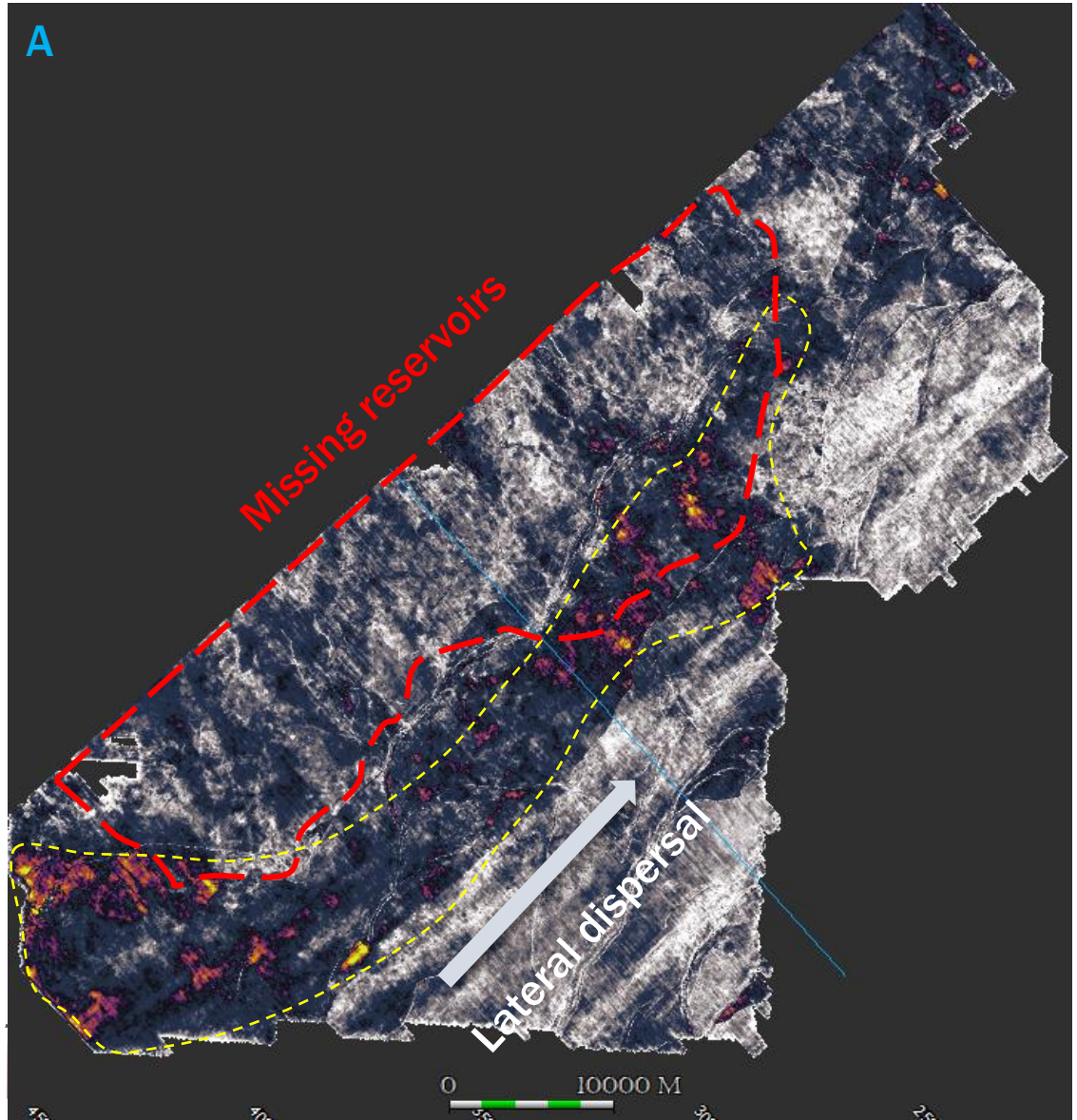
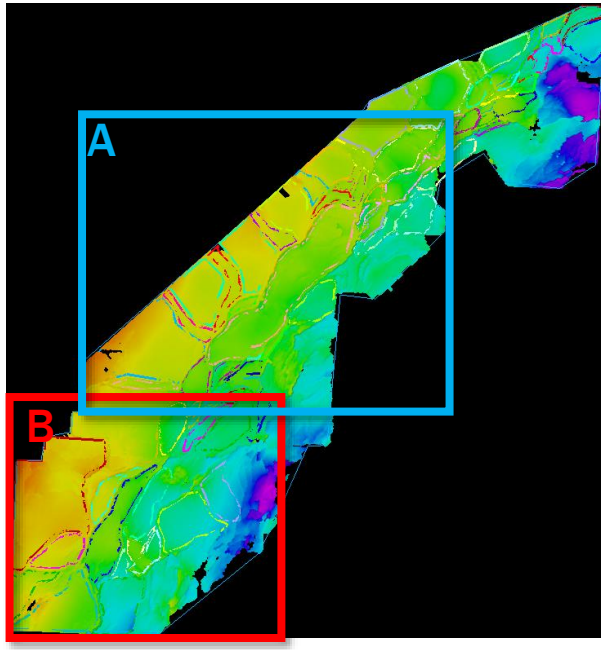
