# Reservoir Characterisation Deep-Marine Sediments Northwest, Borneo

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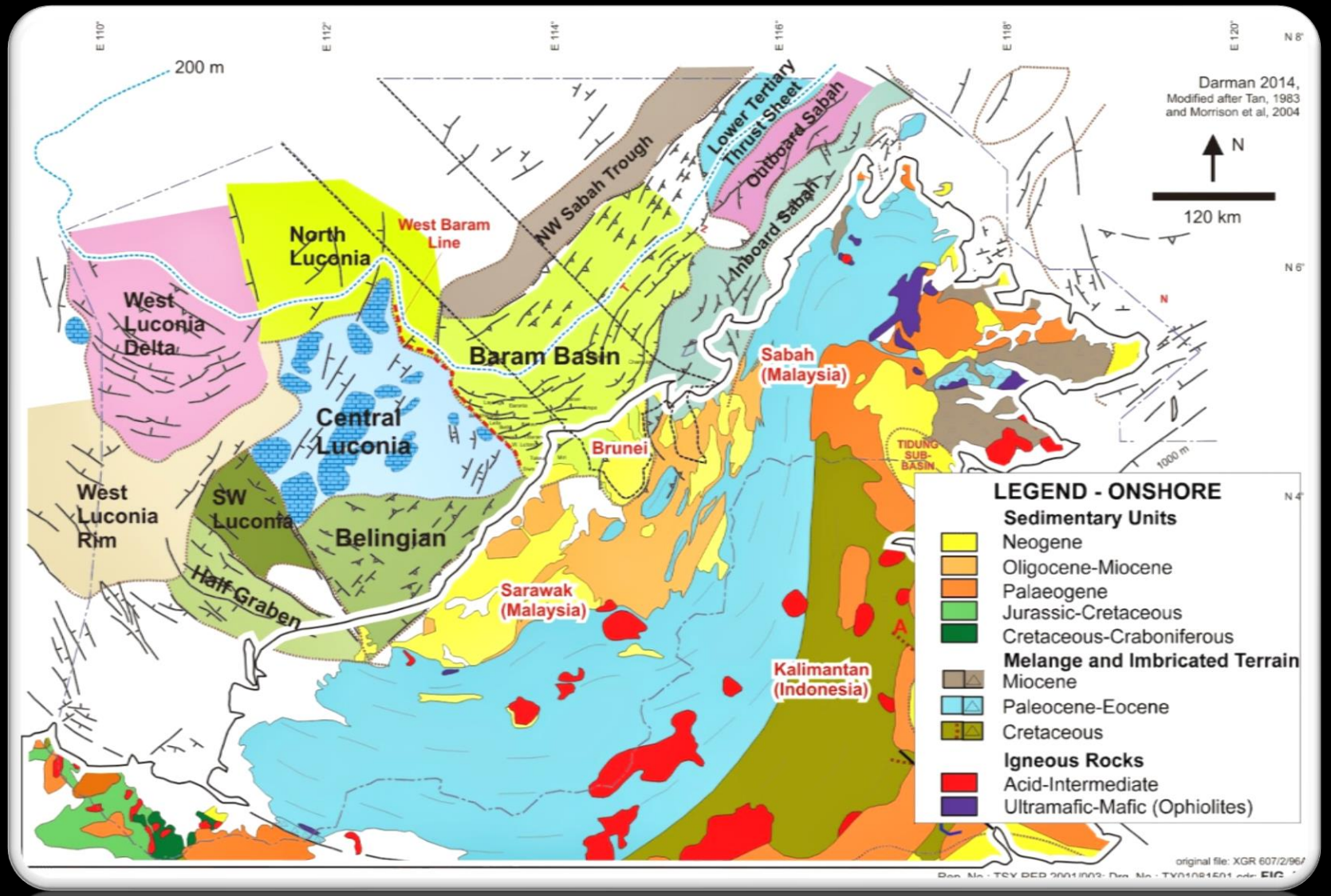
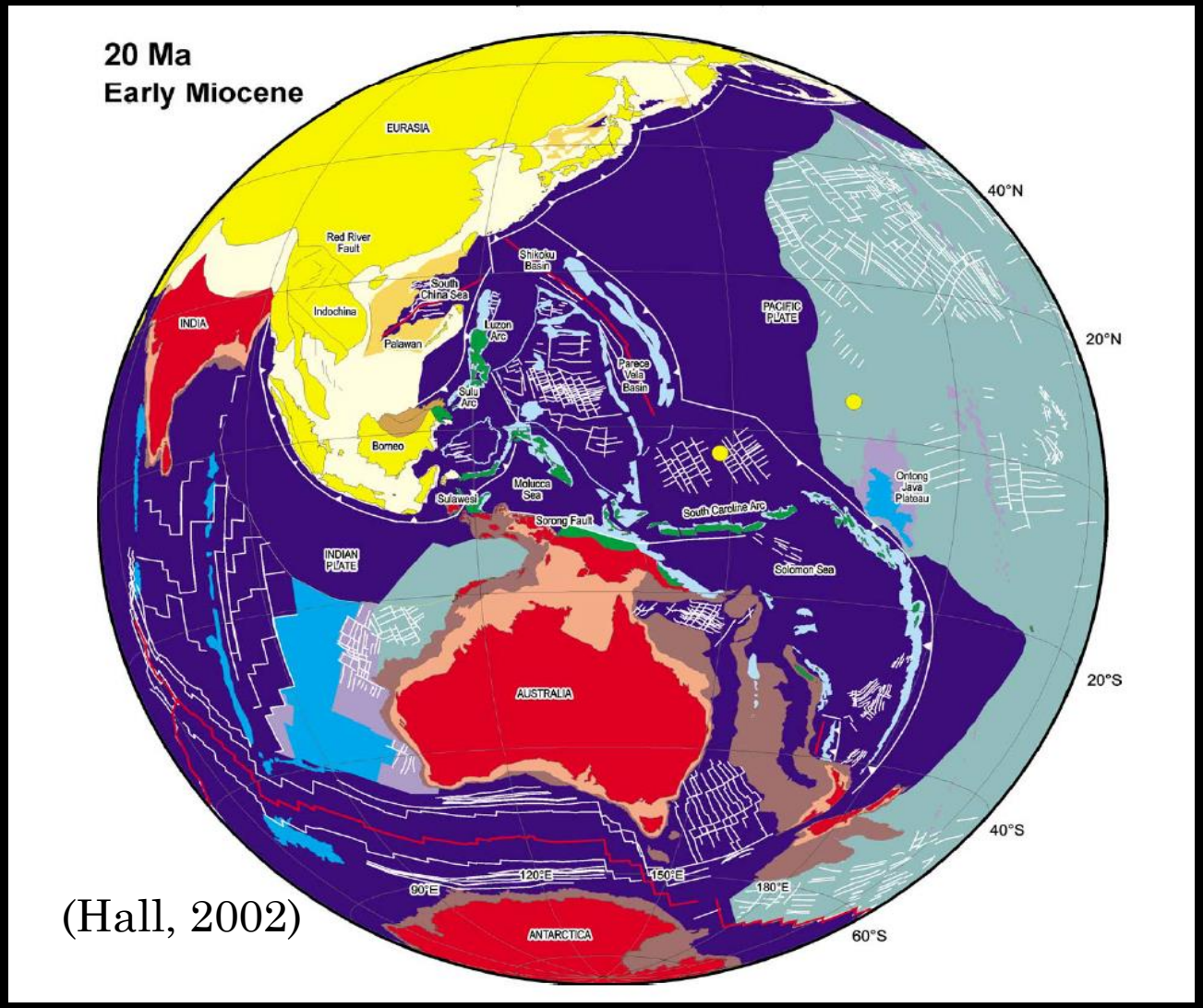
# Geological Provinces and Basins of Northwest Borneo



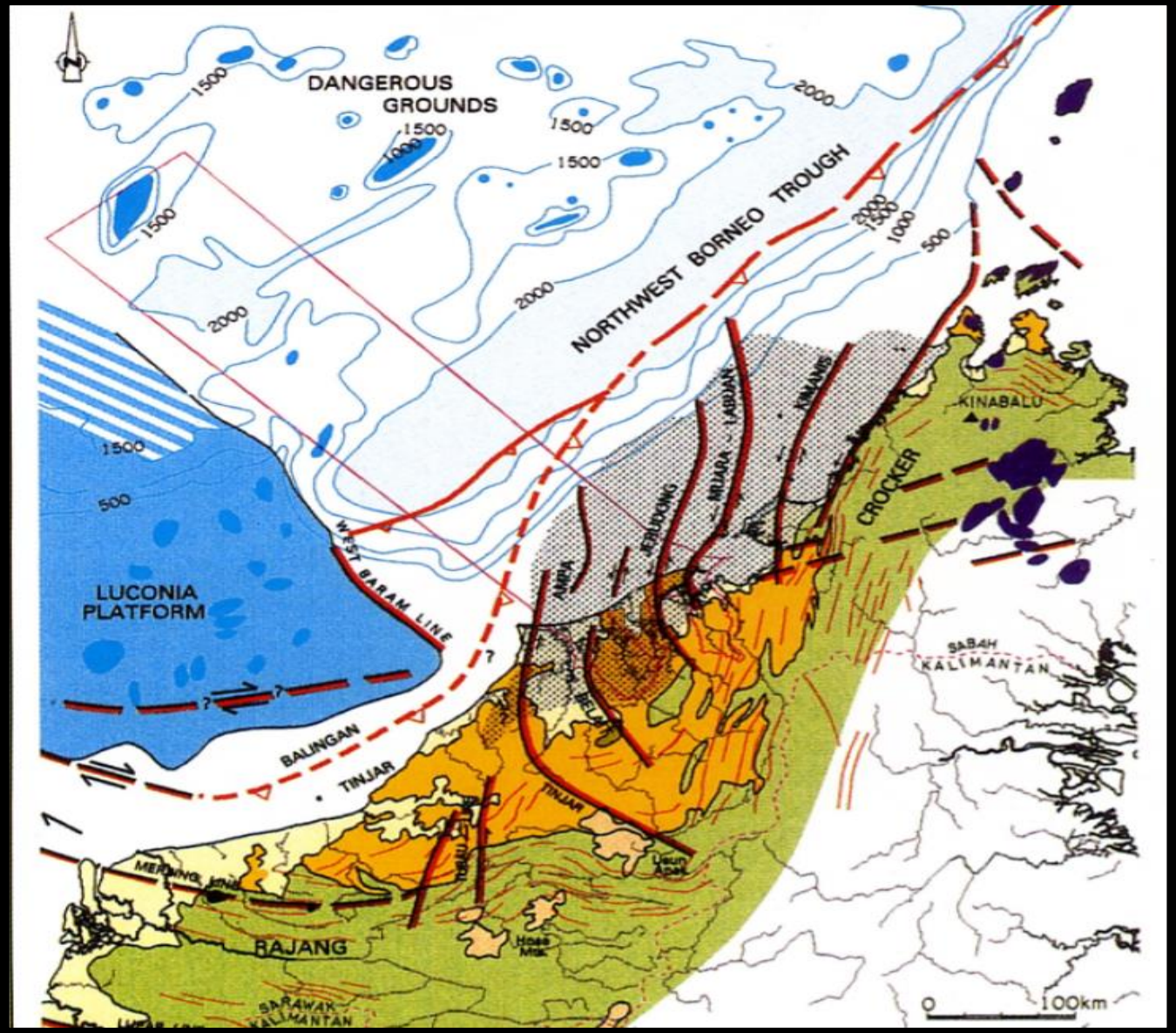
# Tectonic Setting of Borneo 20Ma




(Hall, 2002)

