On-Shelf Lower Miocene Oakville Sediment-Dispersal Patterns within a 3D Sequence Stratigraphic Architectural Framework and Implications for Deepwater Reservoirs in the Central Coastal Area of Texas*

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Abstract

The sequence stratigraphic architecture of the lower Miocene Oakville Formation along the central part of the Texas Gulf Coast that is revealed in 3-D seismic data and wireline logs shows four third-order sequences—the lower two containing lowstand, transgressive, and highstand systems tracts and the upper two containing only transgressive and highstand systems tracts. The sequences average 1.2 m.y. in duration, and the lowstand incised-valley-fill sandstones are massive and as much as 420 feet thick. Seismic stratal slices demonstrate that the incised valleys are dip oriented and more than 20 mi wide. Strata within the incised valleys onlap sides of the channel. The incised-valley fills have been interpreted by past authors to have been deposited in a shoreface depositional system that produced strike-parallel sand bodies. The transgressive systems tract comprises backstepping fourth- and fifth-order sequences. Seismic stratal slices and wireline-log patterns within the transgressive systems tracts suggest deltaic sediment dispersal patterns that are generally reworked. Highstand systems tracts comprise aggradational to progradational fourth- and fifth-order sequences, and seismic stratal slices and wireline-log patterns indicate a variety of depositional environments, including deltaic, shoreface, coastal plain, and interdistributary. The highstand systems tract is significantly truncated by the overlying sequence boundary. Sandstone-rich, incised-valley fills suggest that large amounts of sediment may have been transported through these channels to the shelf edge 20 mi seaward and delivered to basin-floor-fan, slope-fan, and prograding-wedge lowstand systems.

Reference

Galloway, W.E., 1986, Deposition and structural framework of the distal Frio Formation, Texas coastal zone and shelf: Bureau of Economic Geology, University of Texas at Austin, Austin, Texas, Circular No. 86-8, 18 p.

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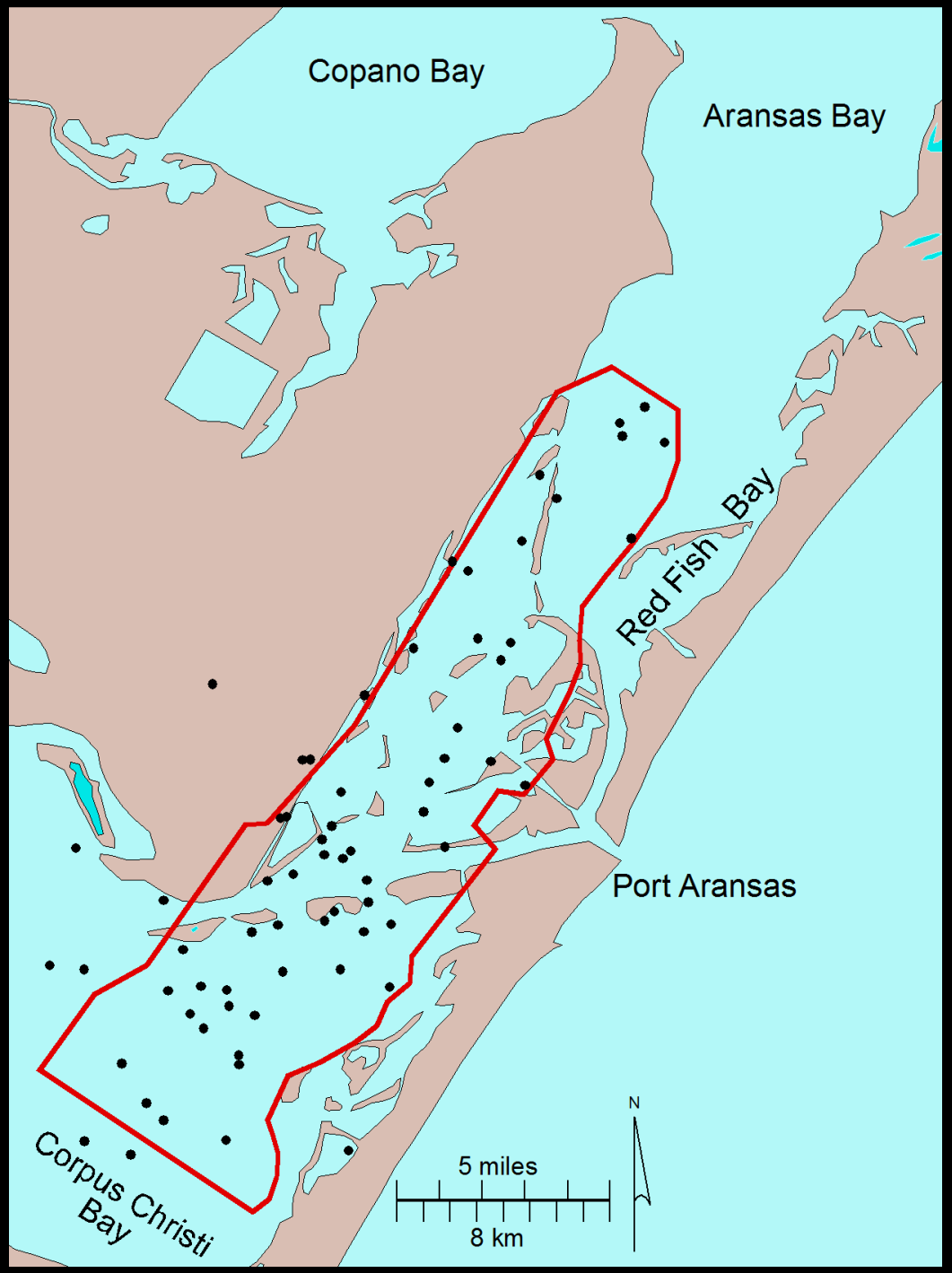
Goals

- Construct a 3D sequence-stratigraphic framework of the lower Miocene Oakville interval
- Define general depositional systems that compose third-order sequences
- Speculate on the implications of well-developed incised valleys for off-shelf sedimentation

Location

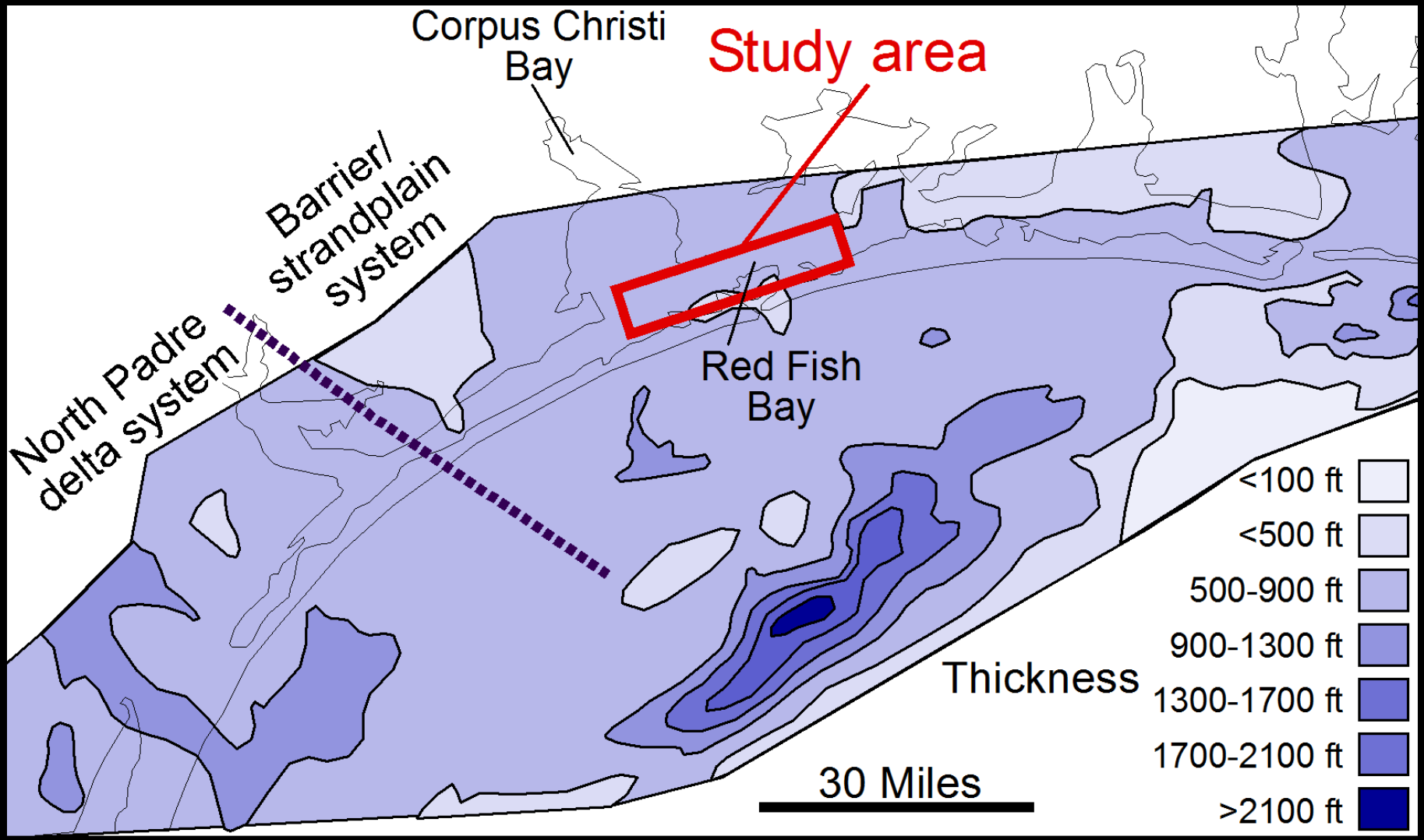

Texas


Copano Bay
Aransas Bay
Red Fish Bay
Port Aransas
Corpus Christi Bay
5 miles
8 km
N

