



AAPG

Latin America & Caribbean Region

SURINAME 2019

Geosciences Technology Workshop

Hydrocarbon System and Major Tectonic Events of the Guyana Basin

Ken Nibbelink

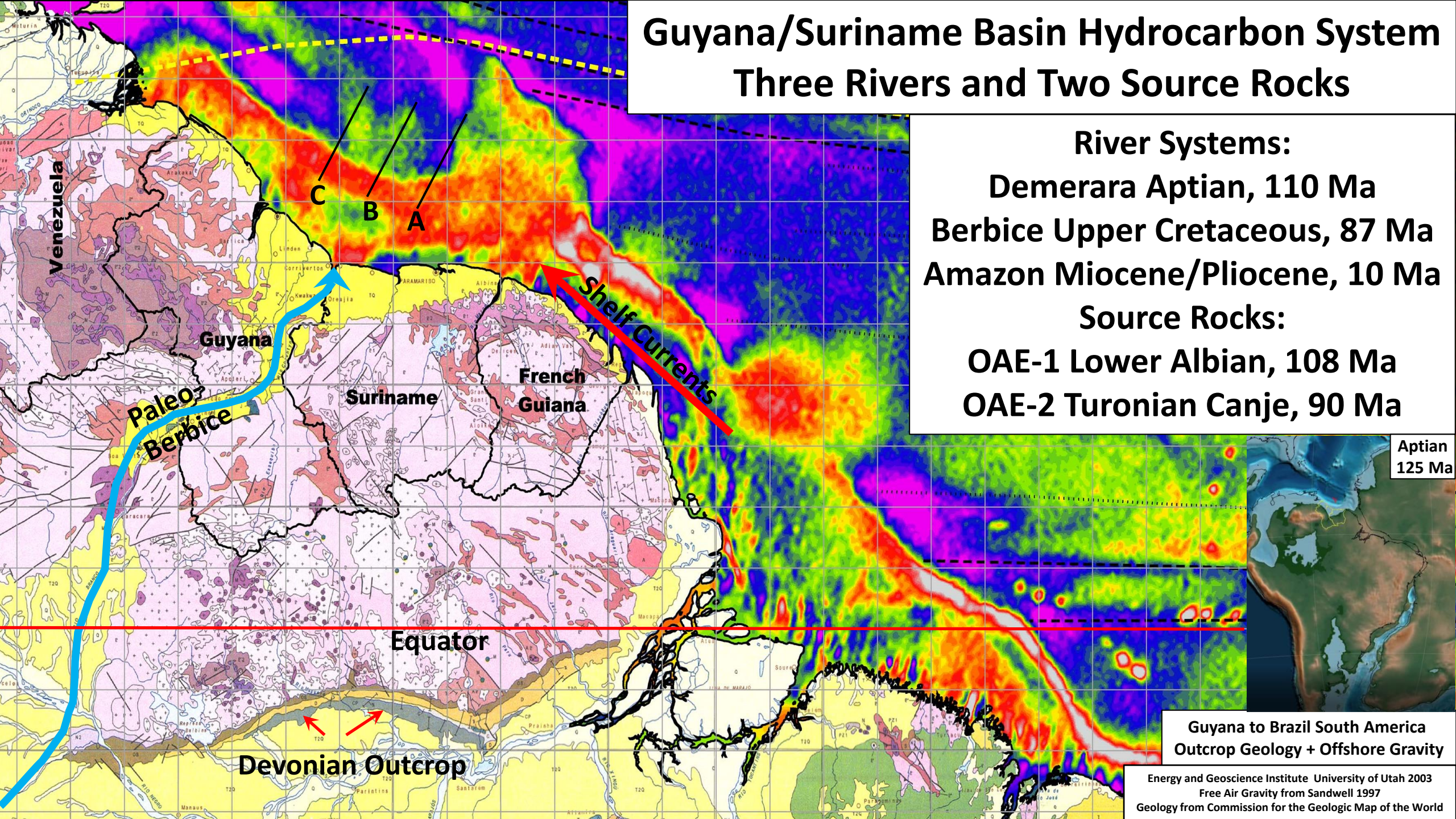
Dick Boyce, Mosab Nasser, Jack Boyce, Bob Webster, Fred Cedoz

JHI Associates (BVI)



Guyana/Suriname Basin Hydrocarbon System

Three Rivers and Two Source Rocks



River Systems:

Demerara Aptian, 110 Ma

Berbice Upper Cretaceous, 87 Ma

Amazon Miocene/Pliocene, 10 Ma

Source Rocks:

OAE-1 Lower Albian, 108 Ma

OAE-2 Turonian Canje, 90 Ma

Aptian
125 Ma

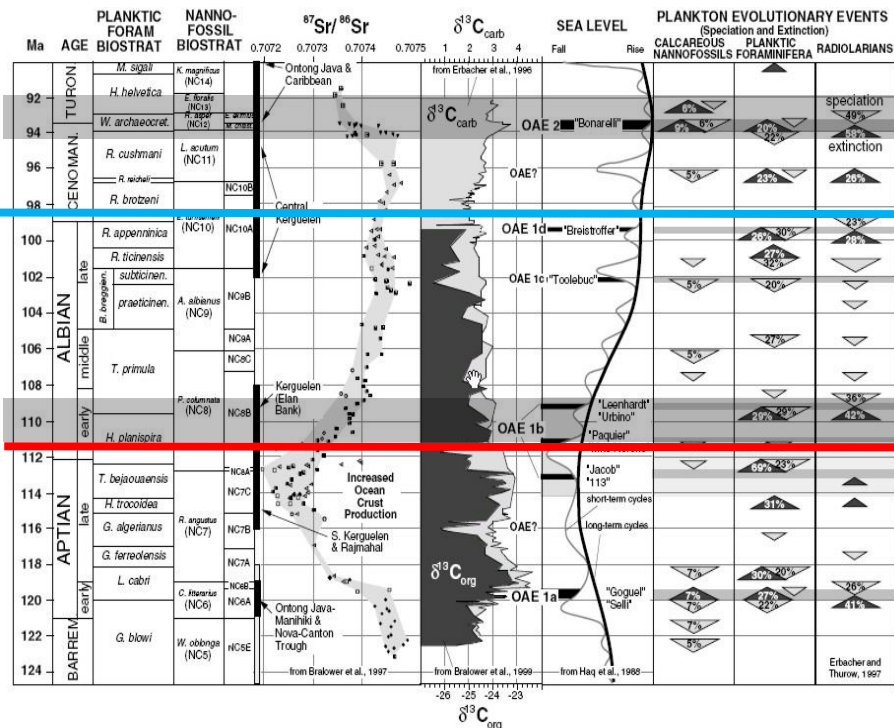
Guyana to Brazil South America
Outcrop Geology + Offshore Gravity

Energy and Geoscience Institute University of Utah 2003
Free Air Gravity from Sandwell 1997
Geology from Commission for the Geologic Map of the World

Guyana/Suriname Basin, Two Source Rocks, Atlantic Basin Regional Analogs

Mid-Cretaceous Black Shale + Oceanic Anoxic Events Erbacher et al 1996

DSDP Leg 207 Demerara Rise

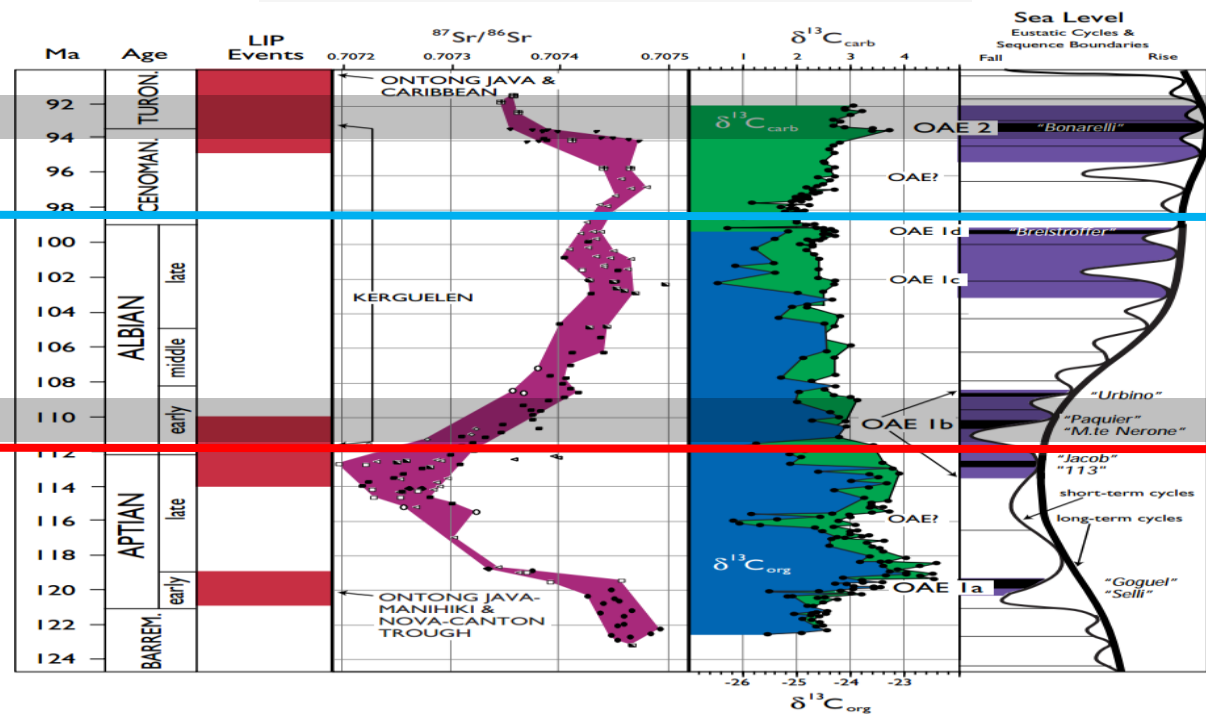


090_Turonian OAE-2

098_Albian

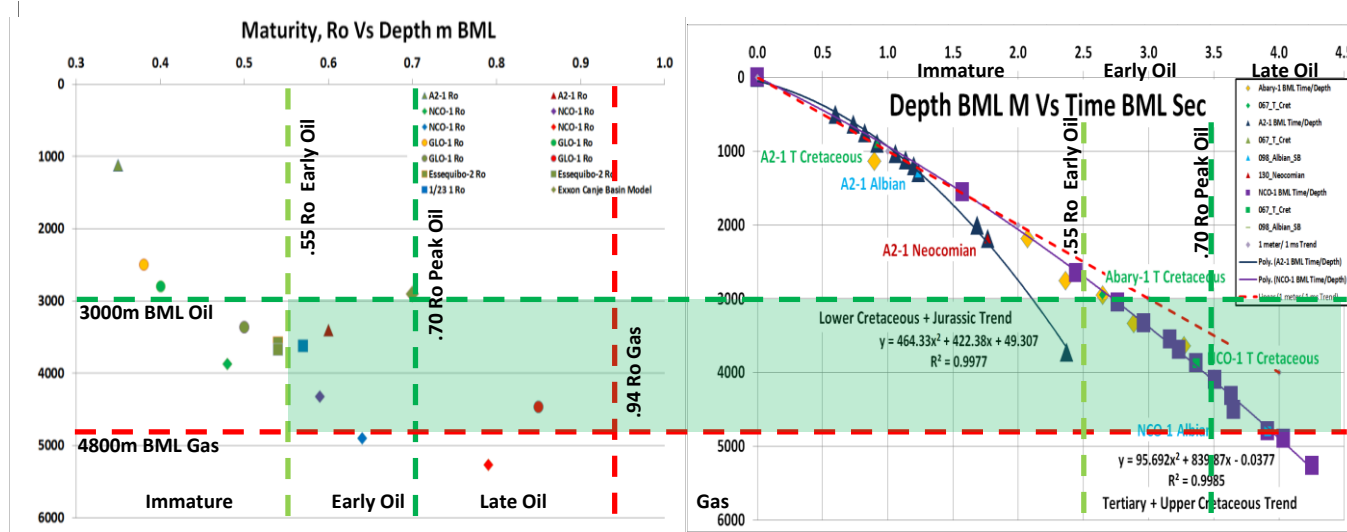
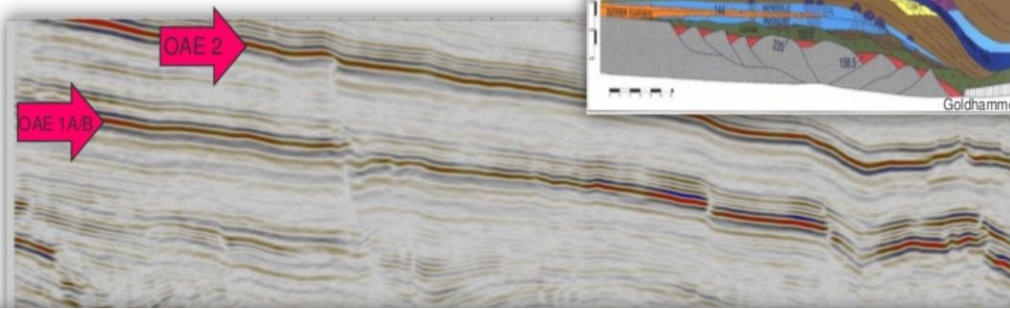
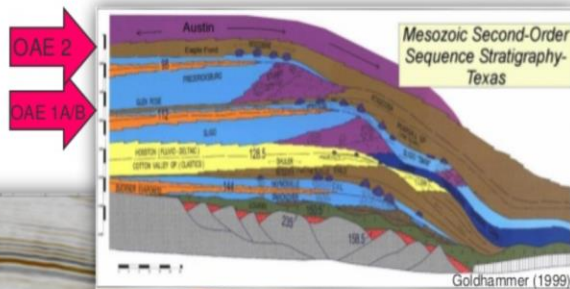
108_L Albian OAE-1

