

PS Mixed Carbonates and Siliciclastics North of the Mahakam Delta, Offshore East Kalimantan, Indonesia*

Arthur Saller¹

Search and Discovery Article #51393 (2017)**

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See similar articles [Search and Discovery Article #50847 \(2013\)](#) and [Search and Discovery Article #30014 \(2003\)](#)

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Abstract

For the last 7 million years, carbonates have been mixed with siliciclastics north of the Mahakam delta, offshore East Kalimantan, Indonesia. The distribution of carbonates is controlled by the location of deltas, currents transporting siliciclastics, rates of sea level rise, and depositional bathymetry. At the present time, modern carbonates are deposited locally north of the delta while large amounts of sand and shale are coming out of the delta. In the late Pleistocene, carbonate mounds and shelf margin carbonates grew during transgressions when siliciclastic shorelines moved landward. Mounded carbonates preferentially occur on the upthrown side of faults, while shelf margin carbonates grew on underlying siliciclastic or carbonate shelf margins. Thin shales accumulated in lows between carbonate mounds. During highstands of sea level, siliciclastics prograded basinward across the shelf. Many carbonate mounds drowned and were covered with siliciclastics. At the shelf margin, carbonates prograded landward during highstands of sea-level. During the last 7 m.y., shelf margins have been generally backstepping landward north of the Mahakam delta because of rapid subsidence and currents transporting most deltaic clays to the south. Carbonates repeatedly grew during transgressions. During the latest Miocene and Pliocene, thick very elongate carbonates grew on the underlying siliciclastic shelf margins while thinner roughly circular mounds grew on depositional and structural highs of the shelf interior. Most of the carbonates are covered by highstand siliciclastics. The shelf margin and mounded carbonates are mainly lime grainstone and boundstones with good porosity. Unfortunately, shales covering carbonates are downlapping packages that were generally not effective seals.

References Cited

Crumeyrolle, P., and I. Renaud, 2003, Quaternary Incised Valleys and Low Stand Deltas Imaged with 3D Seismic and 2D HR Profiles, Mahakam Delta, Indonesia: AAPG International Conference & Exhibition, Barcelona, Spain, September 21-24, 2003, [Search and Discovery Article #90017 \(2003\)](#). Website accessed June 2017.

Saller, A.H., S.W. Reksalegora, and P. Bassant, 2011, Sequence Stratigraphy and Growth of Shelfal Carbonates in a Deltaic Province, Kutai Basin, Offshore East Kalimantan, Indonesia, *in* W.A. Morgan, A.D. George, P.M. Harris, J.A. Kupecz, and J.F. Sarg (eds.), *Cenozoic Carbonate Systems of Australasia*: Society for Sedimentary Geology Special Publication 96, p. 147-174.

Mixed Carbonates and Siliciclastics, North of the Mahakam Delta, Offshore East Kalimantan, Indonesia

Arthur Saller, Cobalt International Energy, Houston, Texas

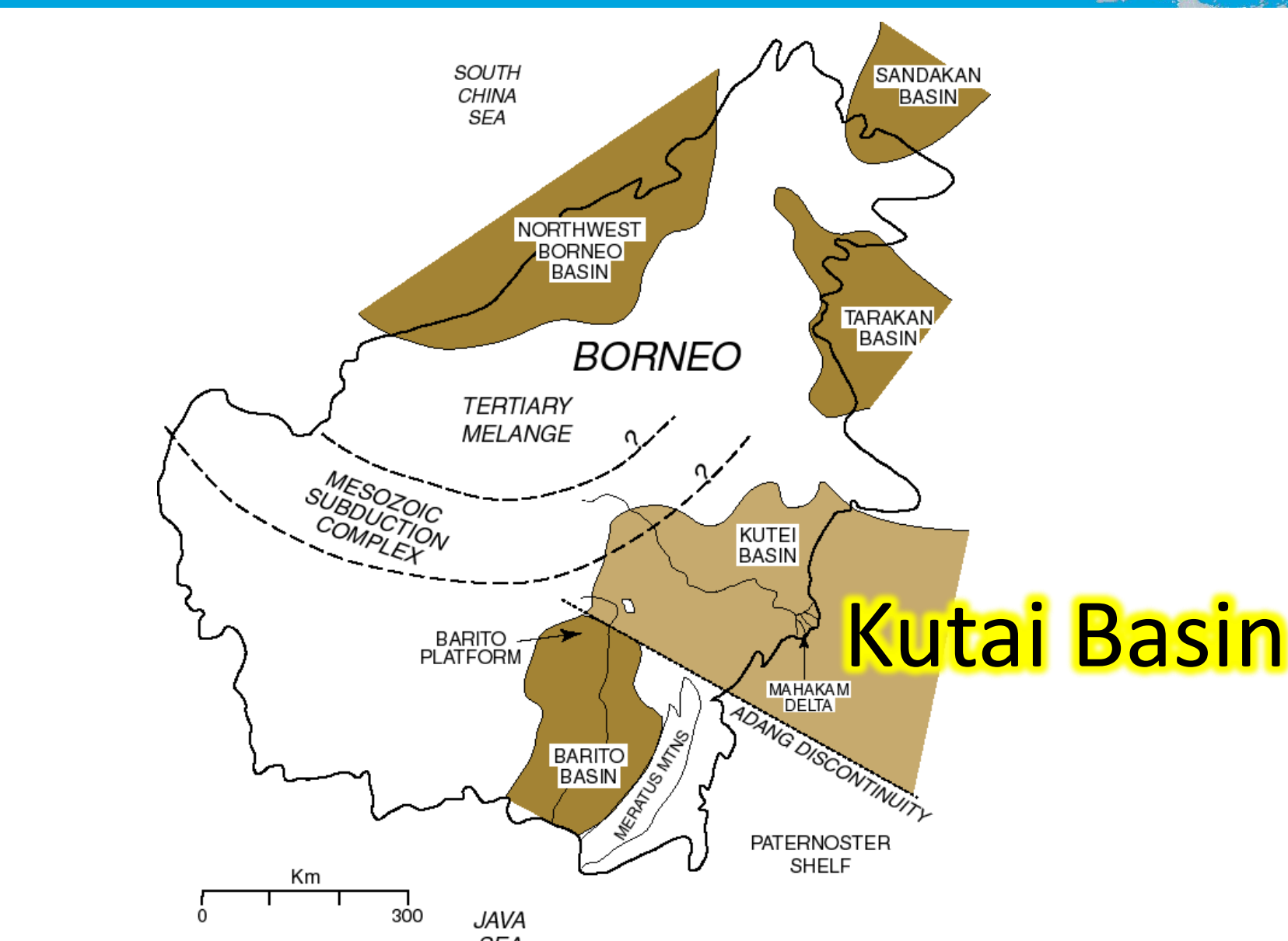
For the last 7 million years, carbonates have mixed with siliciclastics north of the Mahakam delta, offshore East Kalimantan, Indonesia



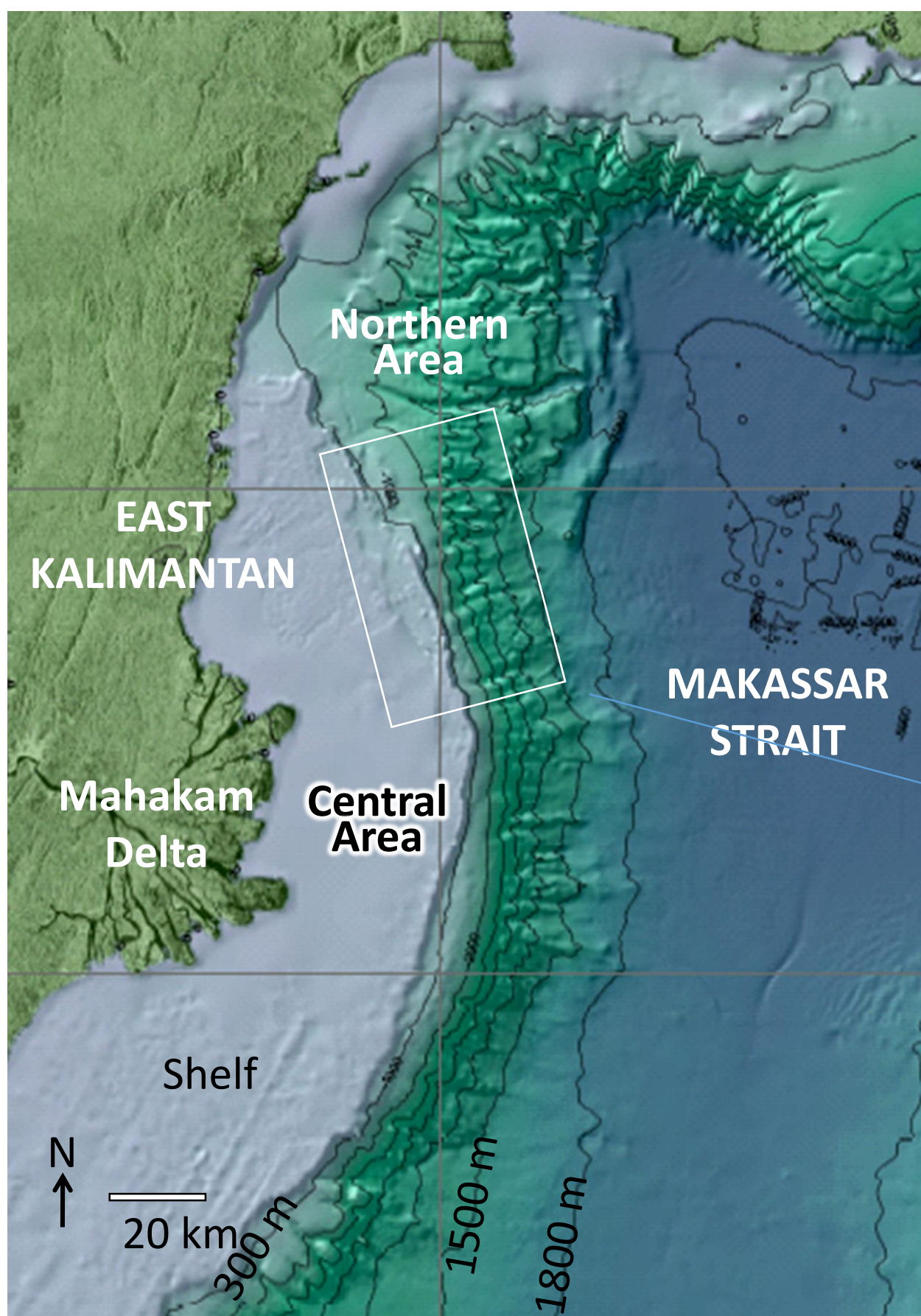
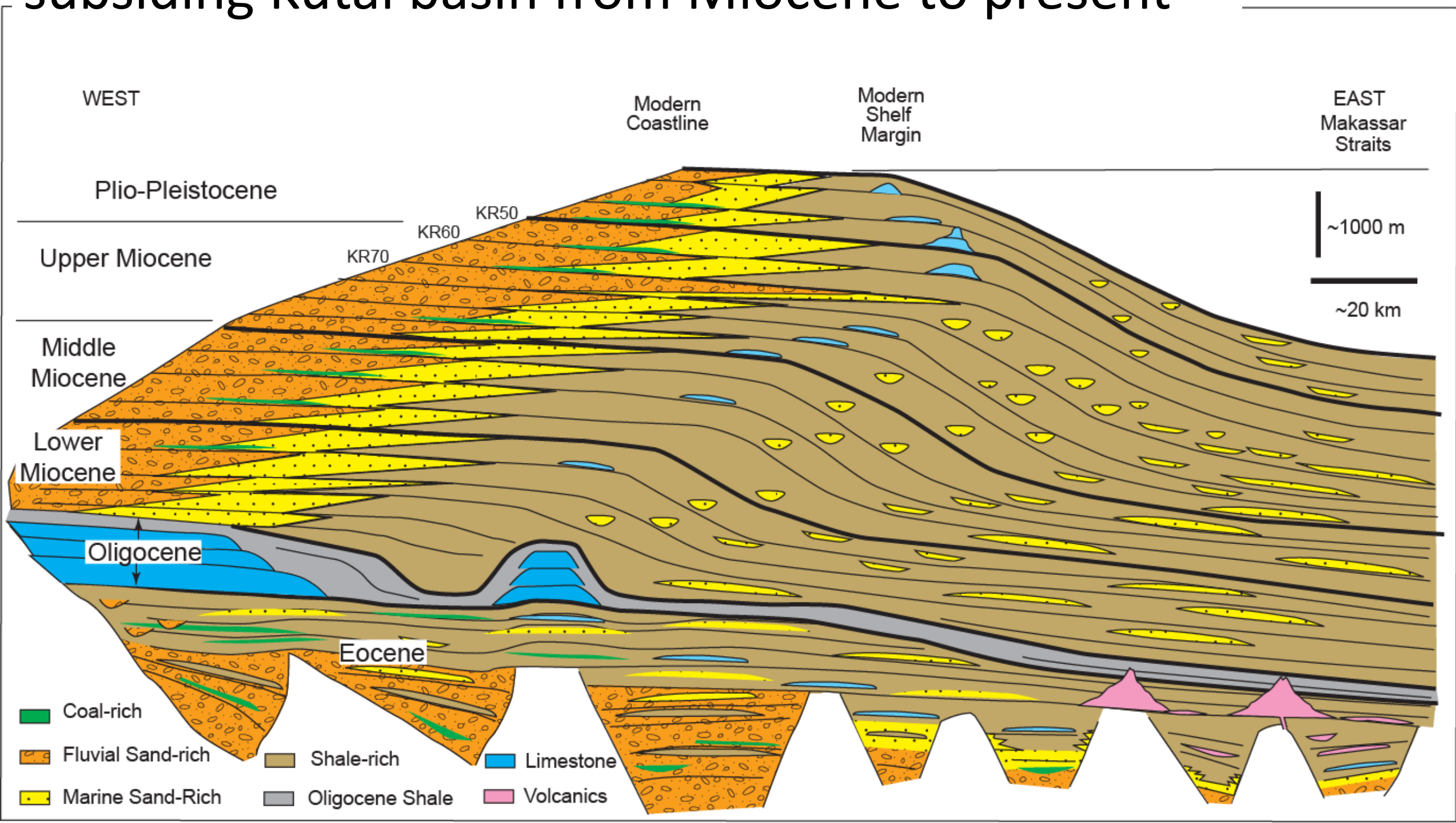
The distribution of carbonates is controlled by the location of deltas, currents transporting siliciclastics, sea level rises & falls, and depositional bathymetry.

Highstands & lowstands are dominated by siliciclastics.

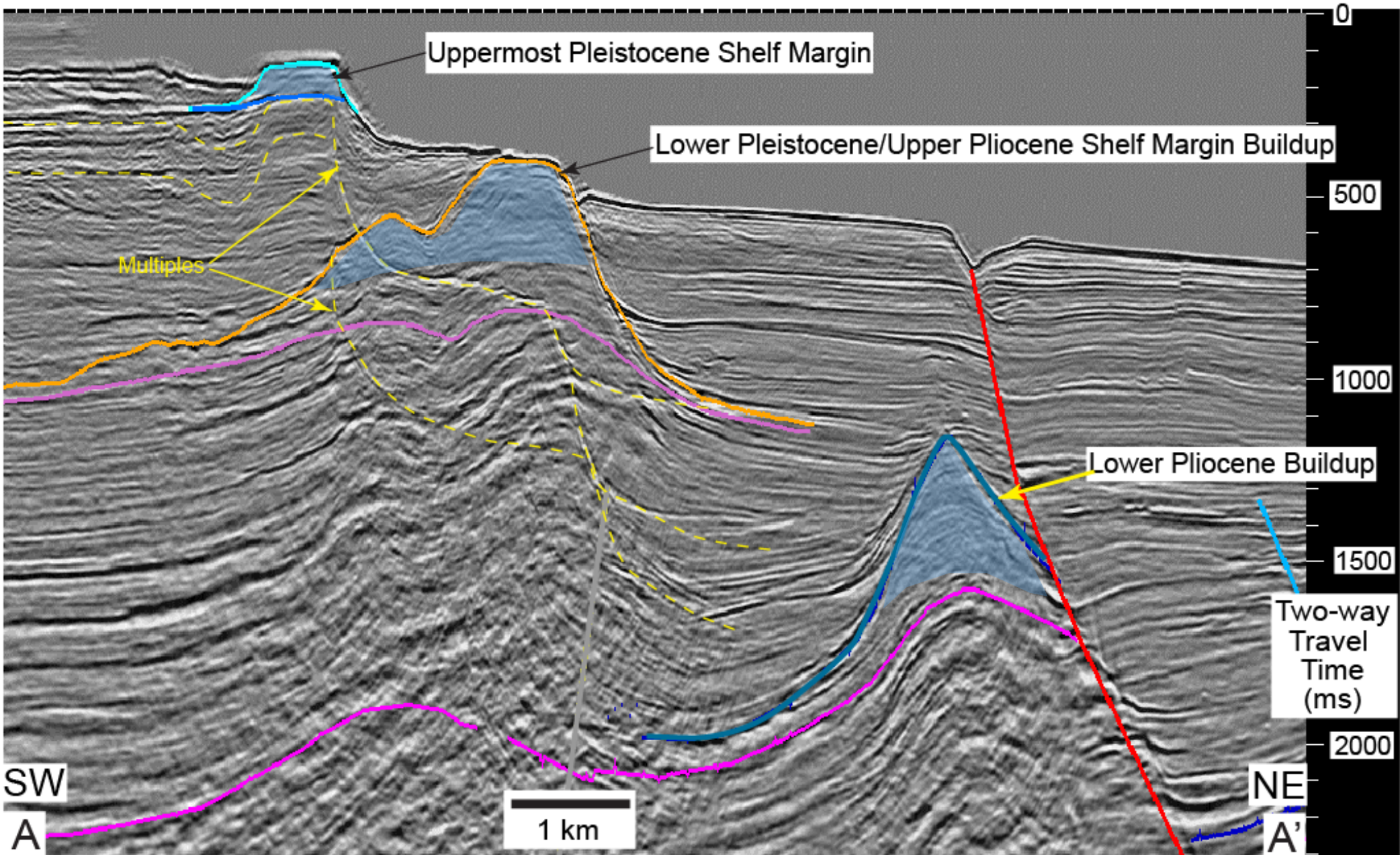
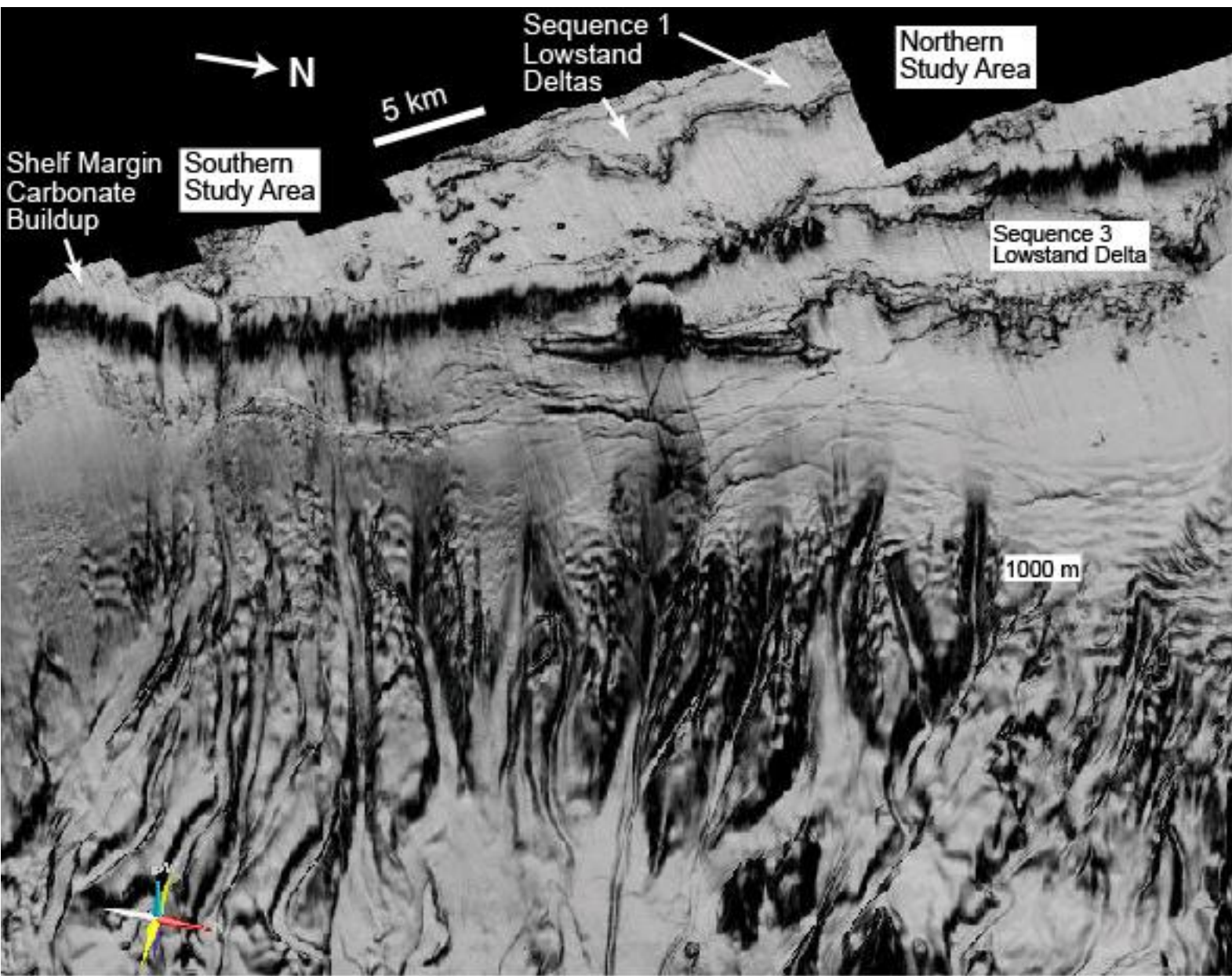
Carbonates accumulate during transgressions when rising sea level pushes shorelines landward.