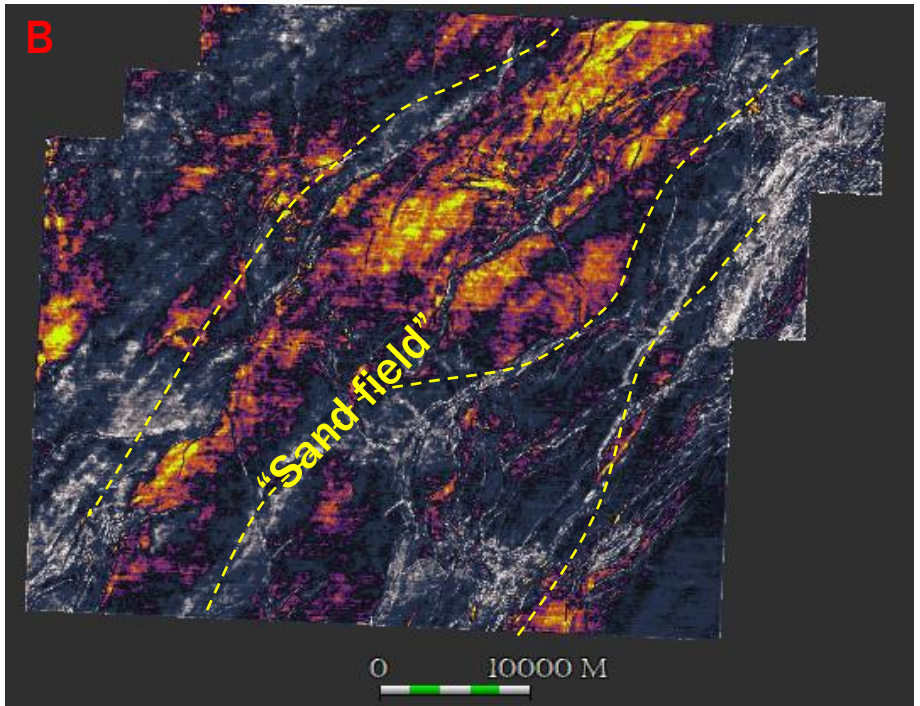
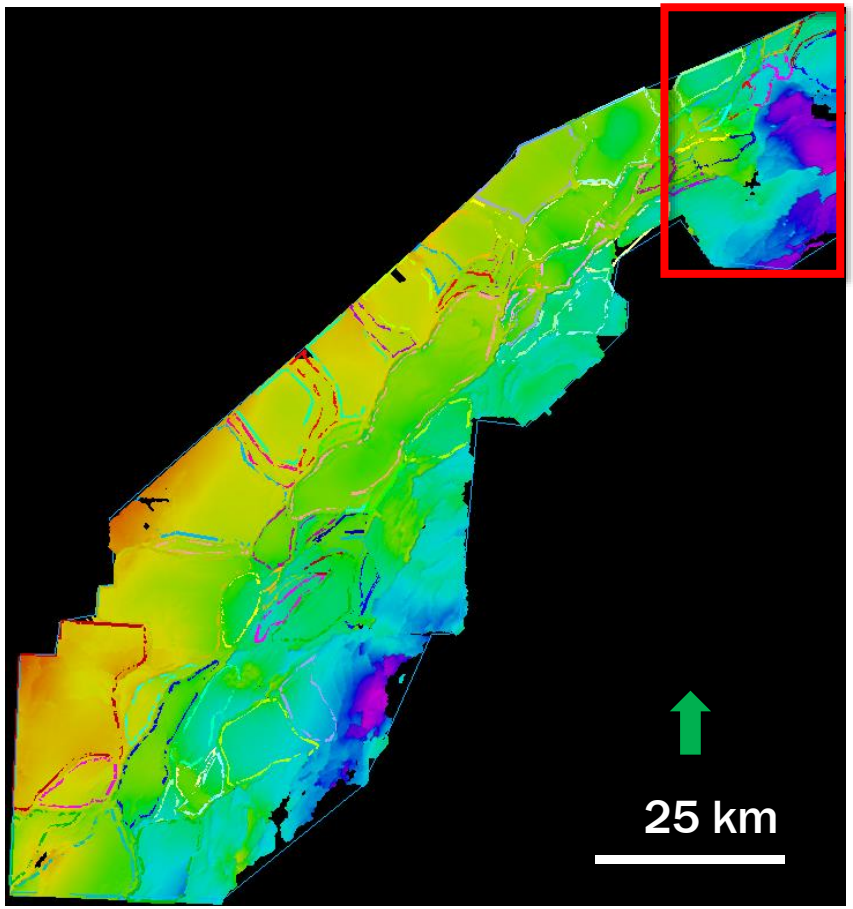
Lower Upper Miocene shoreface system