Key feature is a subduction zone along the NW Borneo Trough forming The Crocker-Rajang Range

# Geological Setting

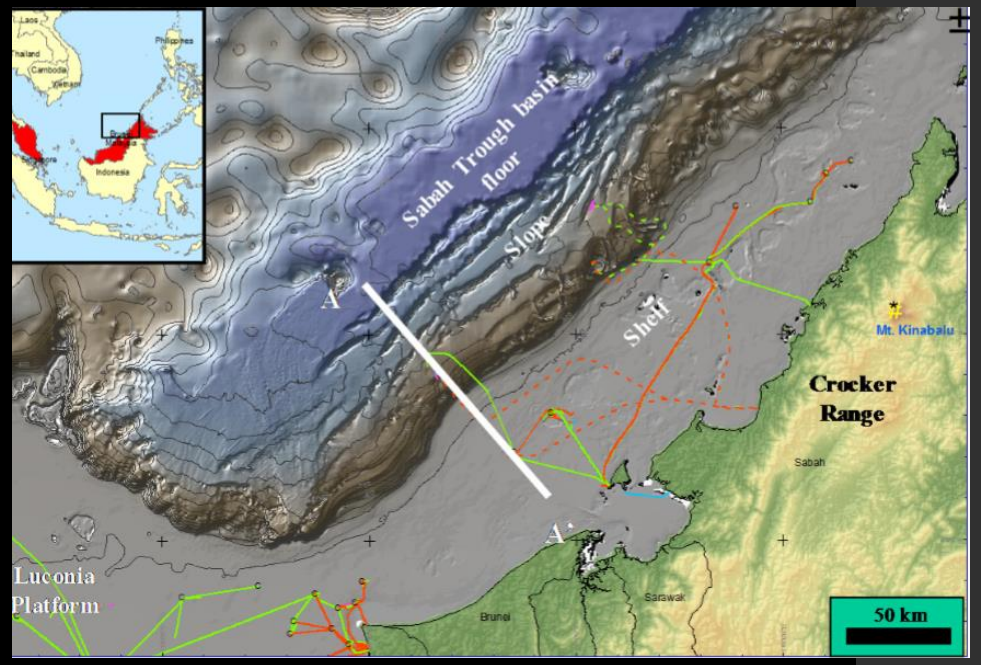


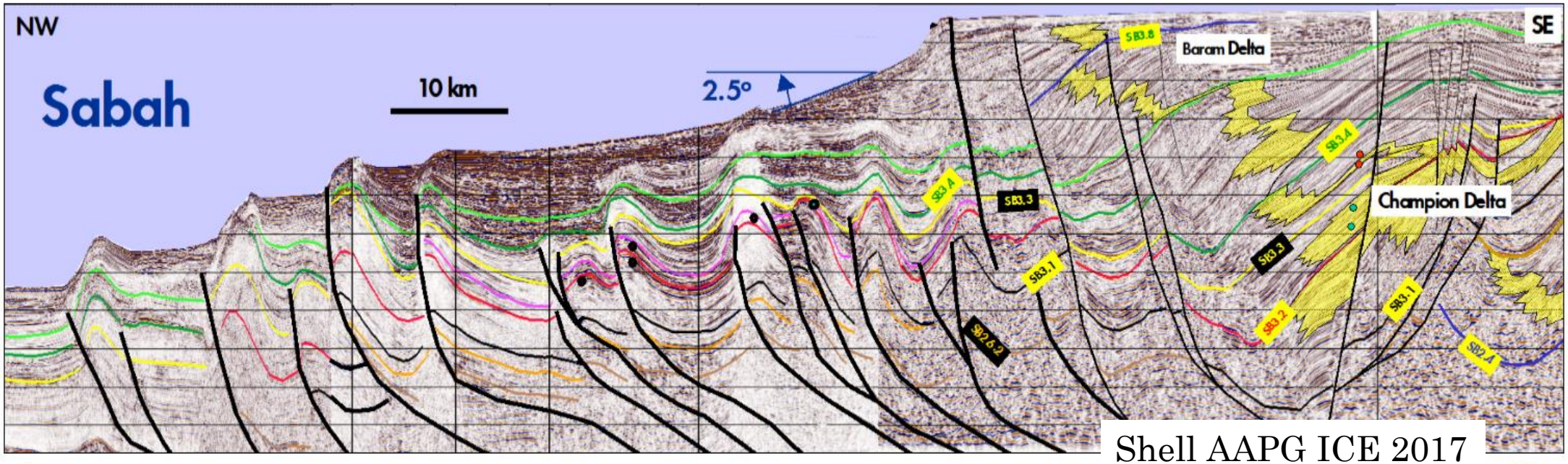

Regional Setting of Brunei Darussalam. The Crocker-Rajang mountain range 1000 x 500km provides vast amounts of sediment to the Neogene Delta Systems

(Schreurs, 1997)

# Structural Cross-Sections

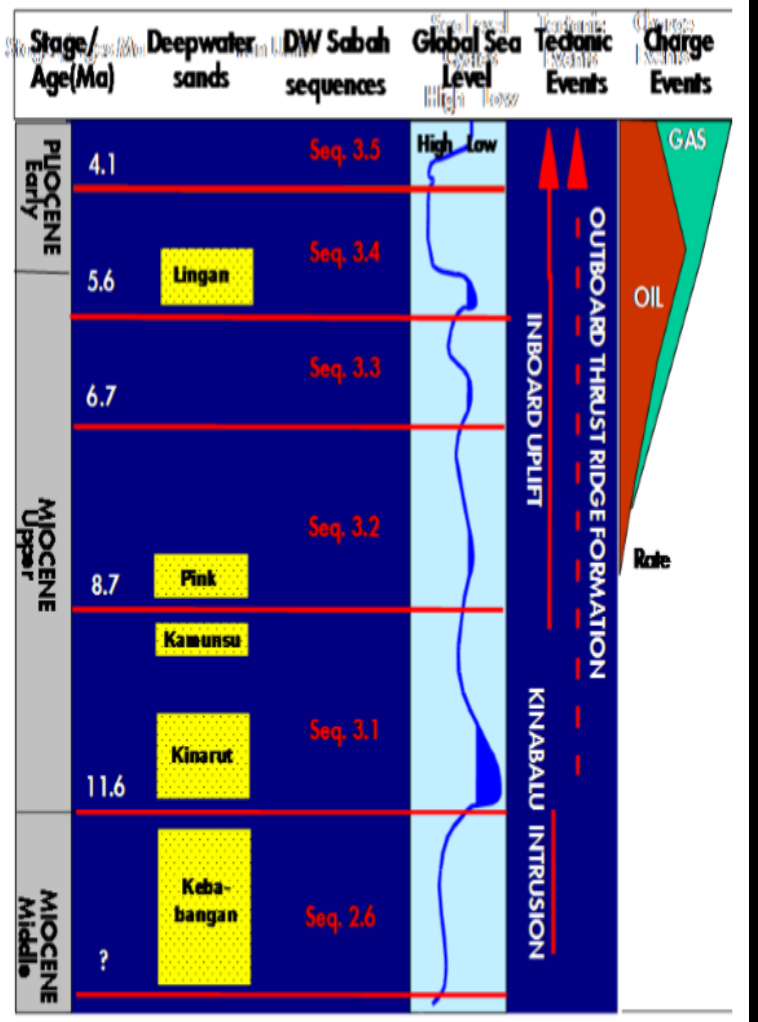
The bathymetric profile offshore Brunei is best described as a “stepped slope” characterized by elongate, structurally controlled mini-basins.