Kutai Basin started with Paleocene & Eocene rifting & fluvial deposition. Oligocene transgression caused widespread carbonate deposition. Miocene uplift in Central Borneo initiated deltaic deposition with eastward progradation into the subsiding Kutai basin from Miocene to present



At the present, modern carbonates are deposited locally north of the delta while large amounts of sand and clay are coming out of the delta.

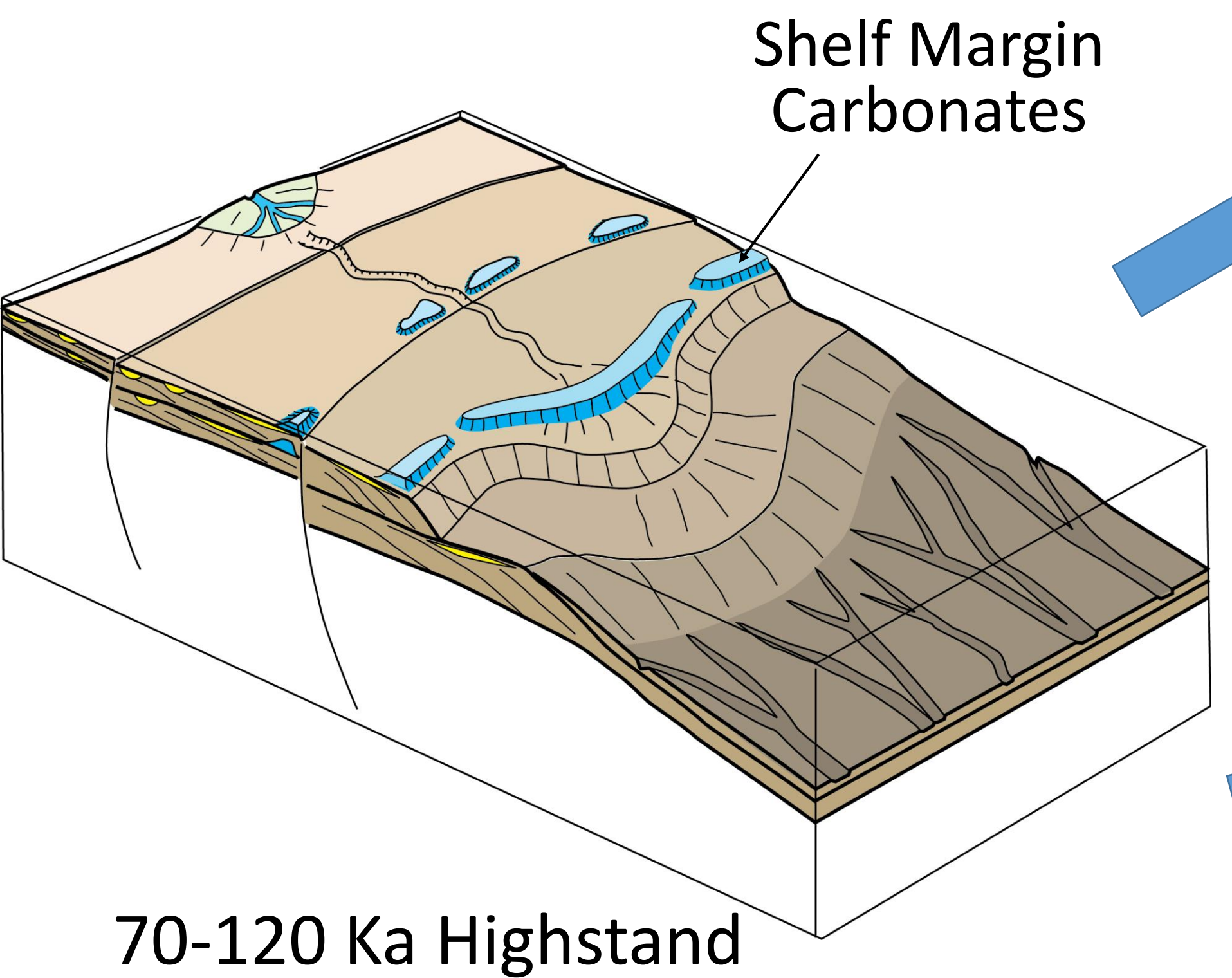
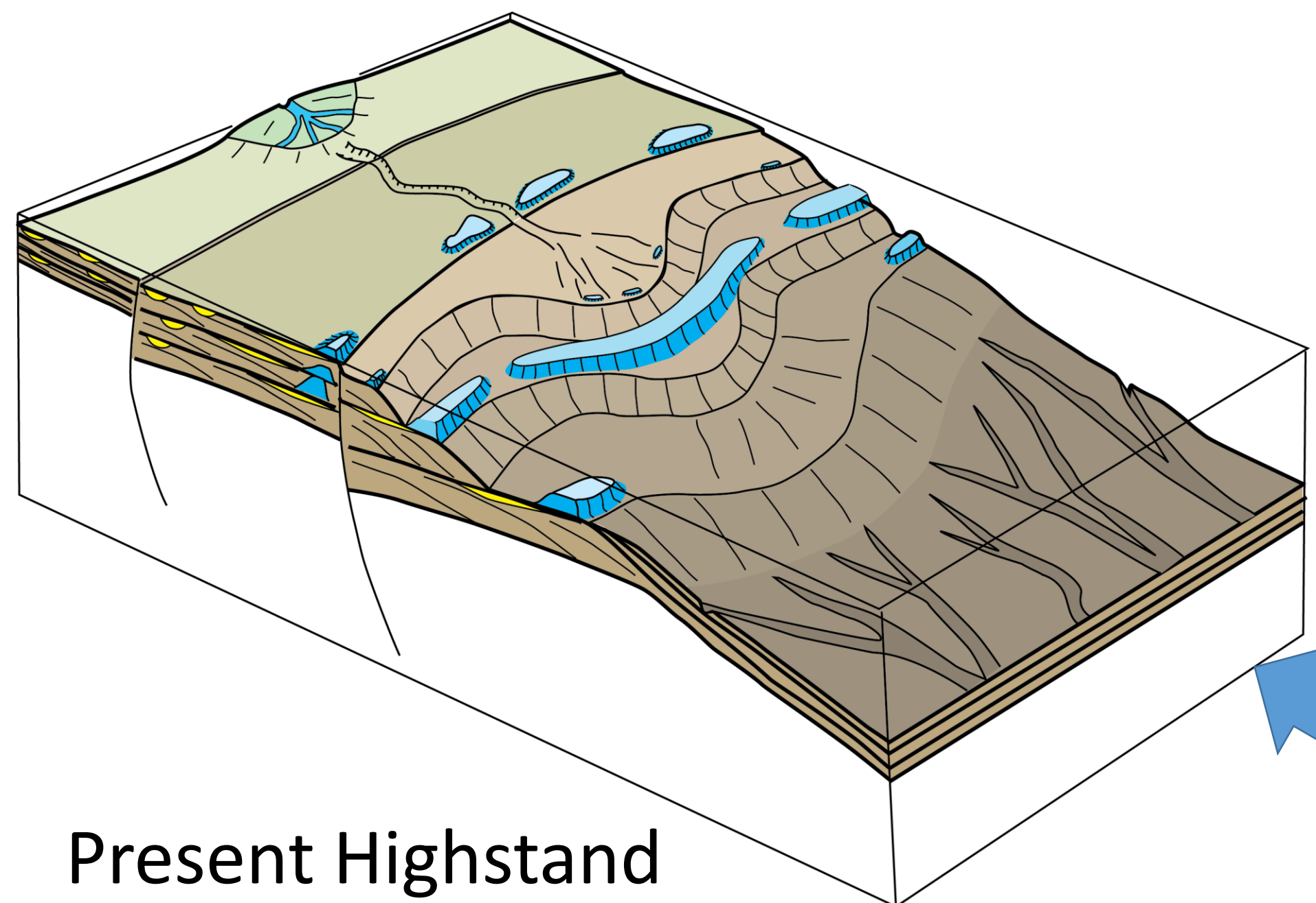


During the last 7 m.y., shelf margins have been generally backstepping landward north of the Mahakam delta because of rapid subsidence and currents transporting most deltaic clays to the south

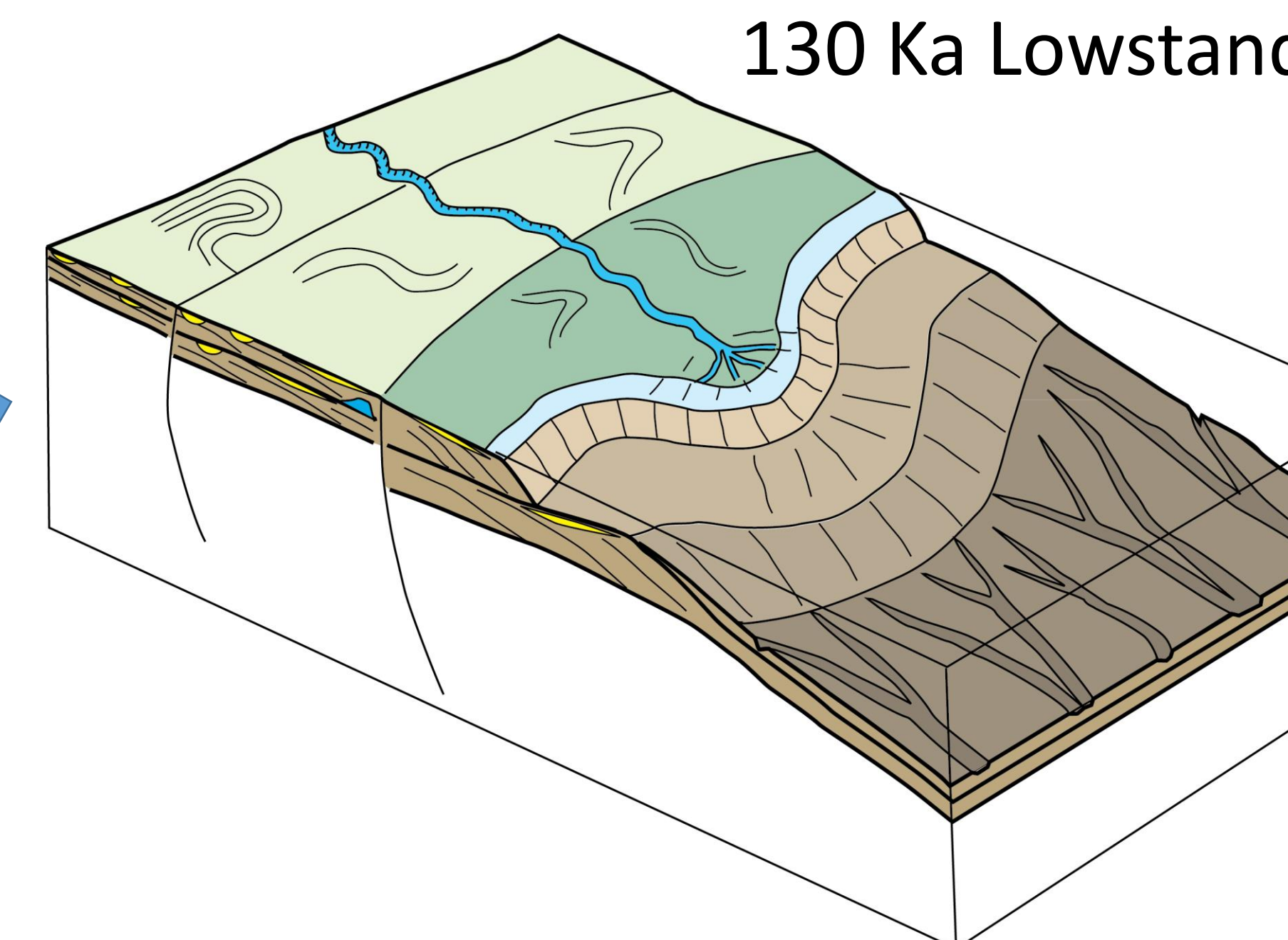
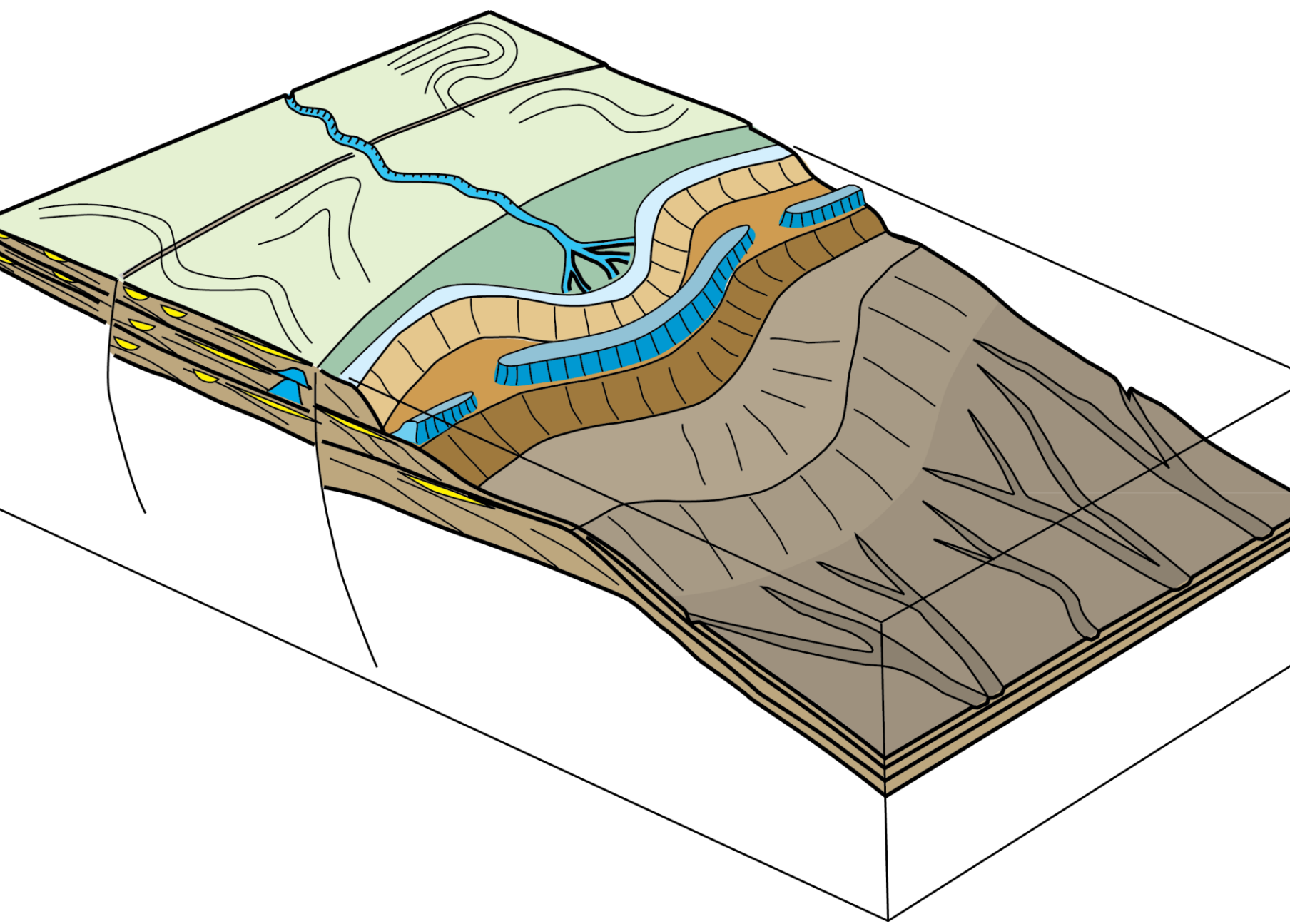
LATE PLEISTOCENE CYCLES (300 KY – PRESENT)

During Transgressions & Rapid Sea Level Rises, Siliciclastic Shorelines Moved Landward & Carbonates Grew, especially on Shelf Margins

Seismic & well data with U-Th dating allow carbonate & siliciclastic deposition to be put onto the eustatic sea level curve



During Highstands & Falling Sea Level Siliciclastic Shorelines & Deltas Prograded Basinward