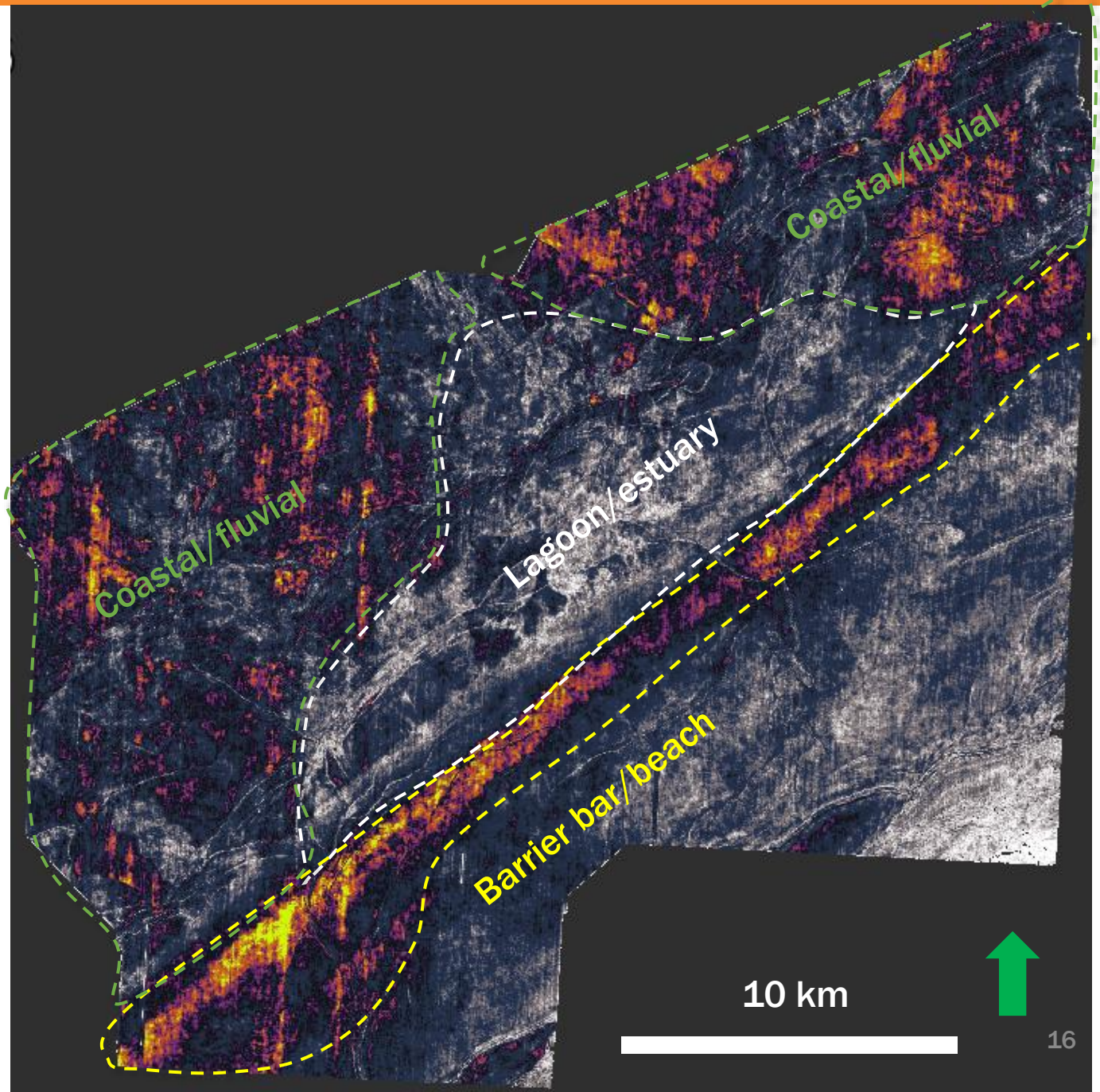






Top Upper Miocene barrier island & lagoon system