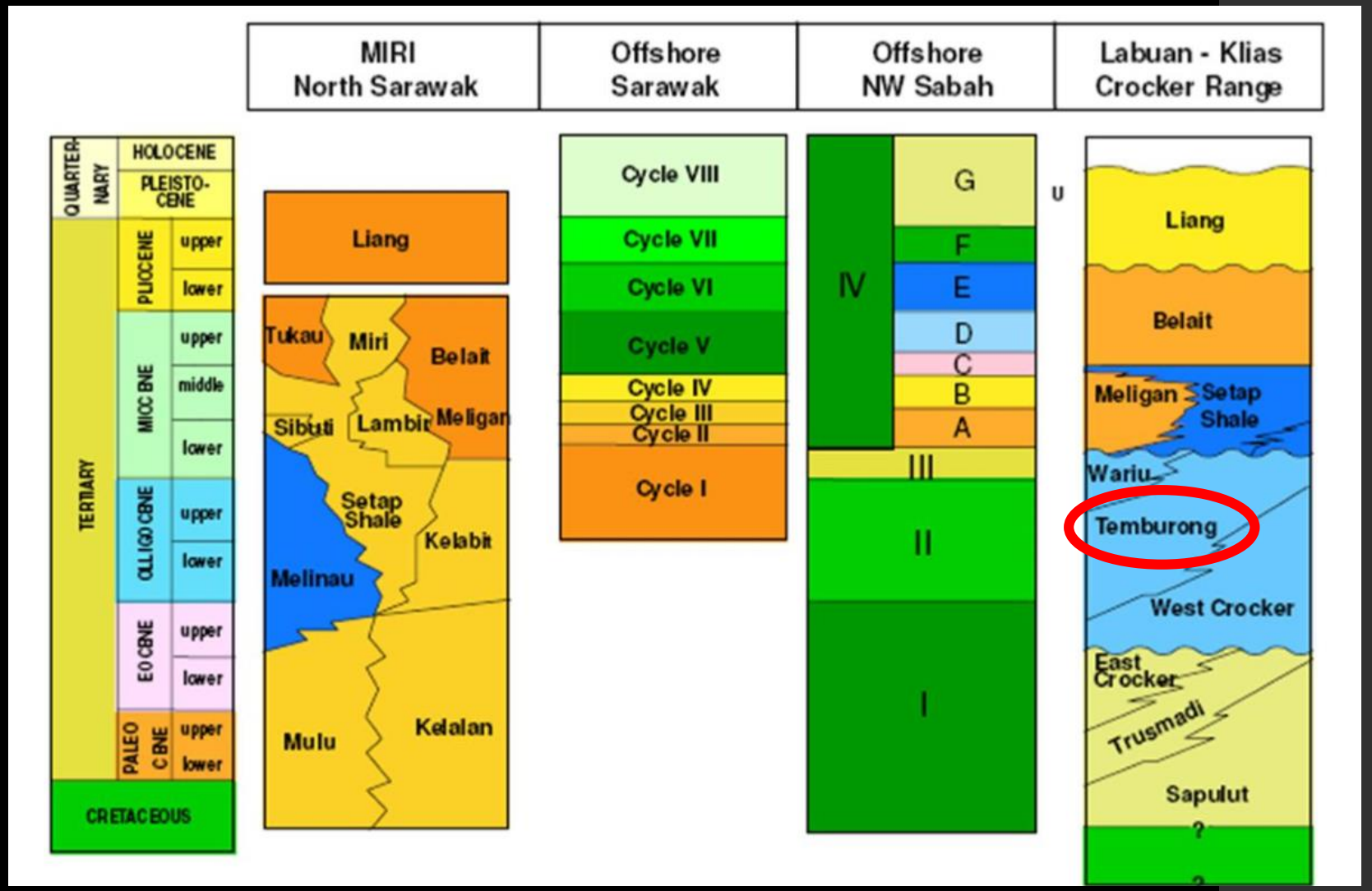



Shell AAPG ICE 2017

# Stratigraphy



# Temburong Formtion Outcrop Tg Punai, Labuan

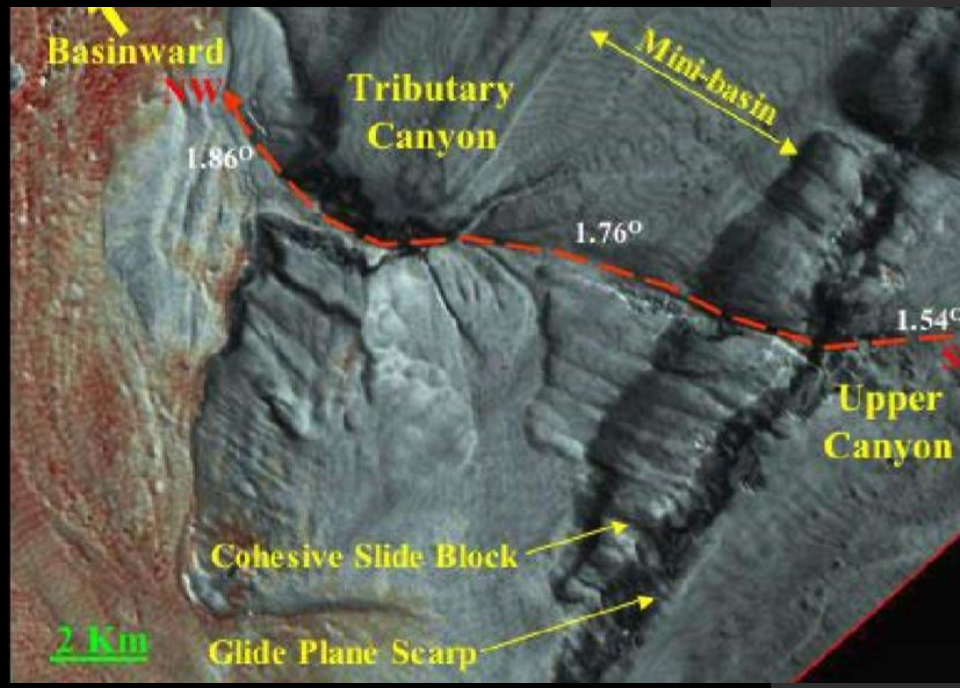
# Depositional Flow Elements of NW Borneo

1) Submarine canyons

2) Sediment dispersal fairways and slope channel systems which include straight erosional channels and sinuous leveed channels,

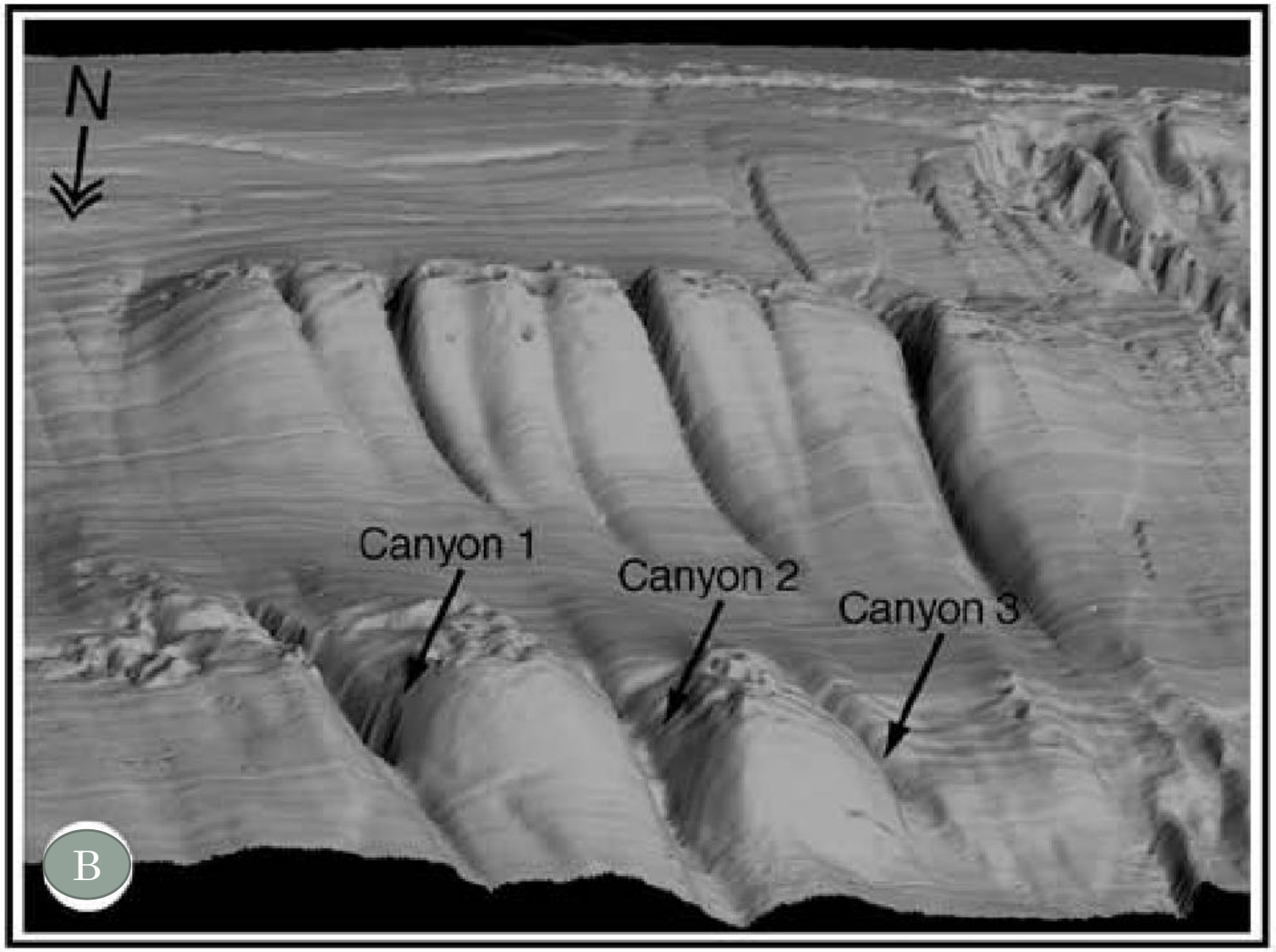
3)Distributary channel/lobe complexes, and

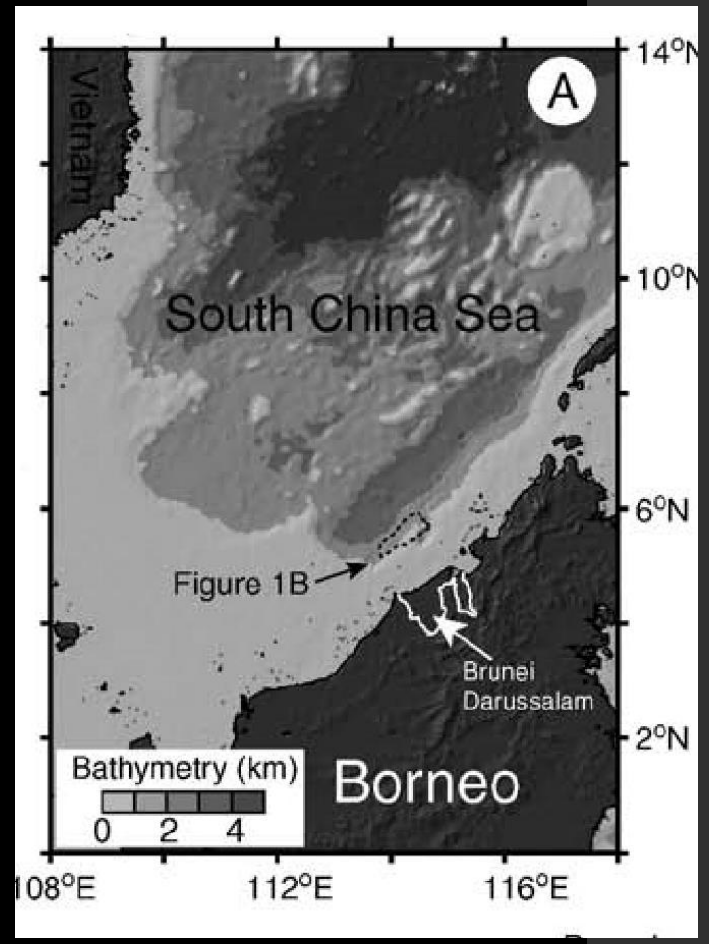
4) Local cohesive slump complexes up to large scale mass transport complexes