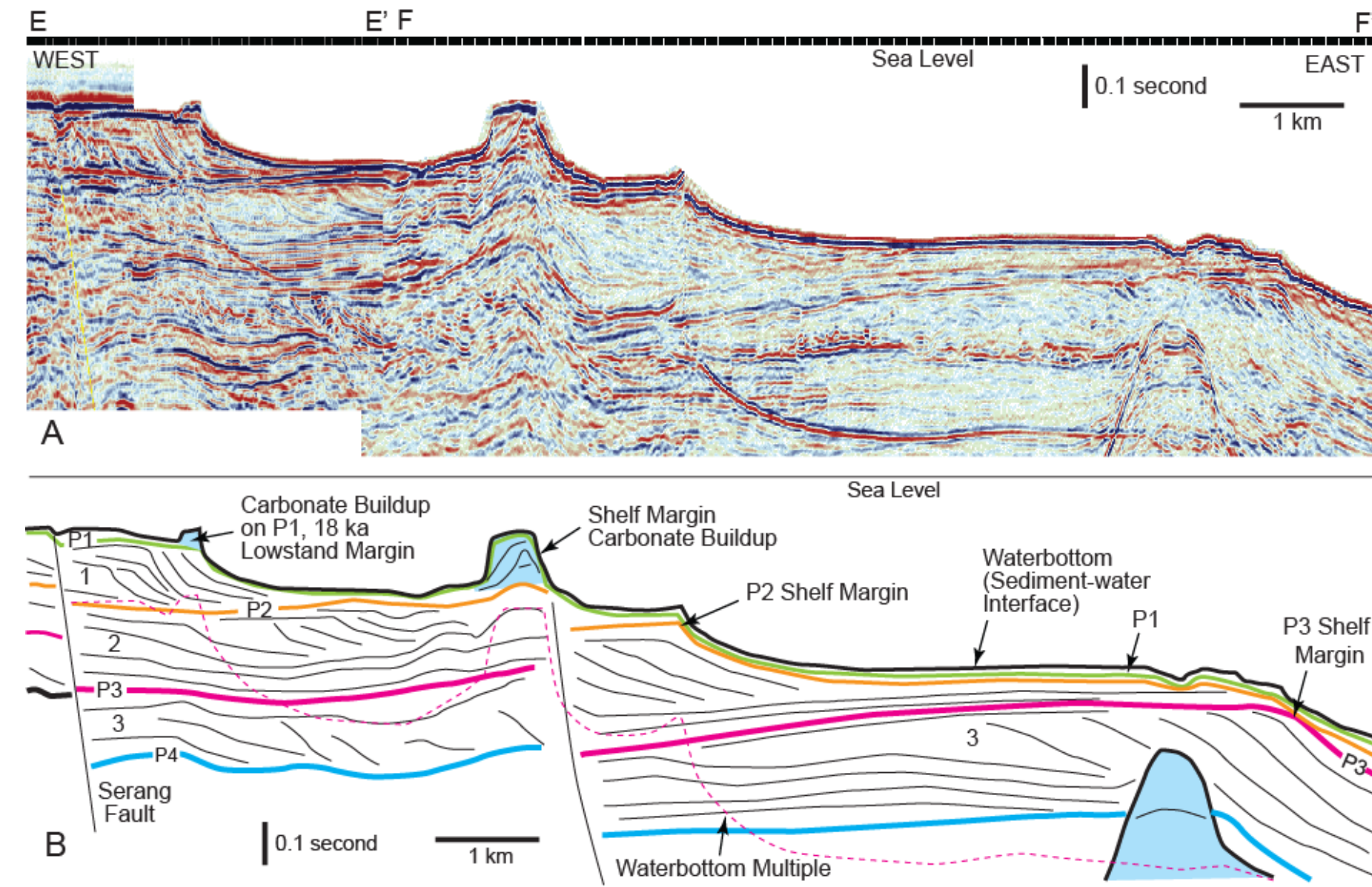
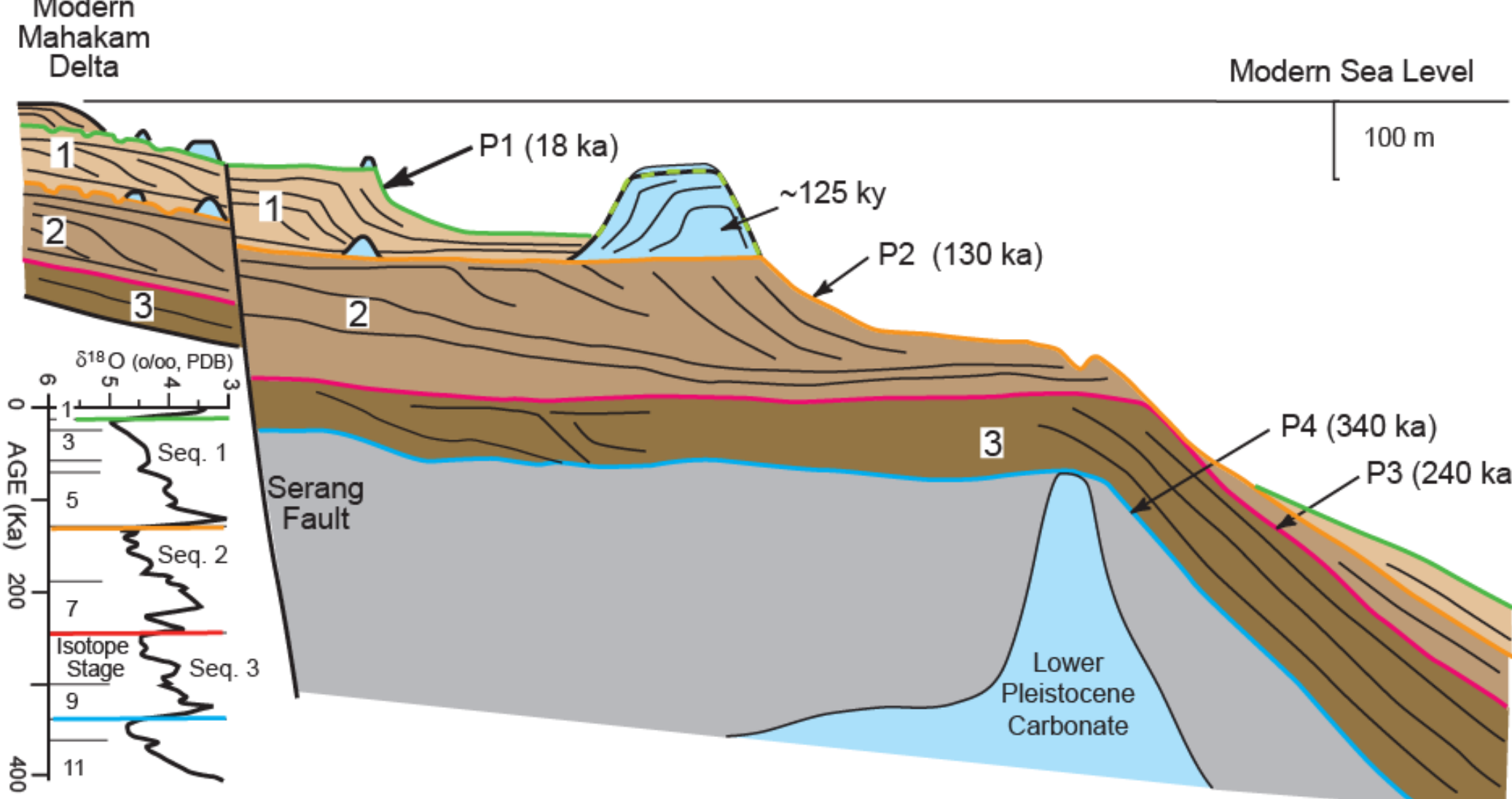


Mixed Carbonates & Siliciclastics, North of the Mahakam Delta, Offshore East Kalimantan, Indonesia

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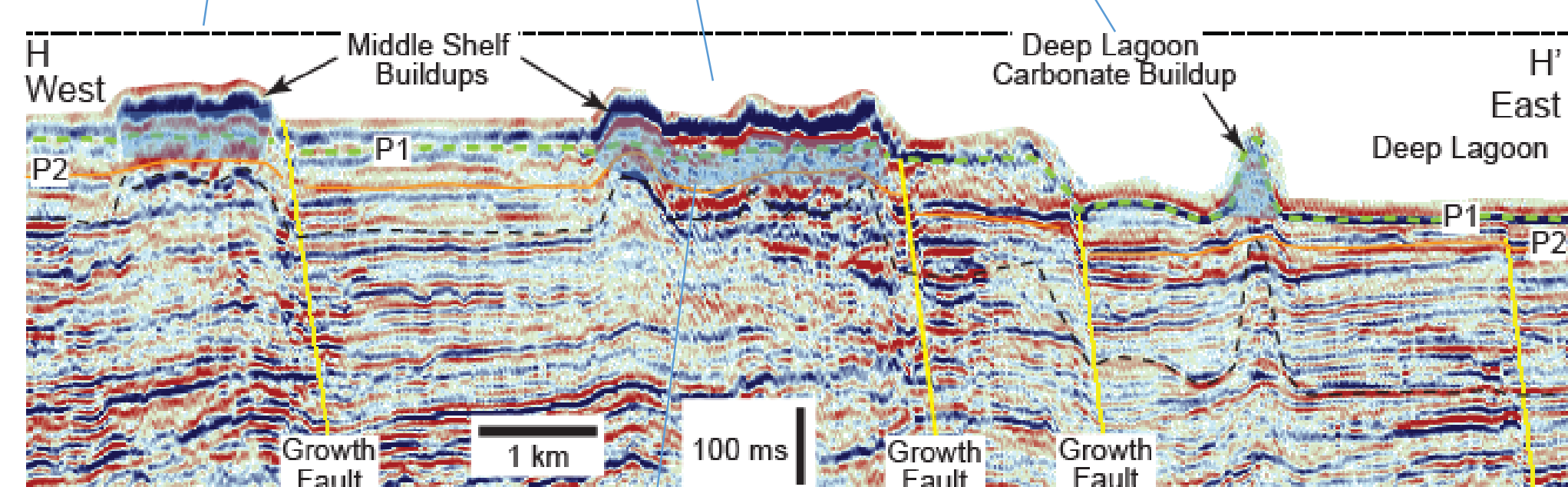
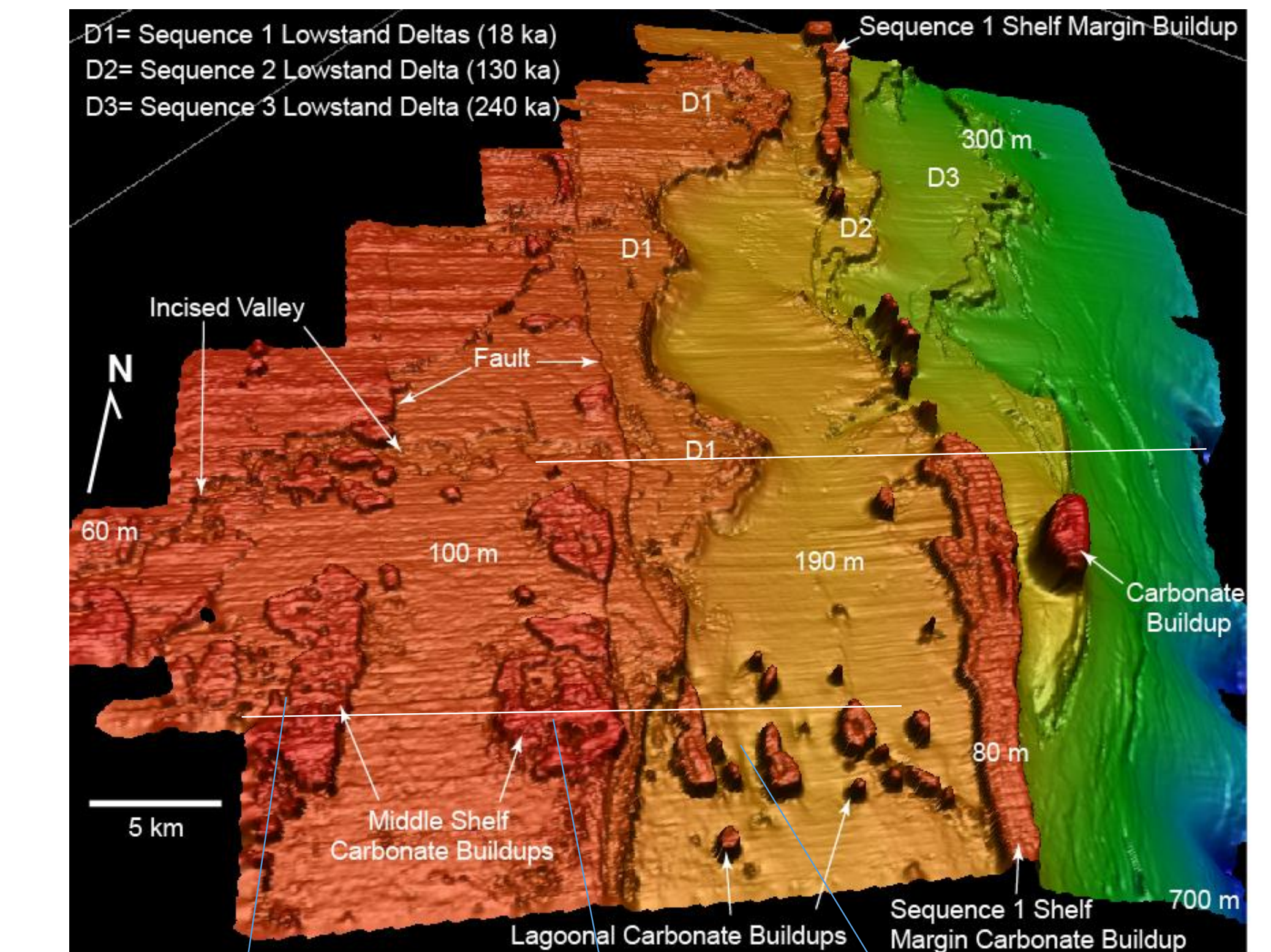
TRANSGRESSIVE SHELF MARGIN & MIDDLE SHELF CARBONATES
GREW ON **PROGRADING HIGHSTAND TO LOWSTAND SILICICLASTICS**
DURING RAPID TECTONIC SUBSIDENCE (80 M/100KY)