Significance of Study

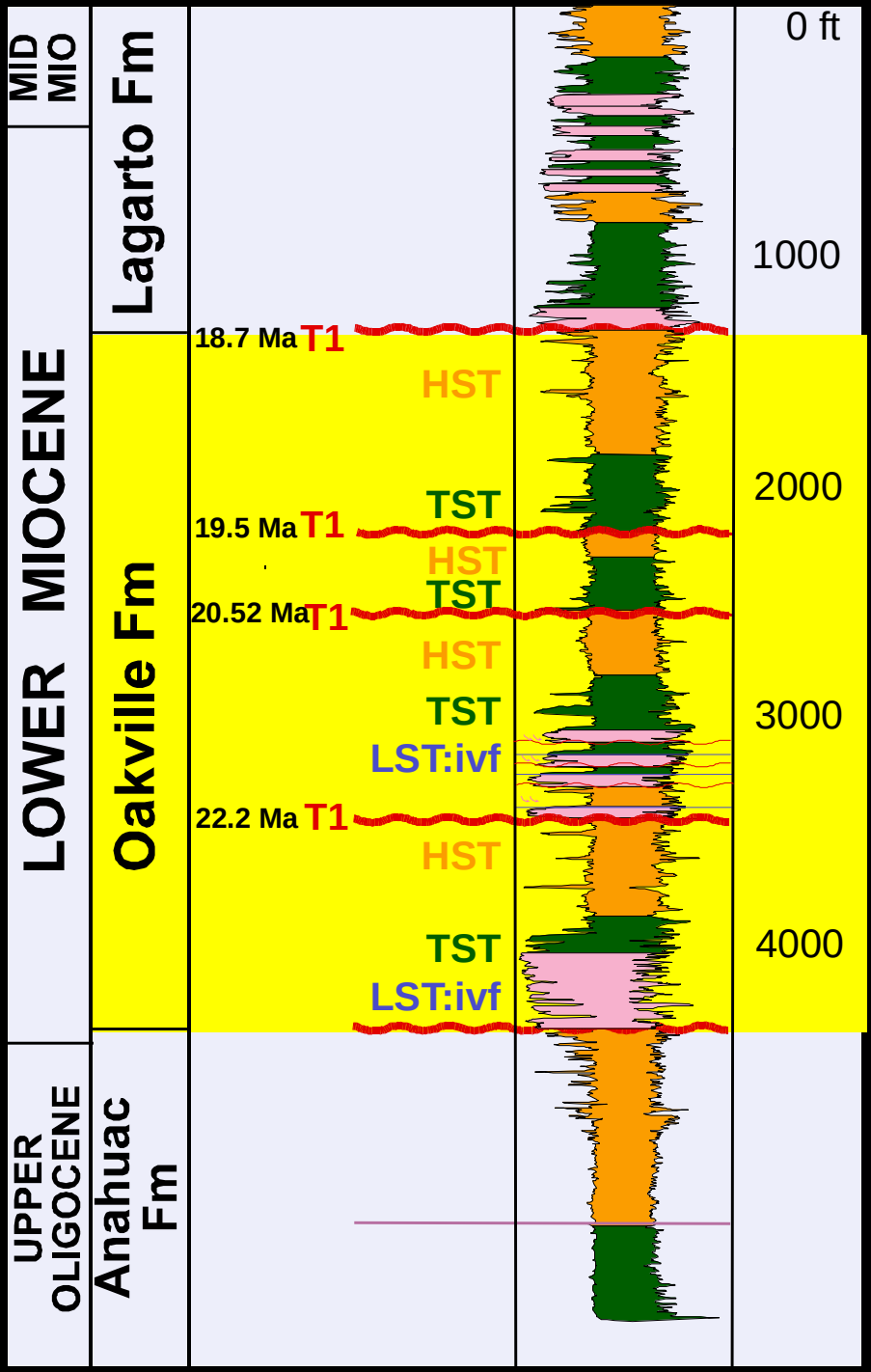
- Earlier work suggested a system of strike-elongated sand bodies
- Study was based on a regional study with limited wireline-log data
- Previous studies would not have suggested across-shelf transport of sand to a deeper water setting
- Present study suggests across-shelf transport of sand to deeper water setting

Regional Oakville Isopach Map

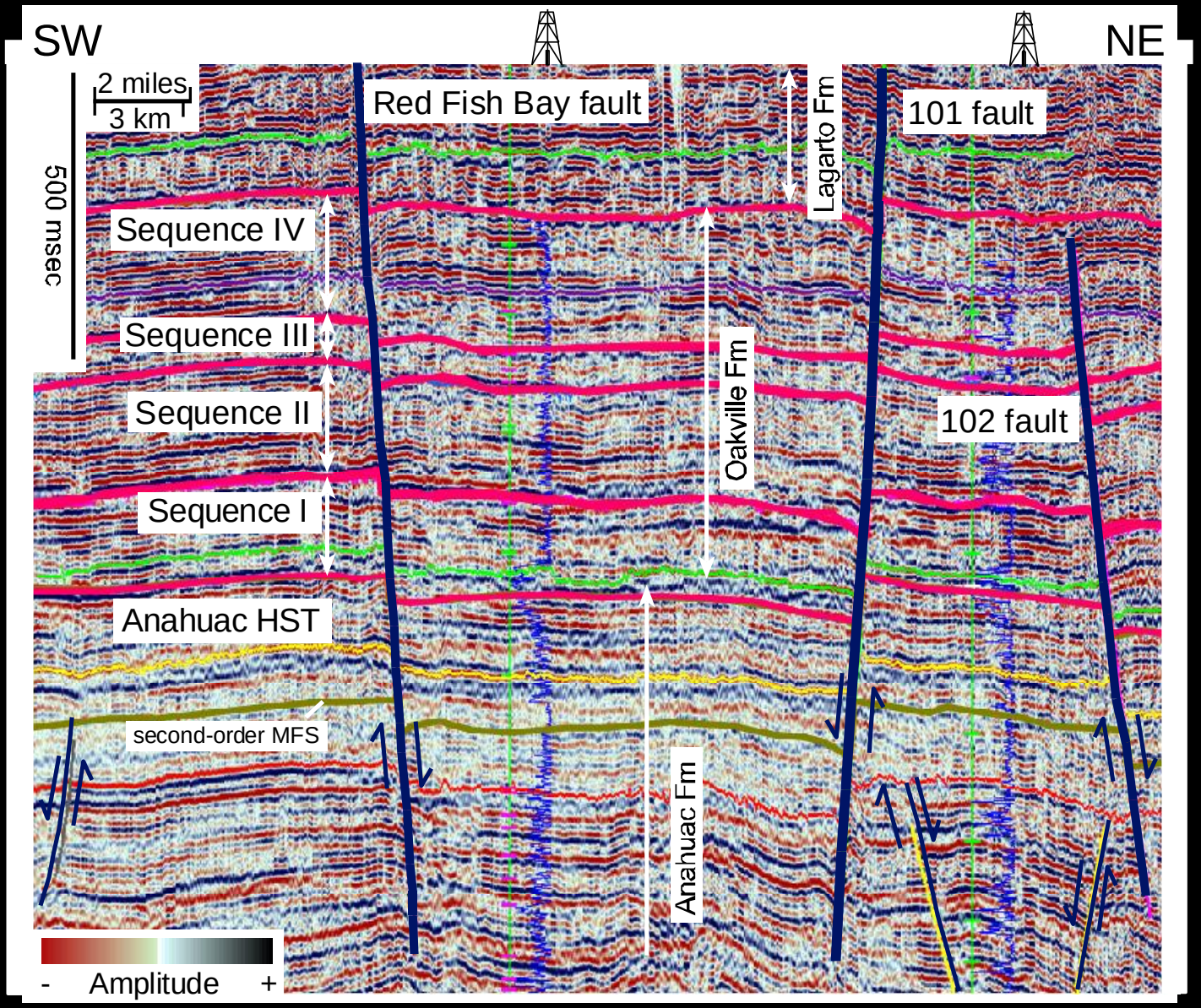


Galloway et al., 1986

Stratigraphic Section



Type Seismic Line



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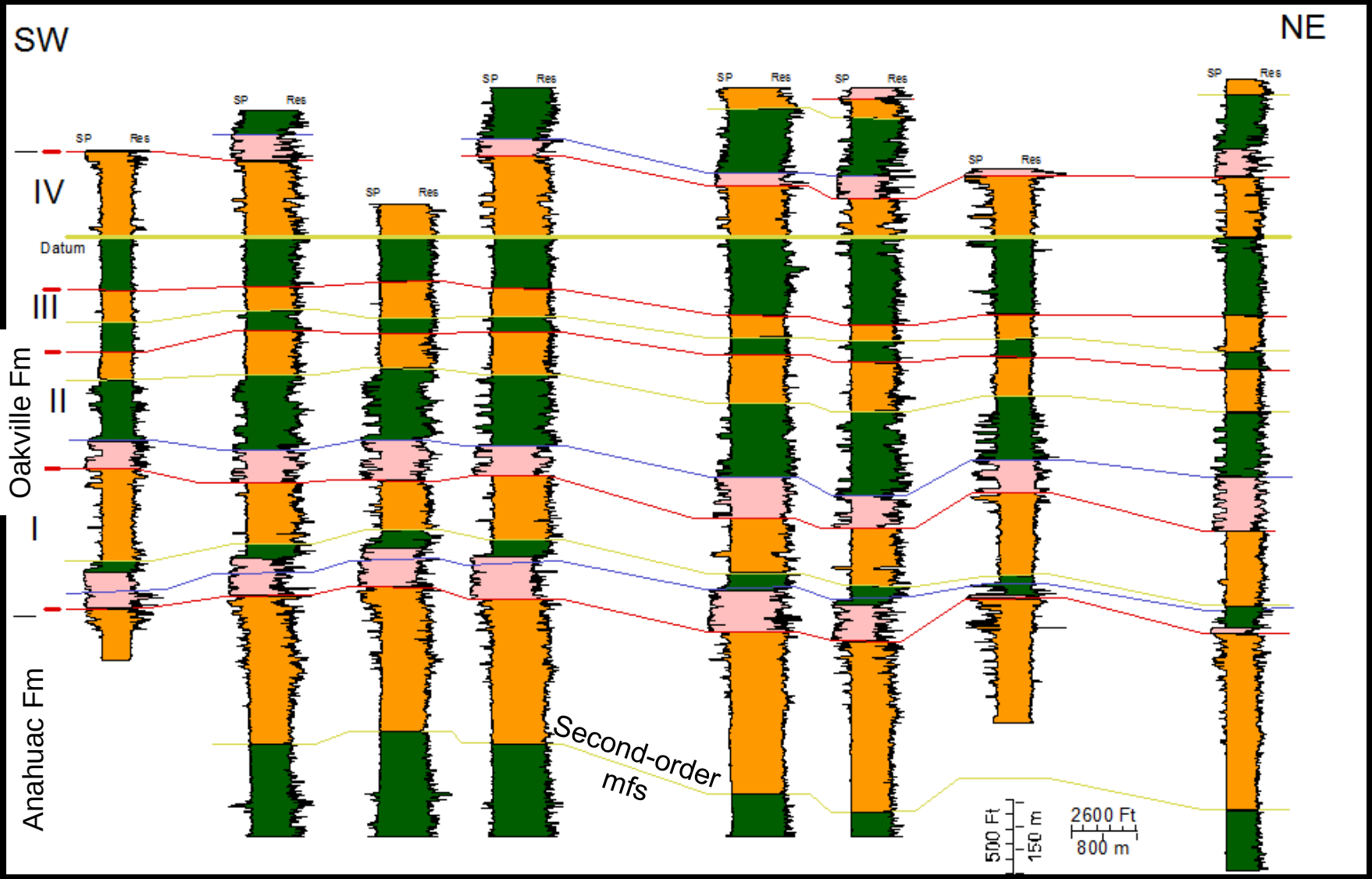
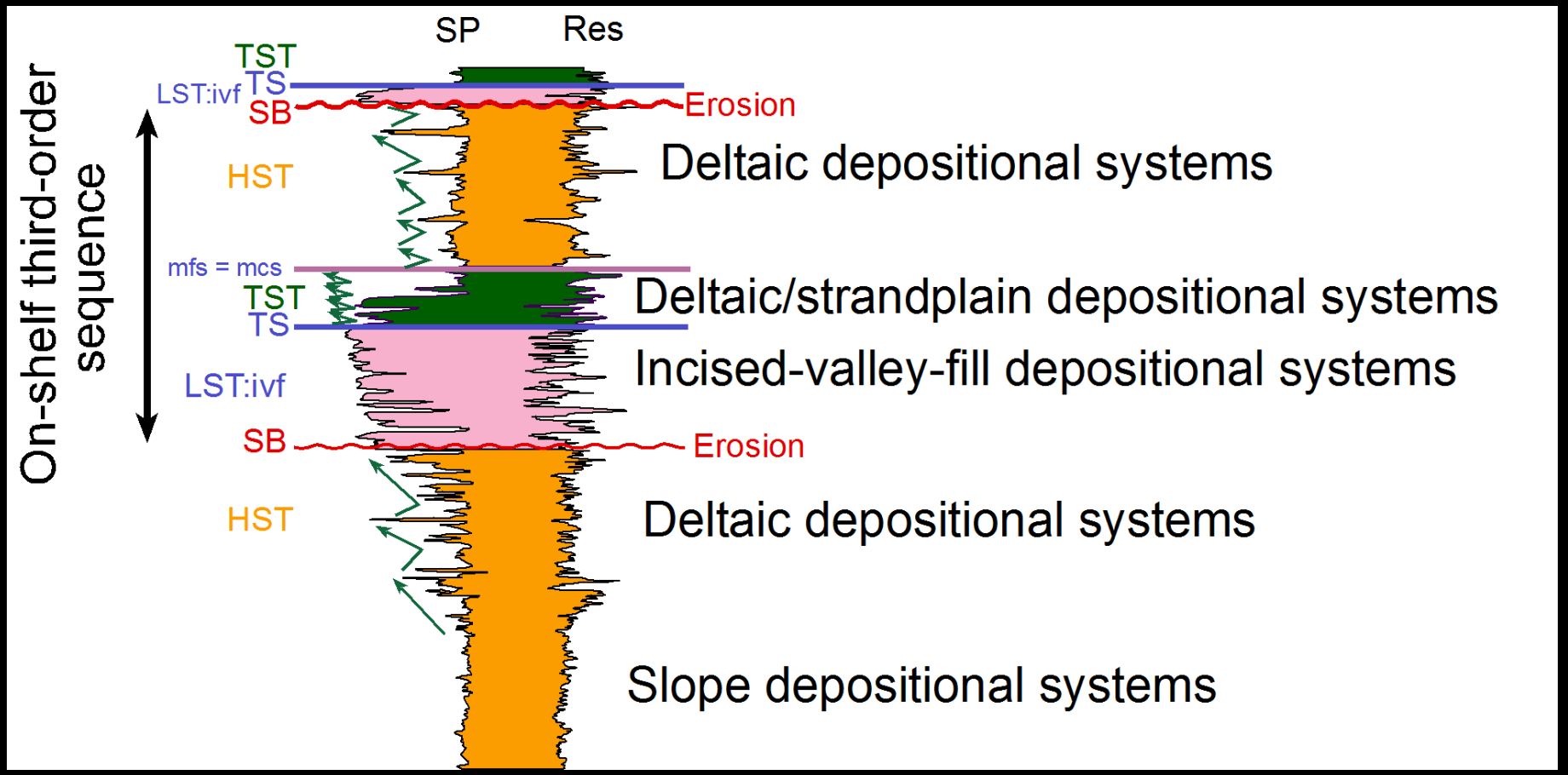