McGilvery & Cook, 2004

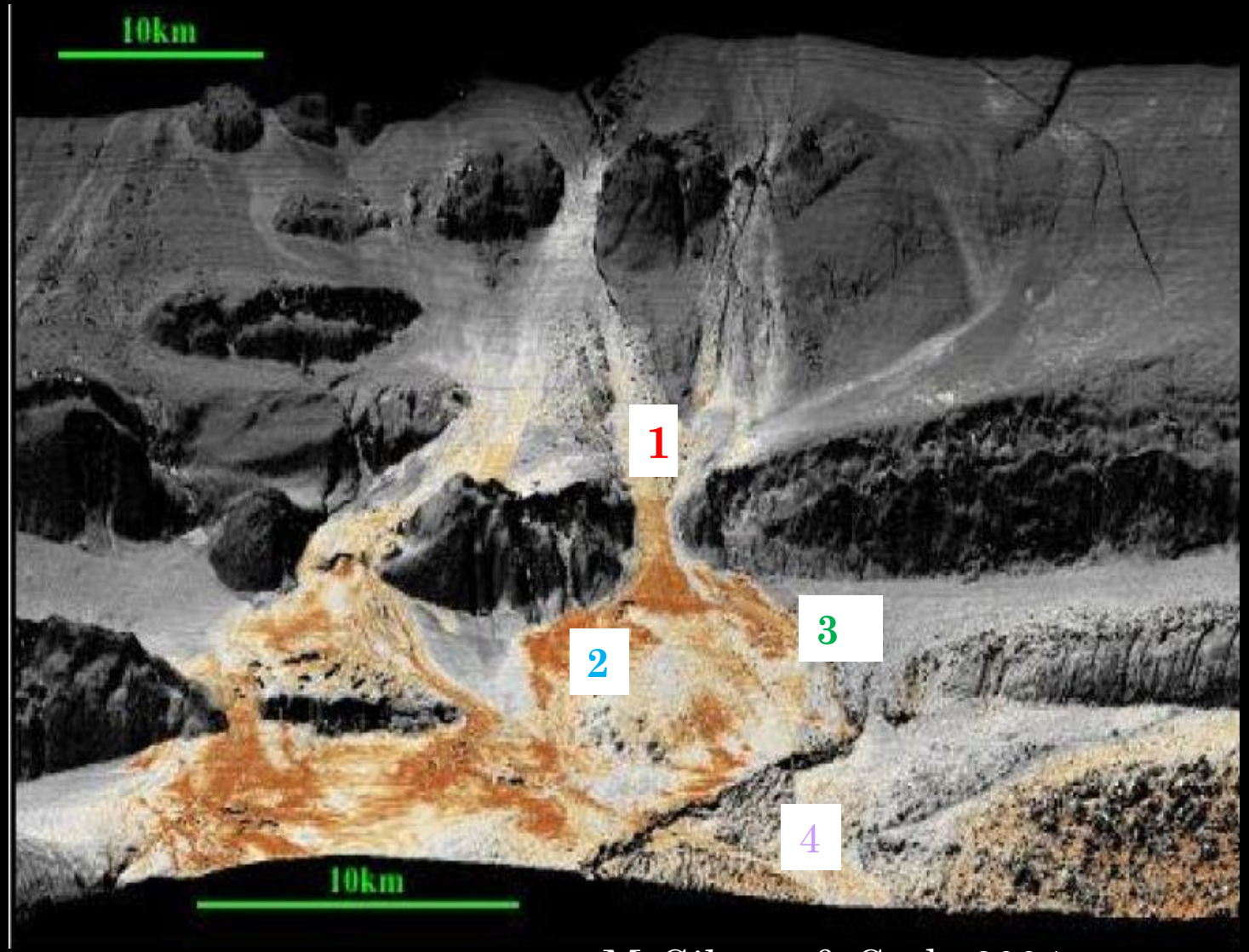
# Submarine Canyon Topography




Kyle & Mohrig, 2009

# Sediment Dispersal and Lobes– offshore Brunei




McGilvery & Cook, 2004

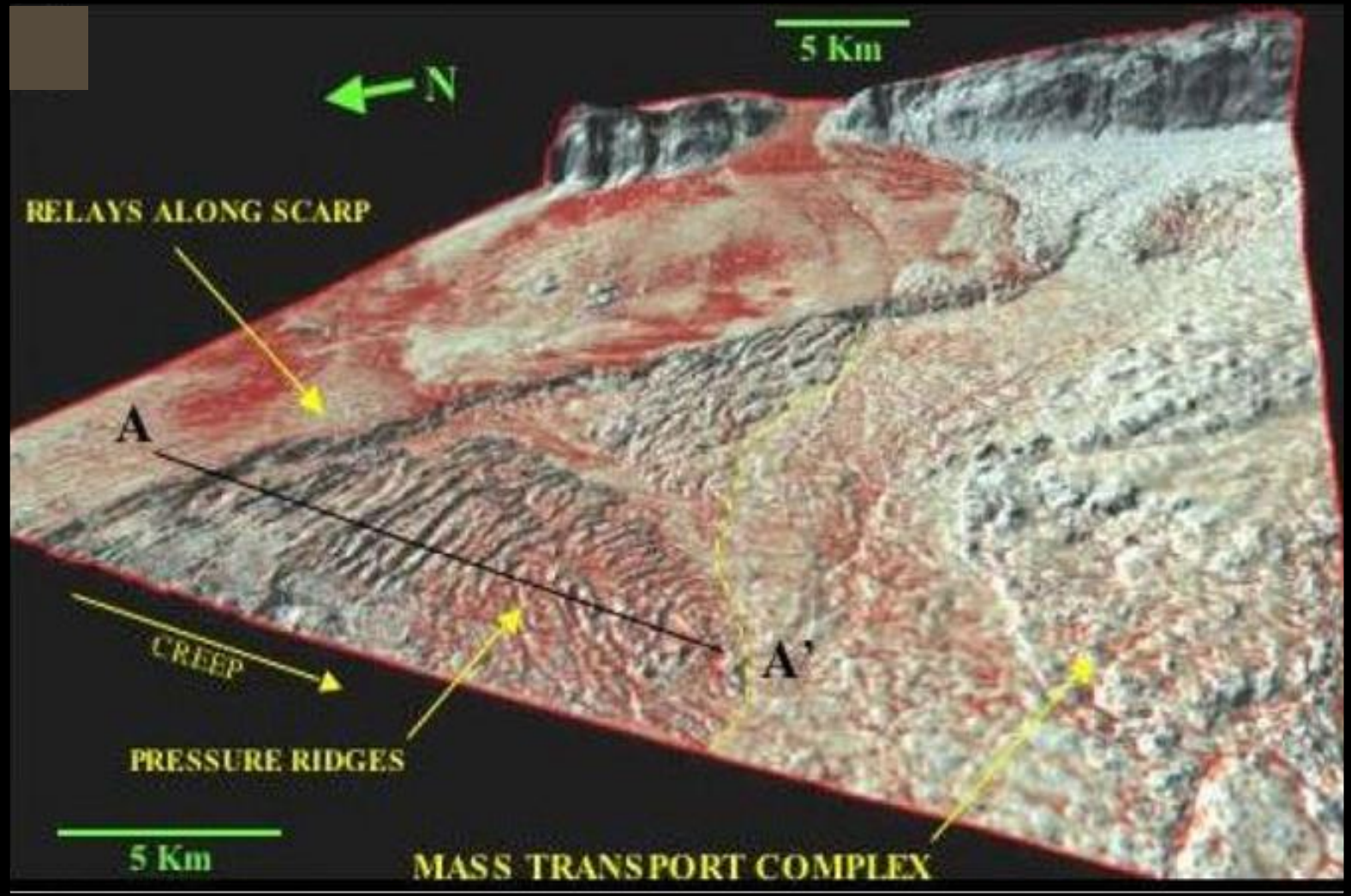
(1) Incised canyon, with by-pass fill, shale clast rich sediments

(2) Depositional fan, amalgamated sand-rich sandstones

(3) Thin bedded intercalated sandstone and mudstones

4) Chaotic Megabeds, shale rich, often sheared, some injectite sandstones

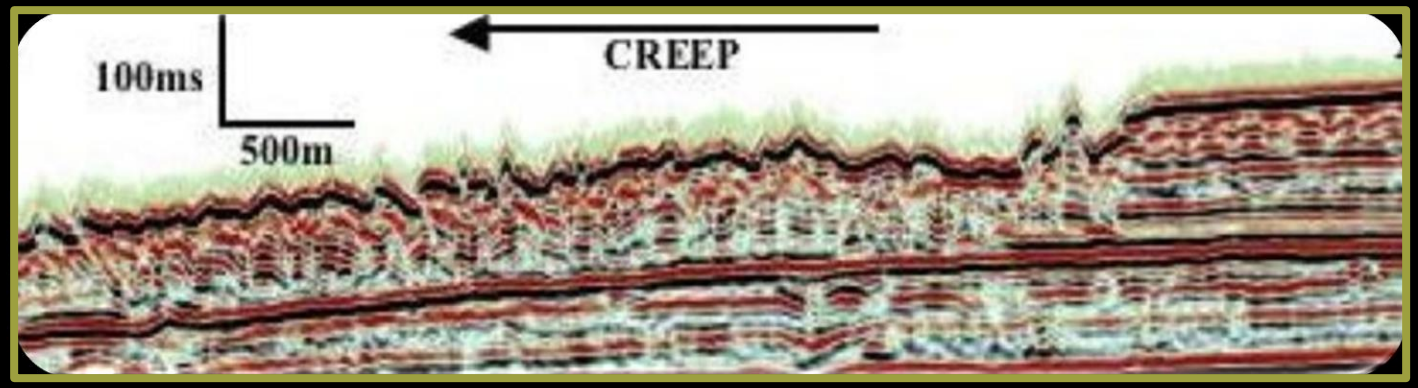
# Mega Slumping - offshore Brunei



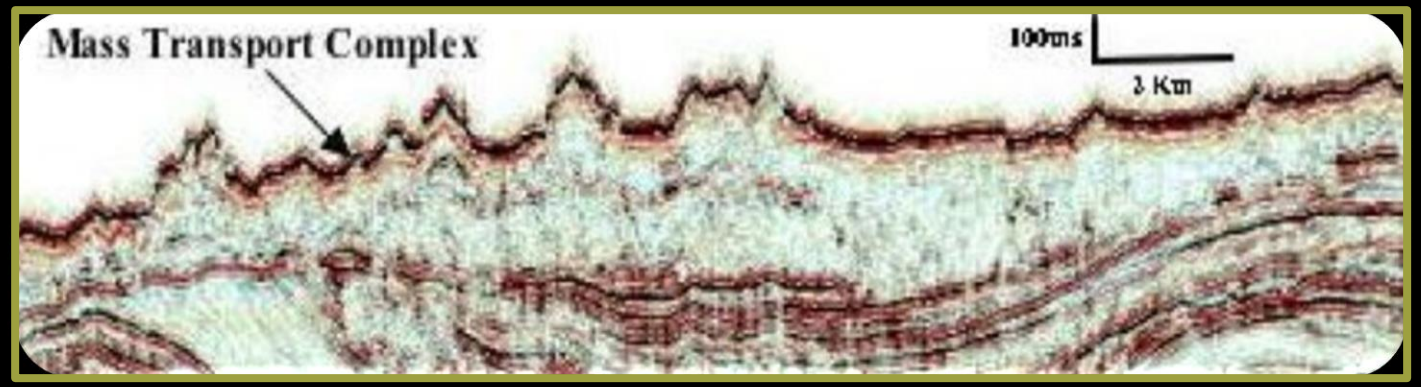

3D perspective of a cohesive slump, off shore Brunei. Pressure ridges are observed perpendicular to the direction of creep. (McGilvery & Cook, 2004)