110_Aptian Salt/Basalt

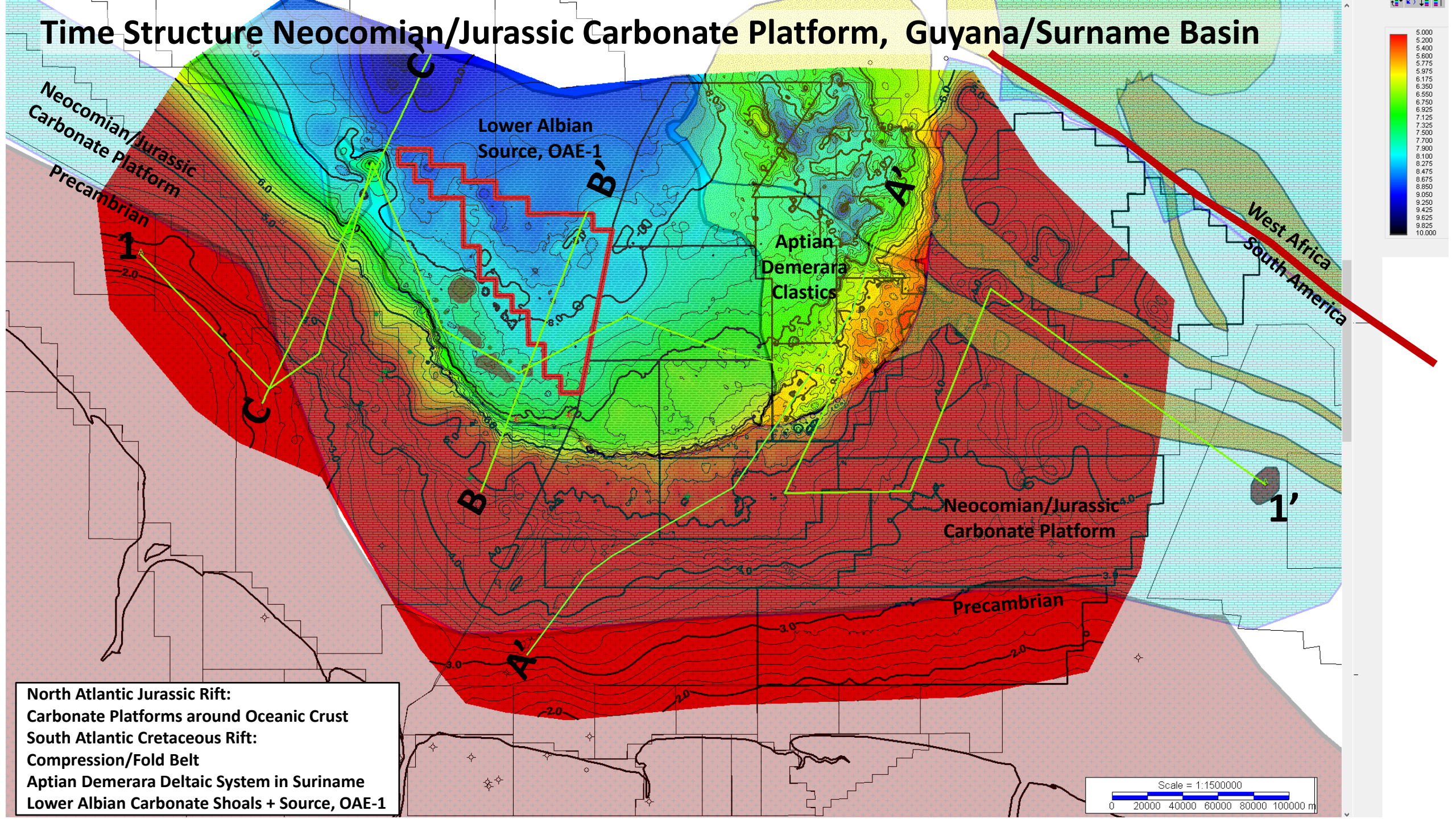


Example: Packaged play OAE 1A, Mesozoic of N. GoM

OAE form seismically-resolvable stratigraphic breaks that can be mapped over hundreds of km². Event recovery reefs with grainstone aprons are also easily imaged.



Time Structure Neocomian/Jurassic Carbonate Platform, Guyana/Surname Basin



North Atlantic Jurassic Rift:
Carbonate Platforms around Oceanic Crust
South Atlantic Cretaceous Rift:
Compression/Fold Belt
Aptian Demerara Deltaic System in Suriname
Lower Albian Carbonate Shoals + Source, OAE-1

1-1' Regional Well Cross Section Guyana/Suriname

River Systems:

Demerara Aptian, 110 Ma

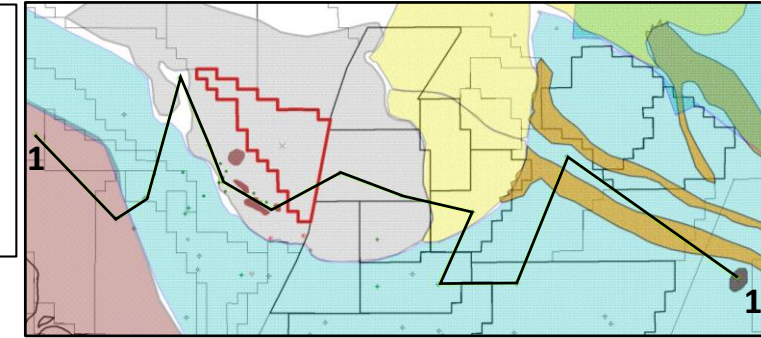
Berbice Upper Cretaceous, 87 Ma

Amazon Miocene/Pliocene, 10 Ma

Source Rocks:

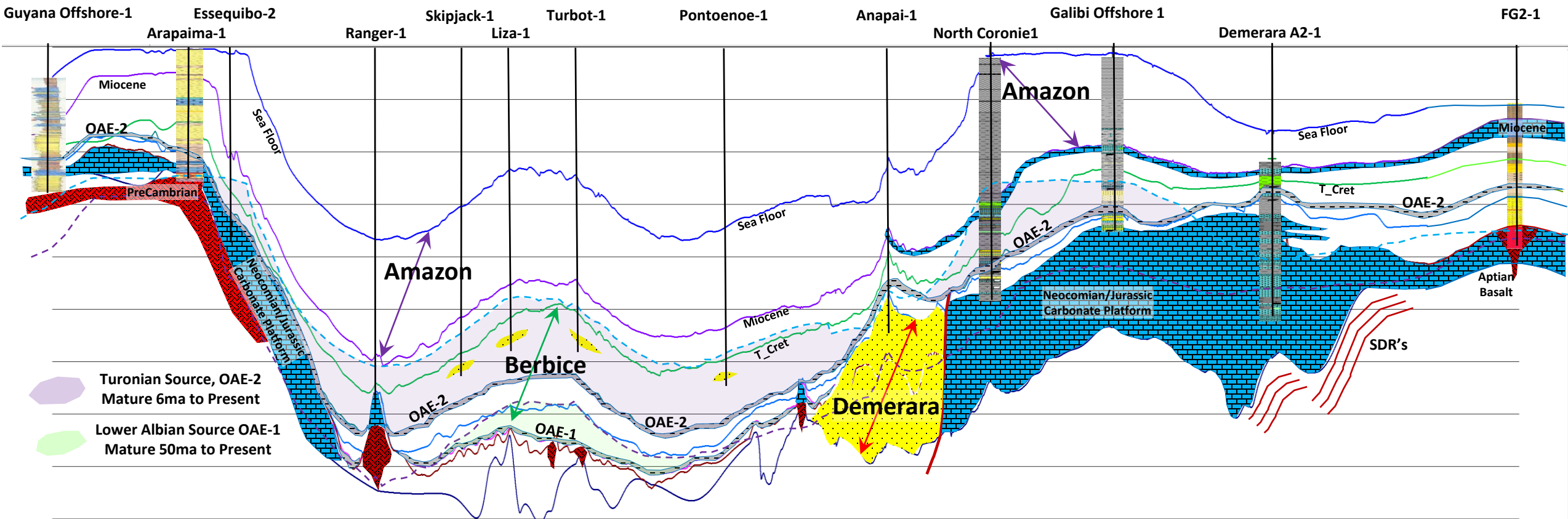
OAE-1 Lower Albian, 108 Ma

OAE-2 Turonian Canje, 90 Ma



1 West

1' East





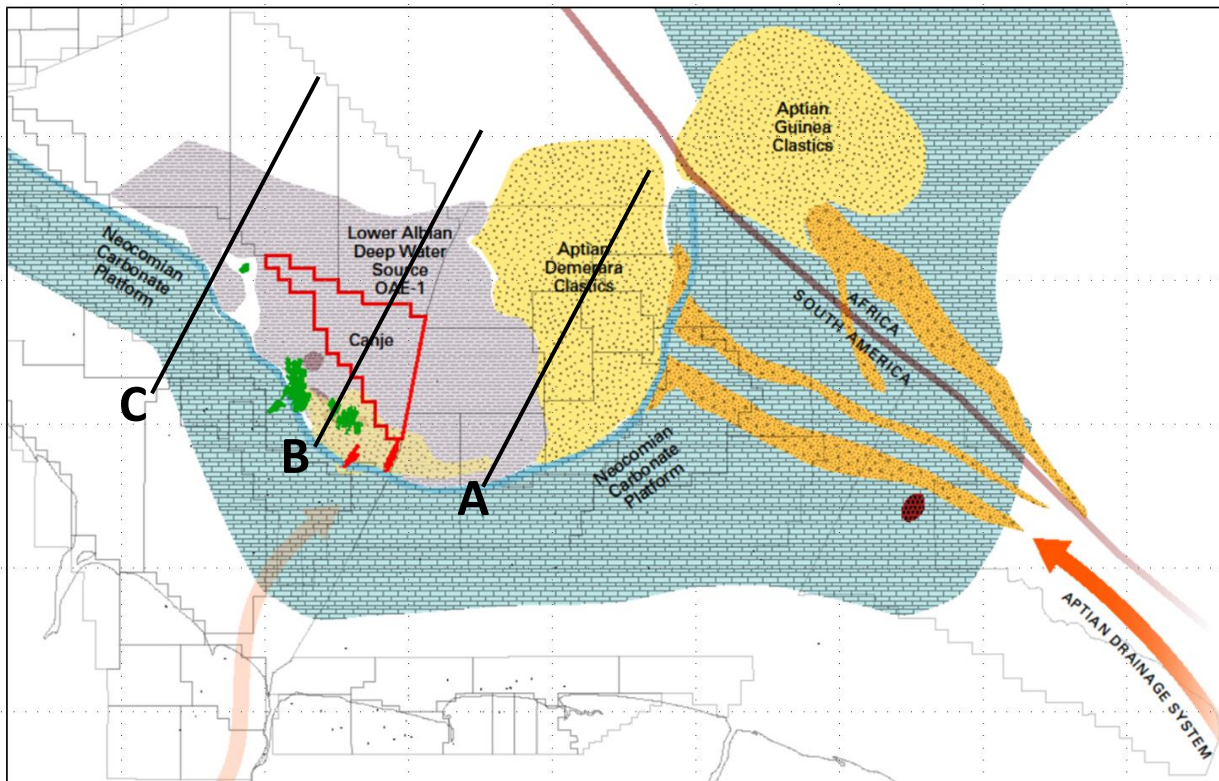
River System:
Demerara Aptian, 125-110 Ma
Source Rocks:
OAE-1 Lower Albian, 108 Ma