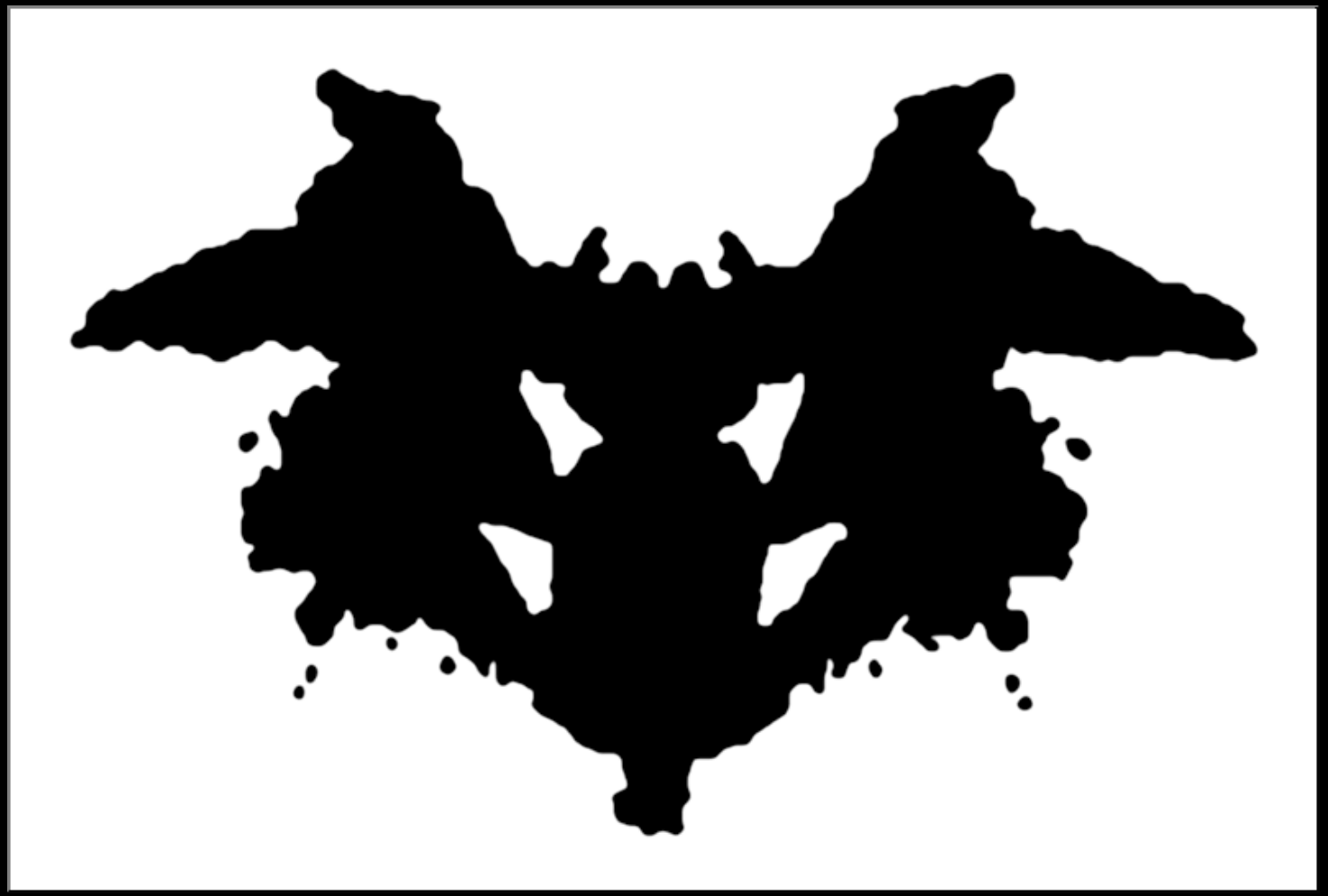
Type Log


SP
Res
On-shelf third-order sequence
TST
LST:ivf
TS
SB
Erosion
HST
Deltaic depositional systems
mfs = mcs
TST
TS
Deltaic/strandplain depositional systems
LST:ivf
Incised-valley-fill depositional systems
SB
Erosion
HST
Deltaic depositional systems
Slope depositional systems

Stratal Slice

- A horizontal seismic attribute display that follows a geologic time surface
- Constructed by proportionally slicing between seismic reference events
- Can be used to define the geomorphology of depositional systems

Rorschach Inkblot Test and Stratal-Slice Interpretations



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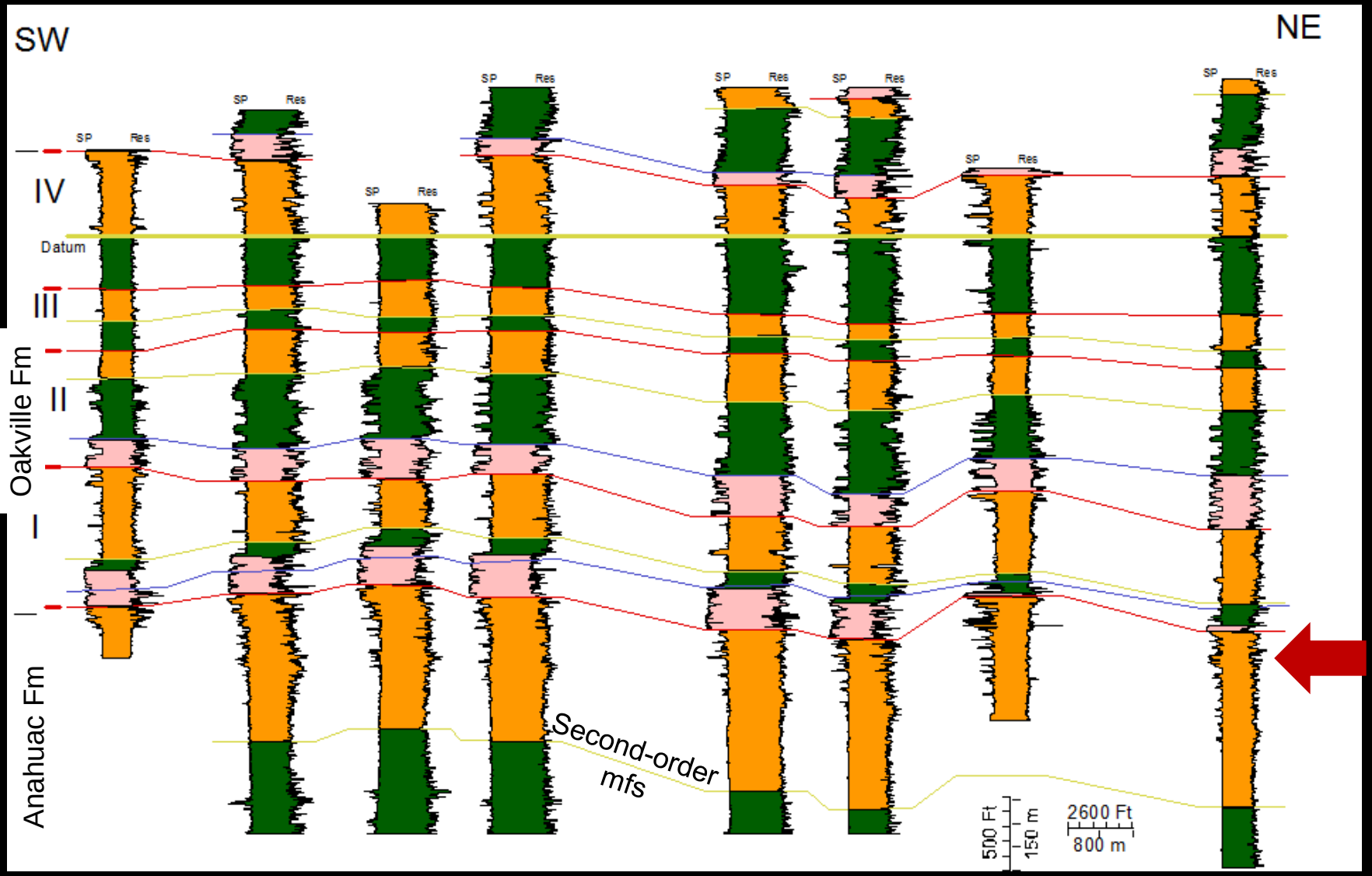
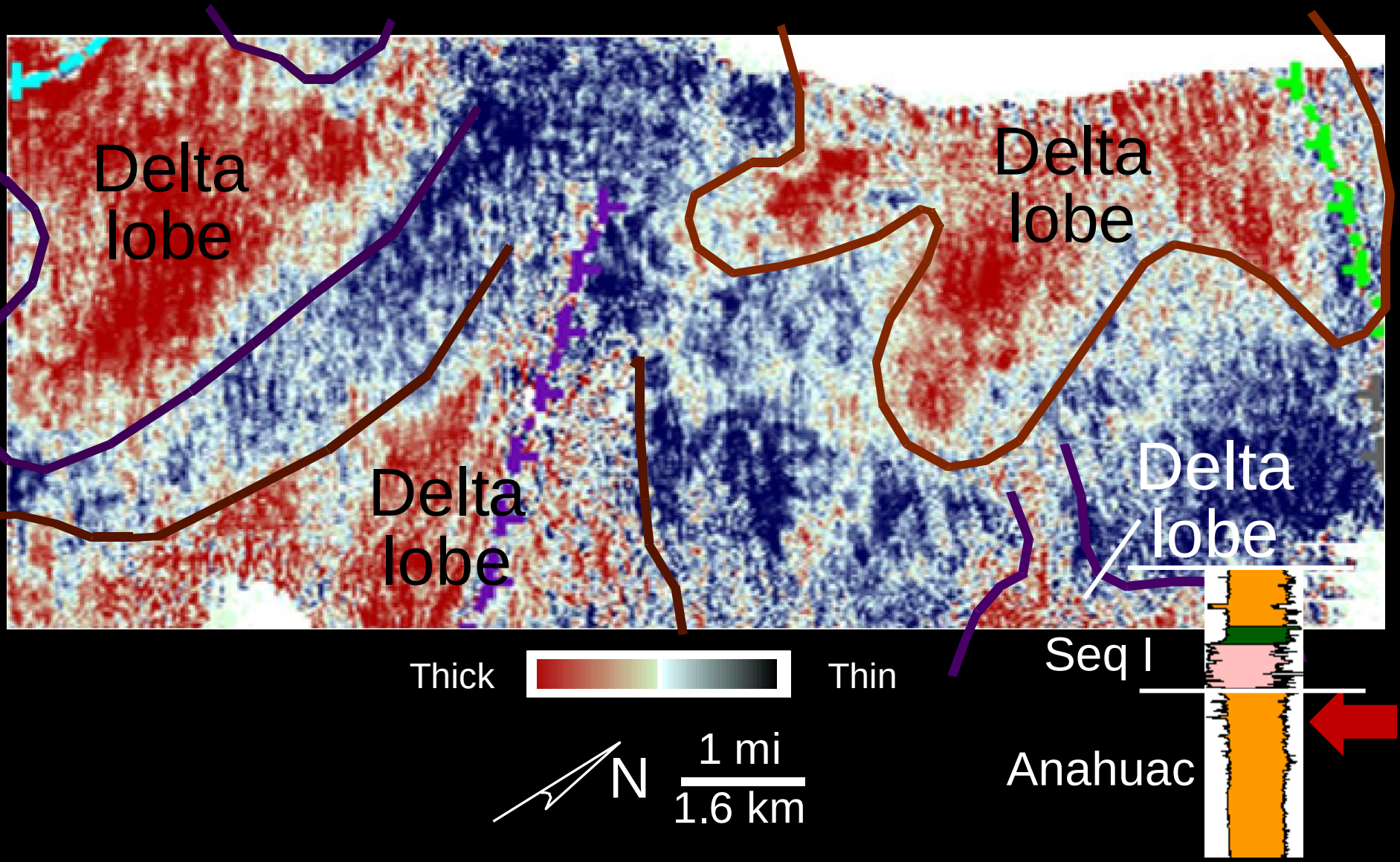