# Seismic Characterists of Slumping– Offshore Brunei

A) Coherent surfces indicating shear surfaces




B) Irregular upper surface, faint, chaotic surfaces

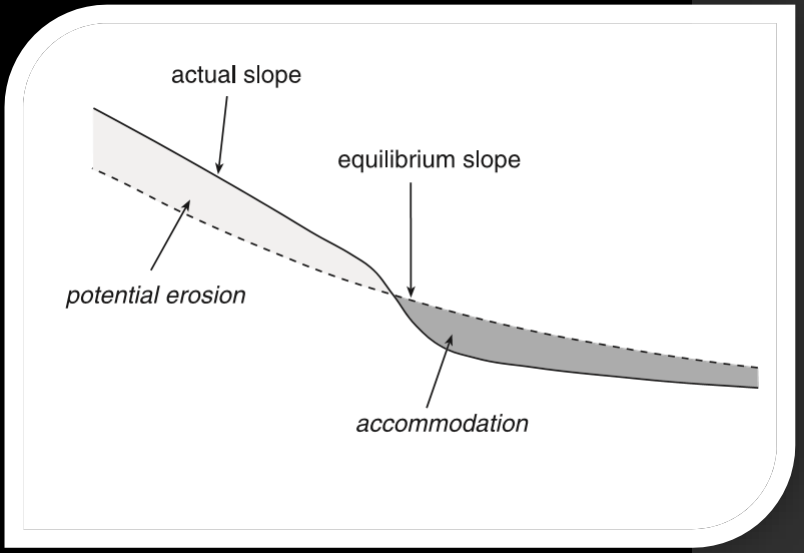



Example from McGilvery & Cook, 2004

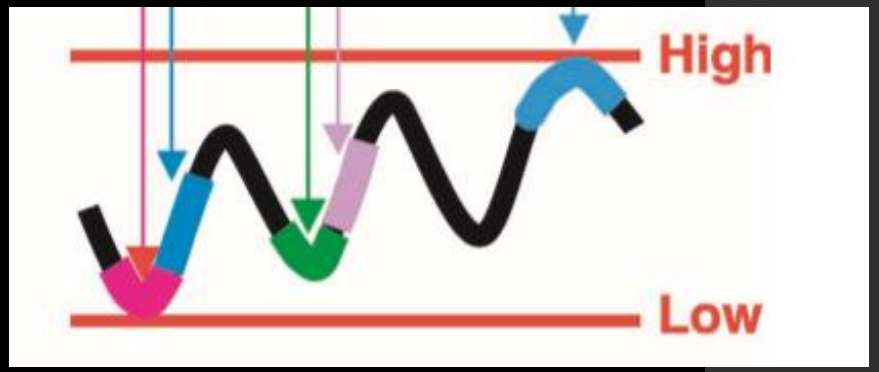
# Seafloor Sediment Transport

Sea Floor Topography

Slope Equilibrium



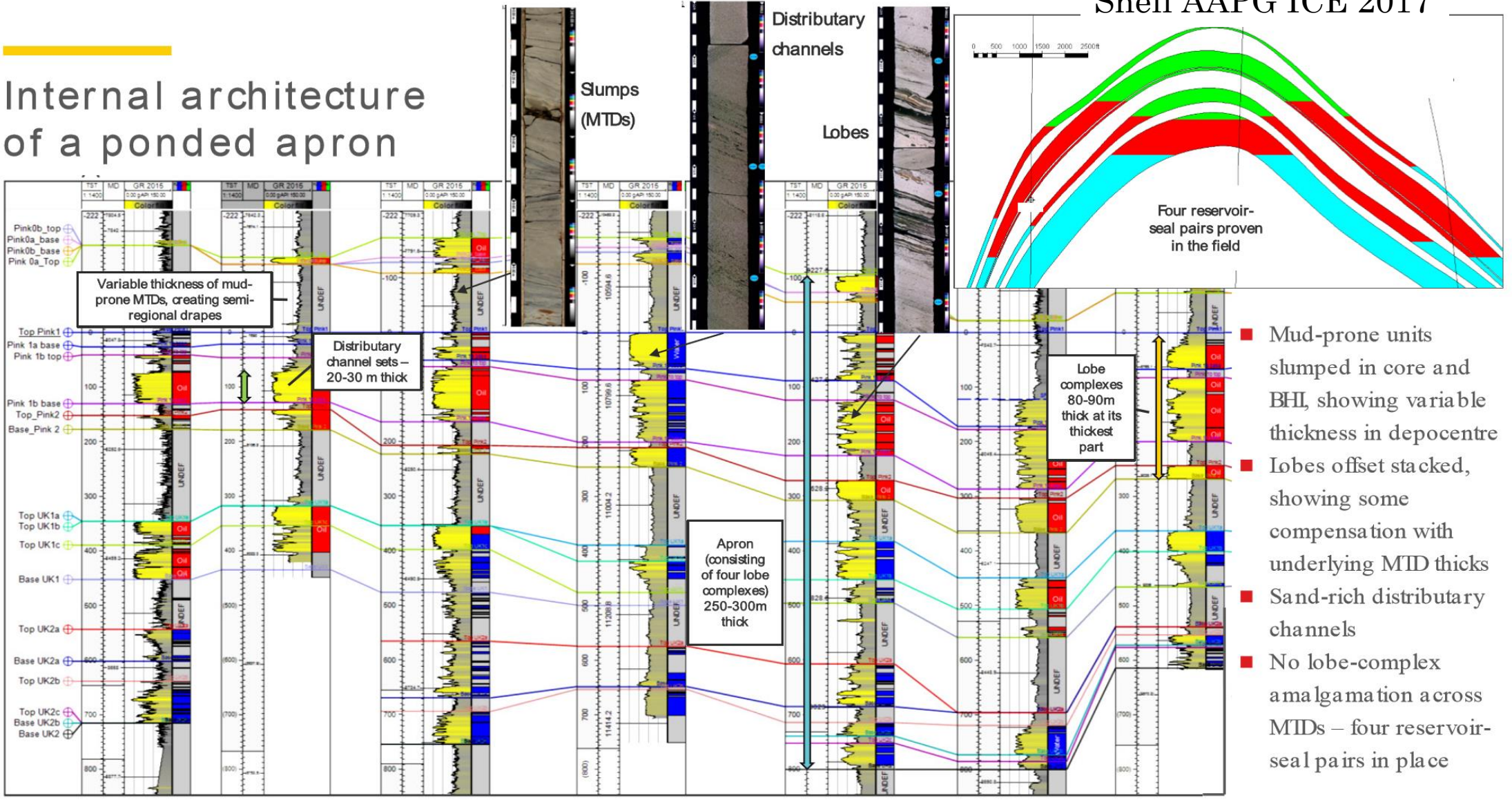

4th & 5th Order Sea Level Change



# Stacked Sandstone– offshore Sabah

Shell AAPG ICE 2017

## Internal architecture of a ponded apron

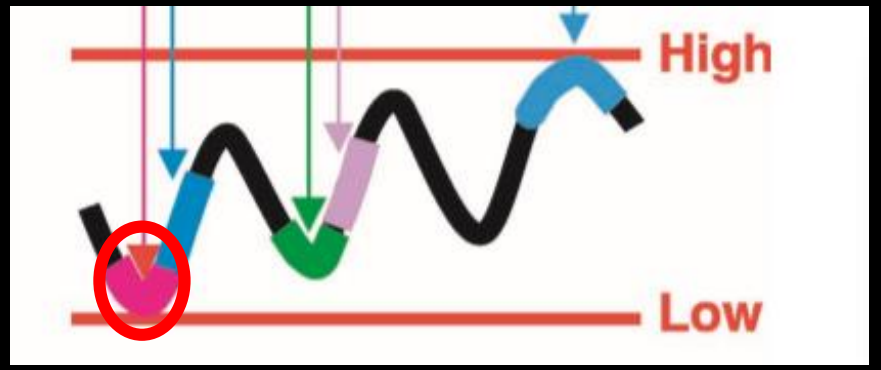


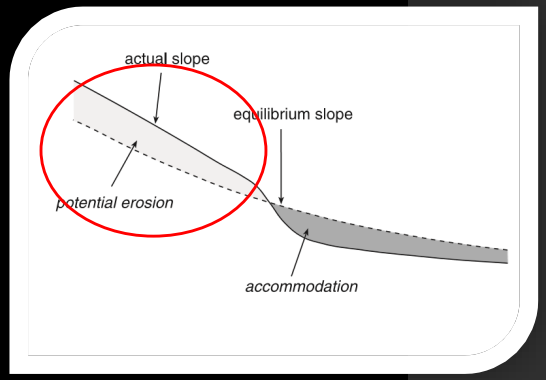


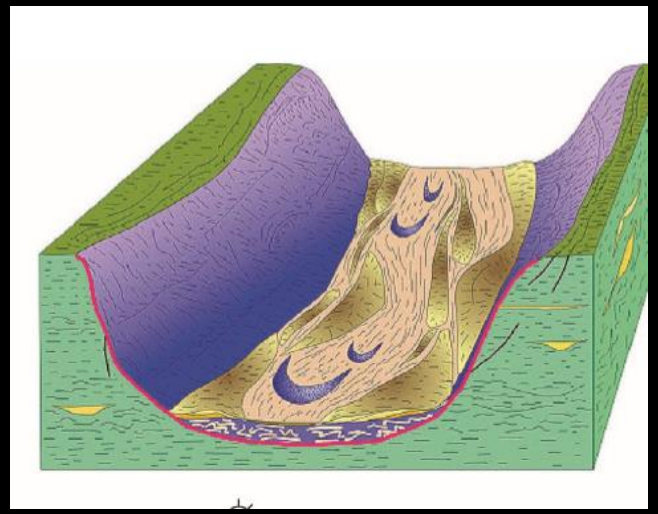


- Mud-prone units slumped in core and BHI, showing variable thickness in depocentre
- Lobes offset stacked, showing some compensation with underlying MTD thicks
- Sand-rich distributary channels
- No lobe-complex amalgamation across MTDs – four reservoir-seal pairs in place