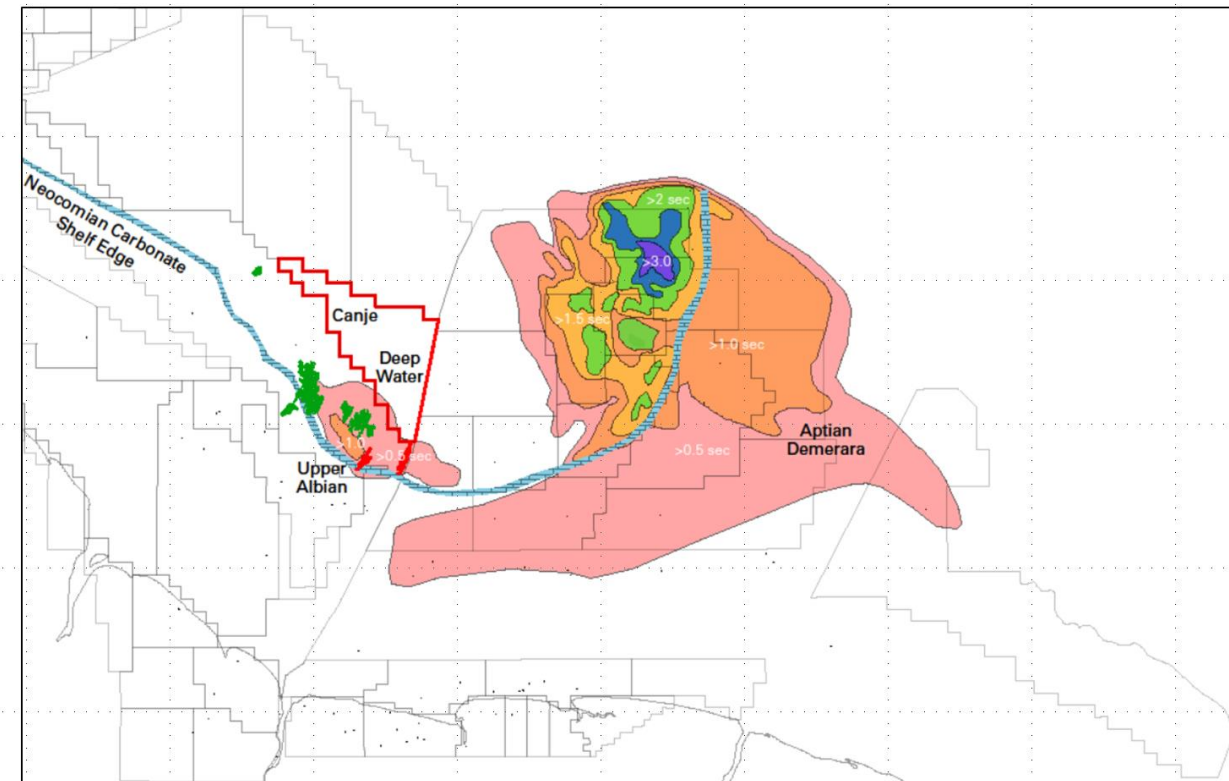
Aptian Demerara Deltaic System

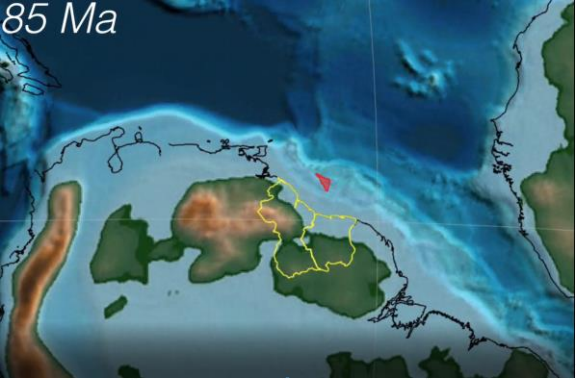
Neocomian to Jurassic Carbonate Platform Rim, Aptian Clastics, Lower Albian Source OAE-1, Upper Albian Proto-Berbice Clastics

Paleogeography

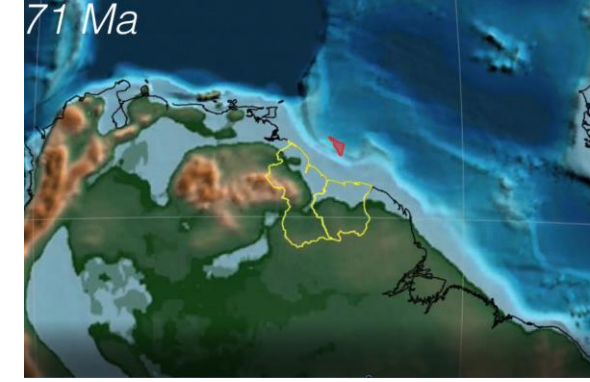


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River System:
Berbice Upper Cretaceous, 87 Ma
Source Rocks:
OAE-2 Turonian Canje, 90 Ma

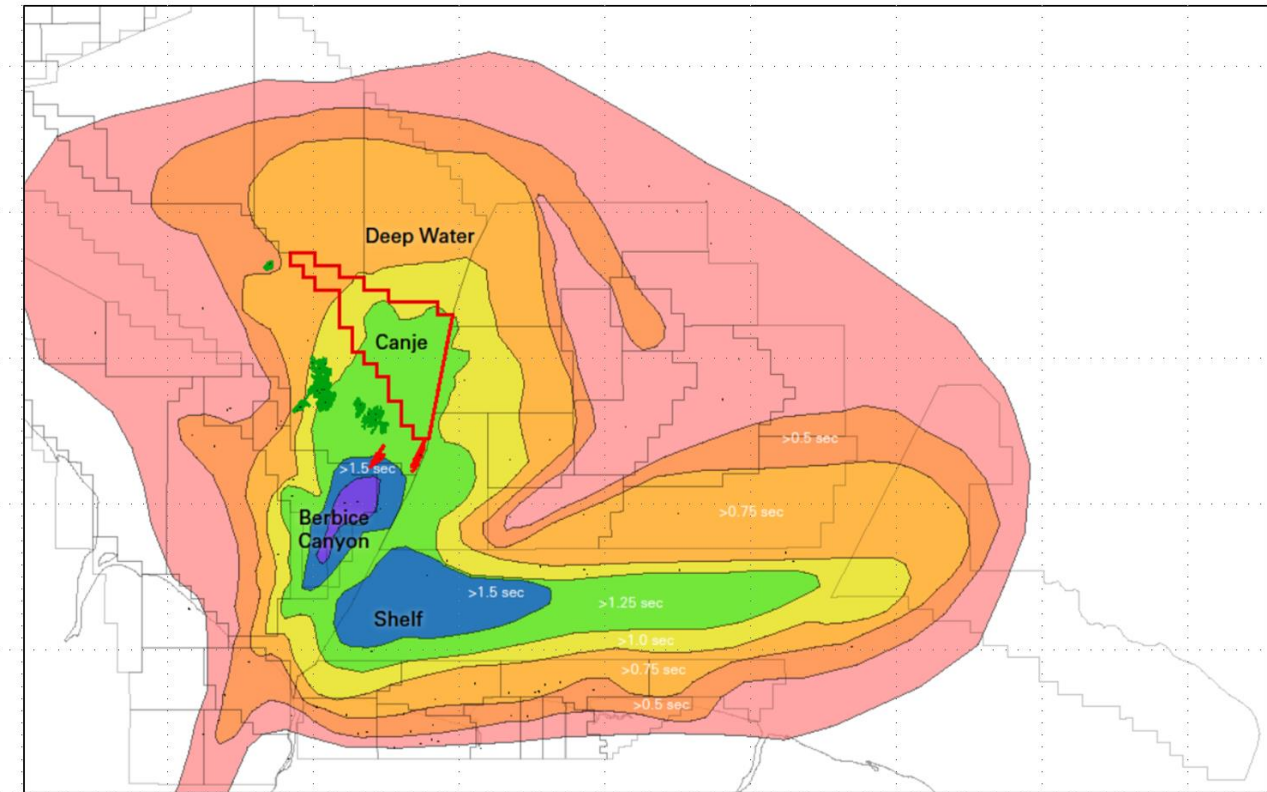
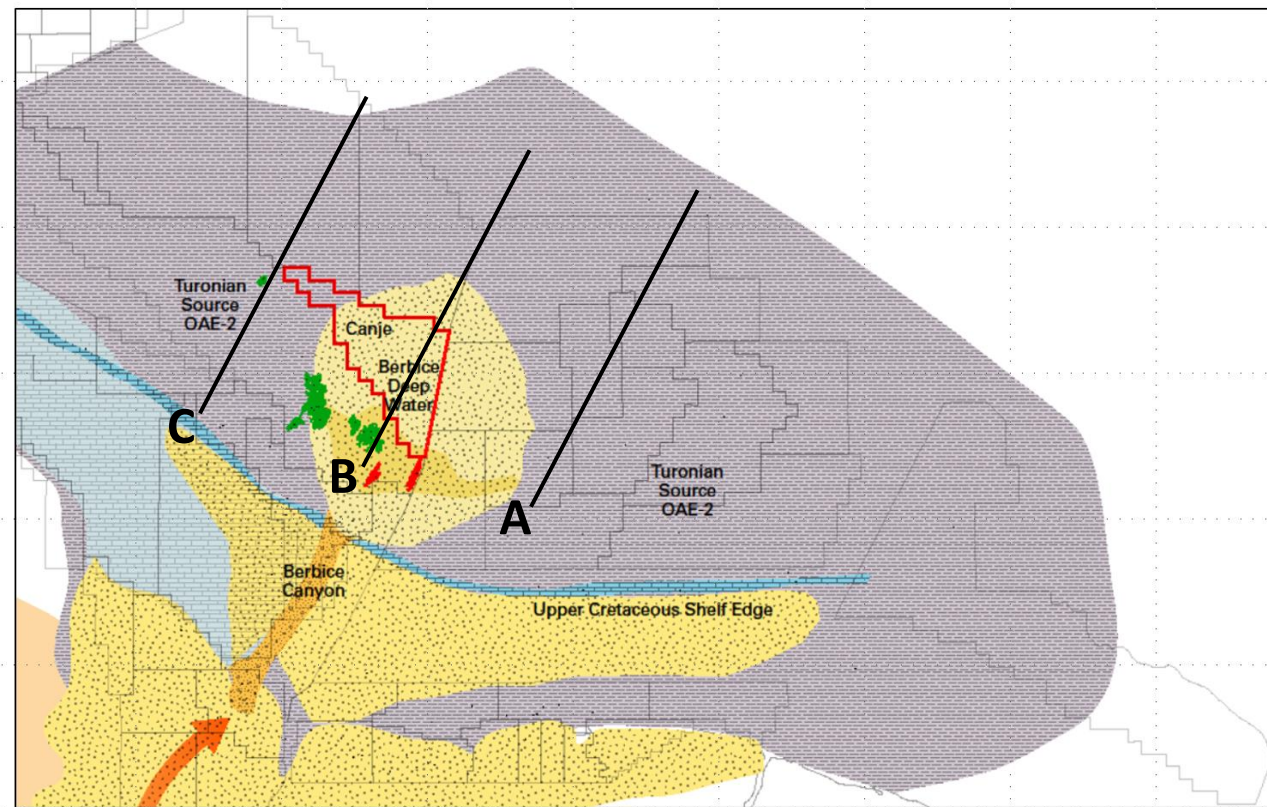