Anahuac HST Stratal Slice



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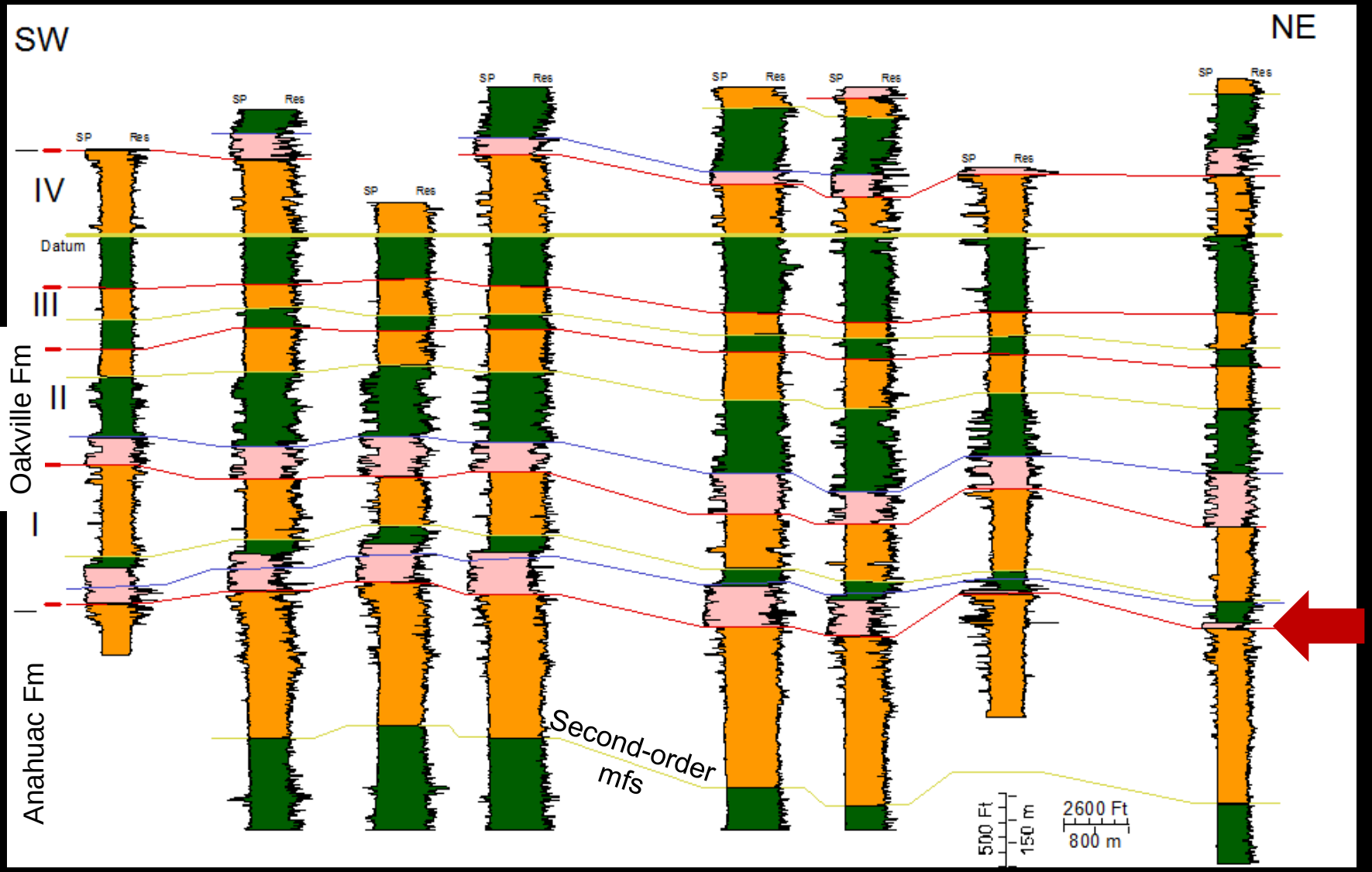
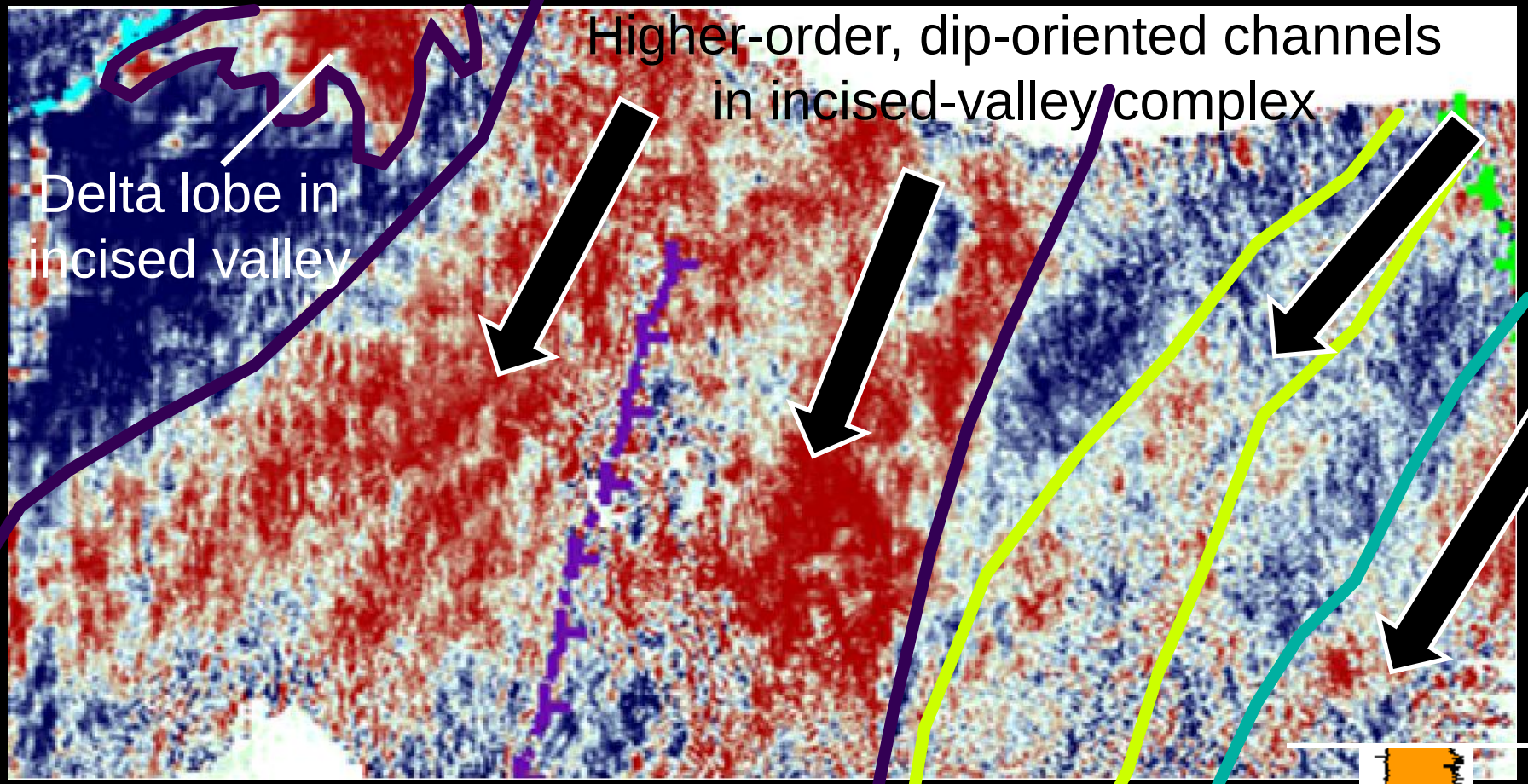
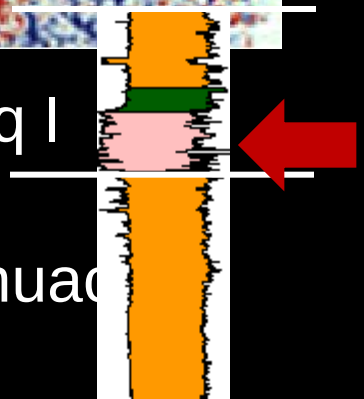