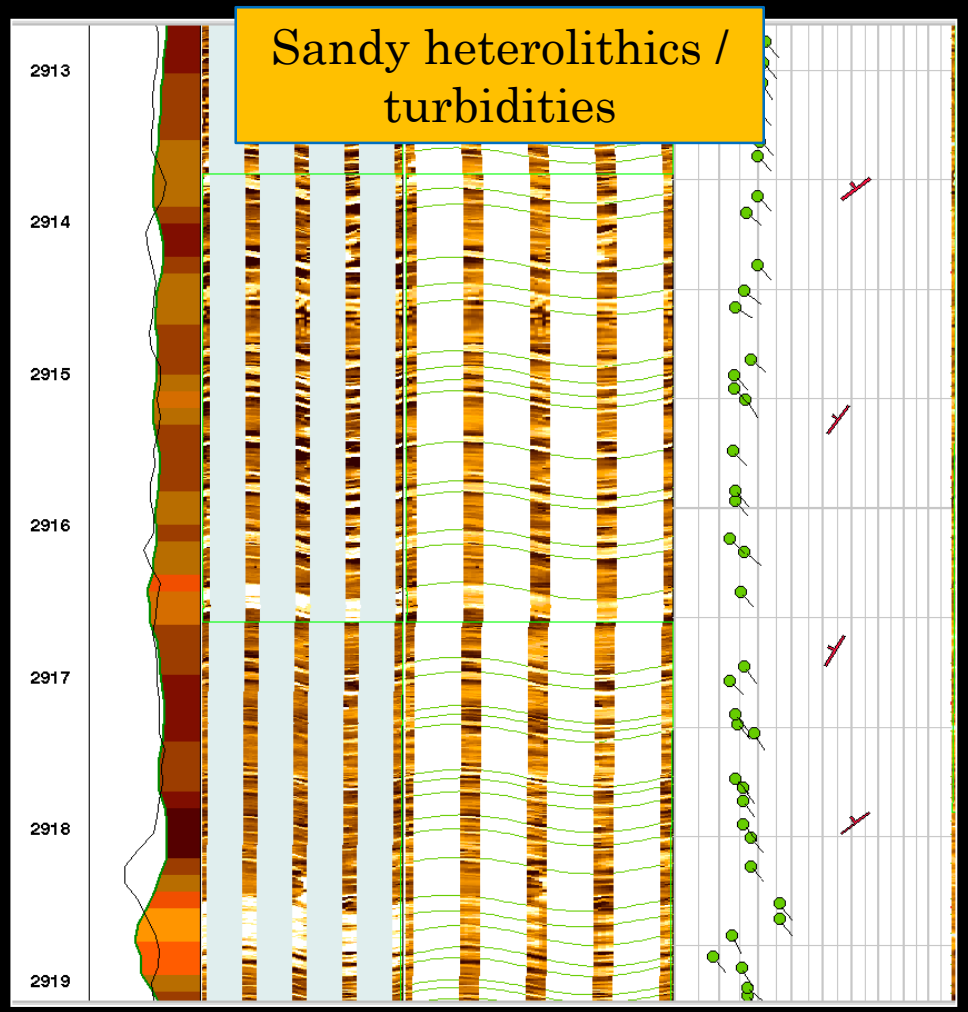
# Initial Channel and Slumping

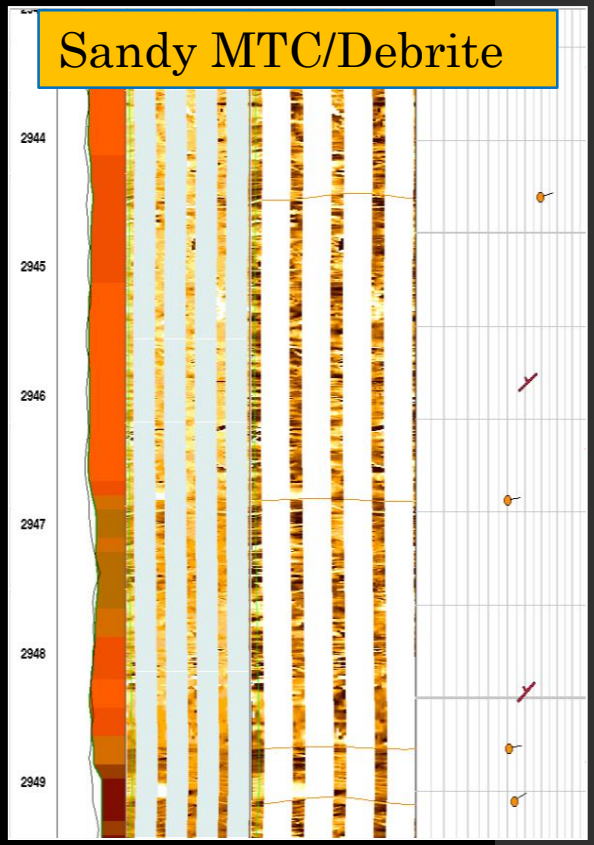


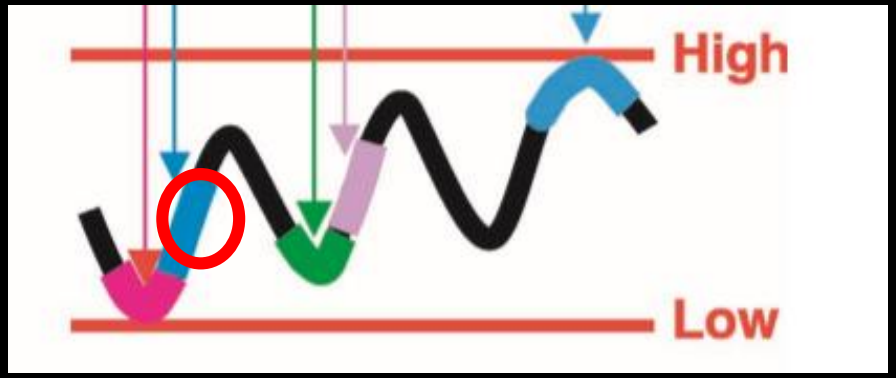
Initial channel incision

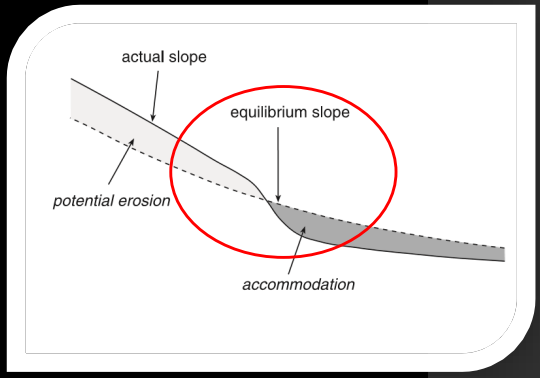


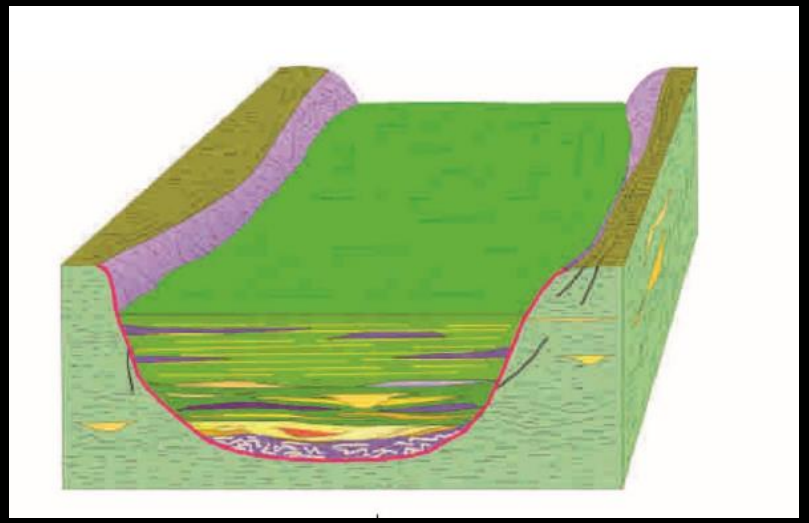




Samuel et al, 2003

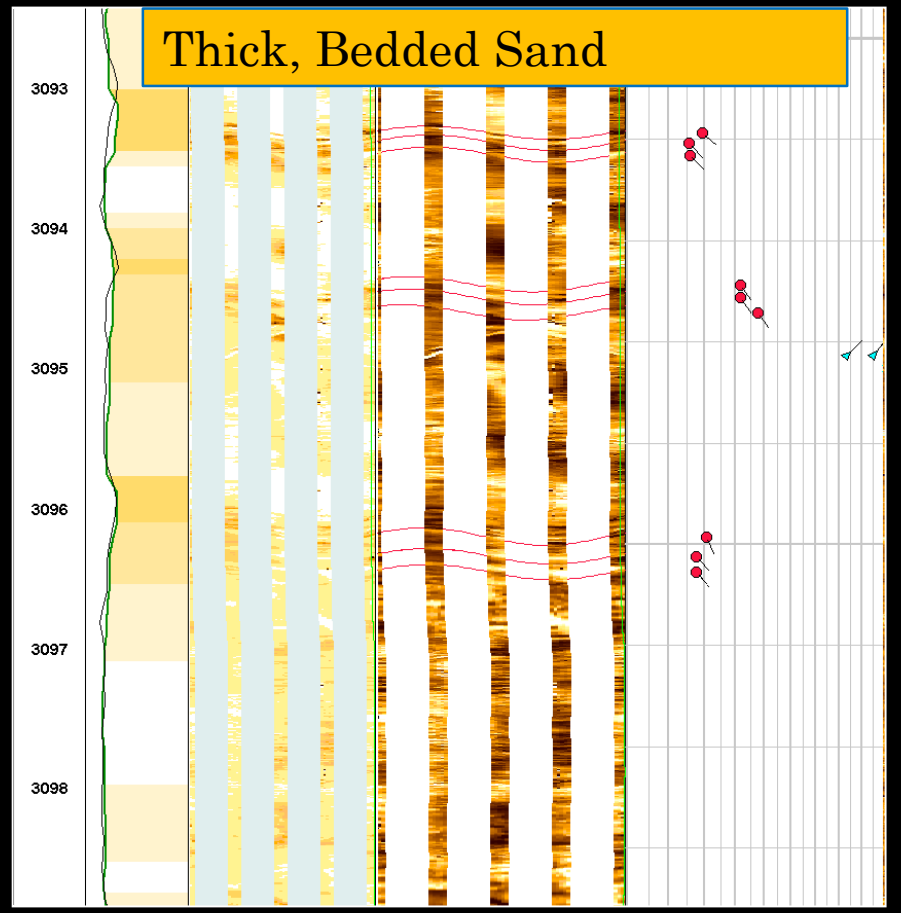
# Initial Channel-Fill



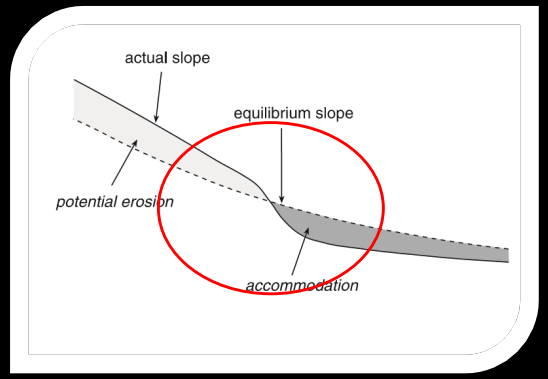



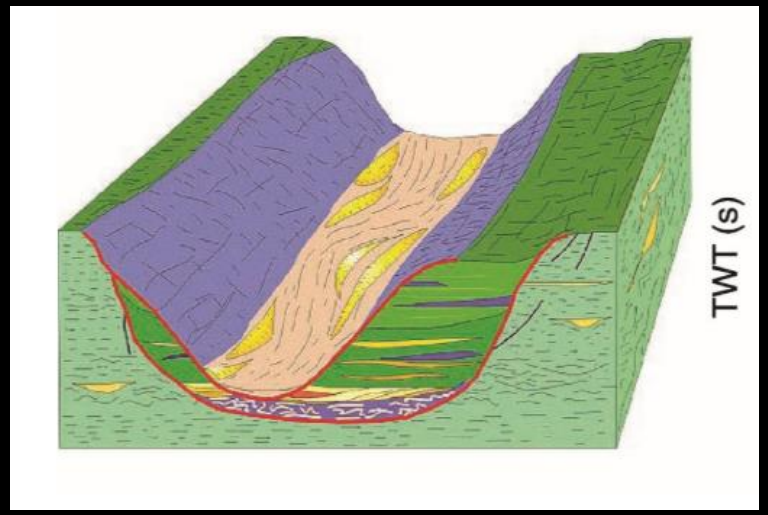



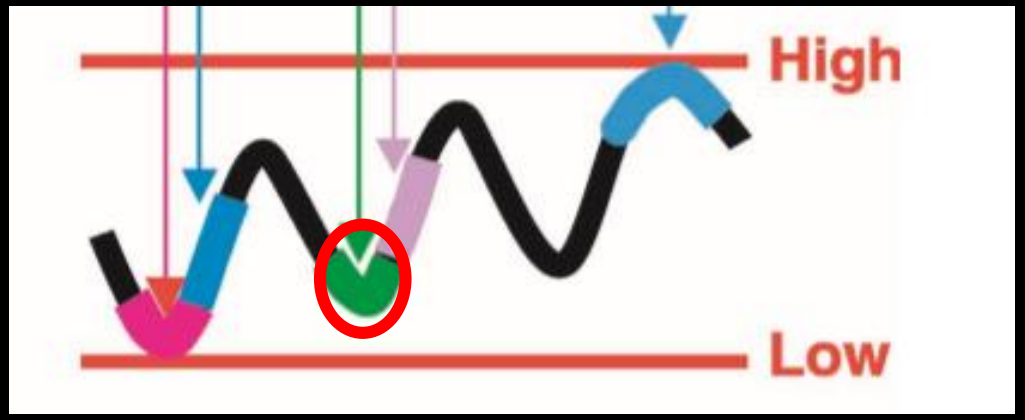