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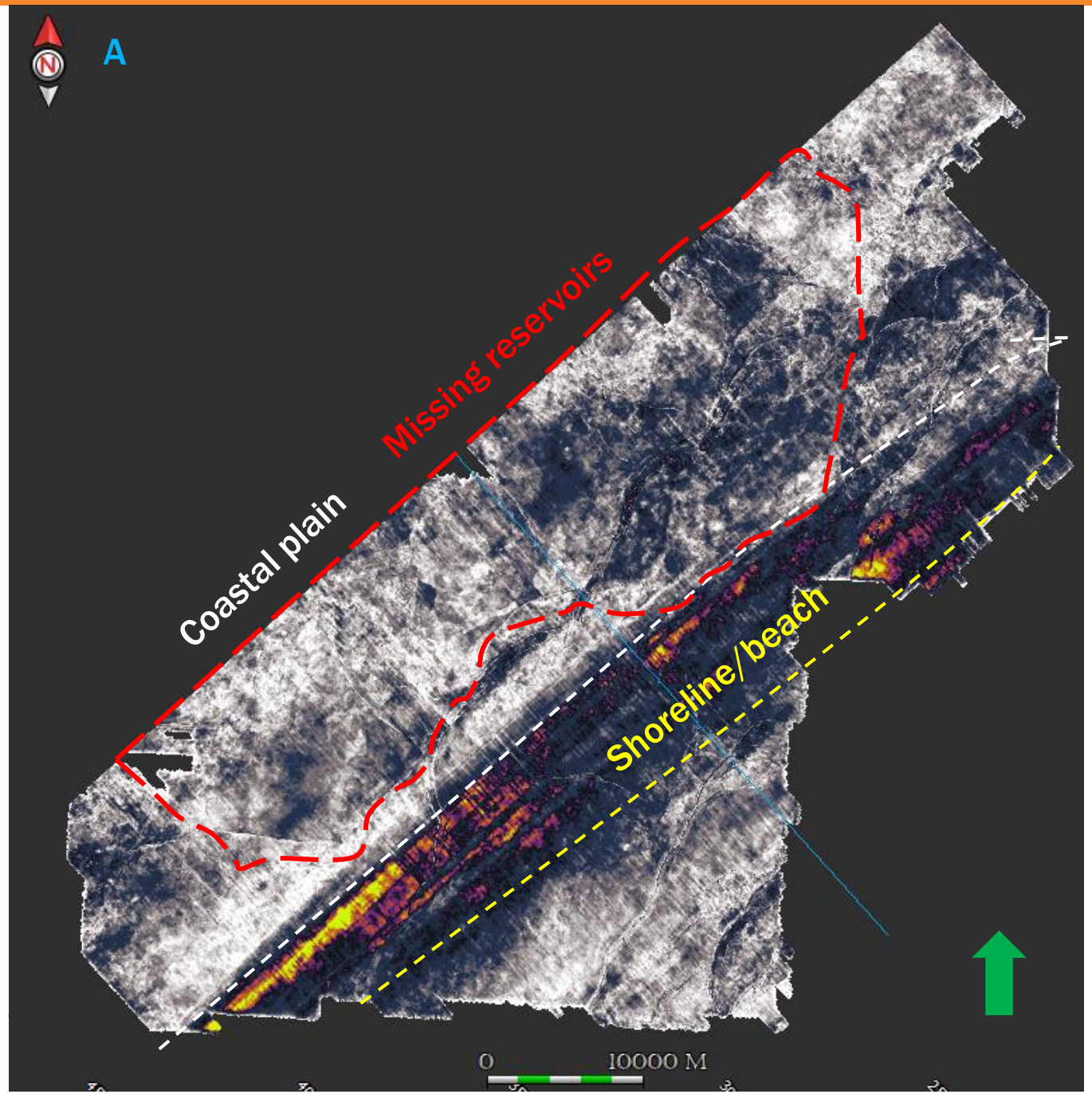