LATE CENOZOIC STRATIGRAPHY - NORTHERN KUTAI BASIN



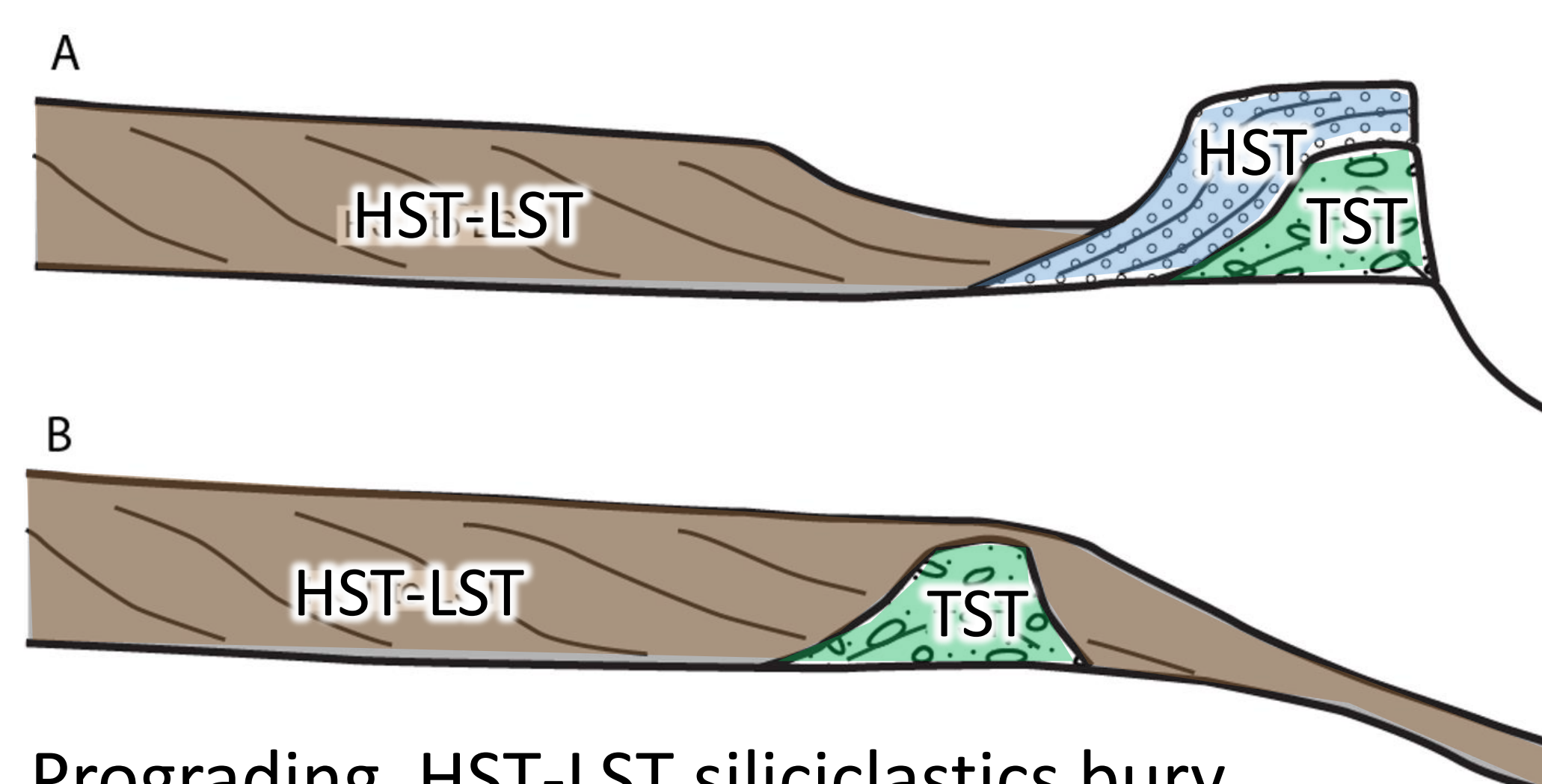
NORTHERN SHELF

CURRENT SEA FLOOR



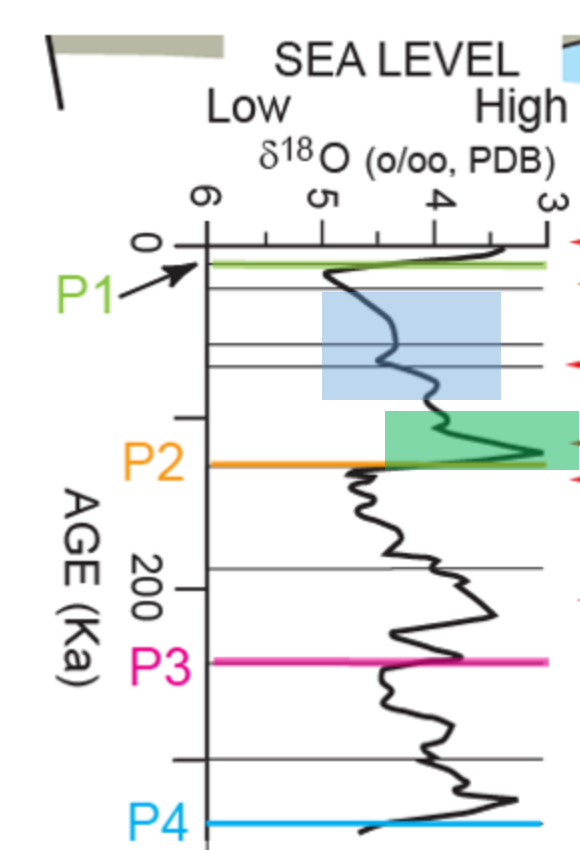
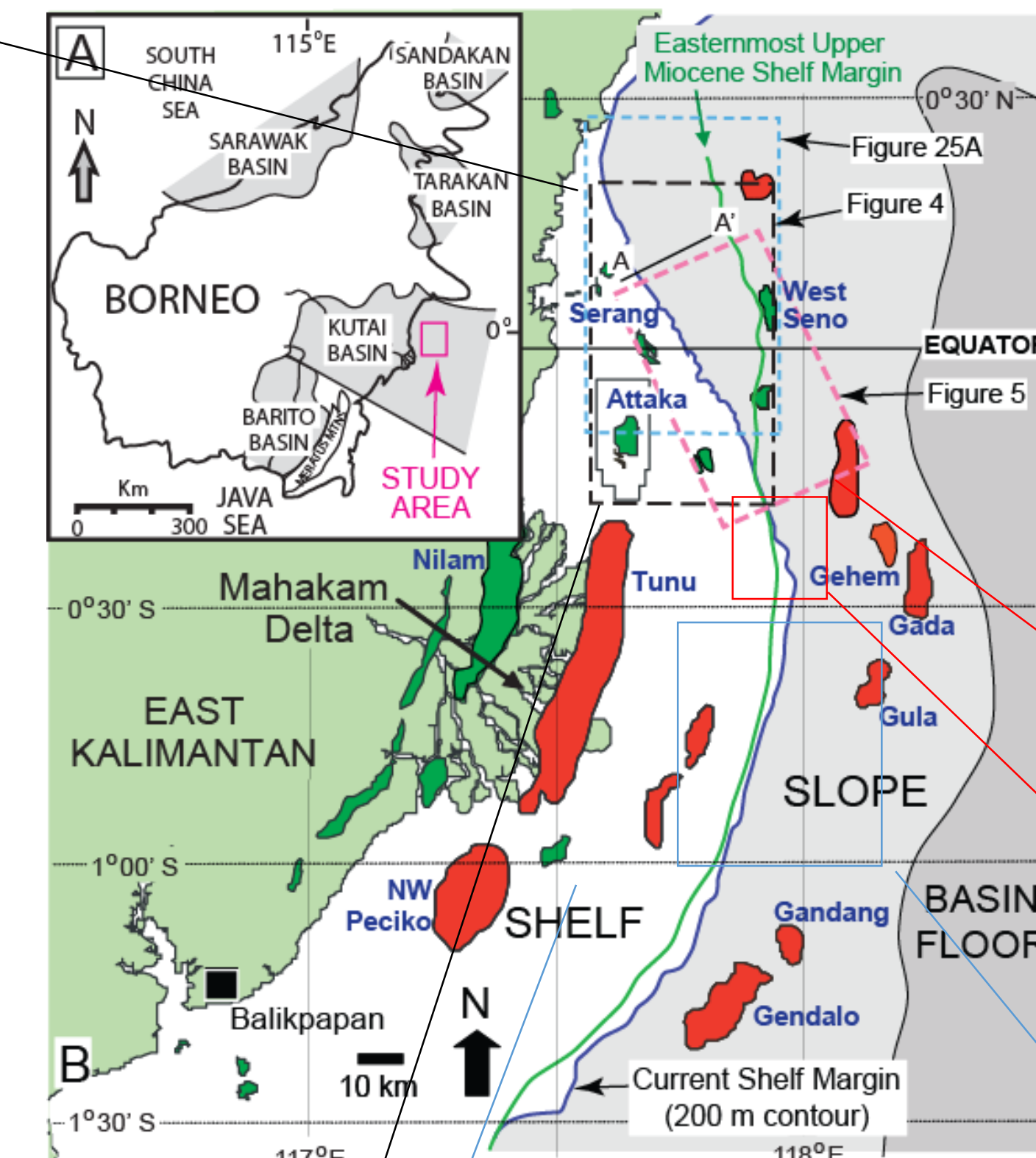
Shelf Interior Buildup on Upthrown Side of Fault

Shelf margin carbonate is beyond prograding HST-LST siliciclastics allowing HST carbonate



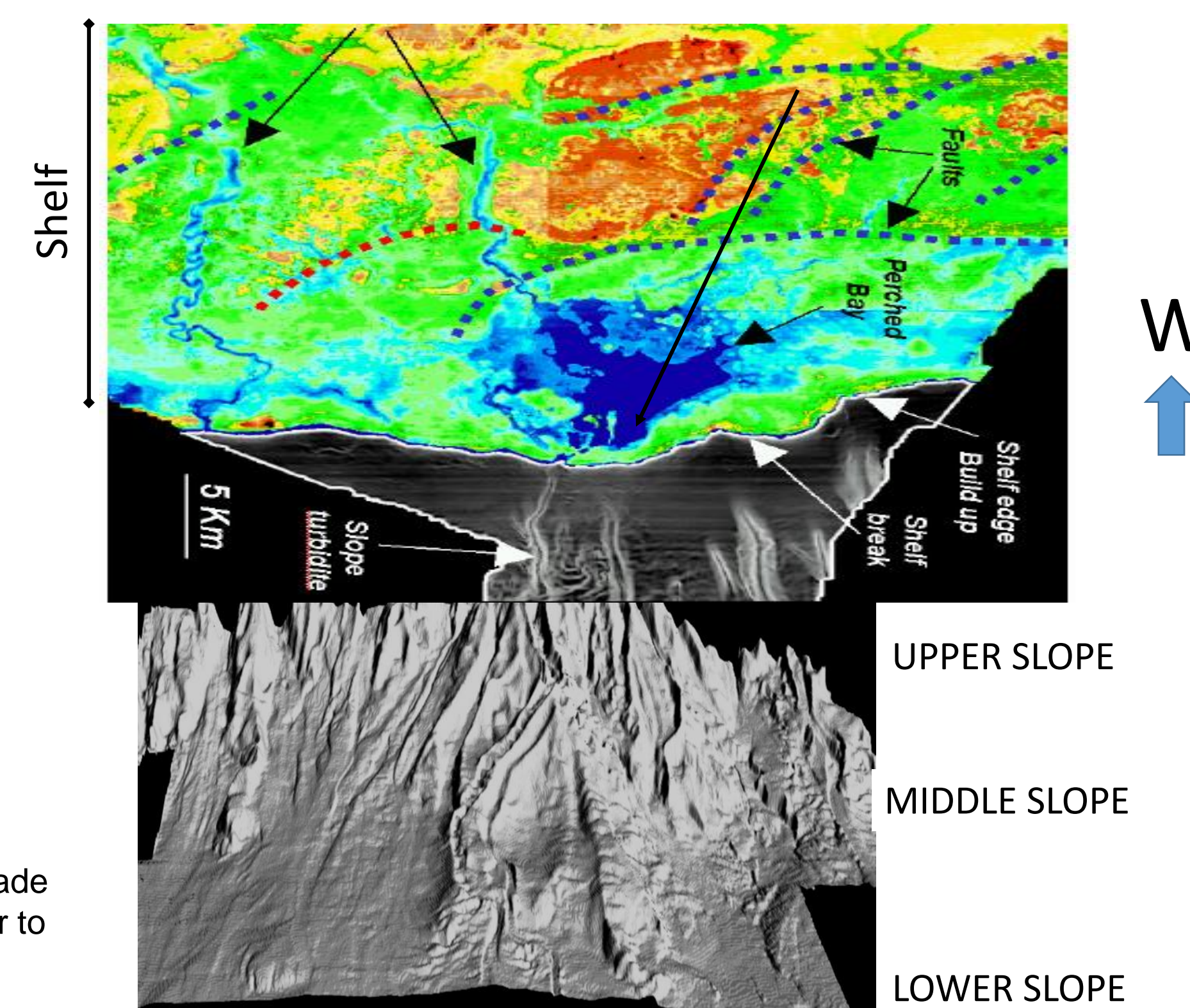
Prograding HST-LST siliciclastics bury carbonate TST & no carbonate HST develops

PLEISTOCENE



MAHAKAM DELTA FRONT SILICICLASTICS

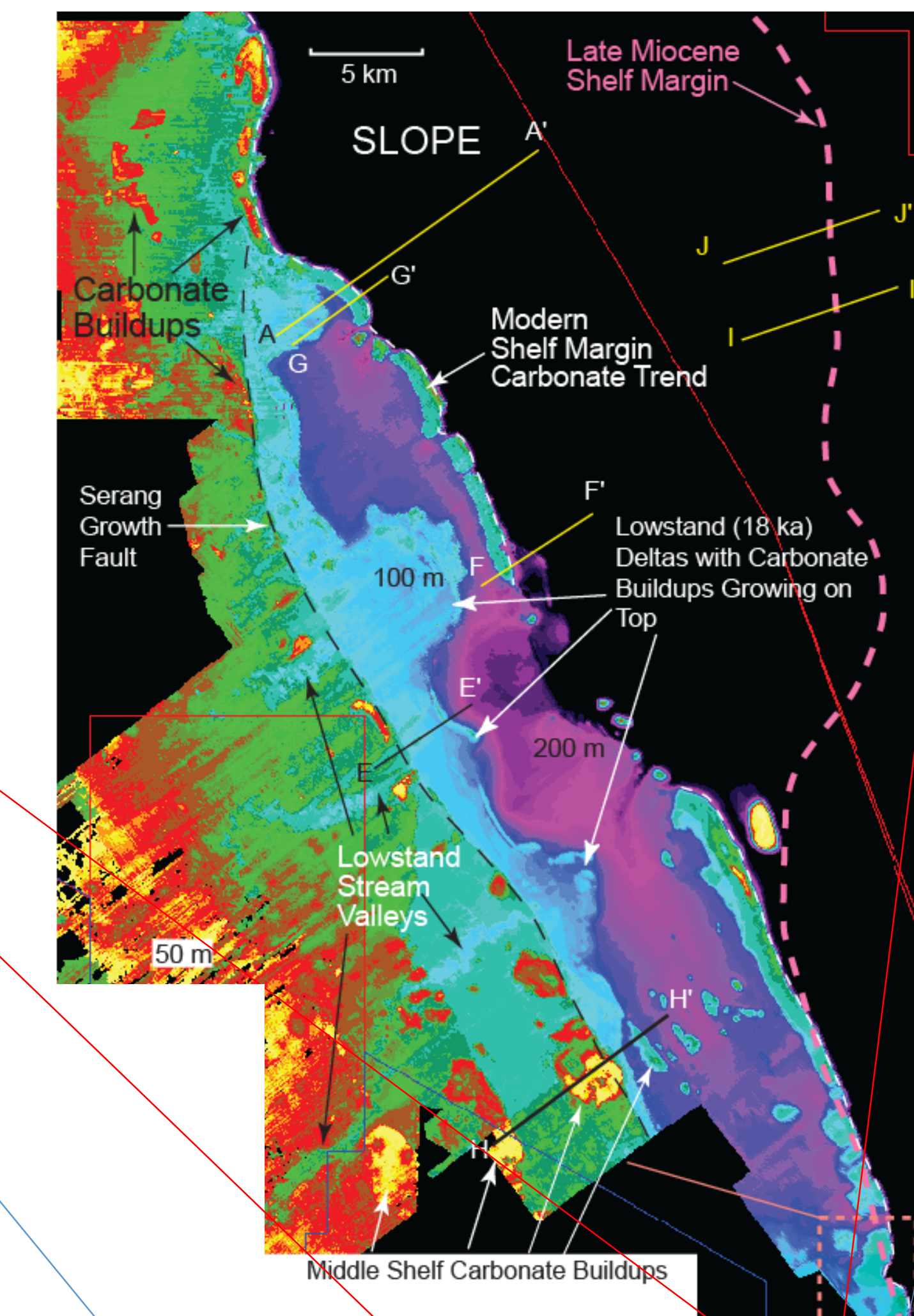
Slope Channels can be traced up to the Shelf Margin
Note incised valley on shelf leading to the only active slope valley



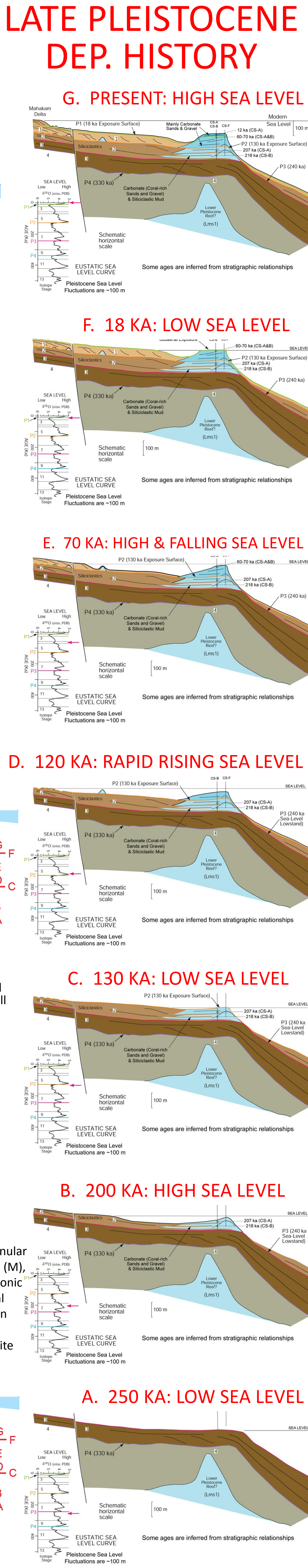
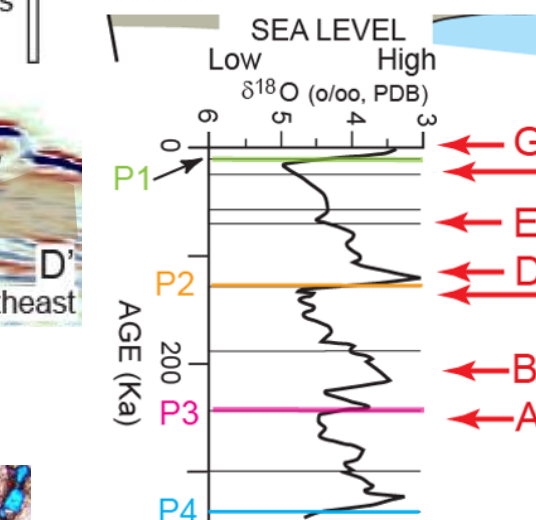
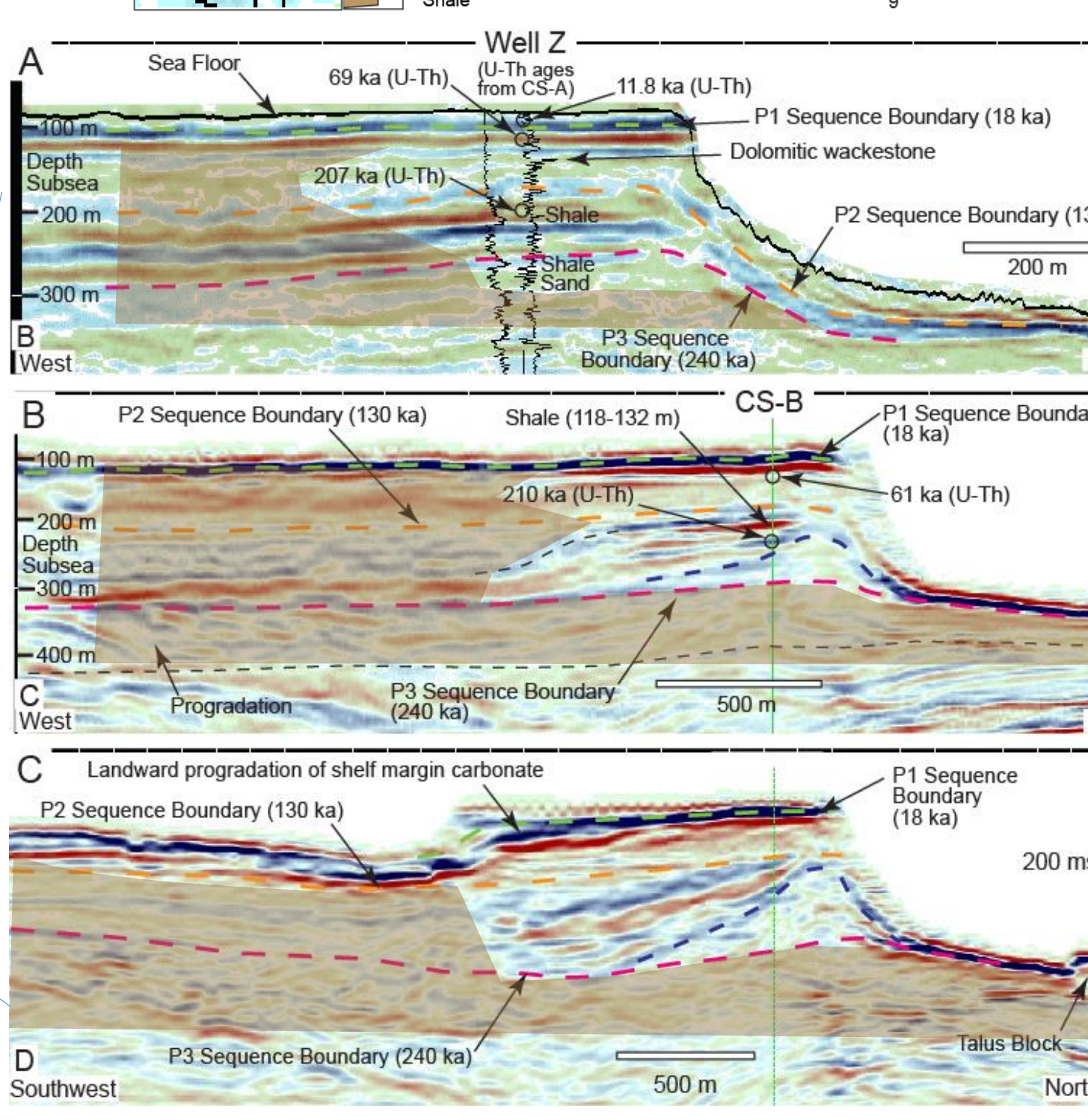
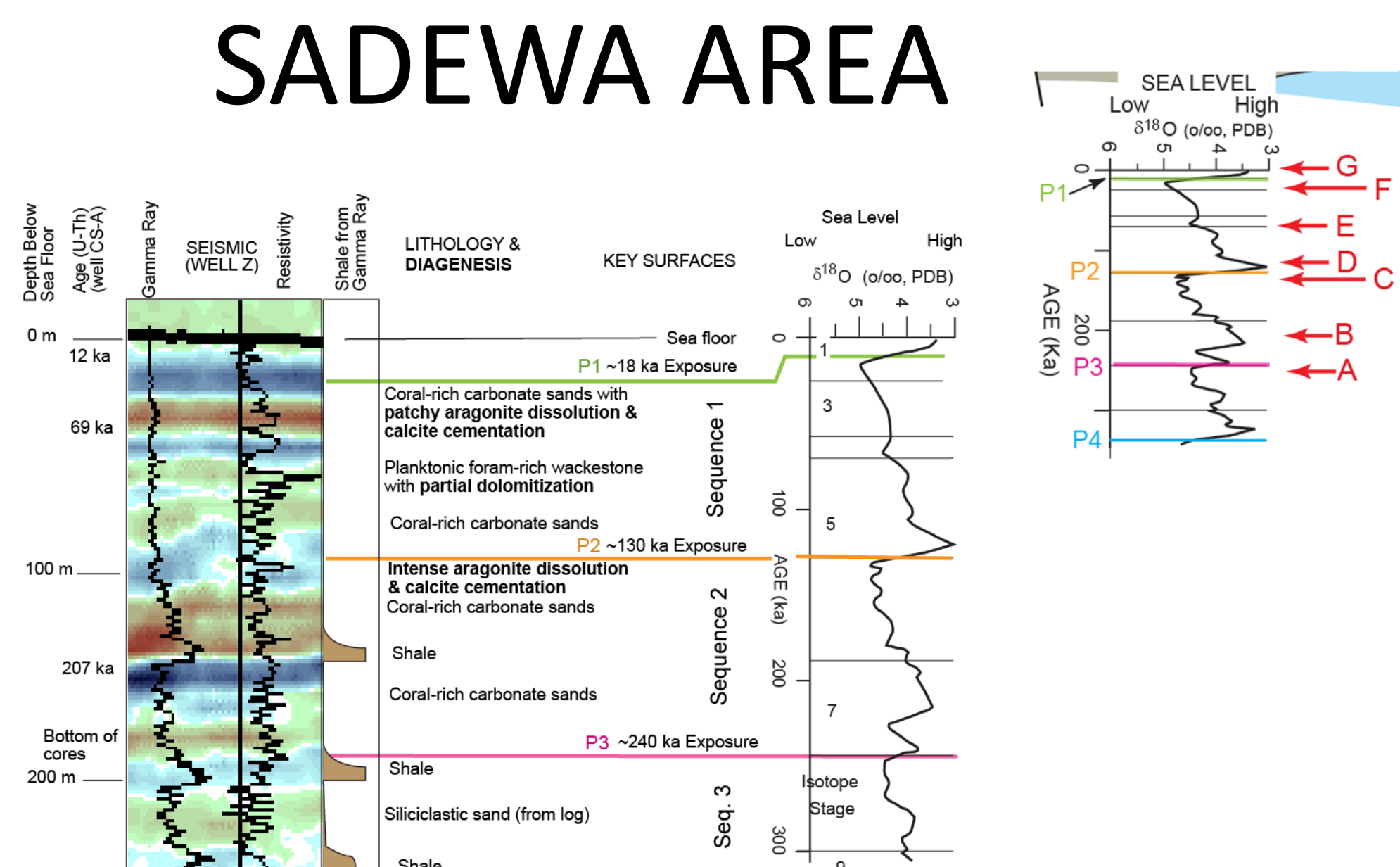
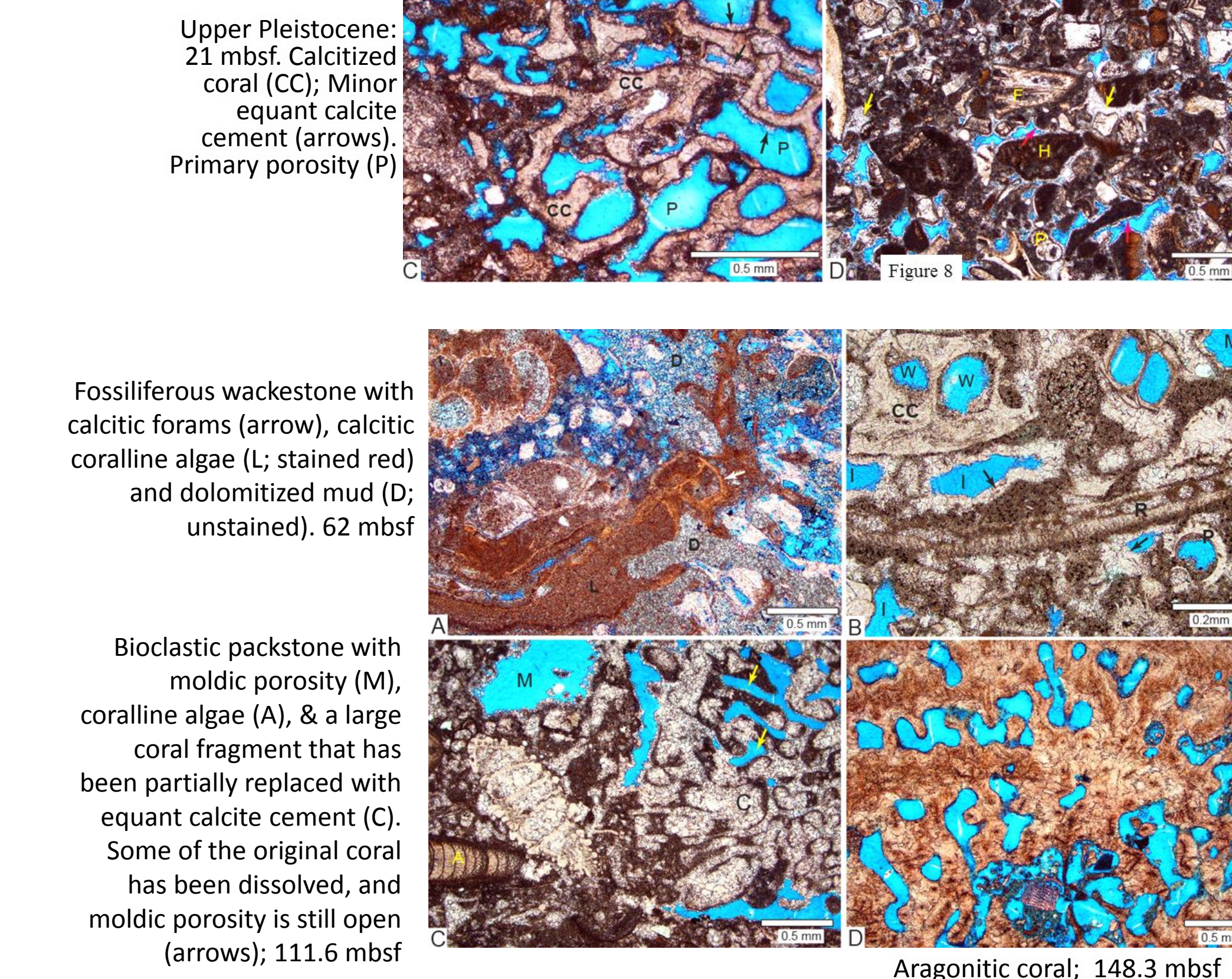
Shelf image from Crumeyrolle and Renaud (2003), used with permission