Samuel et al, 2003

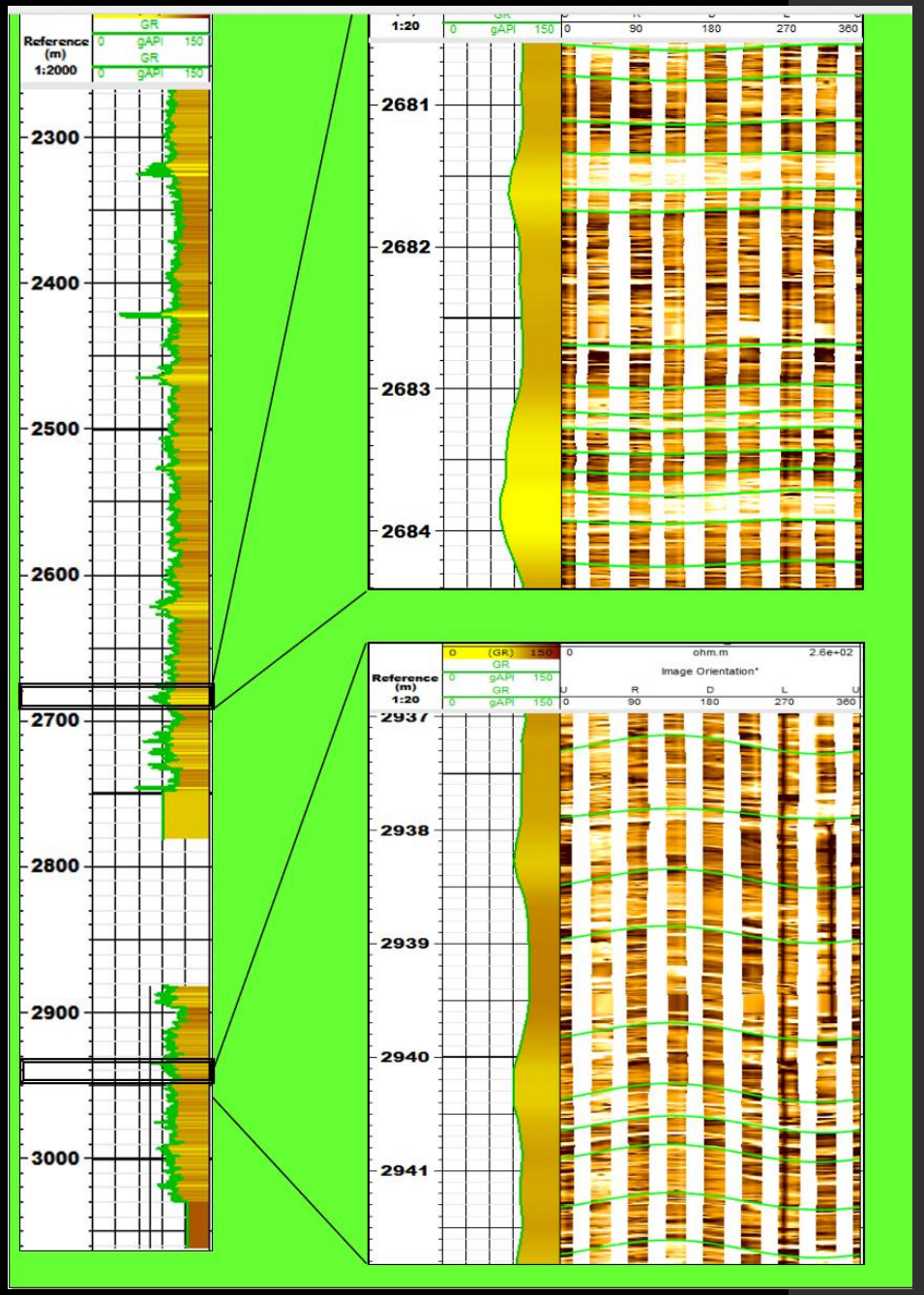


# Reincision & Fill

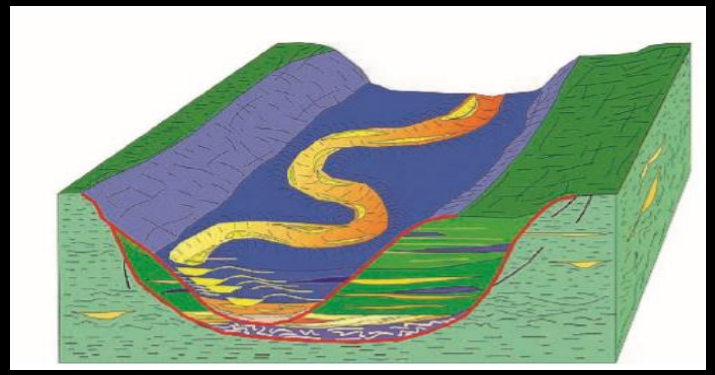


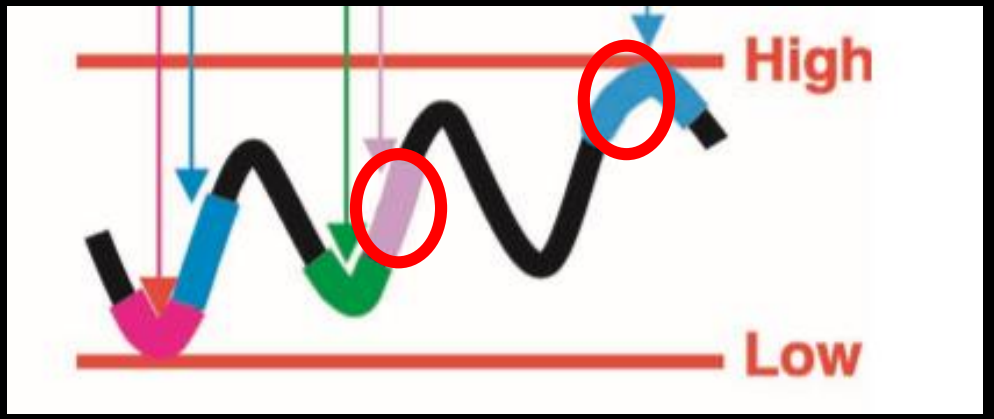



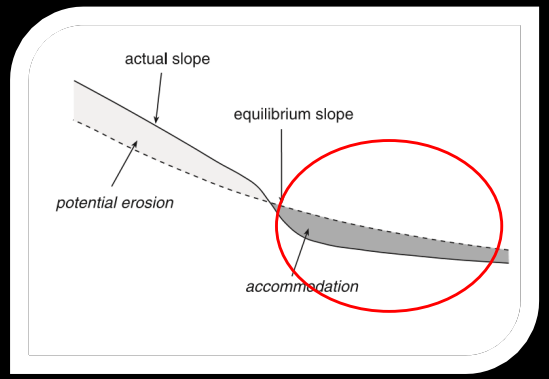



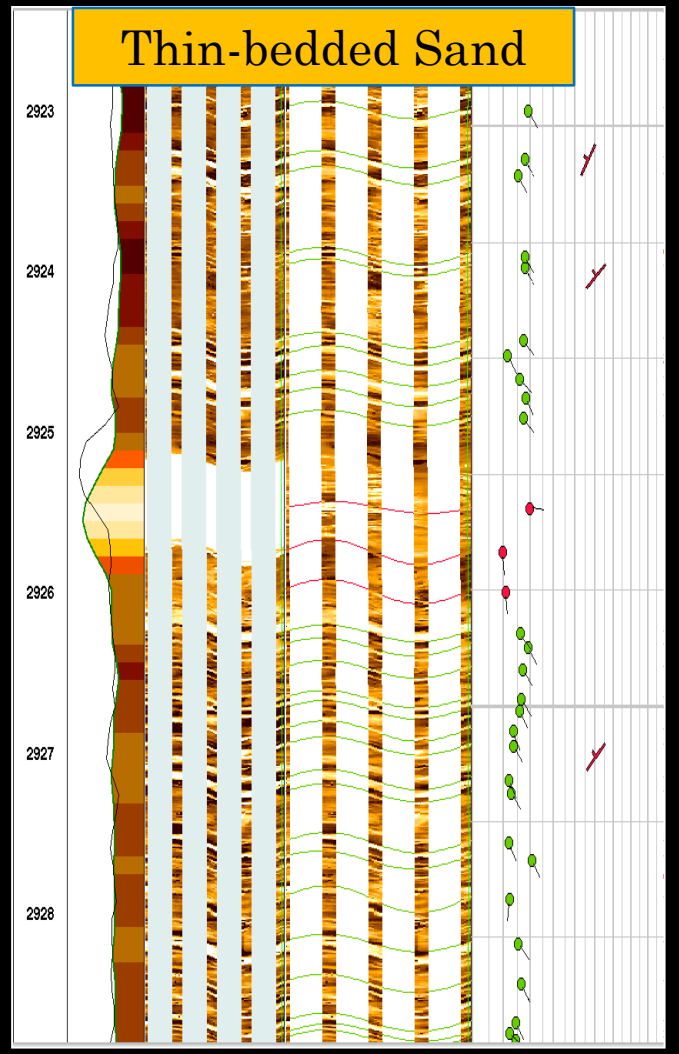



# Channel Fill & Abandonment



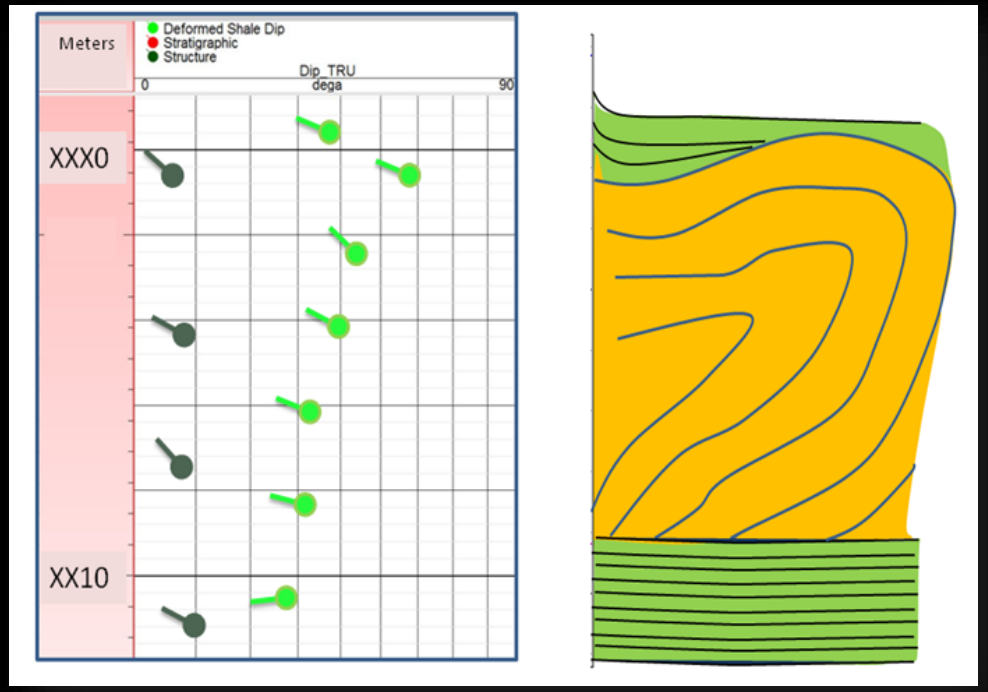


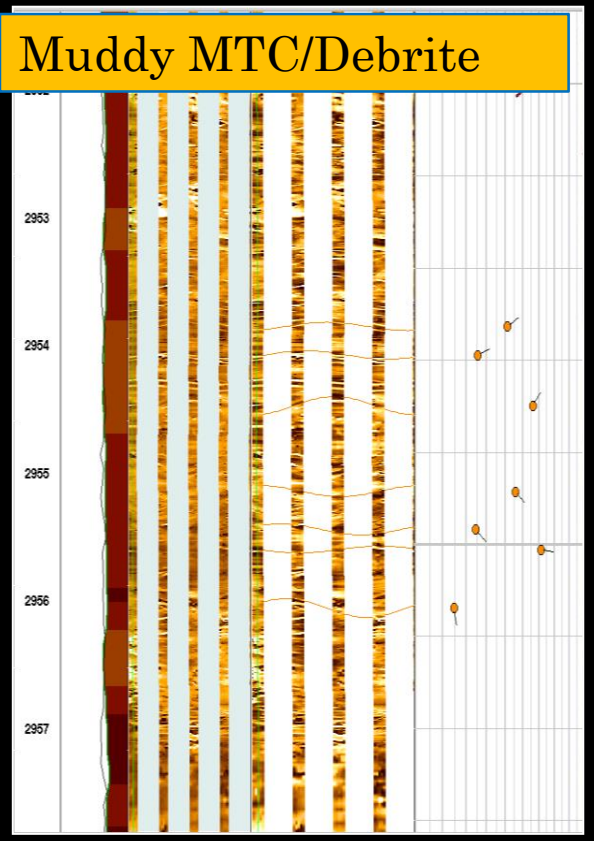



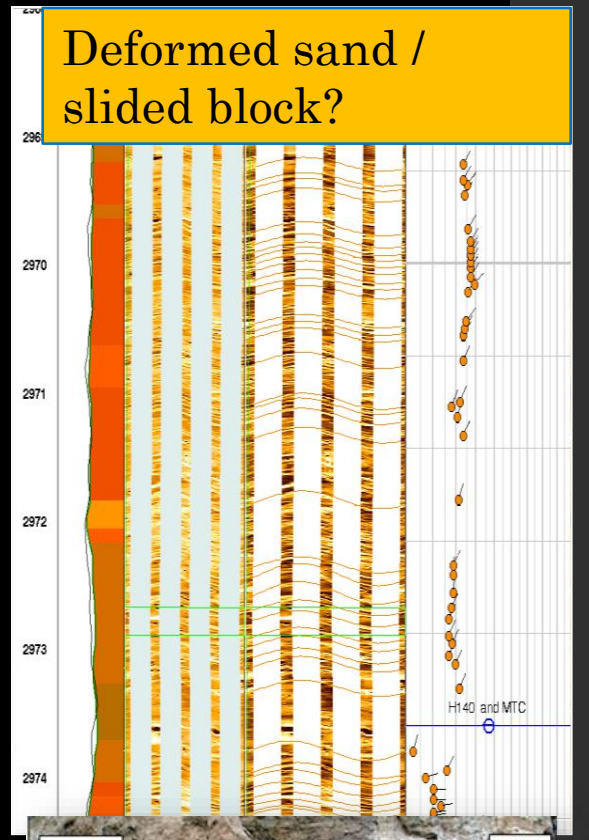

Samuel et al, 2003

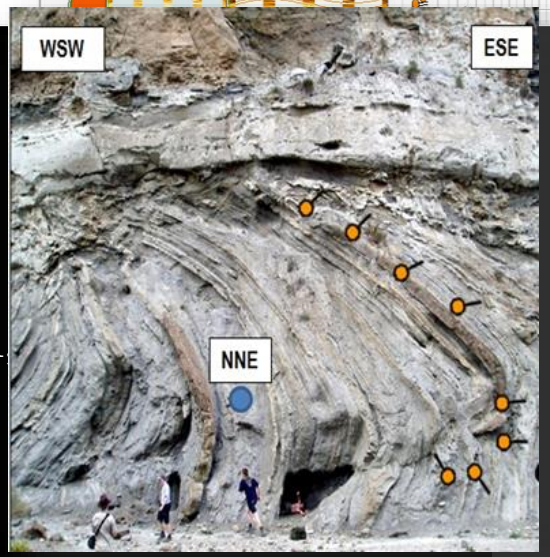
# Mega Slumps




- 10 - >100m thick mudstones
- Ordered Dips, from low magnitude angles increasing up section, followed by decreasing dip above the axis
- Dips parallel or opposing the slope direction




Example from Gordo Megabed Tabernas Basin, Spain

# Conclusion

- Sea floor Topography evolves tortuous fairways into ponded depocentres
- Widths of feeder systems is variable – determined by confinement
- Multiple bypass channels
- Frequent degradation of fold flanks and Slopes produces MTDs – effective seals