Oakville Seq. I LST Stratal Slice



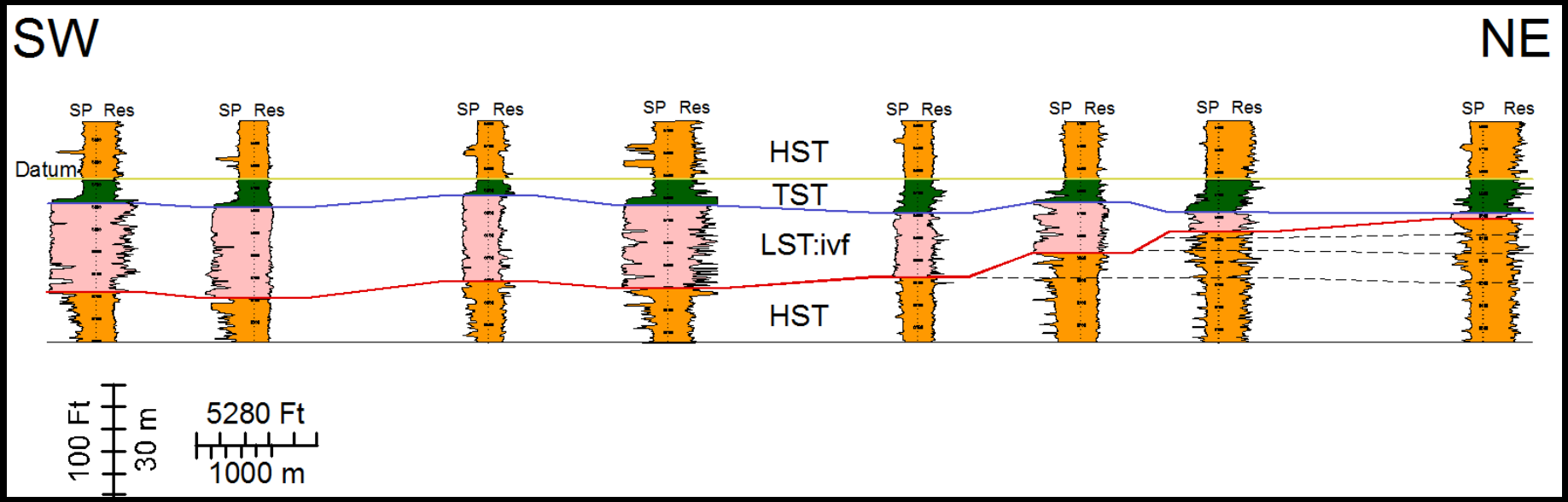
Thick — Thin



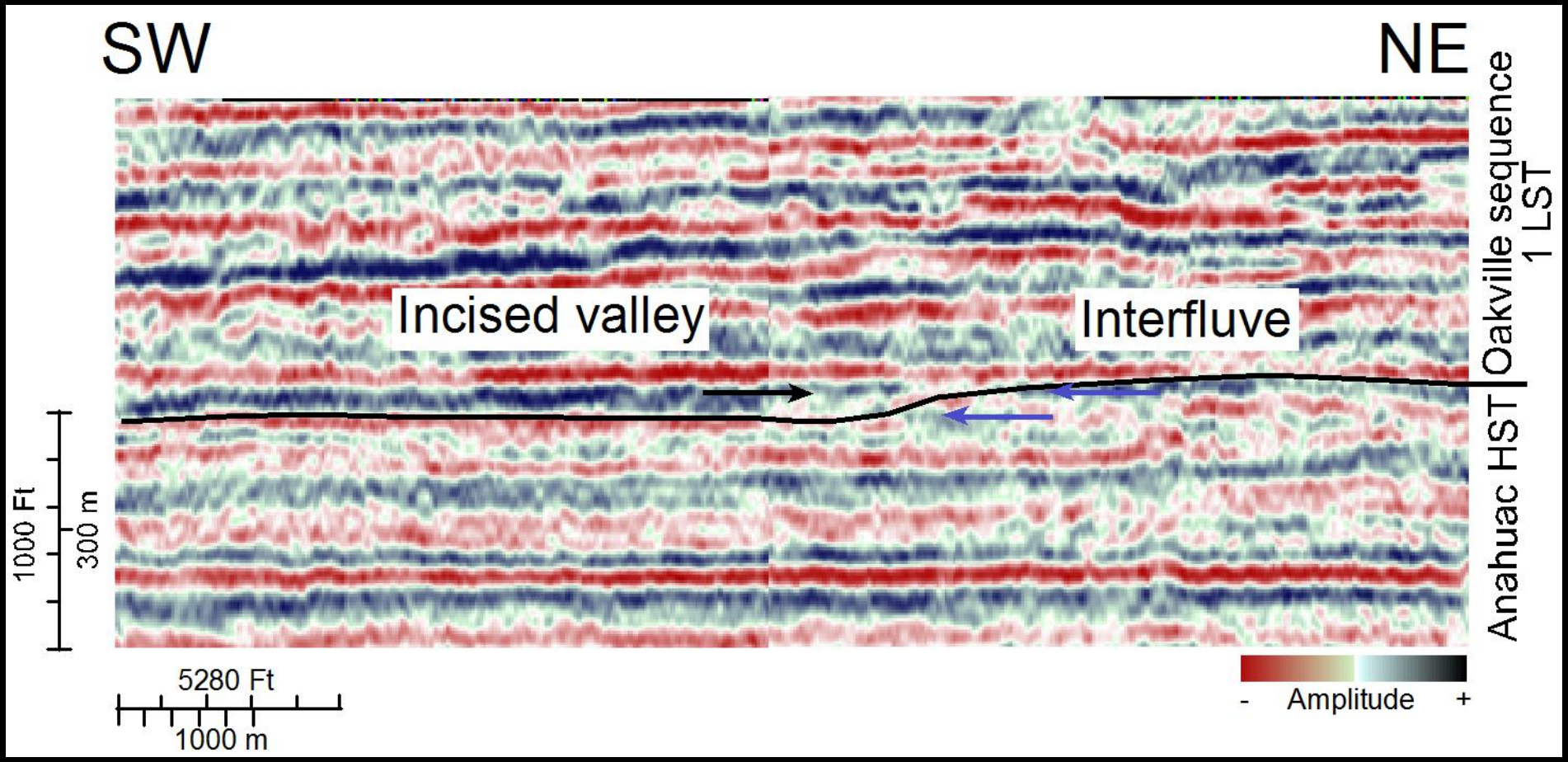
N

1 mi
1.6 km

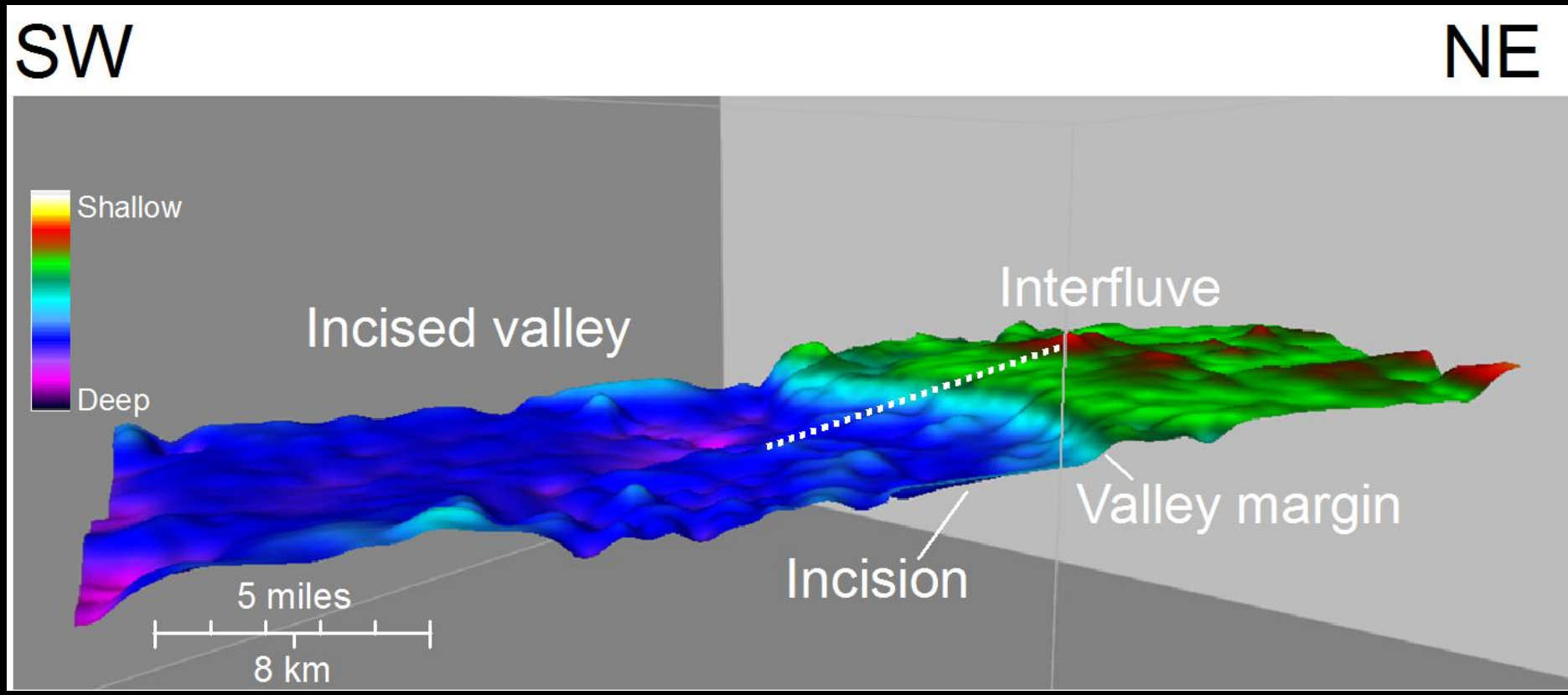
Oakville Seq. I LST X-Section of Incised-Valley Fill