Upper Cretaceous Berbice Deltaic System

Berbice Clastics Mature OAE-1 Source, Cenomanian/Turonian Source OAE-2, Thick Campanian/Maastrichtian Reservoirs

Paleogeography

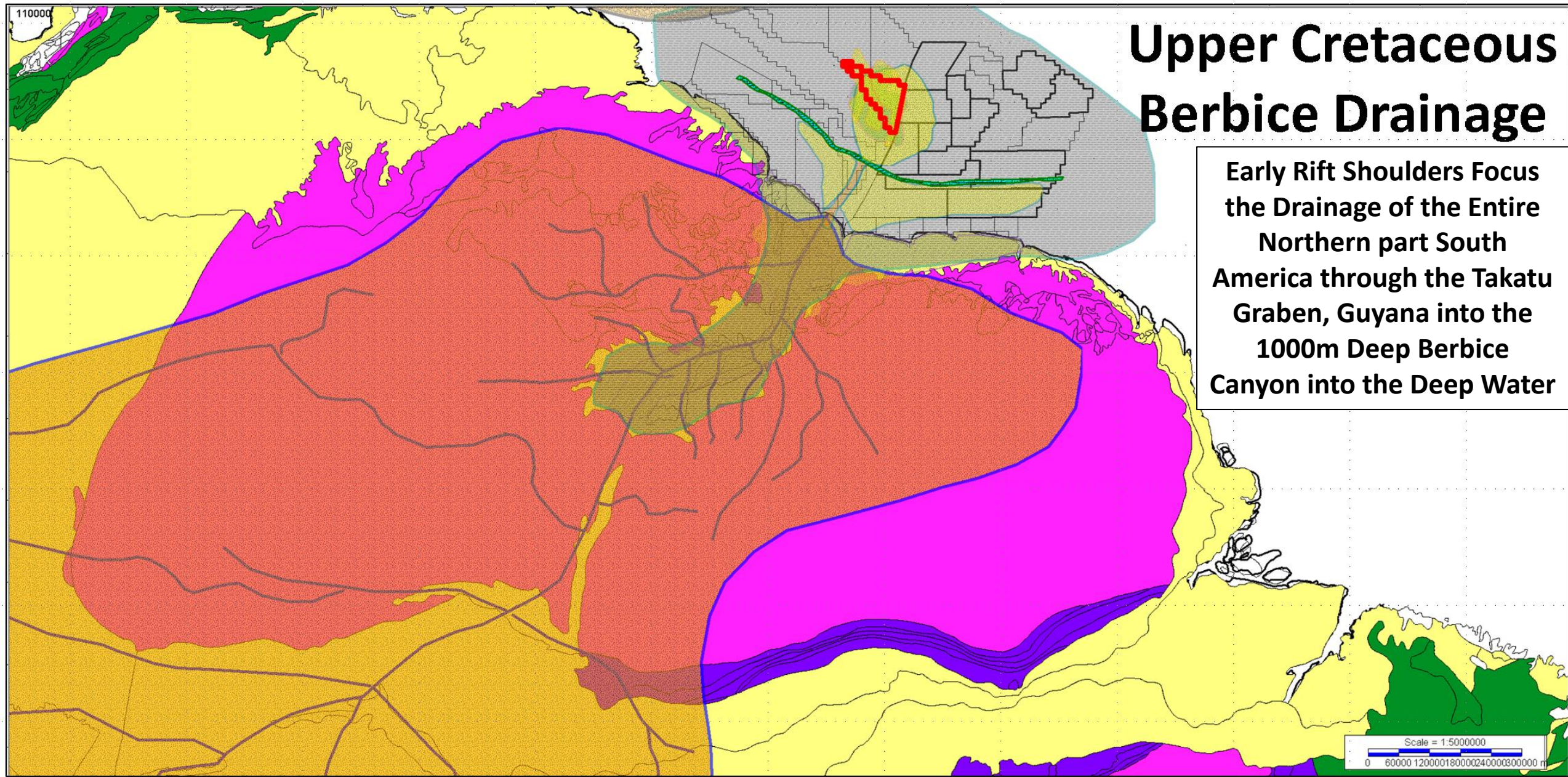
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Upper Cretaceous Berbice Drainage

Early Rift Shoulders Focus
the Drainage of the Entire
Northern part South
America through the Takatu
Graben, Guyana into the
1000m Deep Berbice
Canyon into the Deep Water

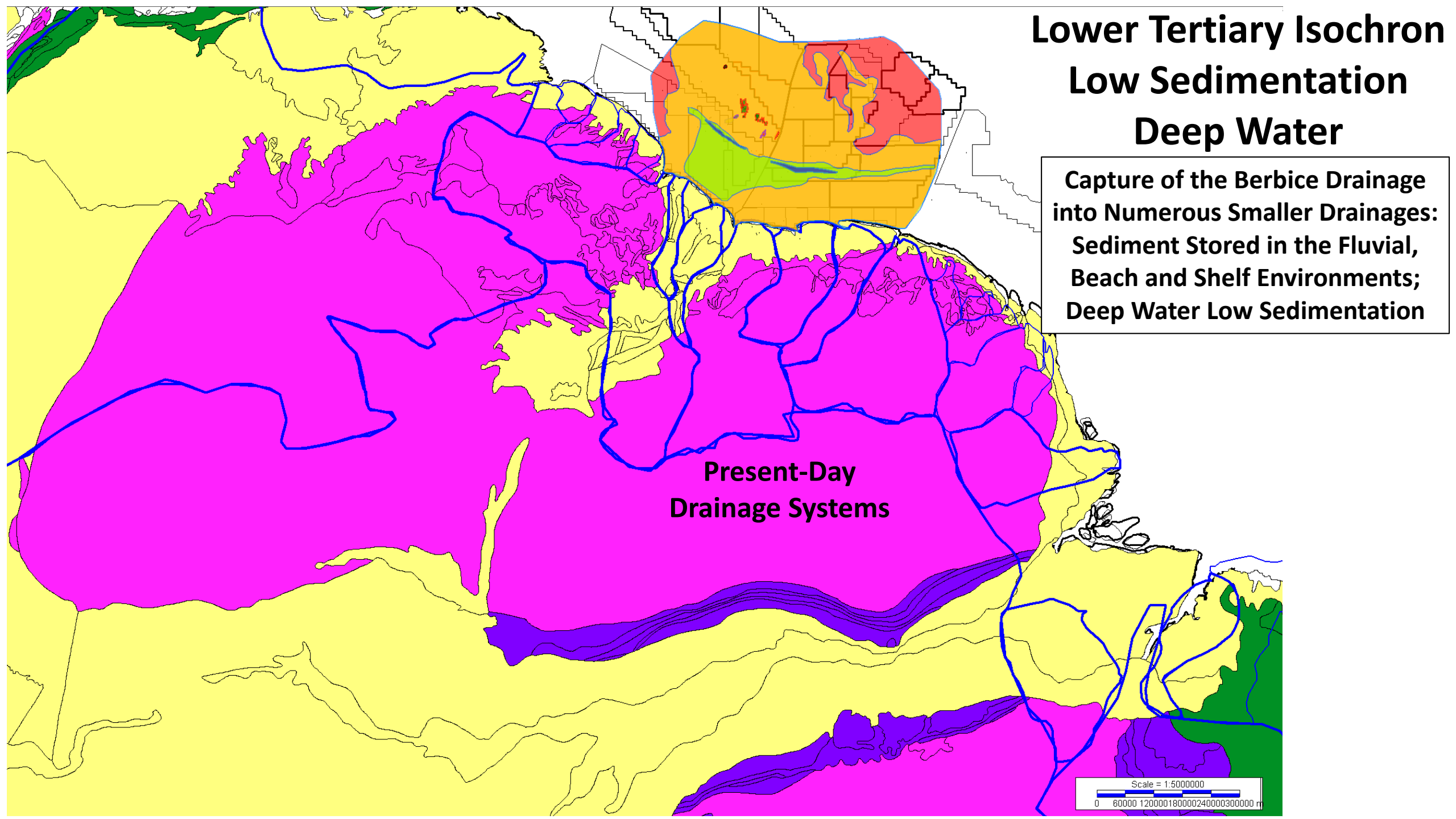
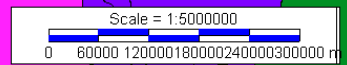


Scale = 1:5000000
0 60000 120000 180000 240000 300000 m

Lower Tertiary Isochron Low Sedimentation Deep Water

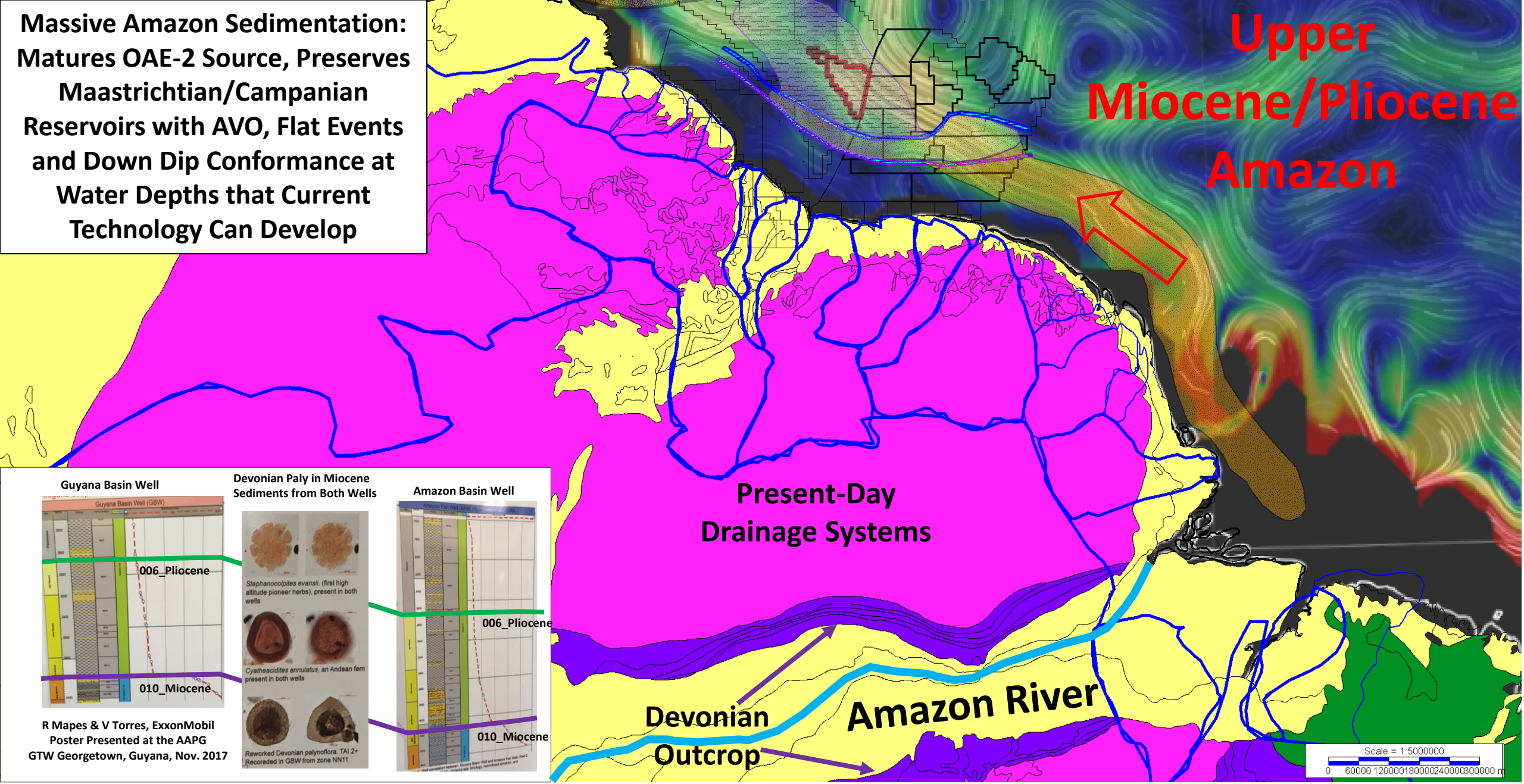
Capture of the Berbice Drainage
into Numerous Smaller Drainages:
Sediment Stored in the Fluvial,
Beach and Shelf Environments;
Deep Water Low Sedimentation