Kristina Kirschner made the gray shaded upper to lower slope image

CURRENT SEA FLOOR



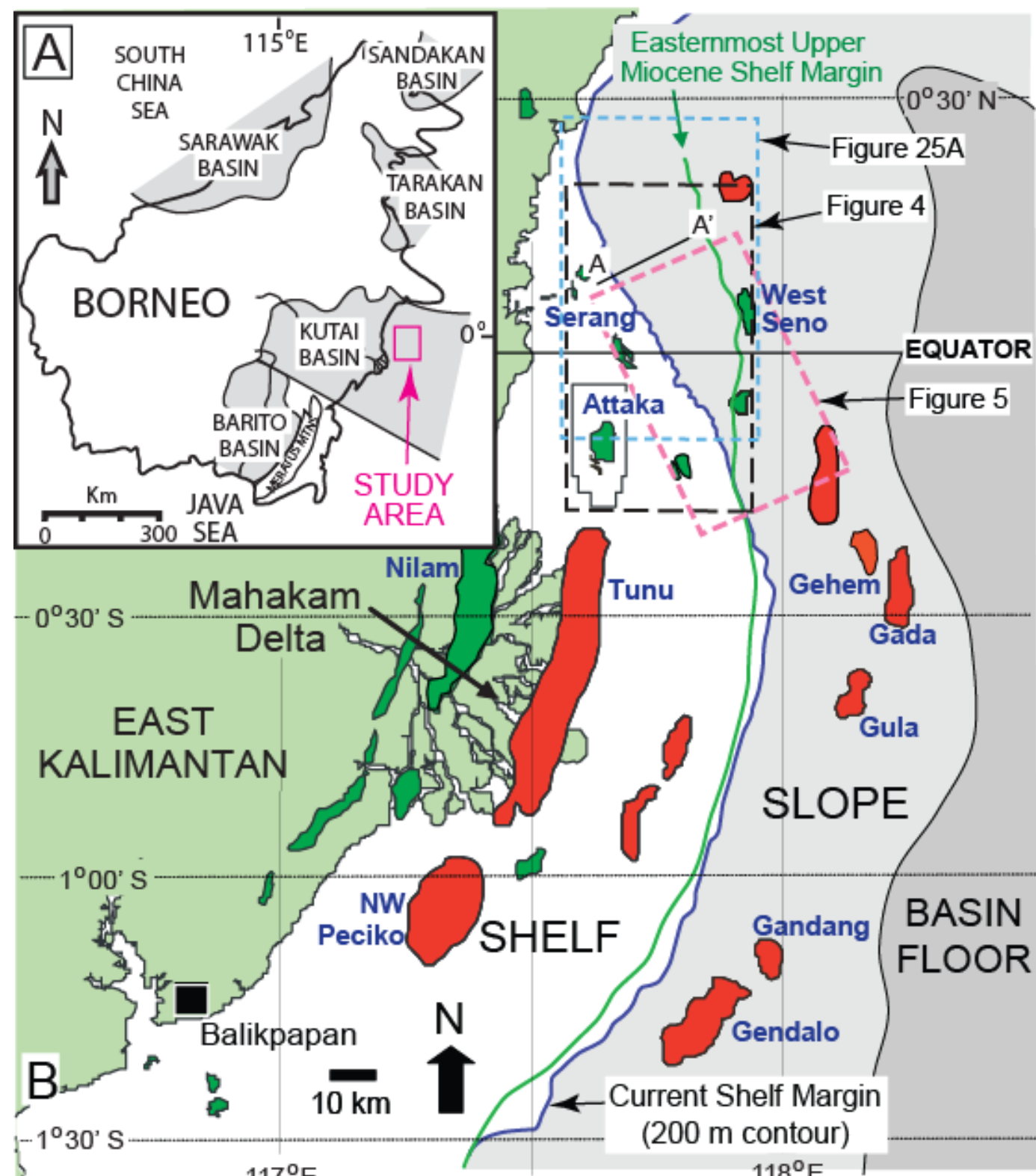
SADEWA AREA



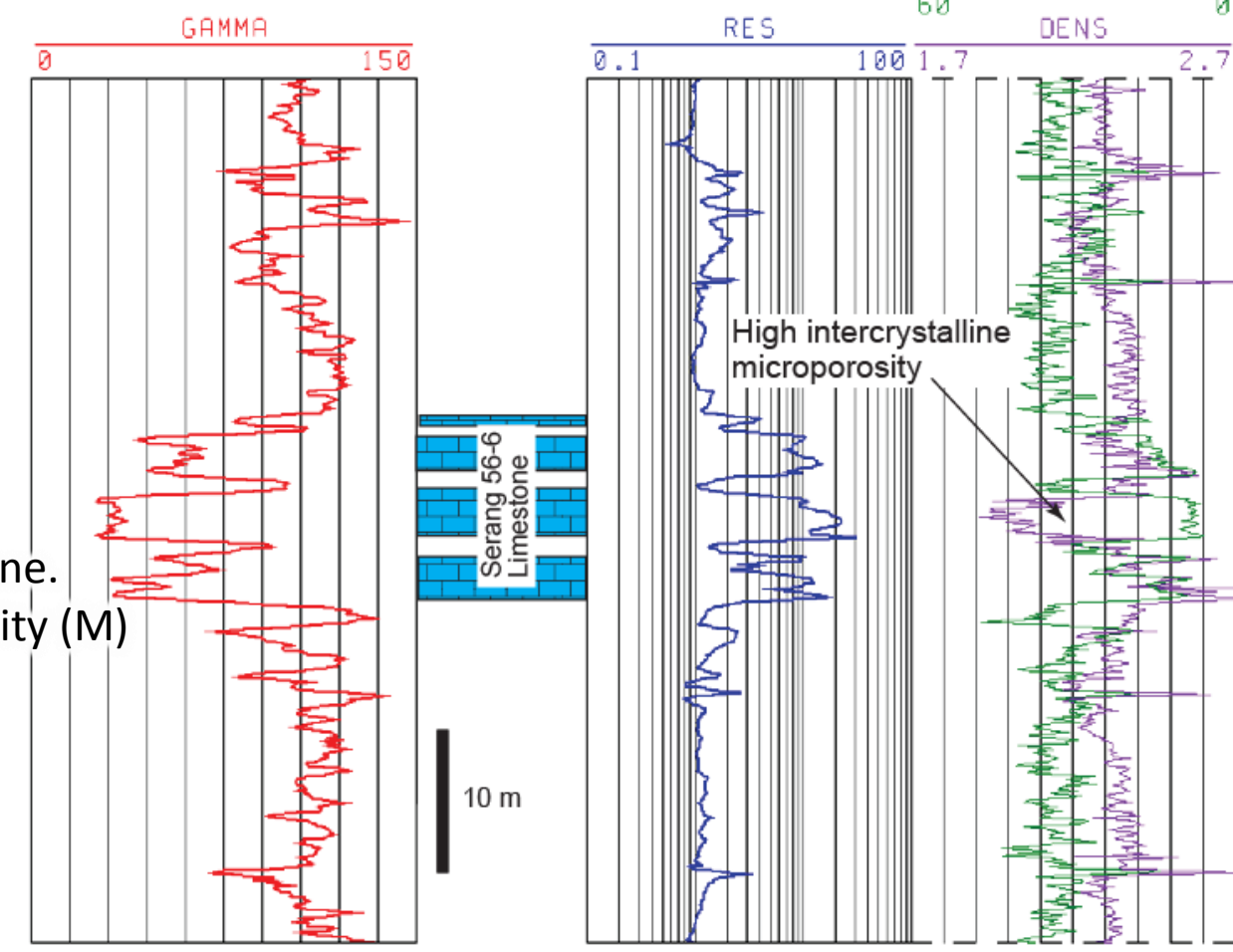
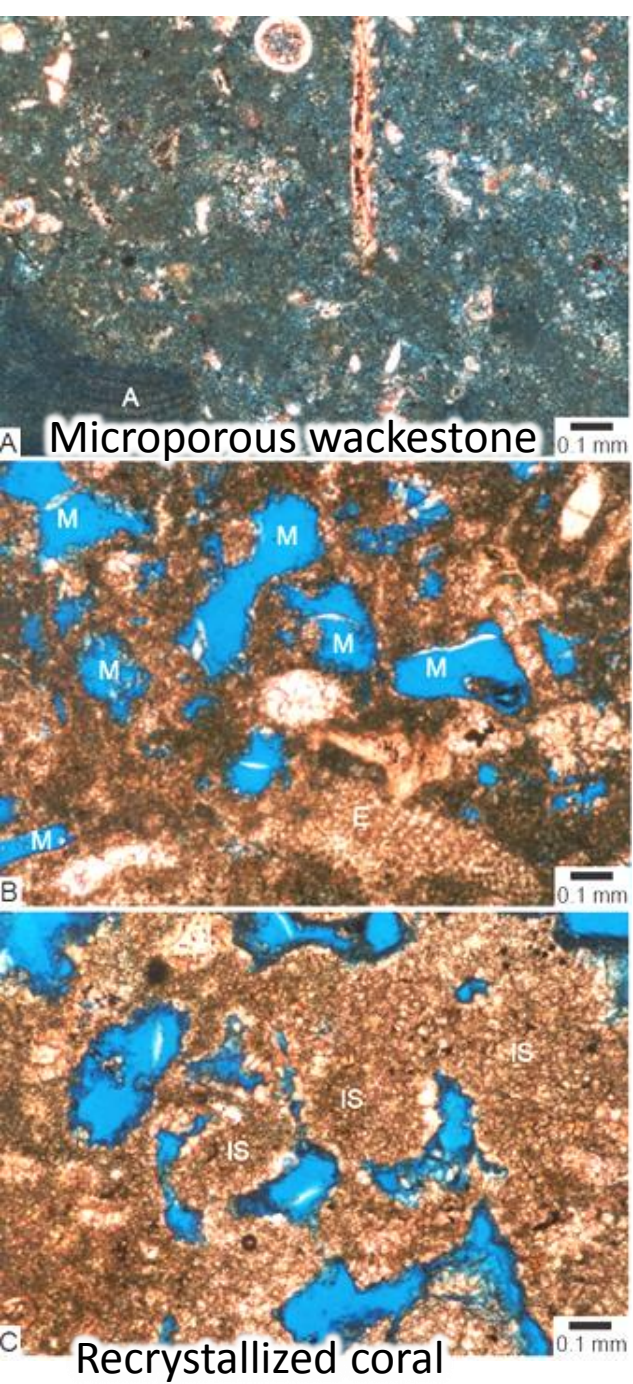
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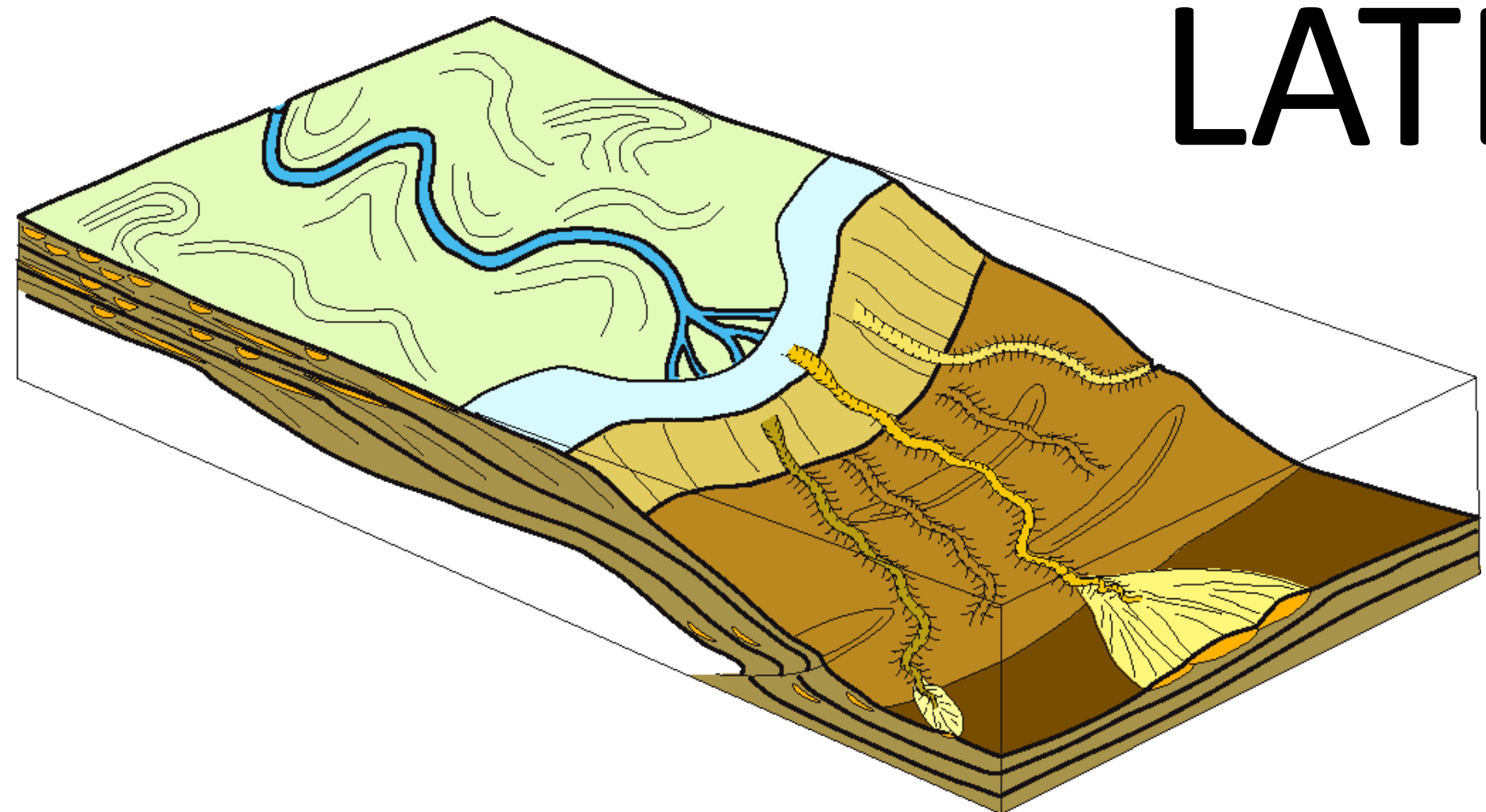
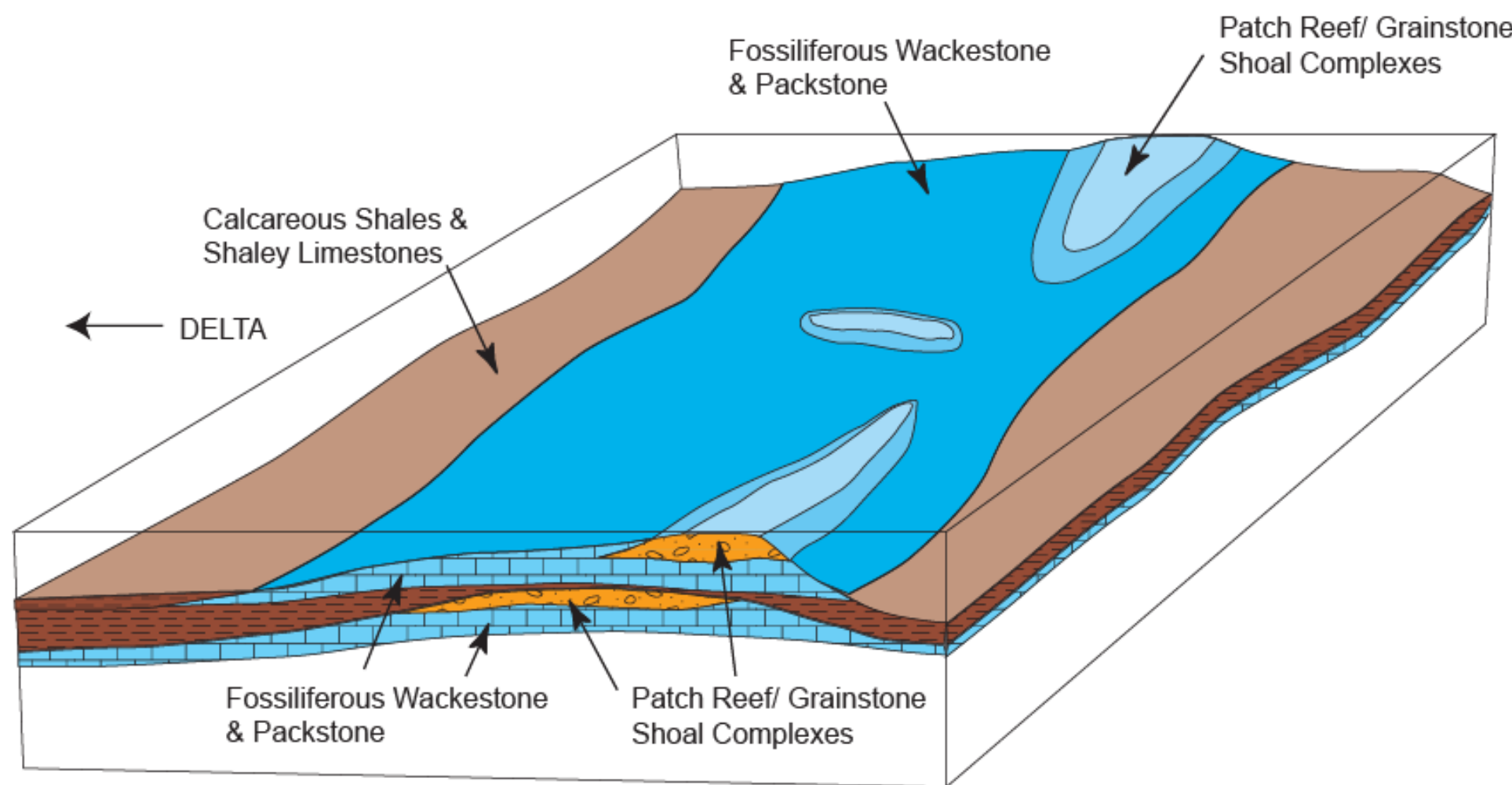
TRANSGRESSIVE SHELF MARGIN & MIDDLE SHELF
CARBONATES GREW ON **PROGRADING
SILICICLASTICS & WERE BURIED BY LATER
PROGRADING SILICICLASTICS (HST-LST)**