Oakville Seq. I LST X-Section of Incised Valley



Oakville Seq. I LST 3D Reconstruction of Incised Valley



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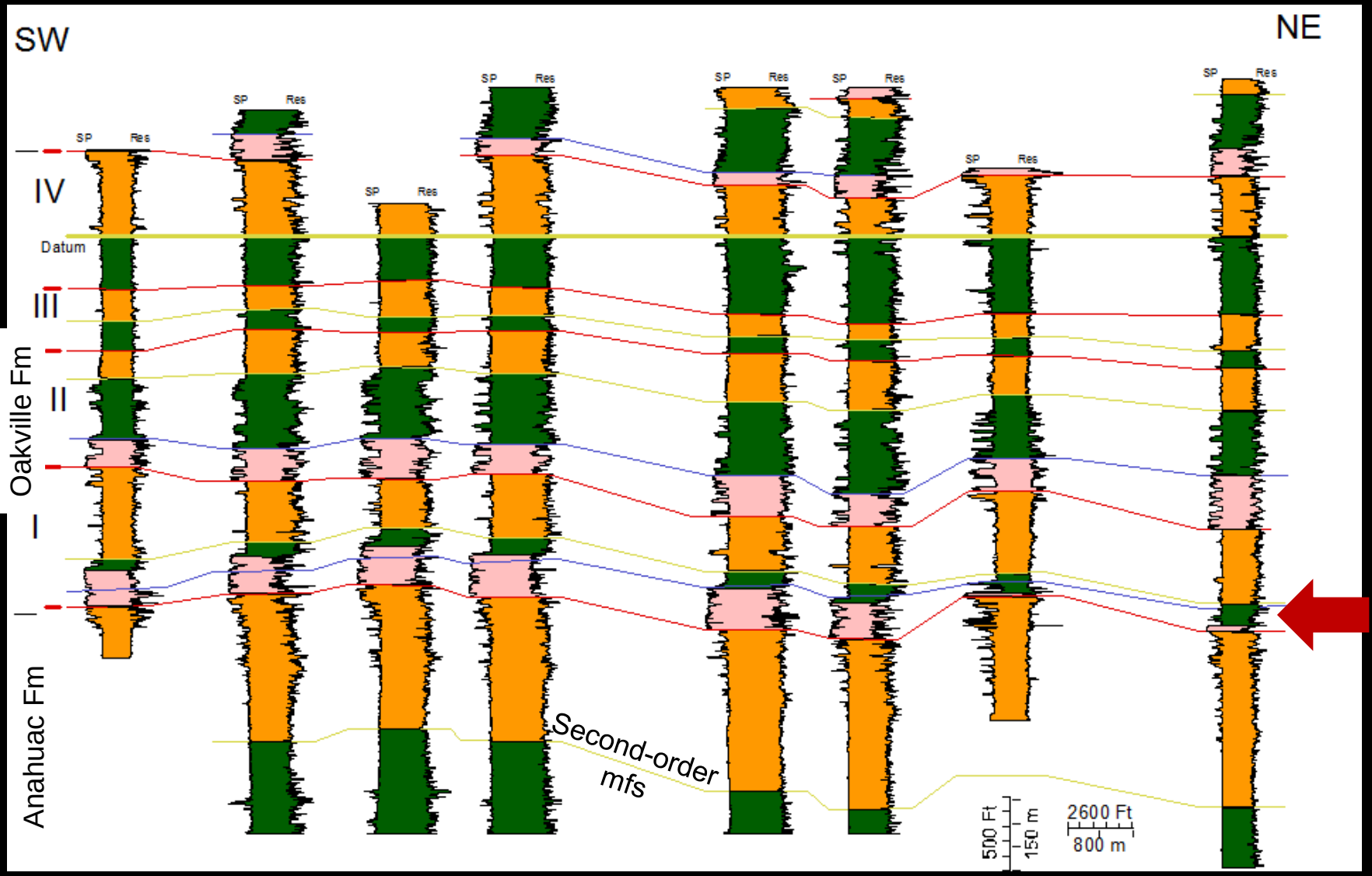
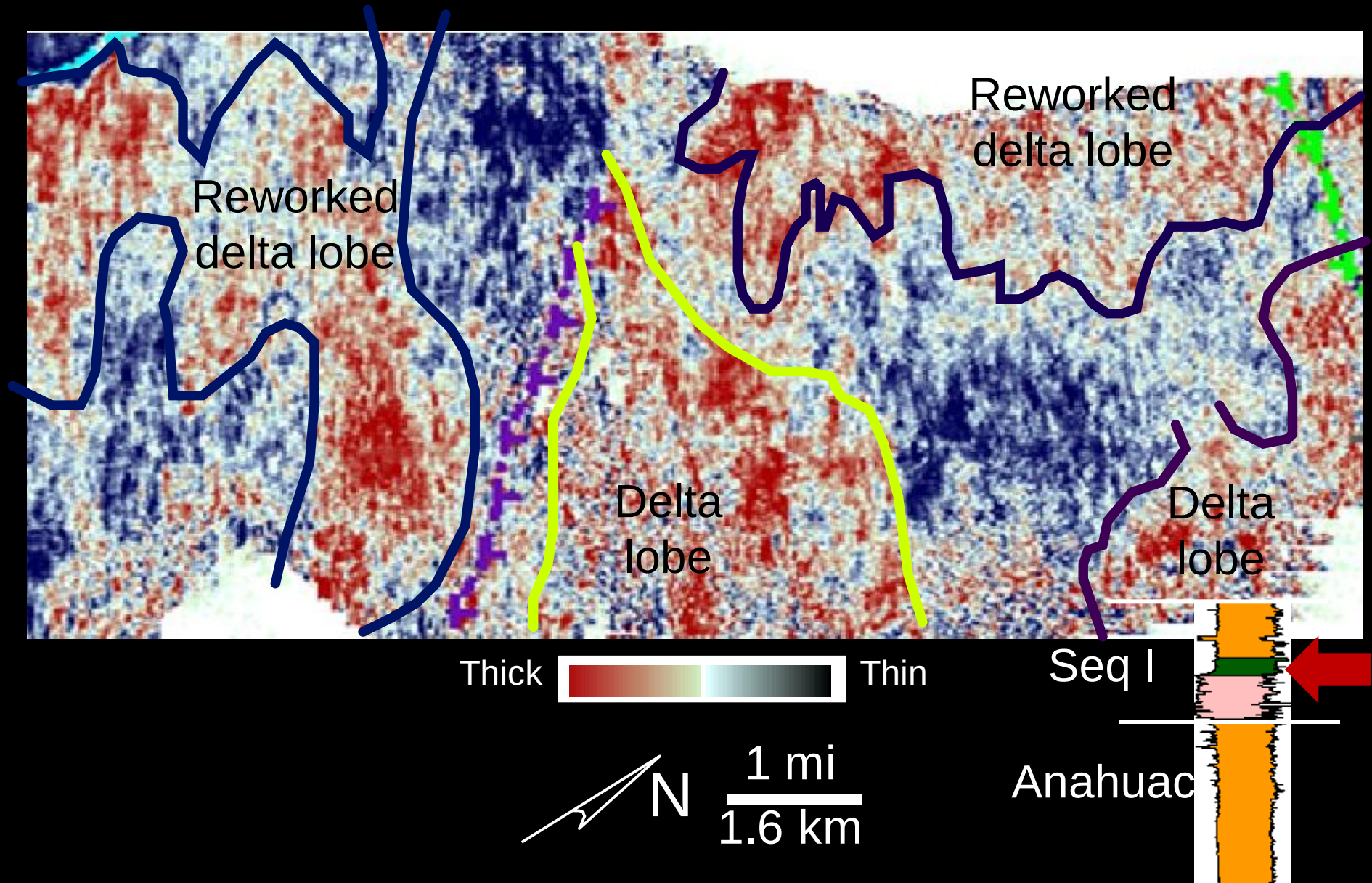


Oakville Seq. I TST Stratal Slice



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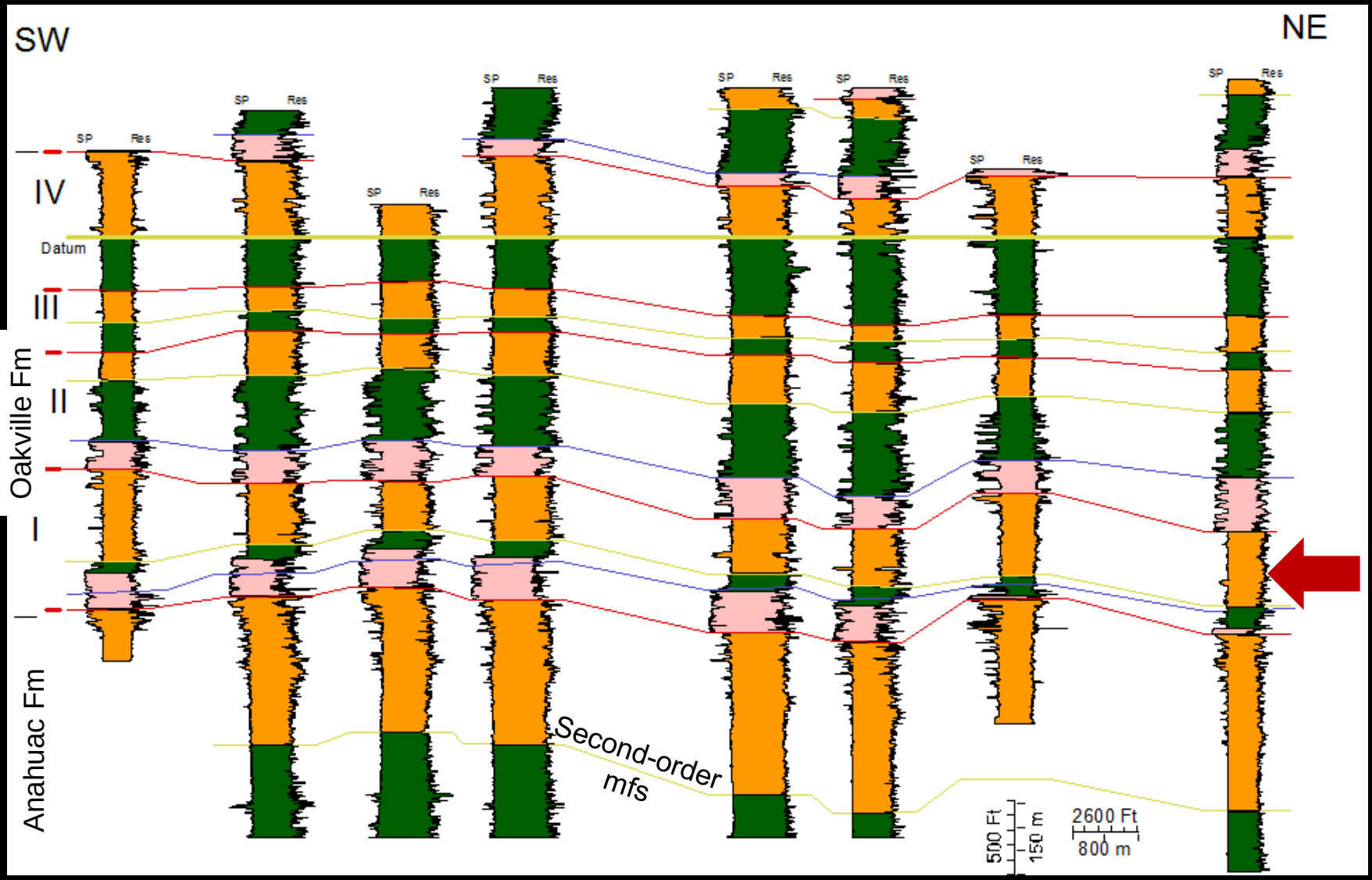
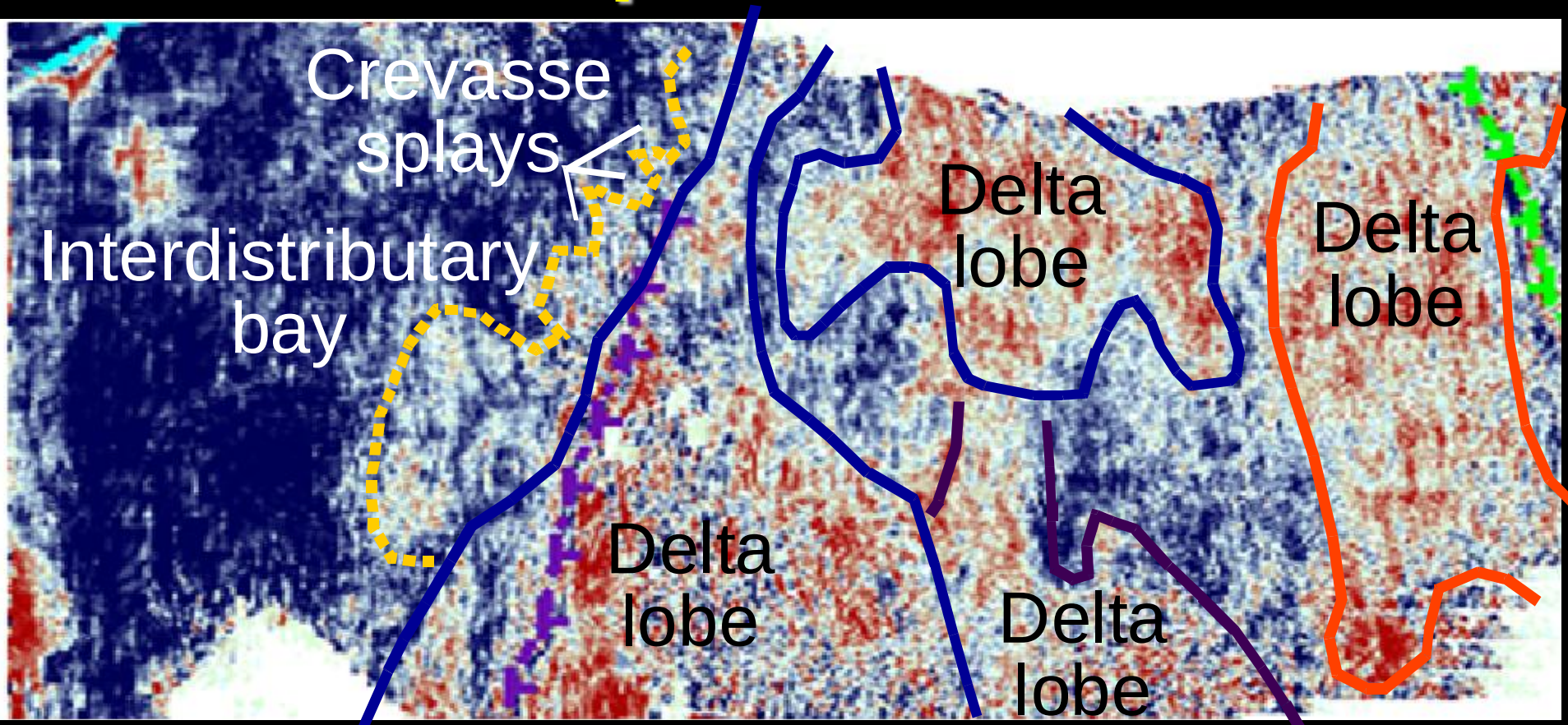