Present-Day
Drainage Systems

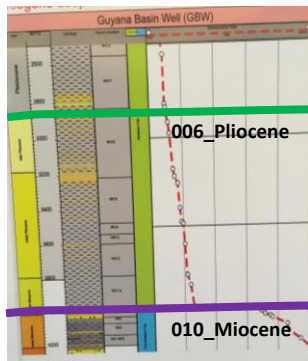


**Massive Amazon Sedimentation:
Matures OAE-2 Source, Preserves
Maastrichtian/Campanian
Reservoirs with AVO, Flat Events
and Down Dip Conformance at
Water Depths that Current
Technology Can Develop**

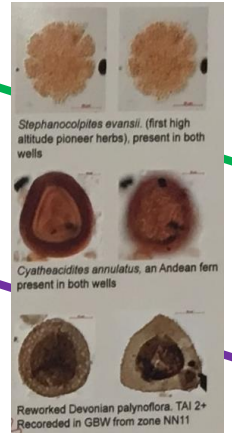
**Upper
Miocene/Pliocene
Amazon**



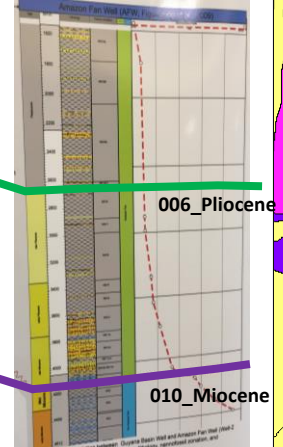
Guyana Basin Well



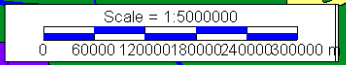
**Devonian Paly in Miocene
Sediments from Both Wells**



Amazon Basin Well

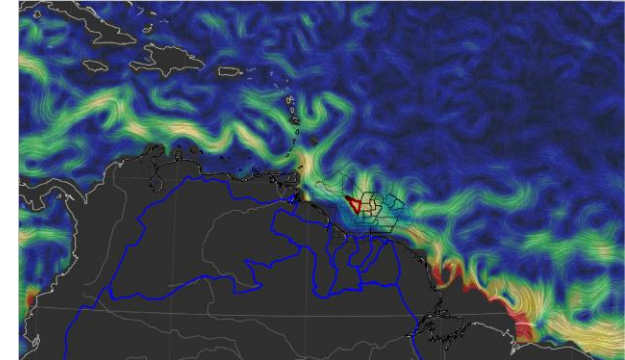


R Mapes & V Torres, ExxonMobil
Poster Presented at the AAPG
GTW Georgetown, Guyana, Nov. 2017





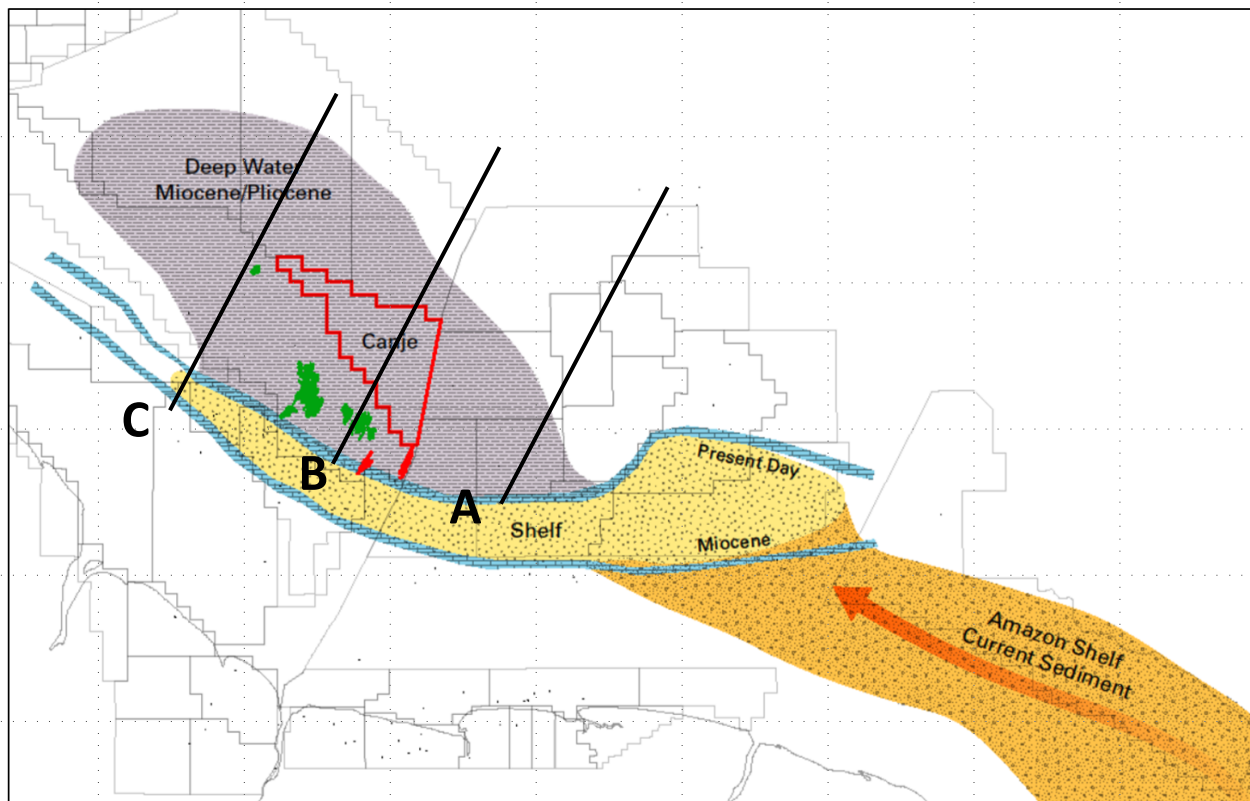
River System:
Amazon Miocene/Pliocene, 10 Ma