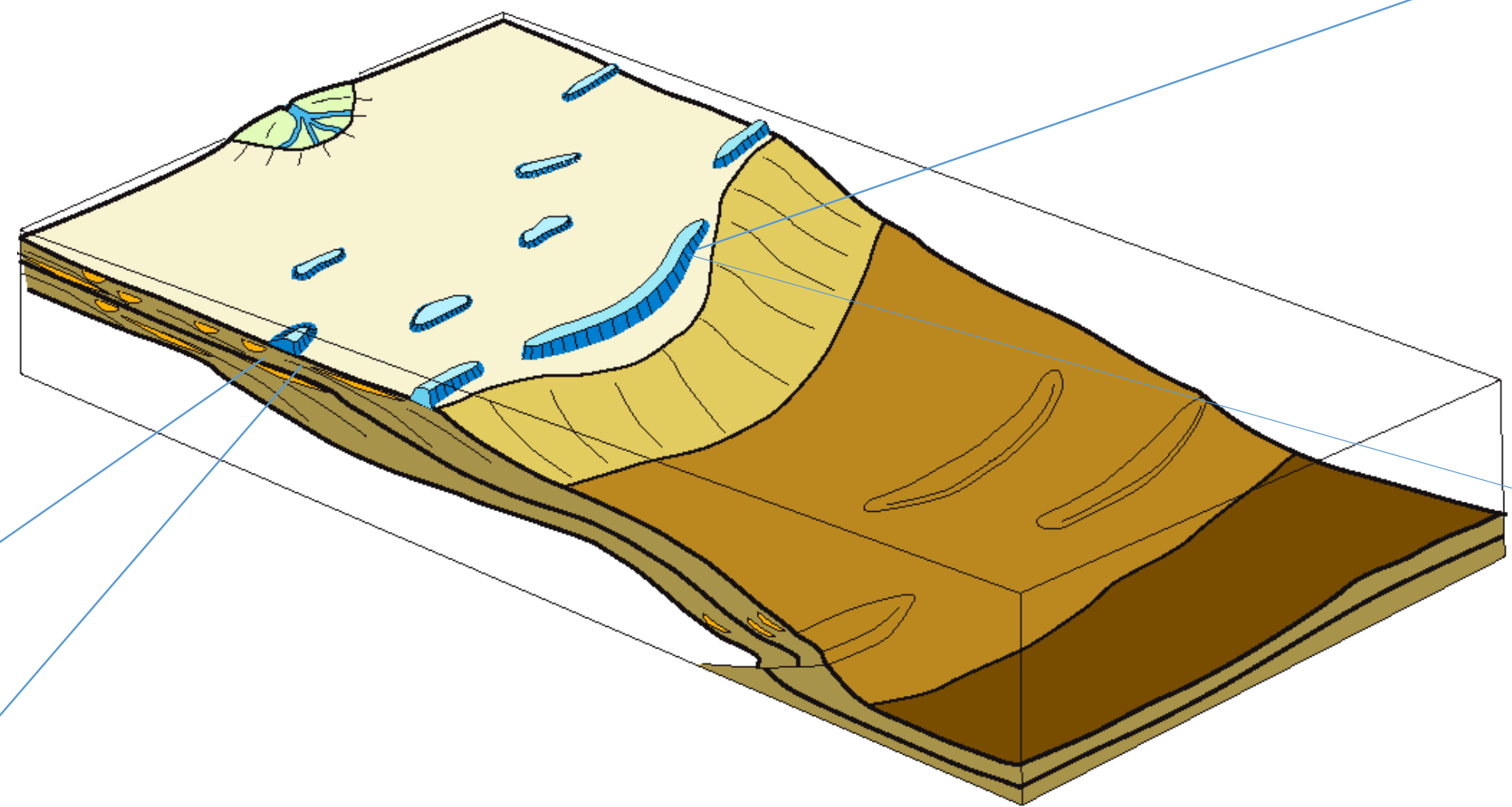
MIDDLE SHELF CARBONATE IN SHALE



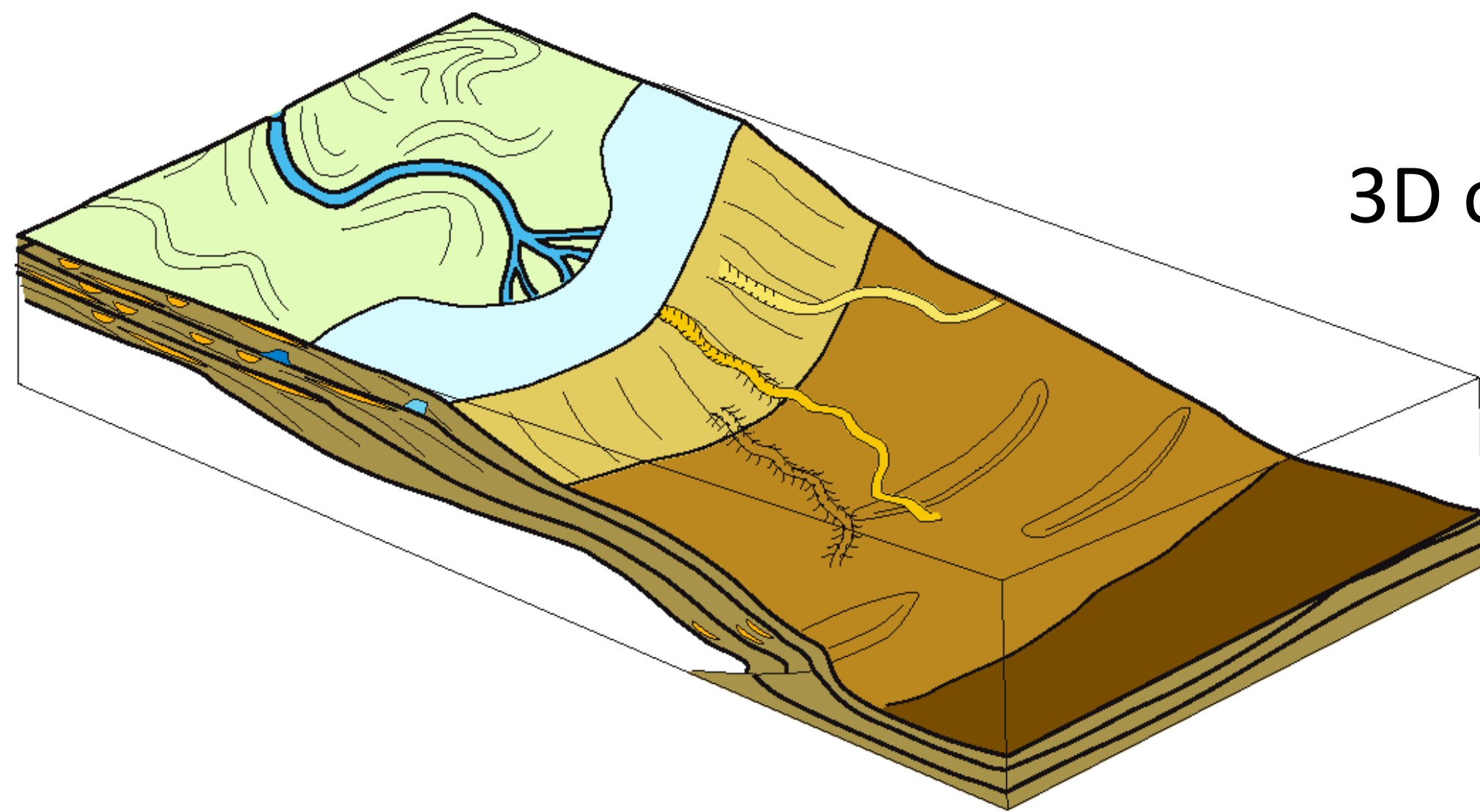
DEPOSITIONAL MODEL FOR MIDDLE SHELF CARBONATES



During Highstands & Falling Sea Level
Siliciclastic Shorelines & Deltas Prograded
Basinward



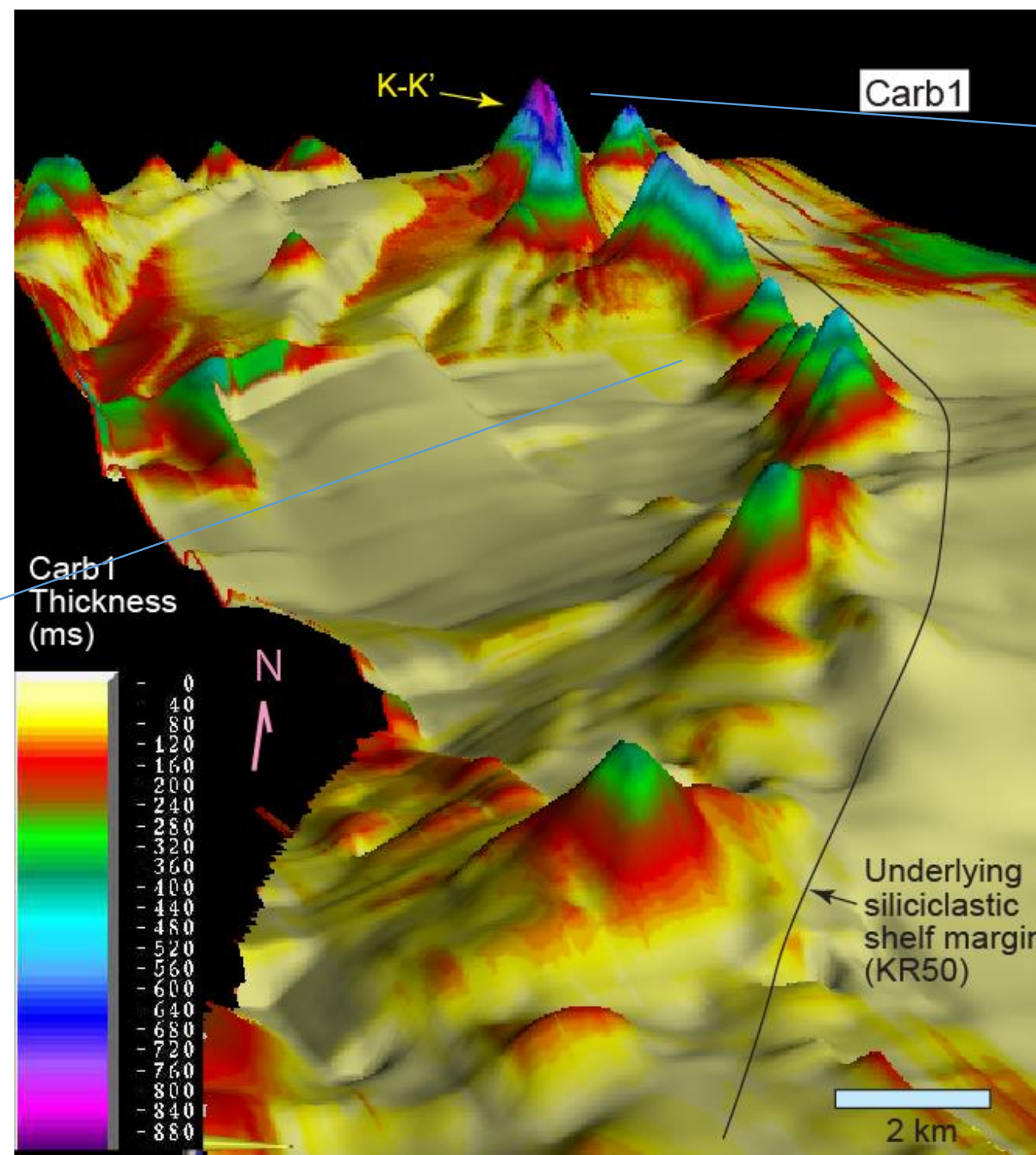
During Transgression & Rapid Sea Level
Rises, Siliciclastic Shorelines Moved
Landward & Carbonates Grew. Biggest
Carbonate Buildups are on the Shelf Margin.
Small Buildups on the Middle Shelf