Oakville Seq. I HST Stratal Slice



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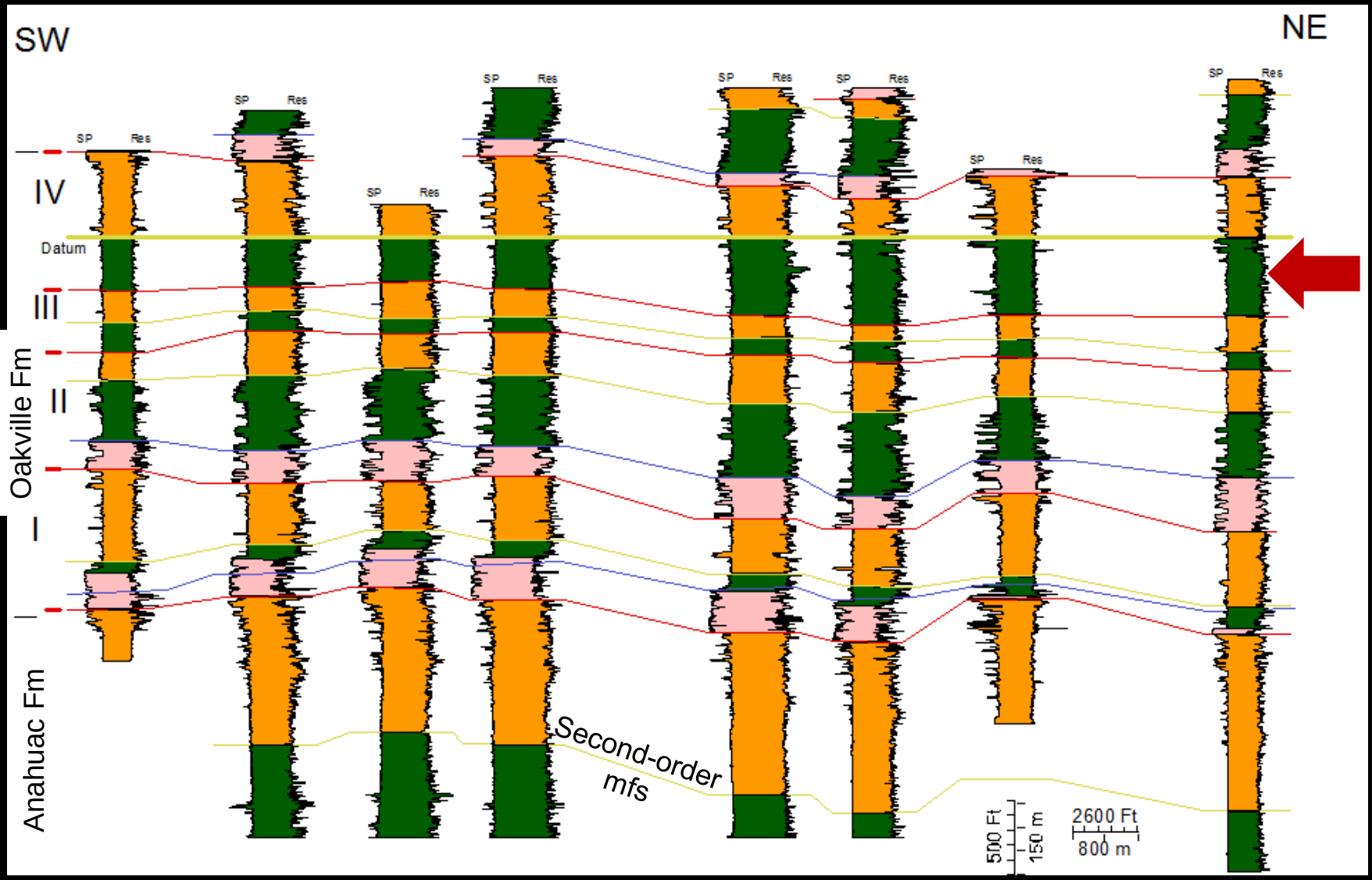
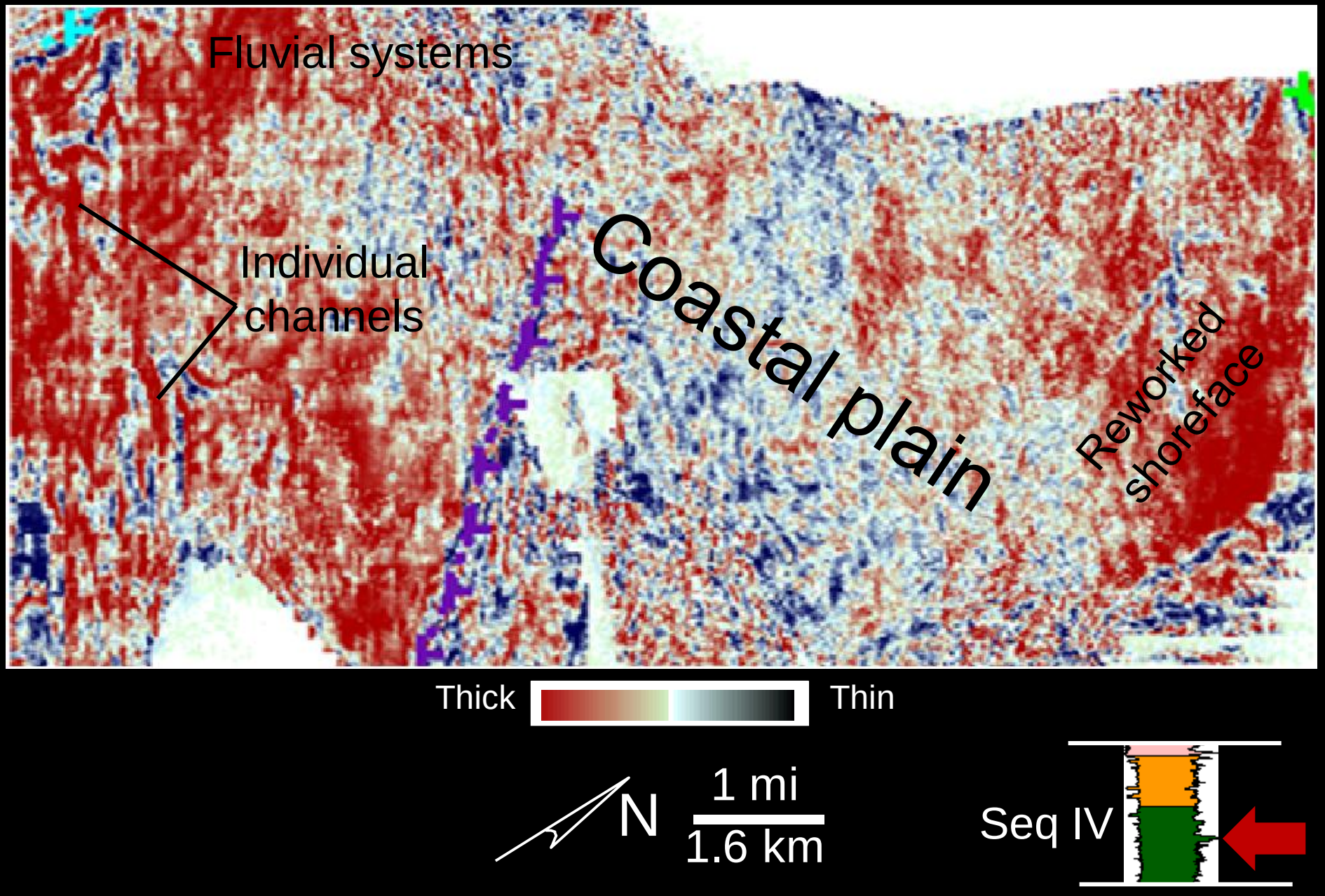
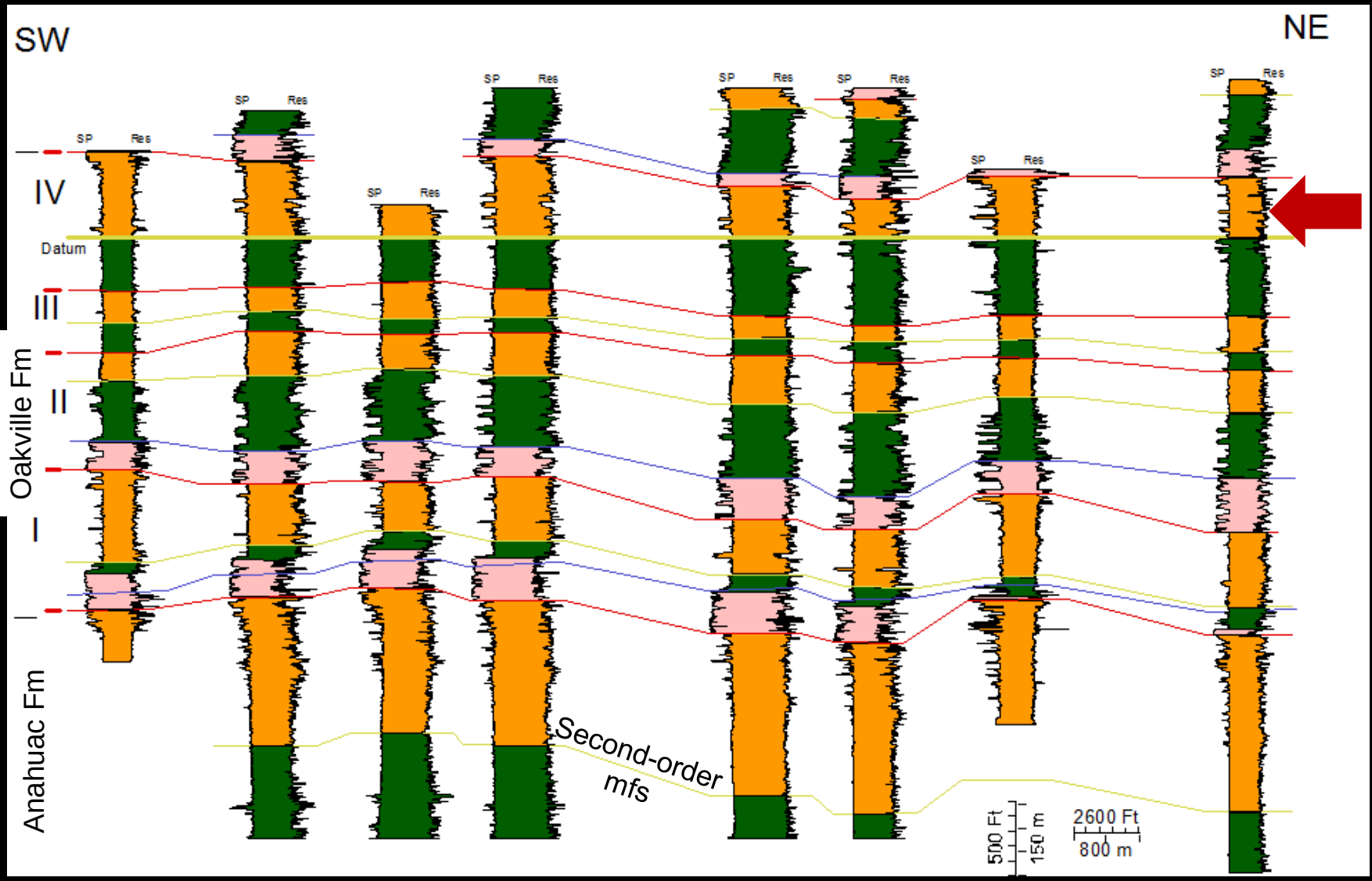