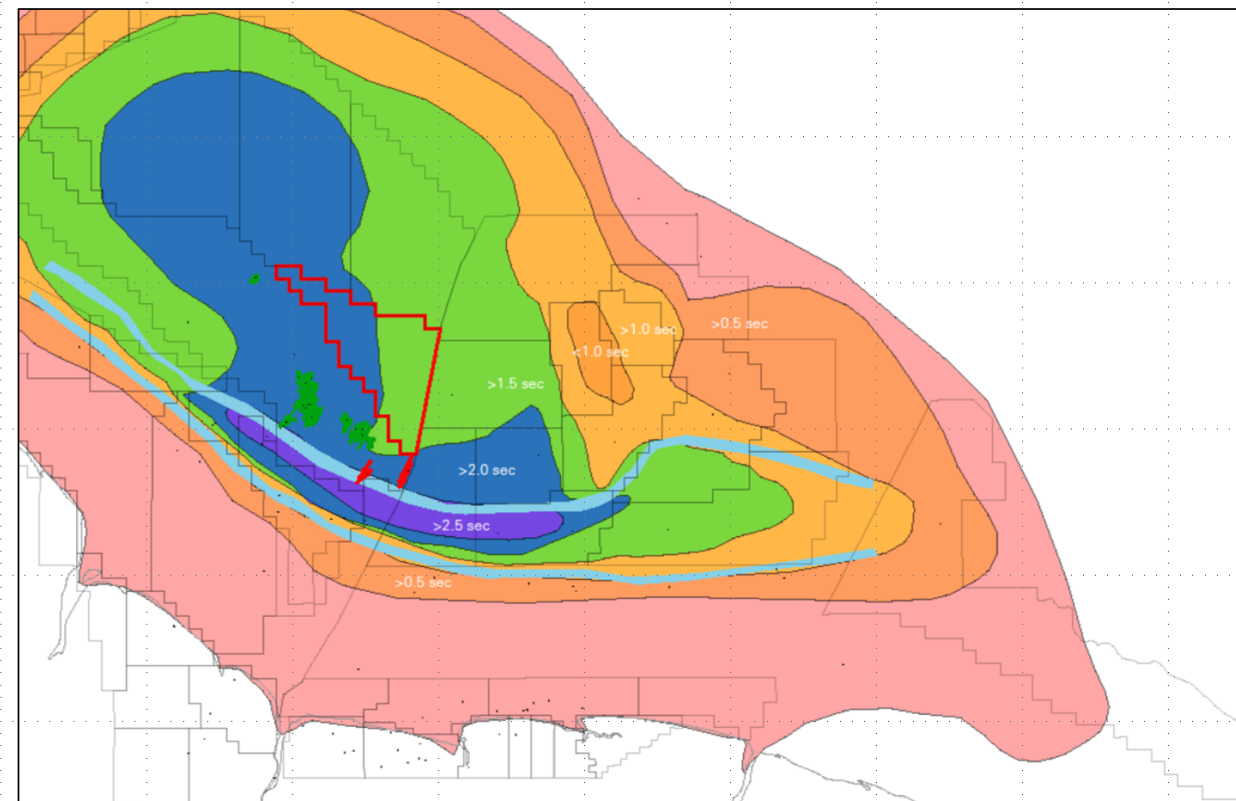
Miocene/Pliocene Amazon Deltaic System

Amazon Sediments Transported by Shelf Currents Mature OAE-2 Source

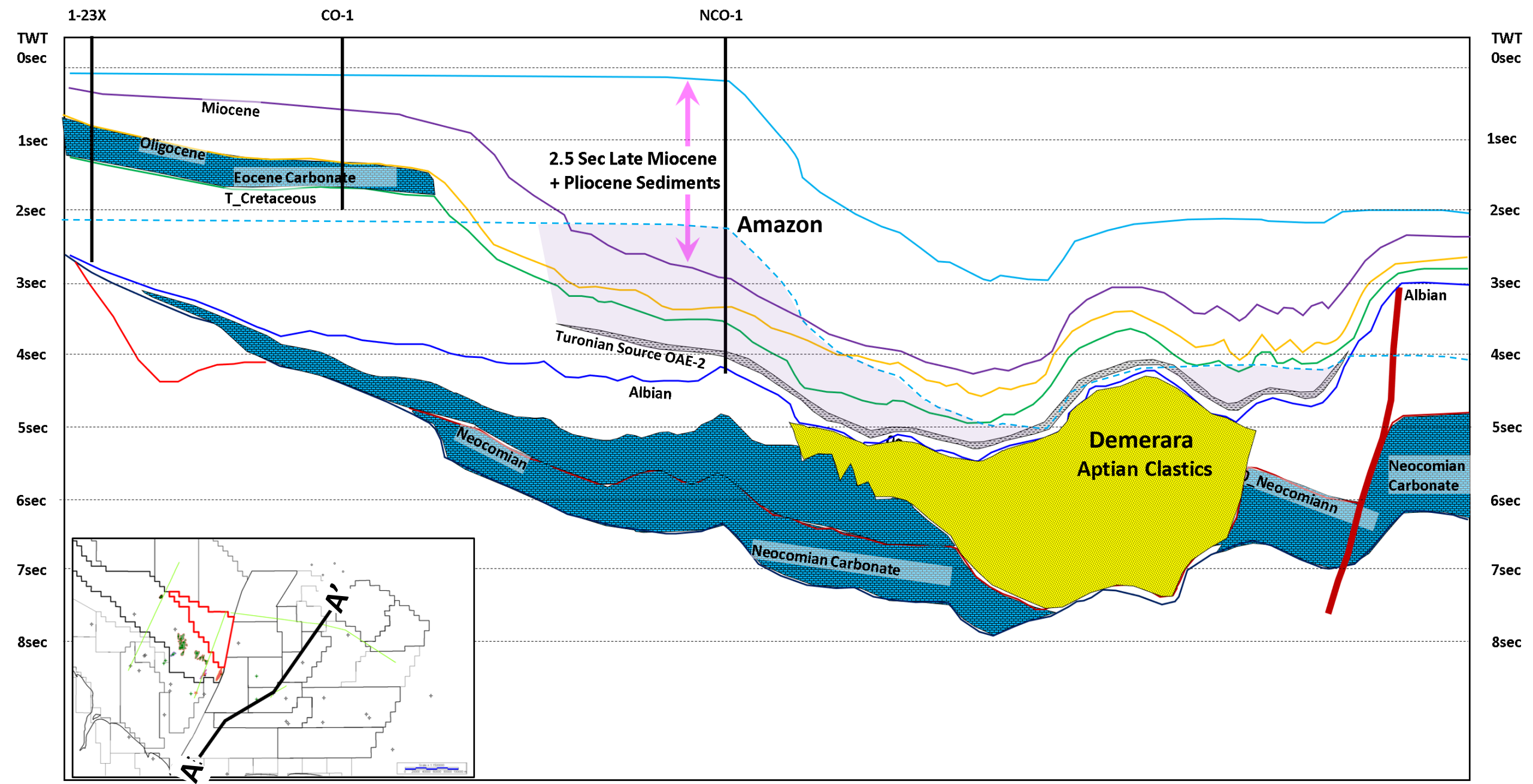
Paleogeography



Isopach



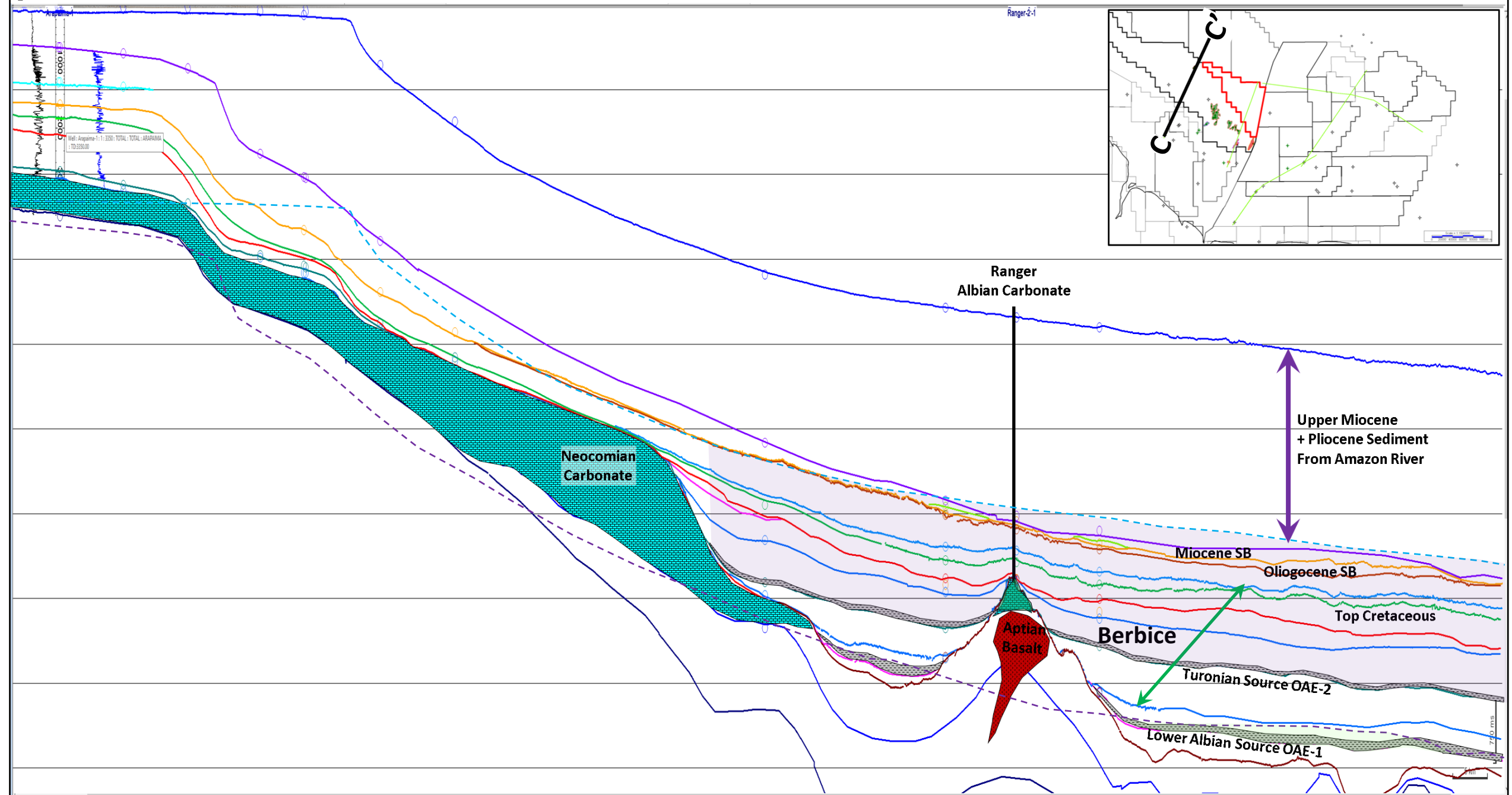
SW A 1/23-1X, Coronie-1, North Coronie-1 Well, Suriname A' NE