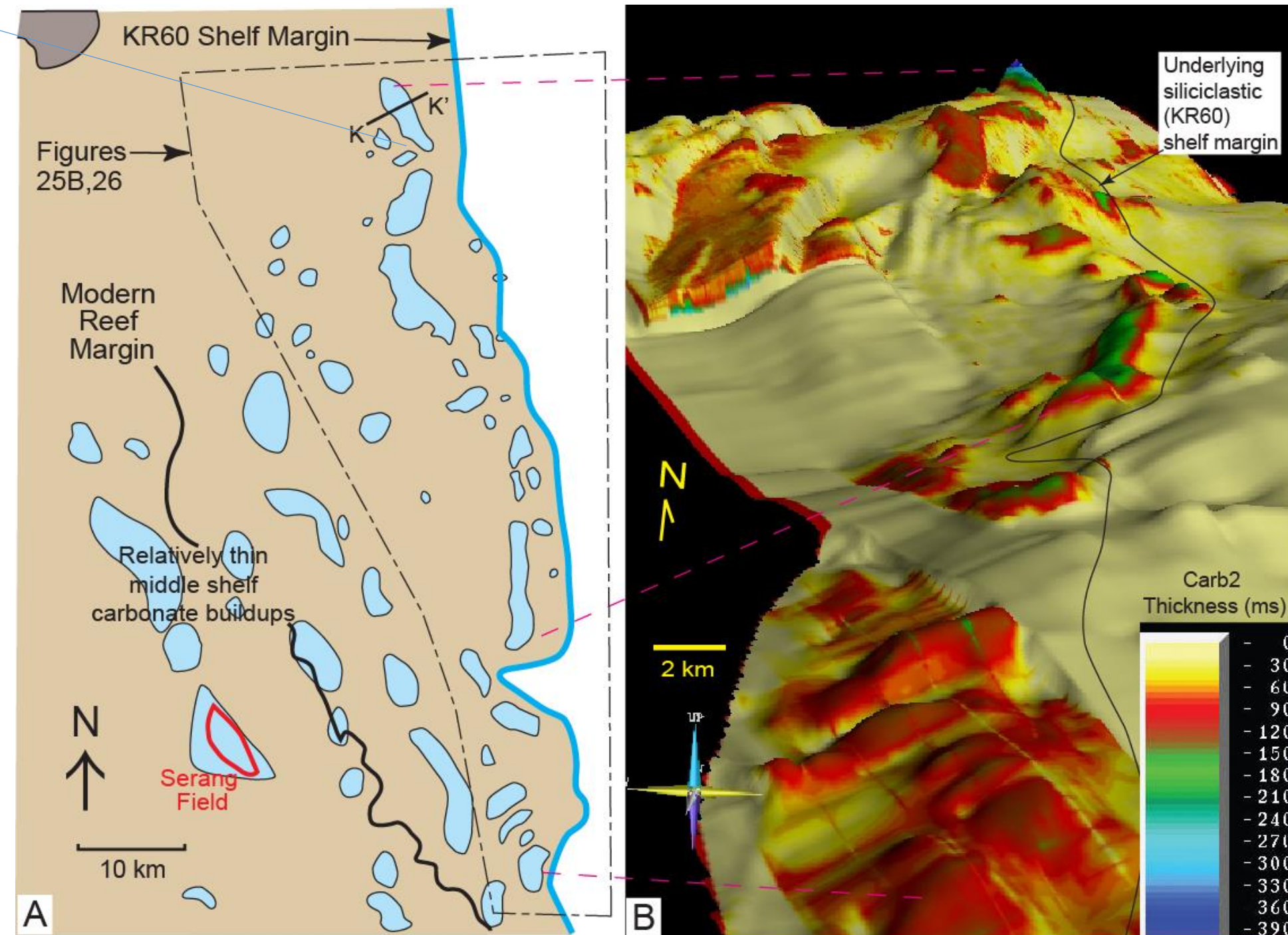
During Highstands & Falling Sea Level
Siliciclastic Shorelines & Deltas Prograded
Basinward & Buried Many Carbonates

LATE MIOCENE-PLIOCENE

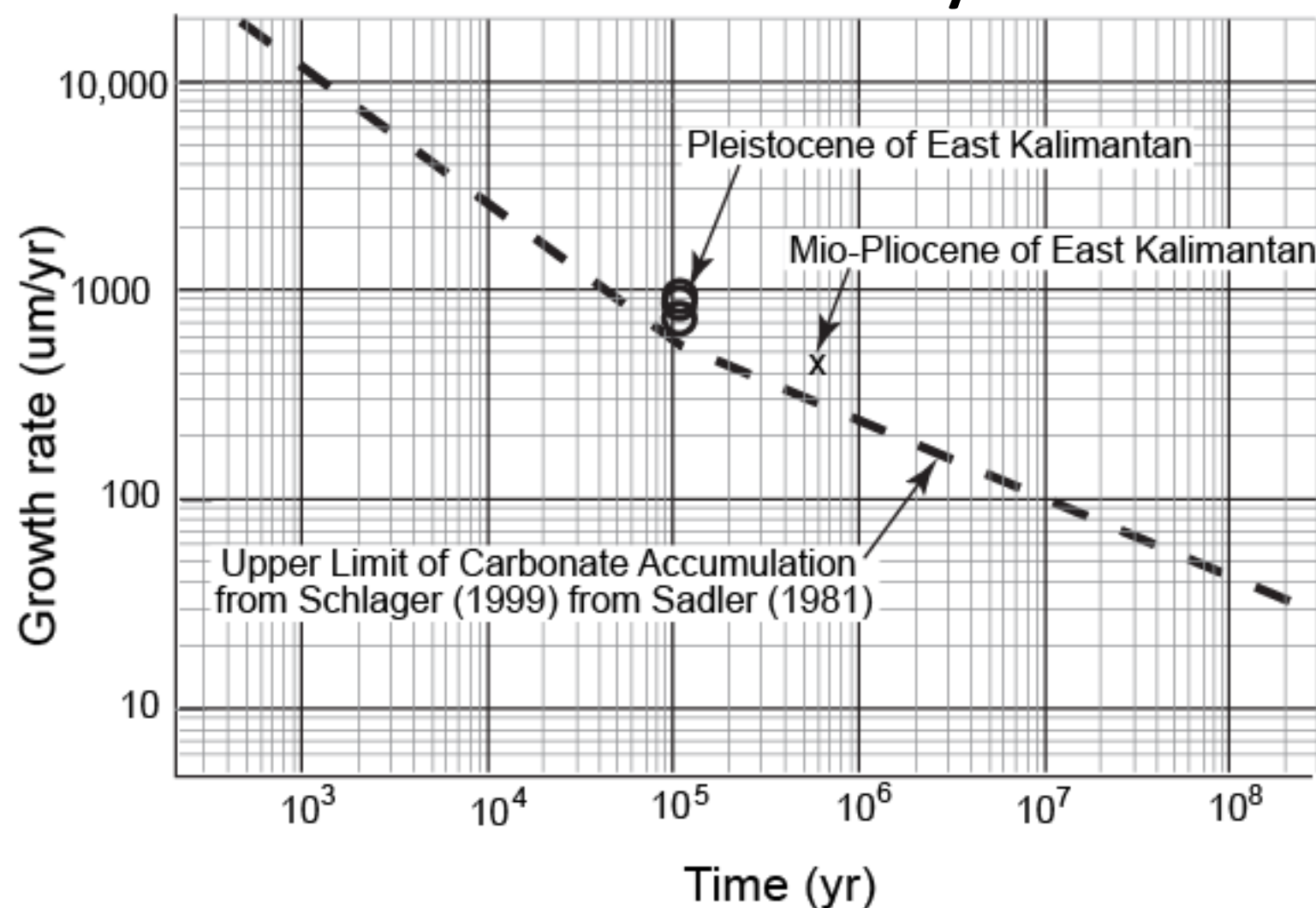
SHELF MARGIN CARBONATES



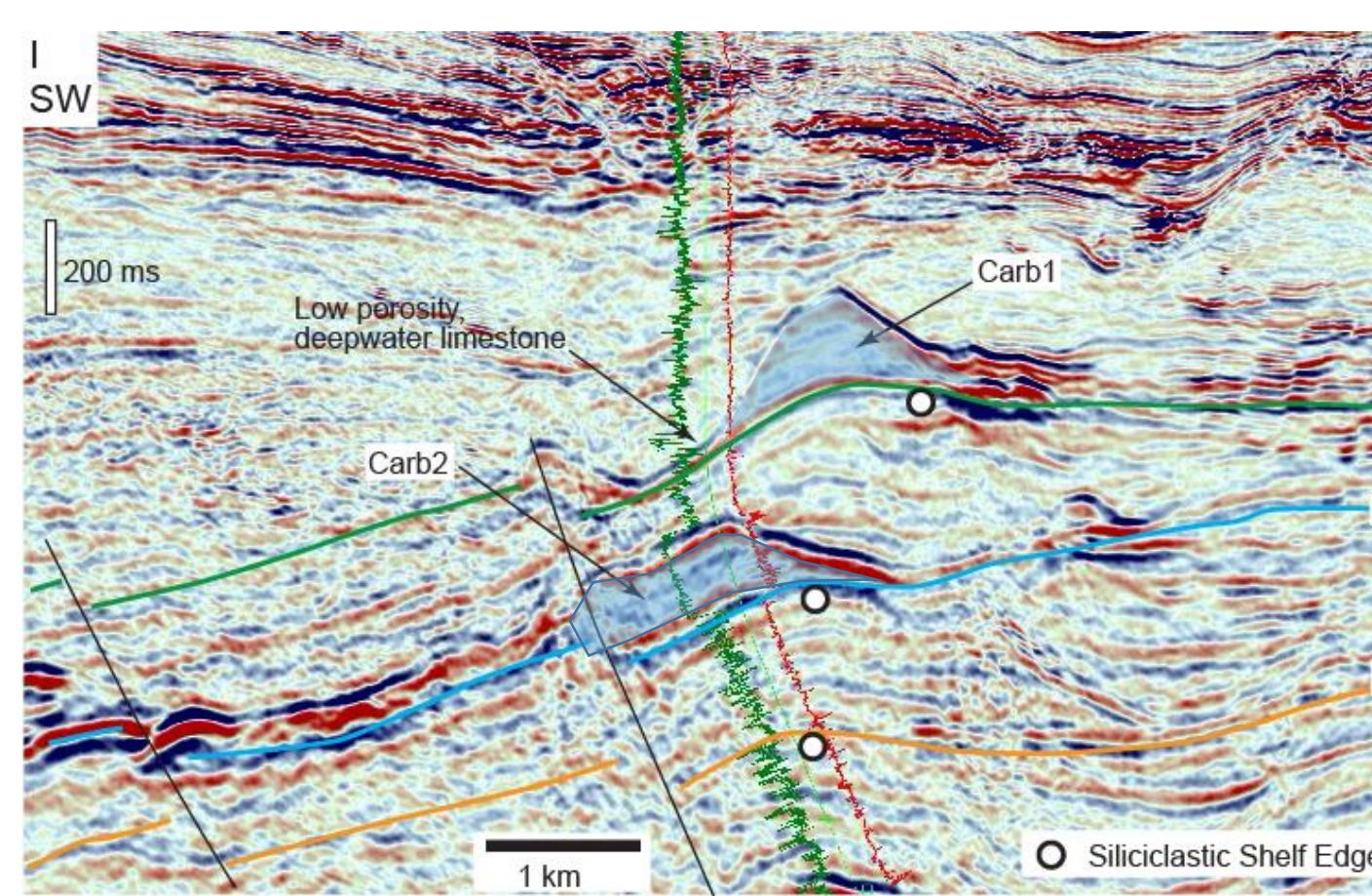
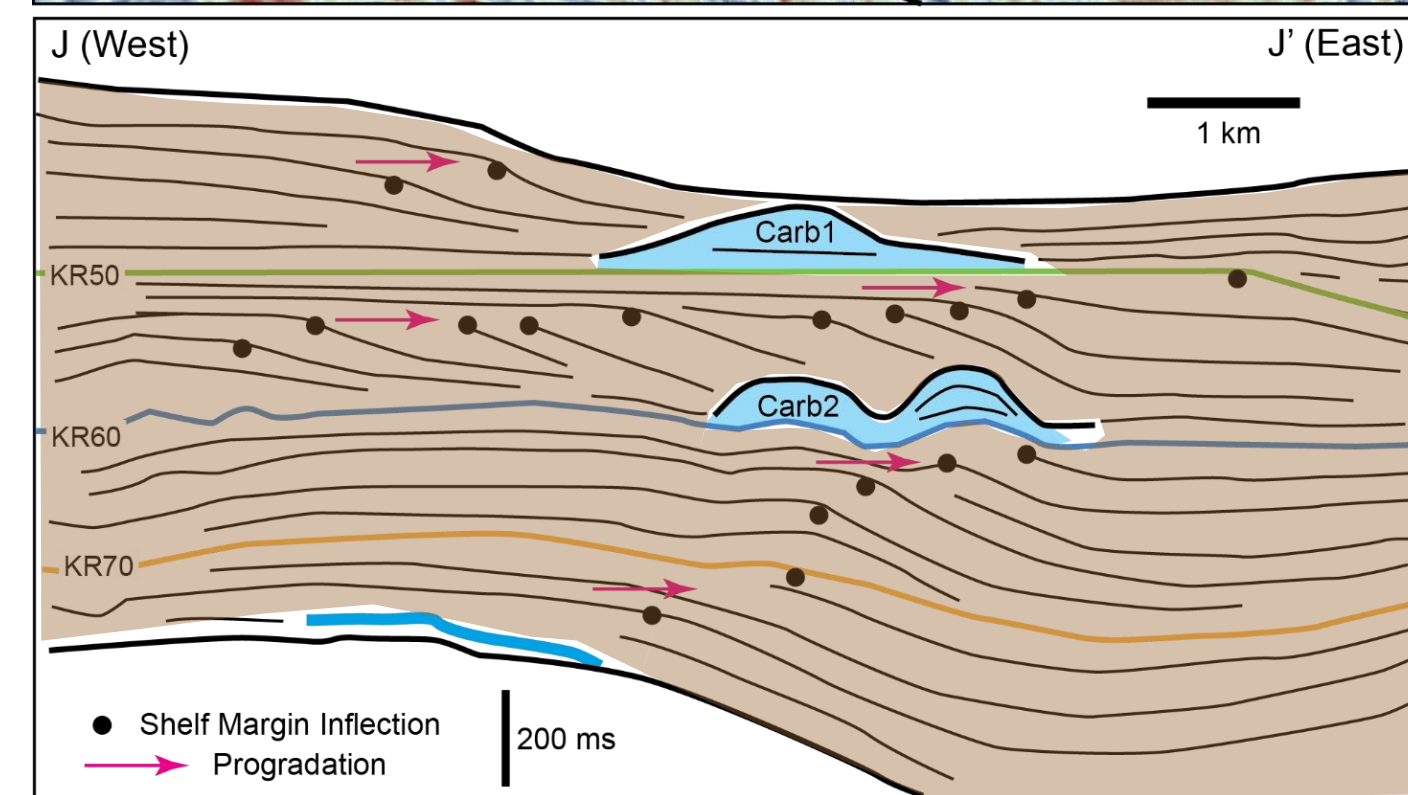
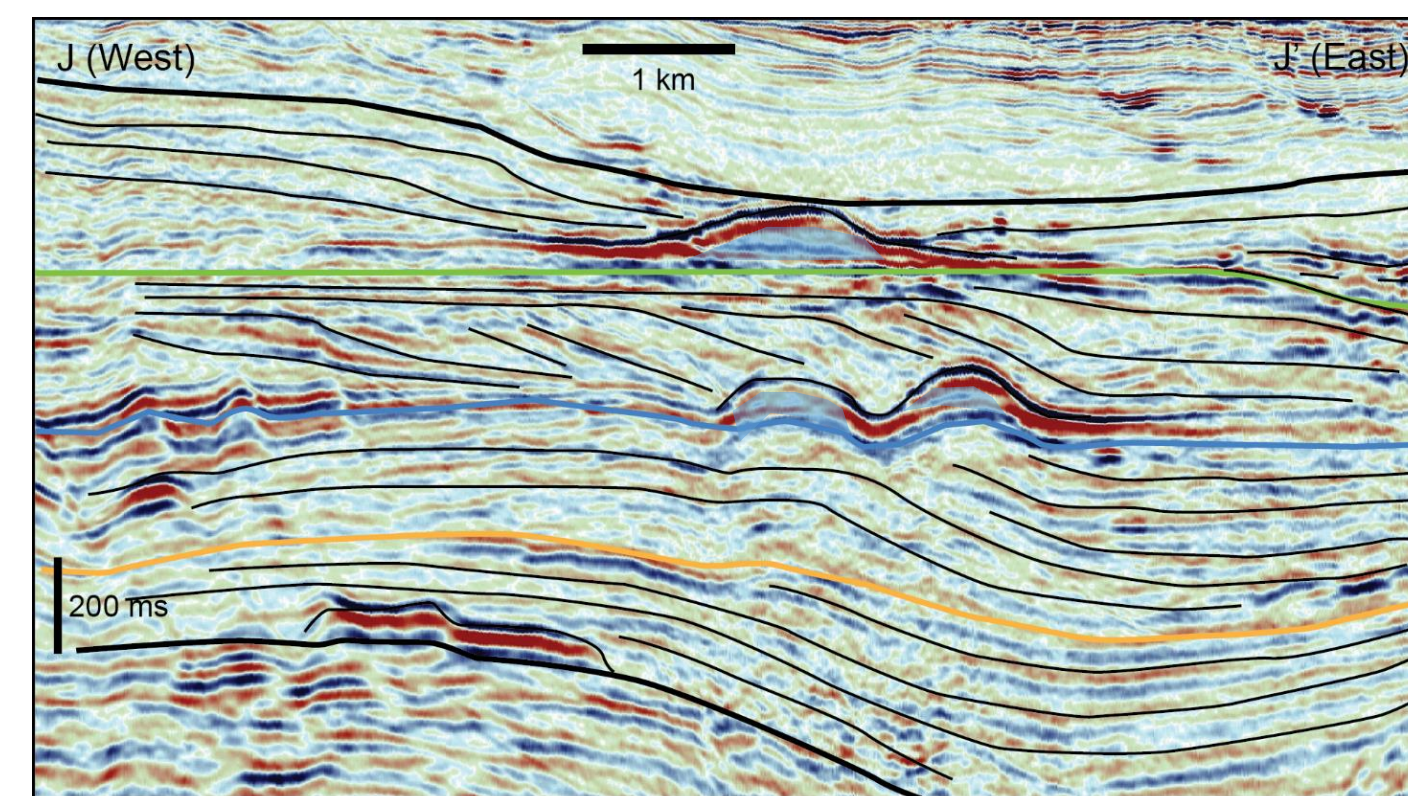
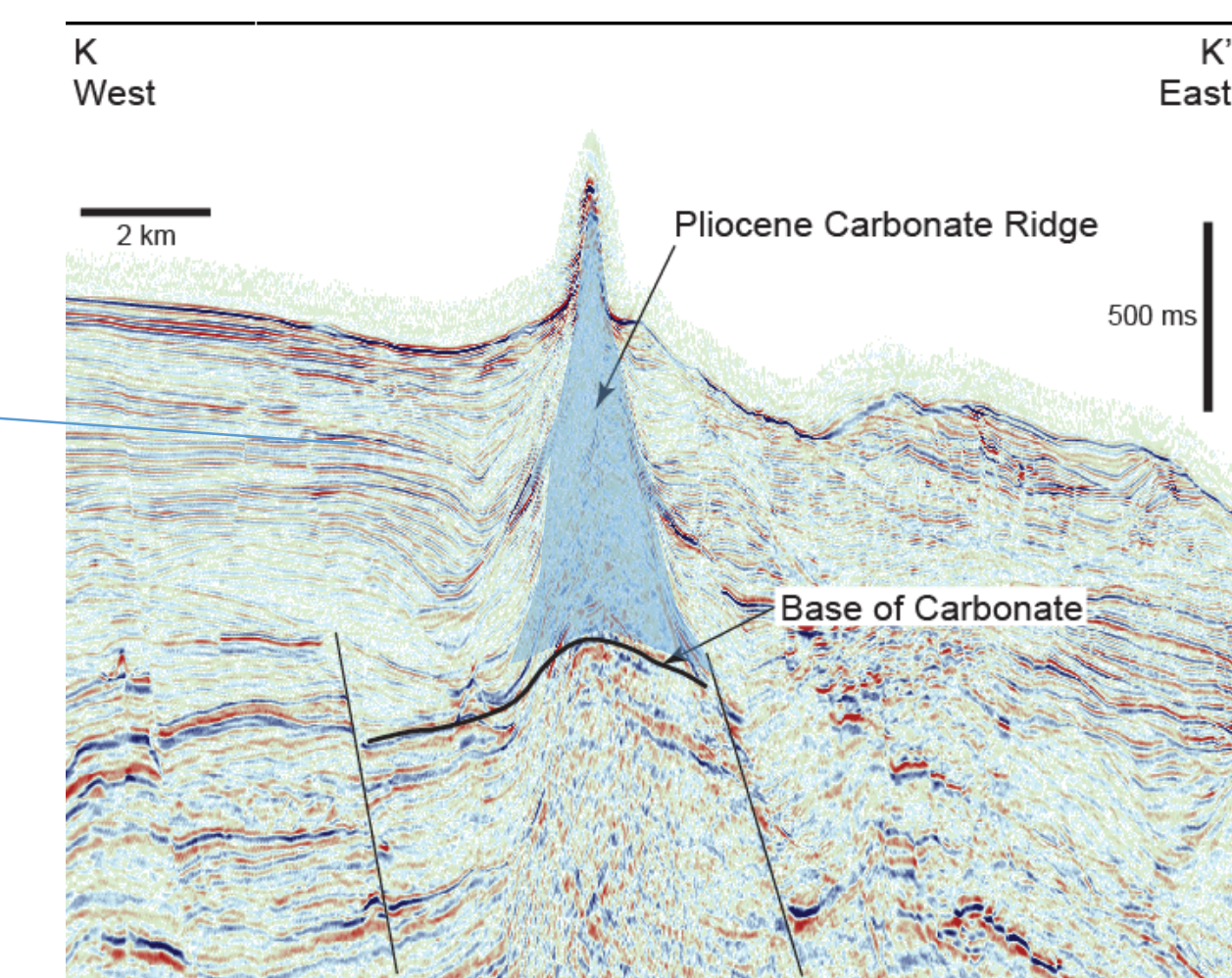
3D of Top Upper Carbonate with
Overlay of Carbonate Thickness