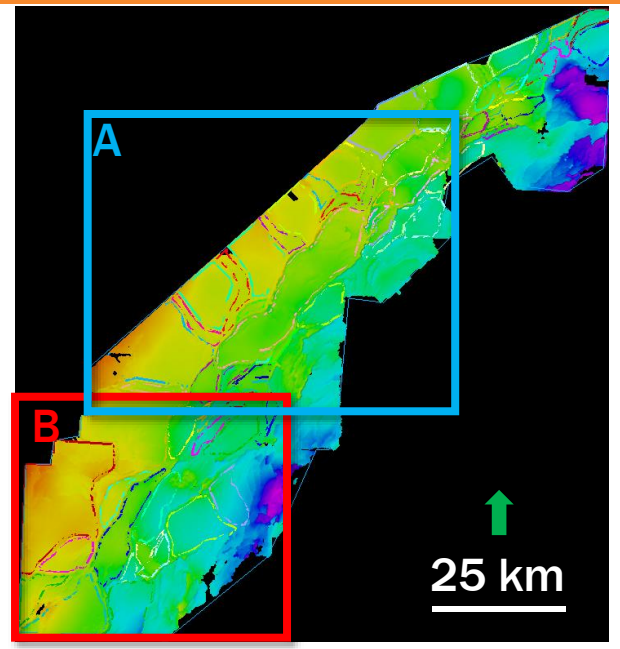
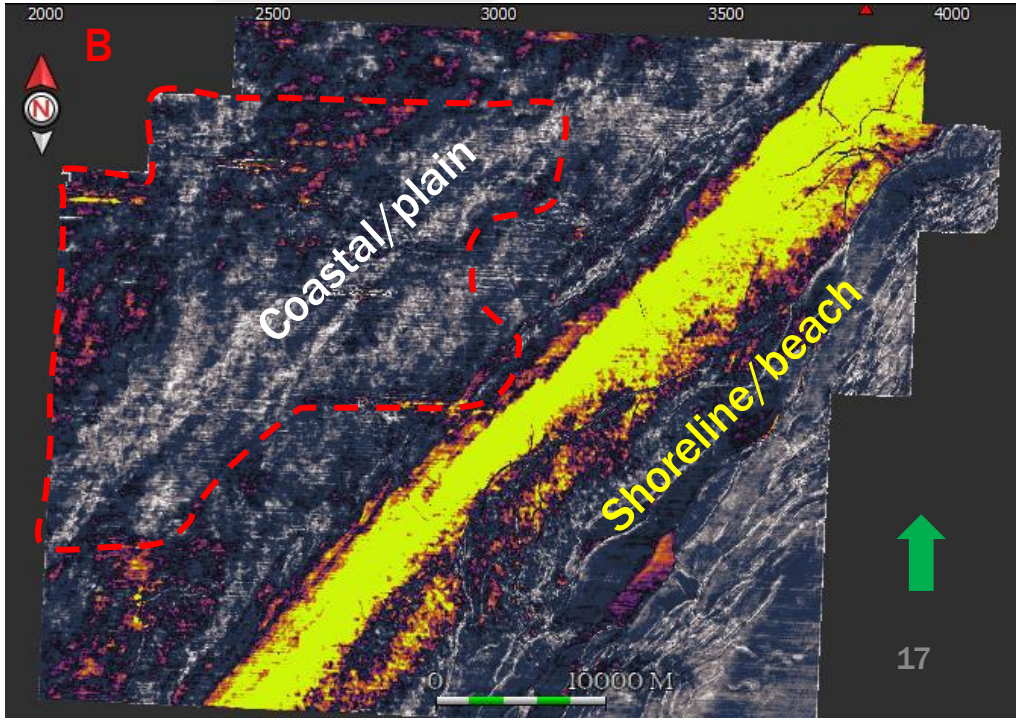
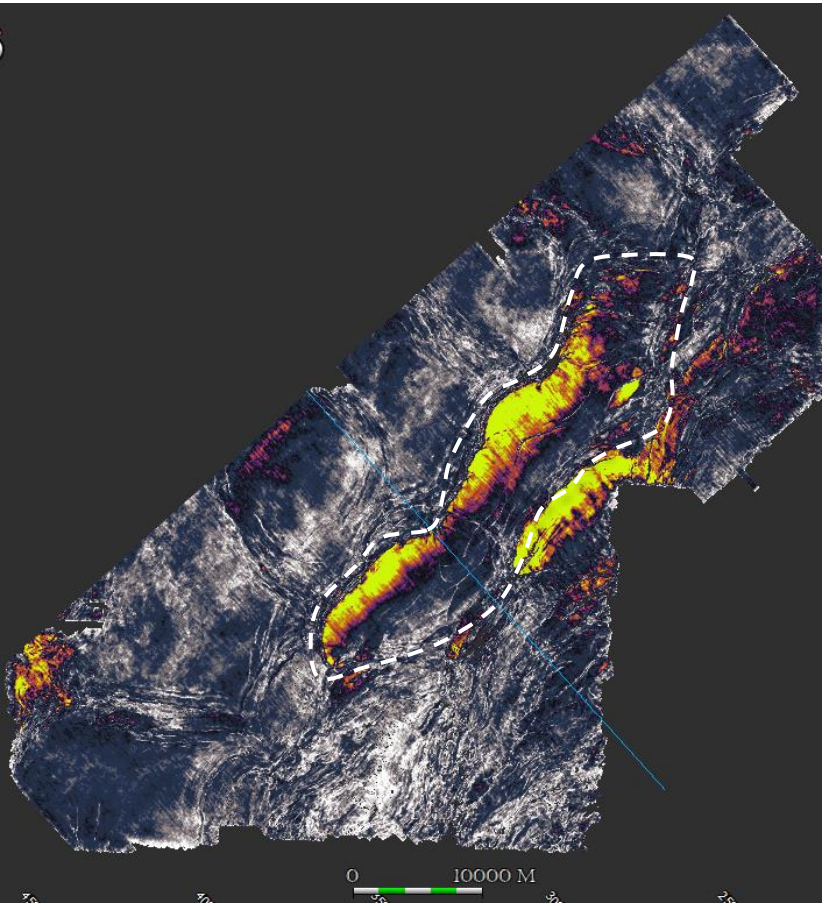