Arapaima-1 Well to Ranger -1 Well, Guyana

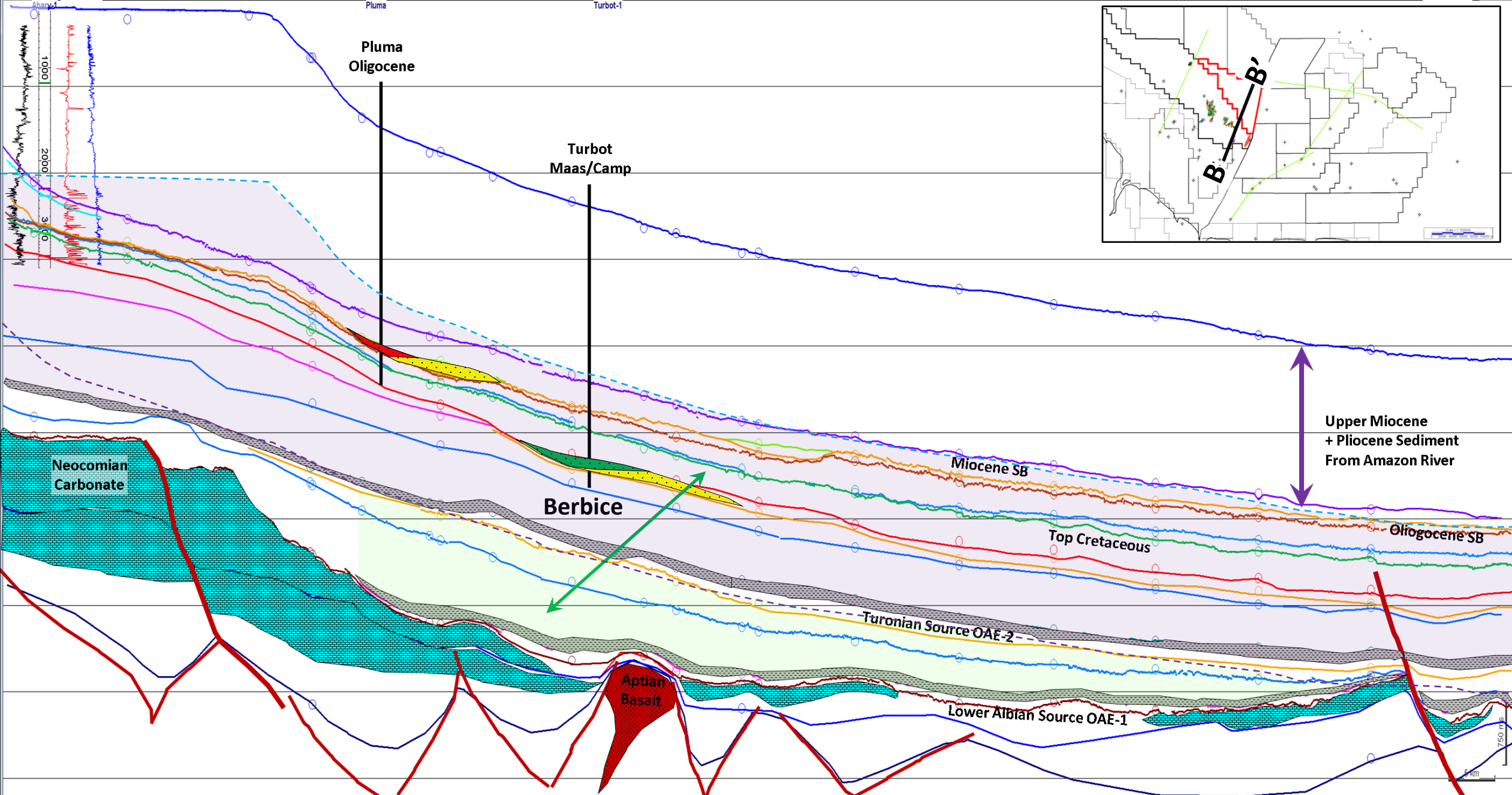
SW C

C' NE



Abary-1, Pluma-1 + Turbot-1 Wells, Guyana

B' NE



SW B

Pluma Oligocene

Turbot Maas/Camp

Berbice

Aptian Basalt

Neocomian Carbonate

Miocene SB

Top Cretaceous

Turonian Source OAE-2

Lower Albian Source OAE-1

Upper Miocene + Pliocene Sediment From Amazon River

Oligocene SB

750 m
5 km

Guyana/Suriname Basin Three River Systems

Demerara

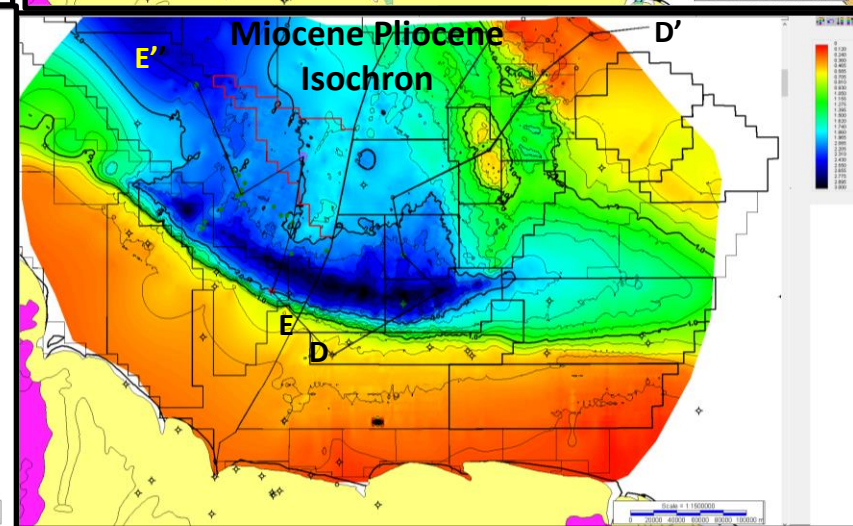
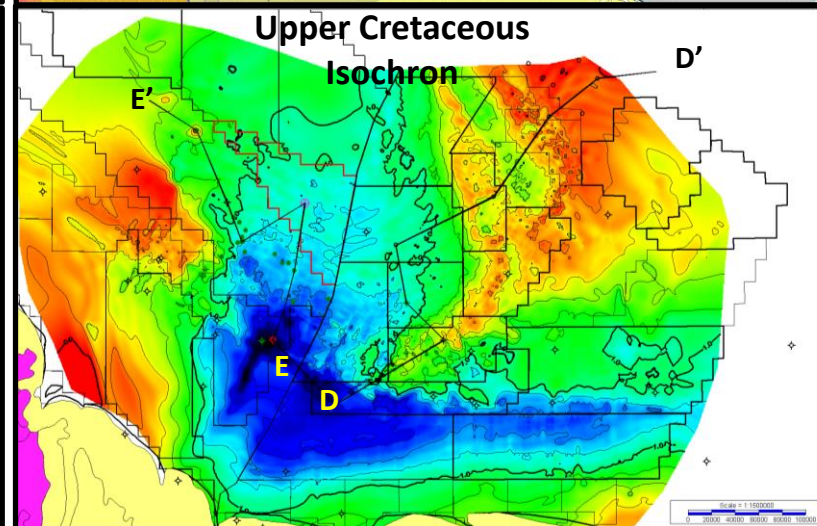
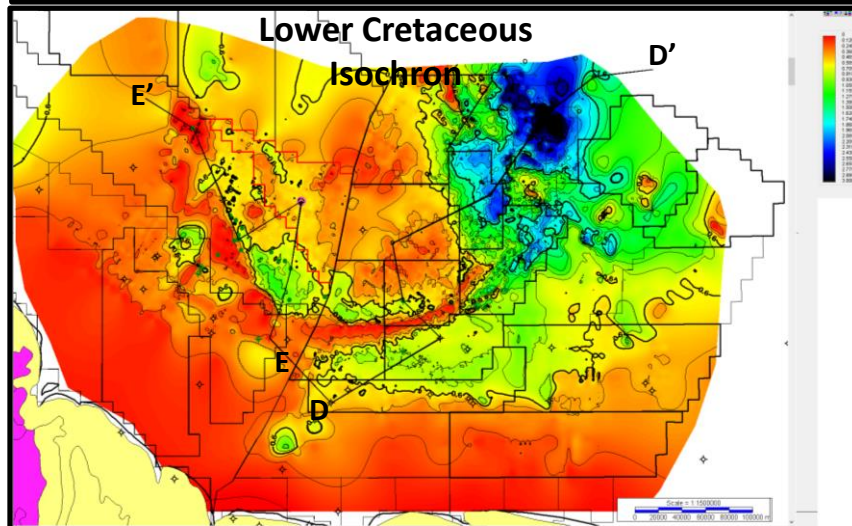
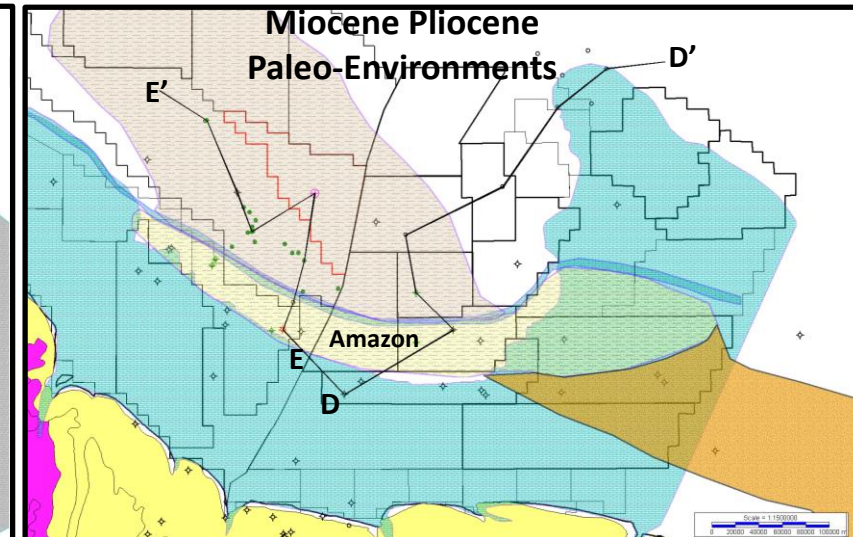
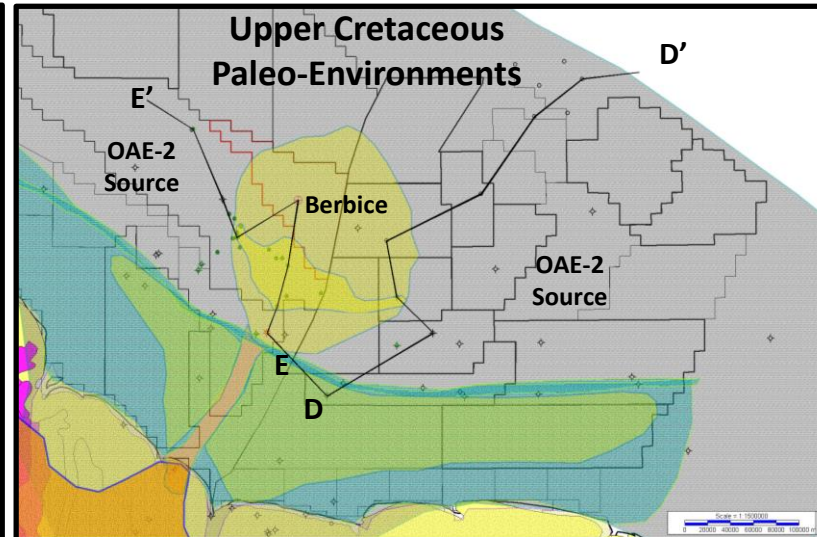
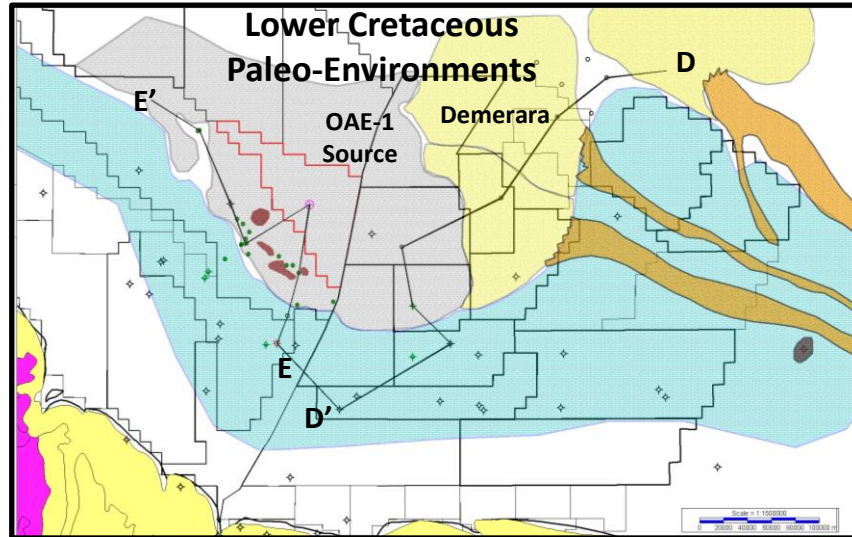
Aptian/Albian, 98-130ma

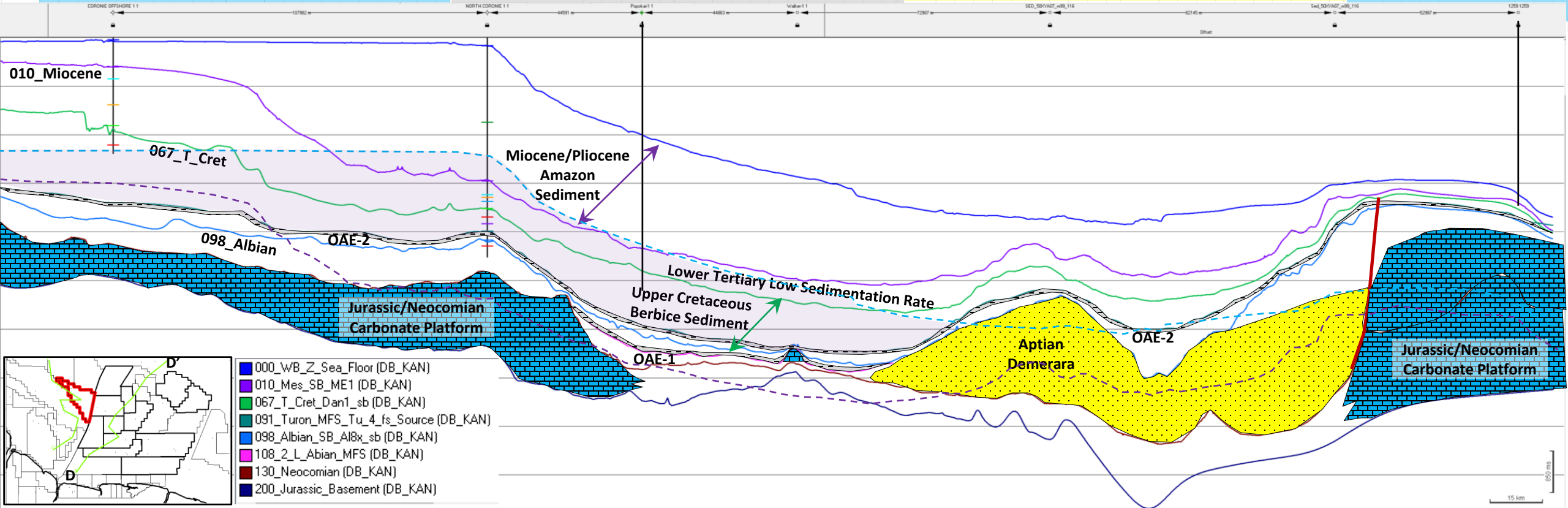
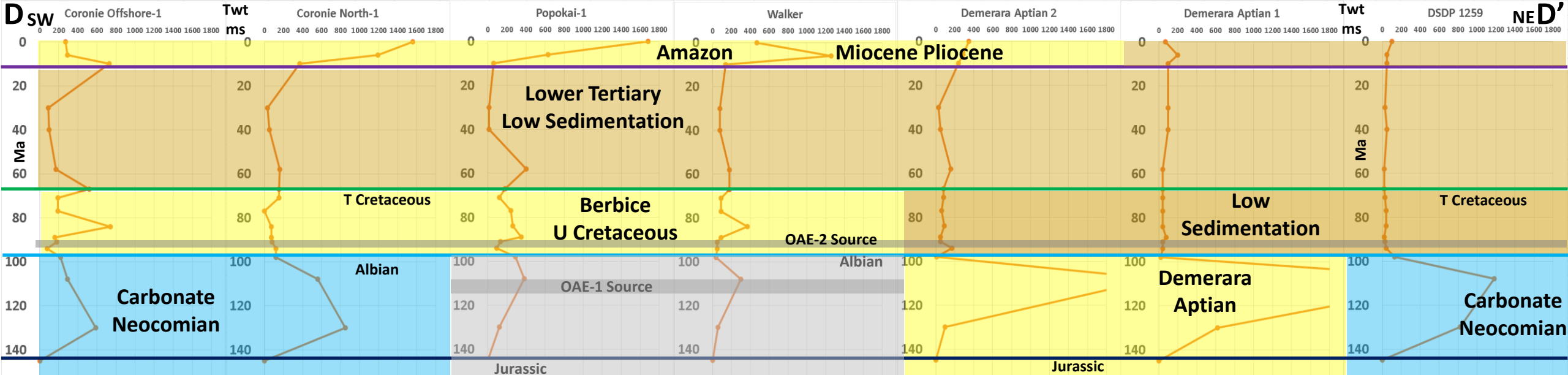
Berbice