3D of Lower Carbonate with Overlay of Thickness



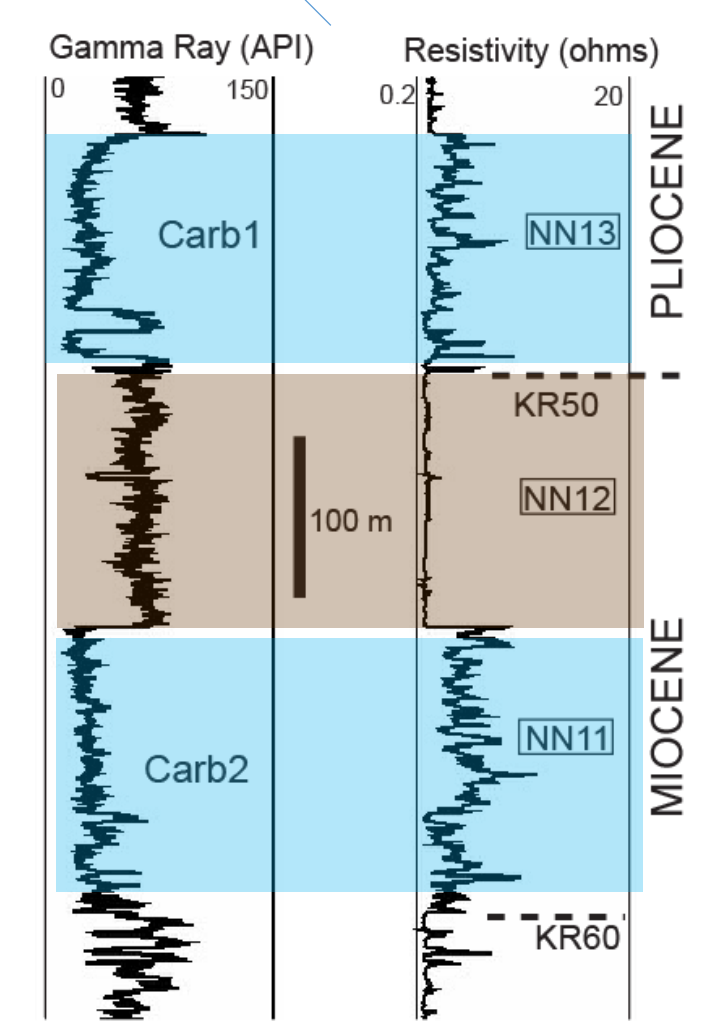
Relatively Rapid Subsidence Allow Very
Rapid Carbonate Growth



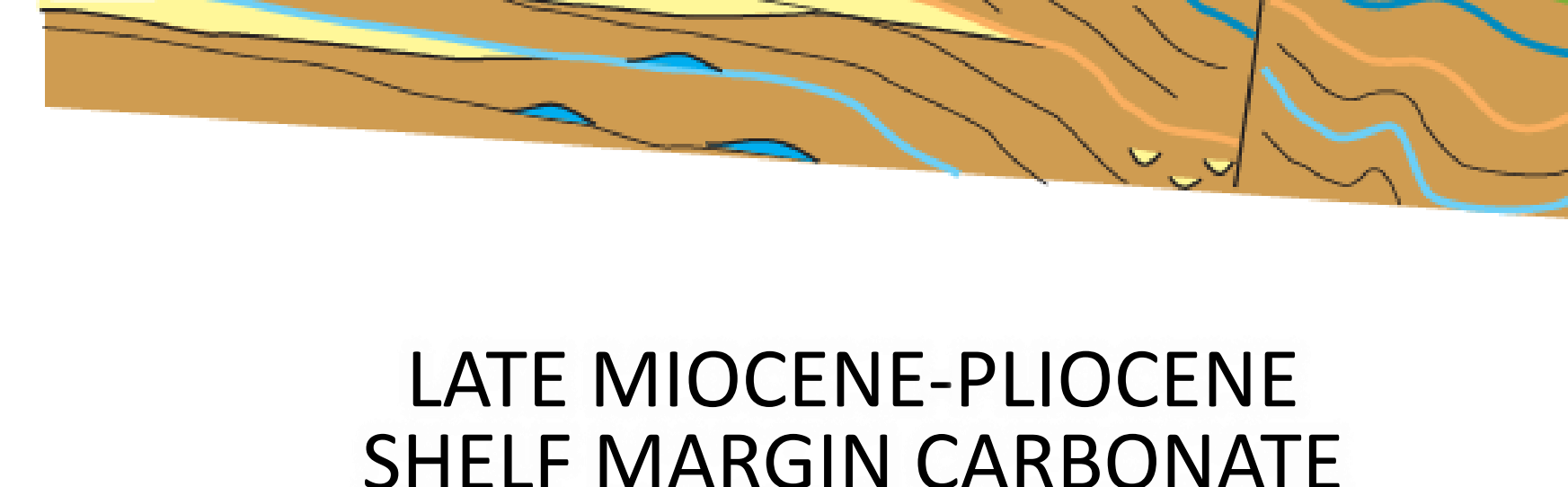
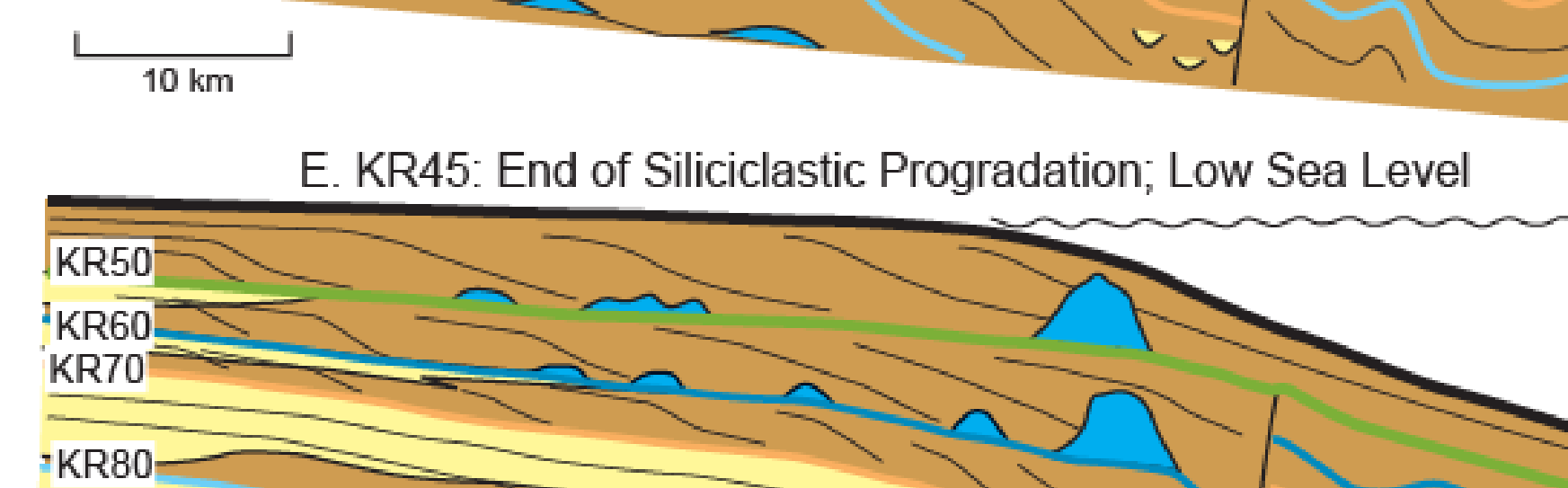
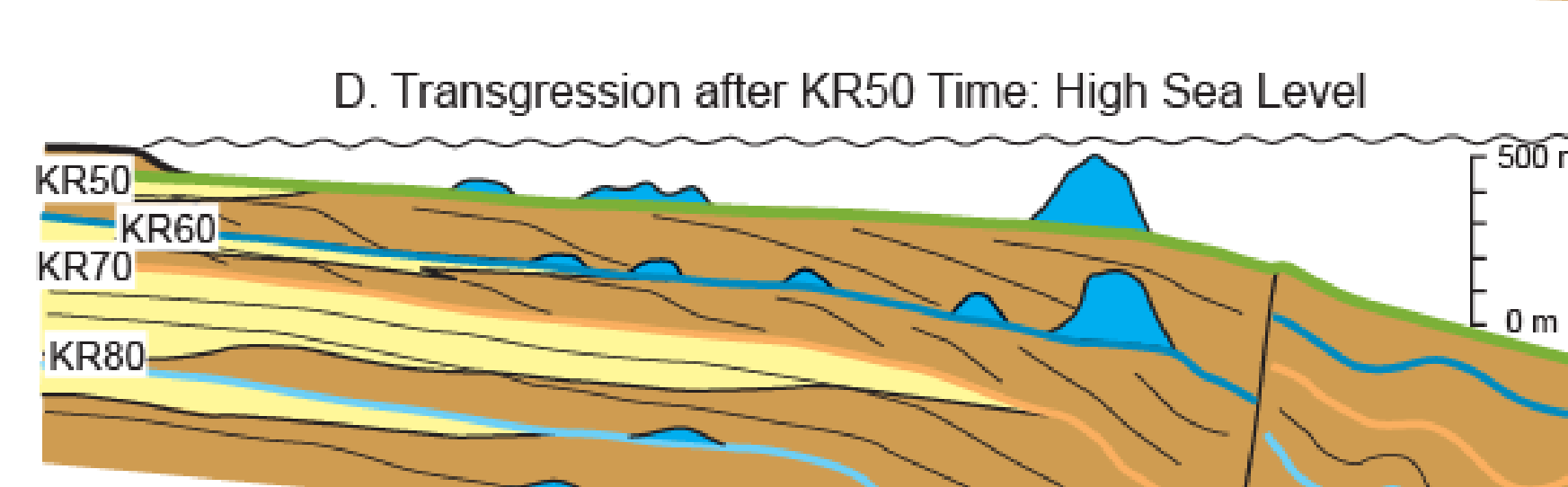
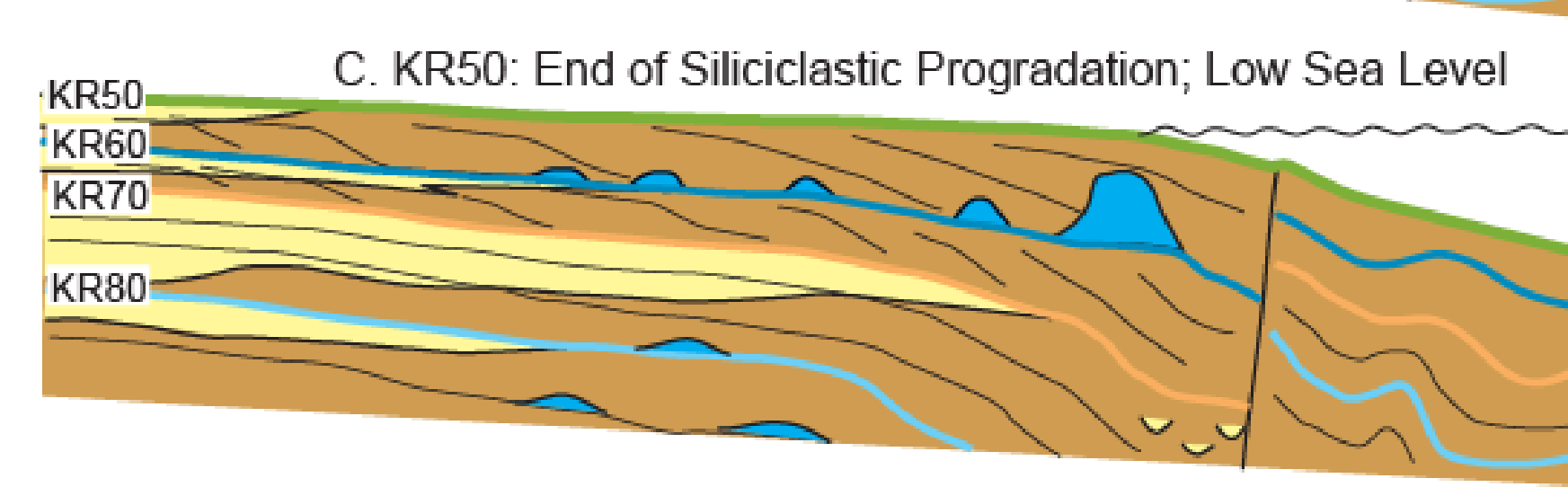
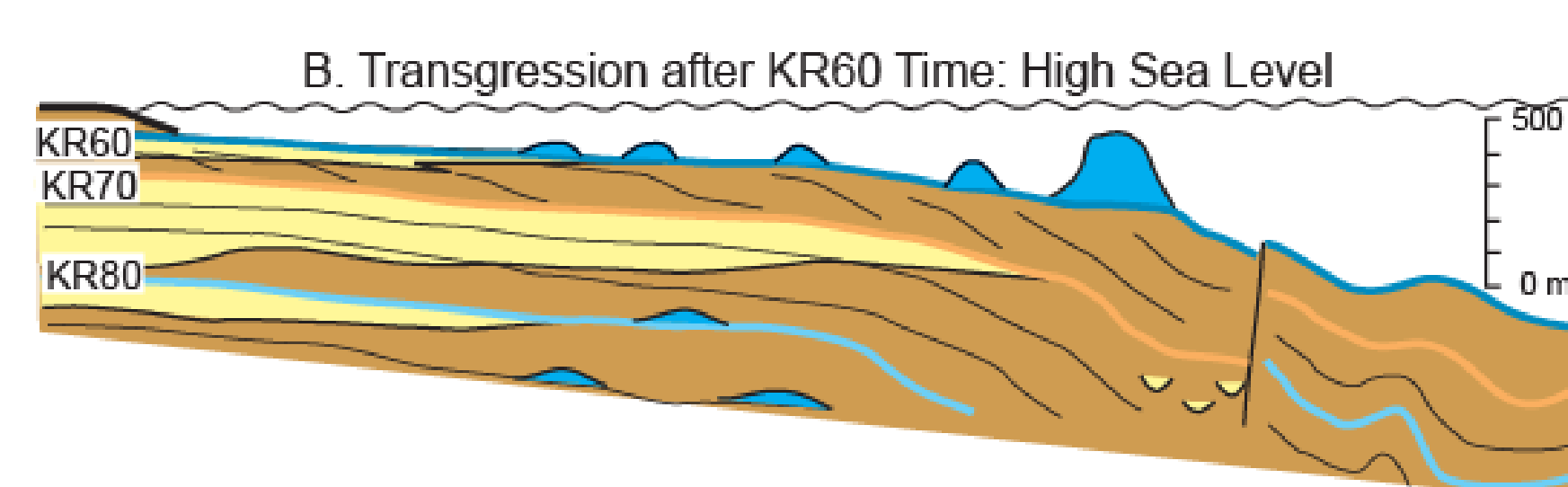
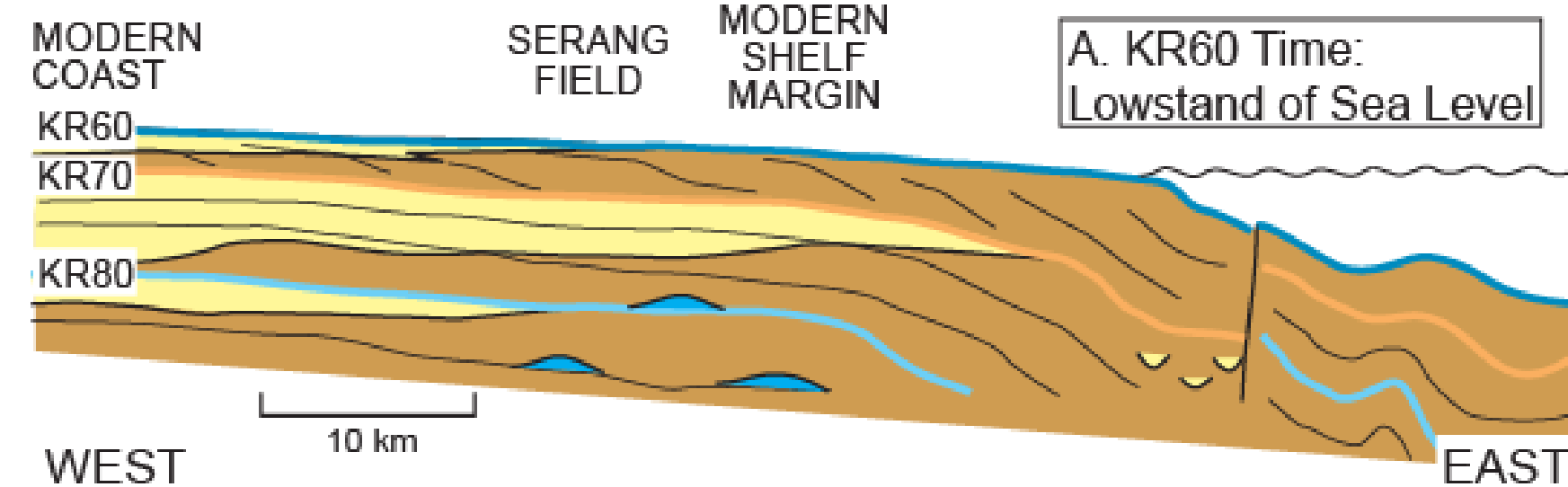
TST

HST-LST

TST



LATE MIOCENE-PLIOCENE DEPOSITIONAL HISTORY



LATE MIOCENE-PLIOCENE SHELF MARGIN CARBONATE