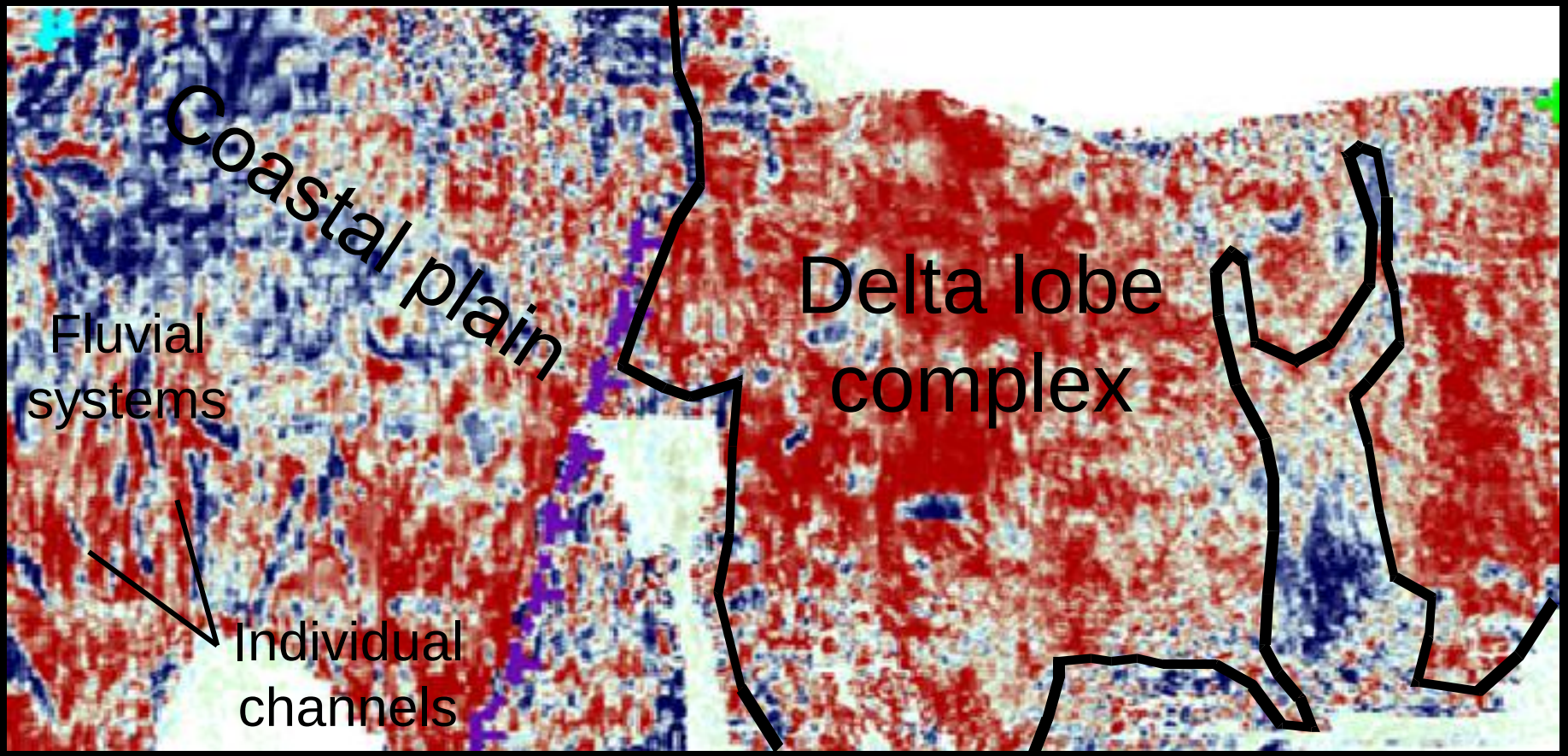
Oakville Seq. IV TST Stratal Slice



Strike Section



Oakville Seq. IV HST Stratal Slice

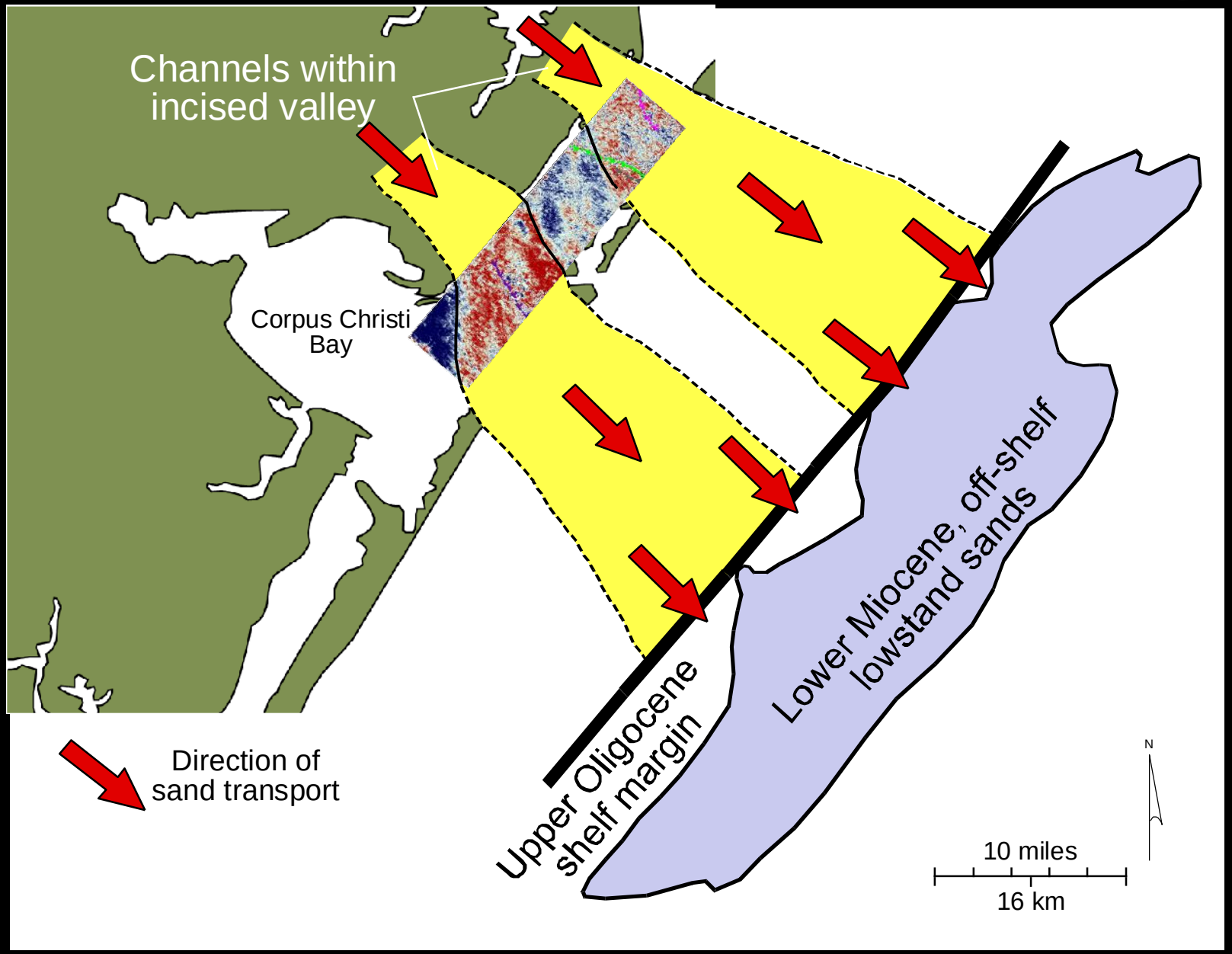


Thick — Thin

N

1 mi
1.6 km

Off-Shelf Lowstand-Sand Transport



Conclusions

- Sequence stratigraphic analysis allowed delineation of the 3D stratal architecture
- Four third-order sequences compose the Oakville Formation
- Seismic stratal slices integrated with wireline logs allow identification of general depositional systems
- Incised valleys appear to have fed deeper water sand bodies that are now reservoirs