A
Missing reservoirs
Coastal plain
Shoreline/beach
0
10000 M


A
B
25 km

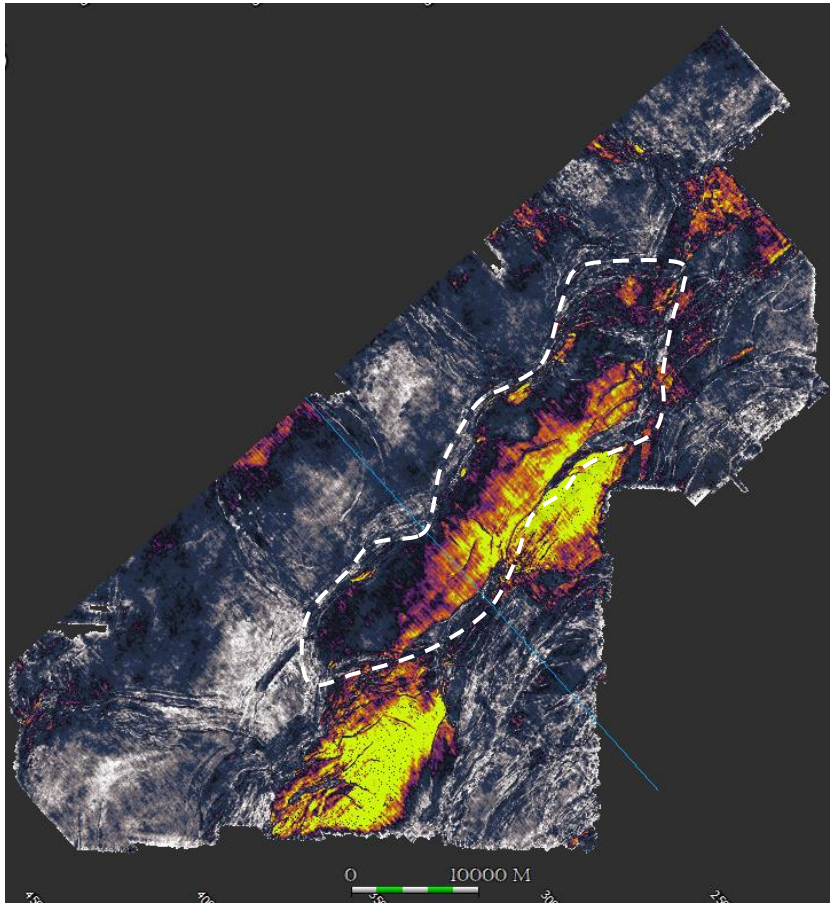

2000
2500
3000
3500
4000
B
Coastal/ plain
Shoreline/beach
0
10000 M

Star compartment

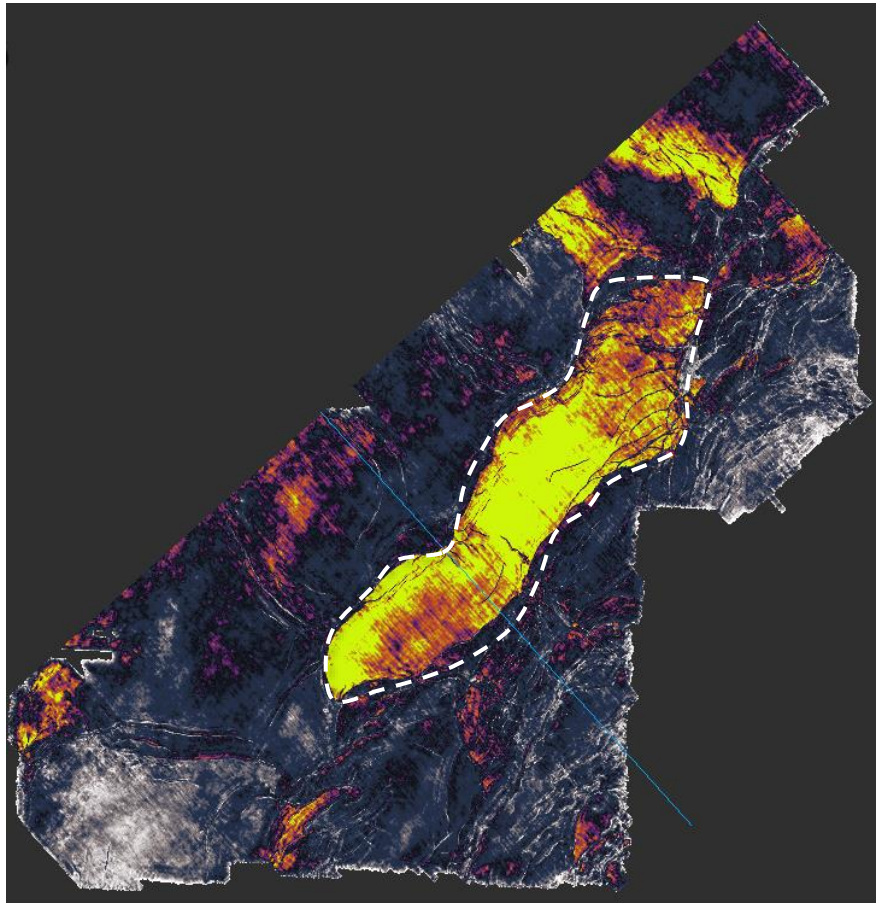
~230 km^2; ~ 60Mton per 100 m net reservoir



@ ~1800 ms



@ ~1700 ms



@ ~1600 ms

What if there are multiple injection intervals?

Where do we stand now?

- Joint compartment and reservoir maps provide a high-level assessment of the value of the area

- Insights into site selection and next phase of the project

Next steps

- Risk analysis (e.g., fault analysis)
- Precise reservoir characterization and refinement of the storage capacity at play scale
- Reservoir & fluid flow modeling