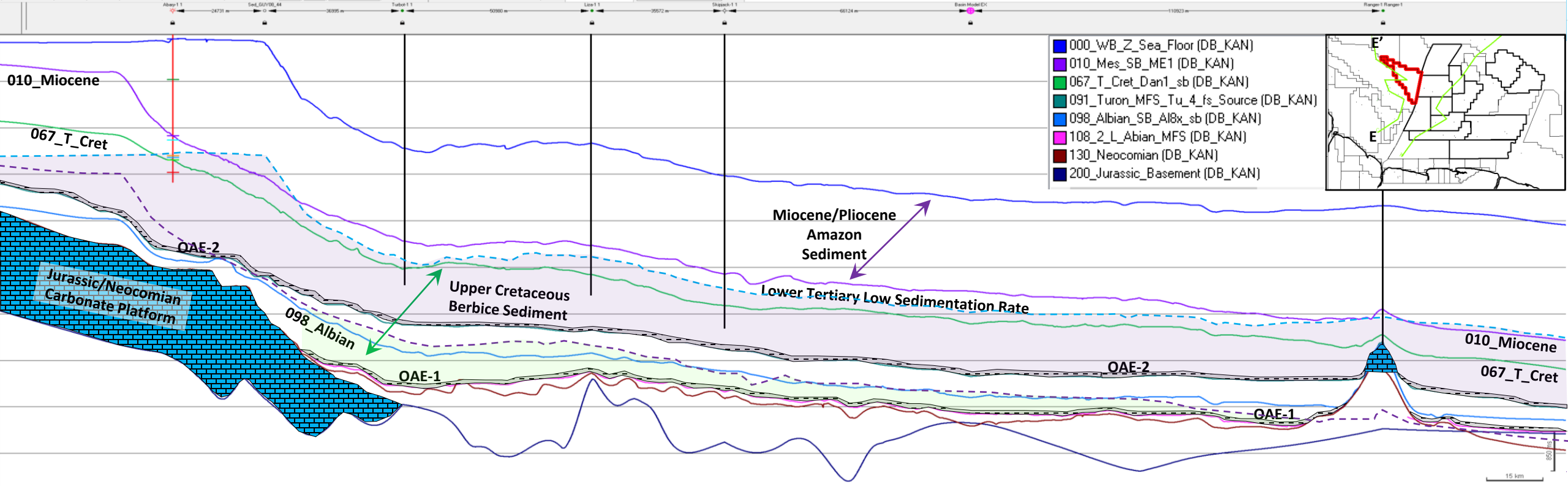
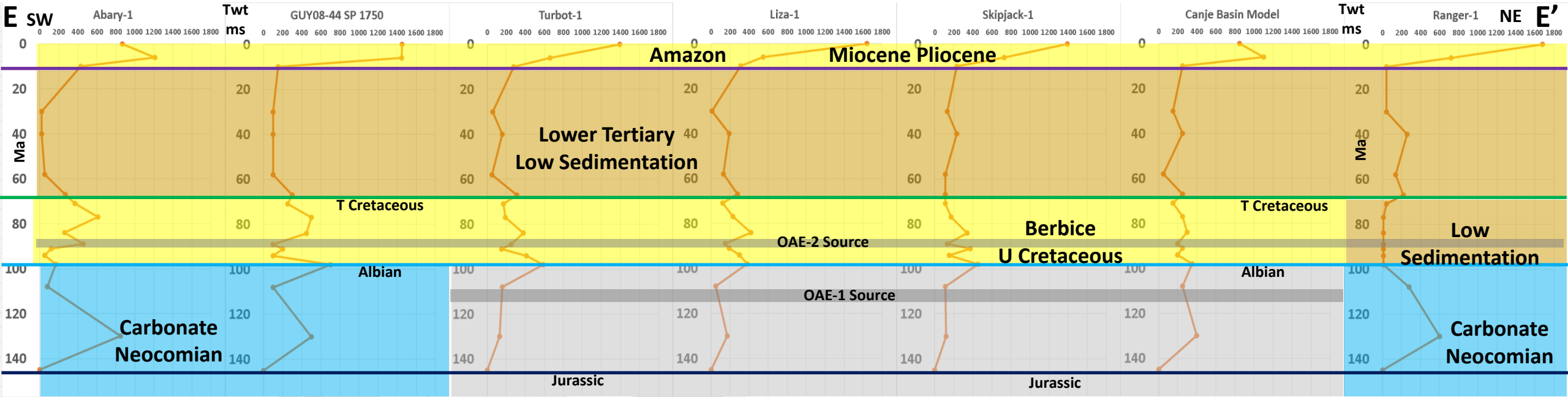
Upper Cretaceous, 90-67ma

Amazon

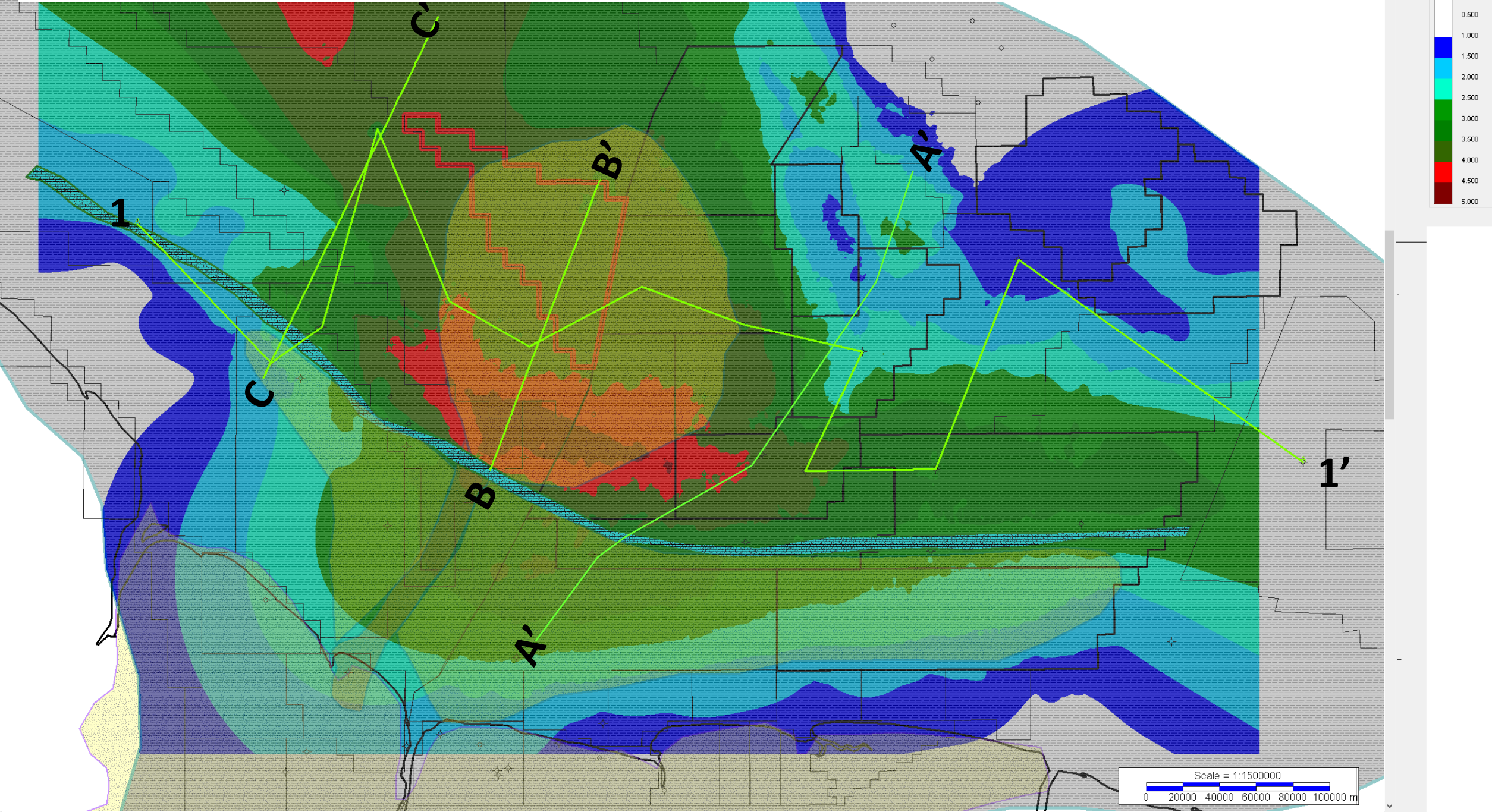
Miocene/Pliocene, 10-0ma



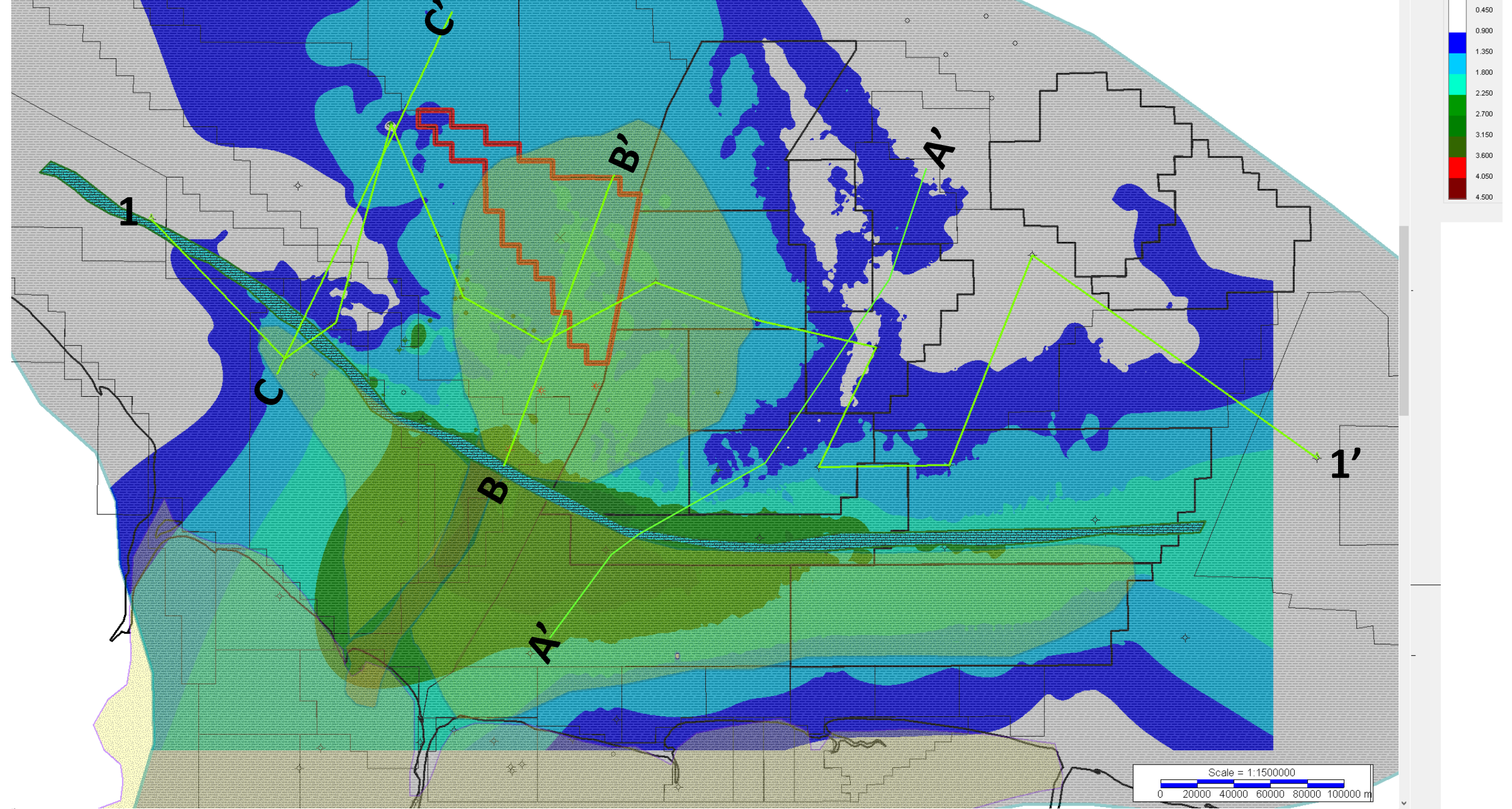




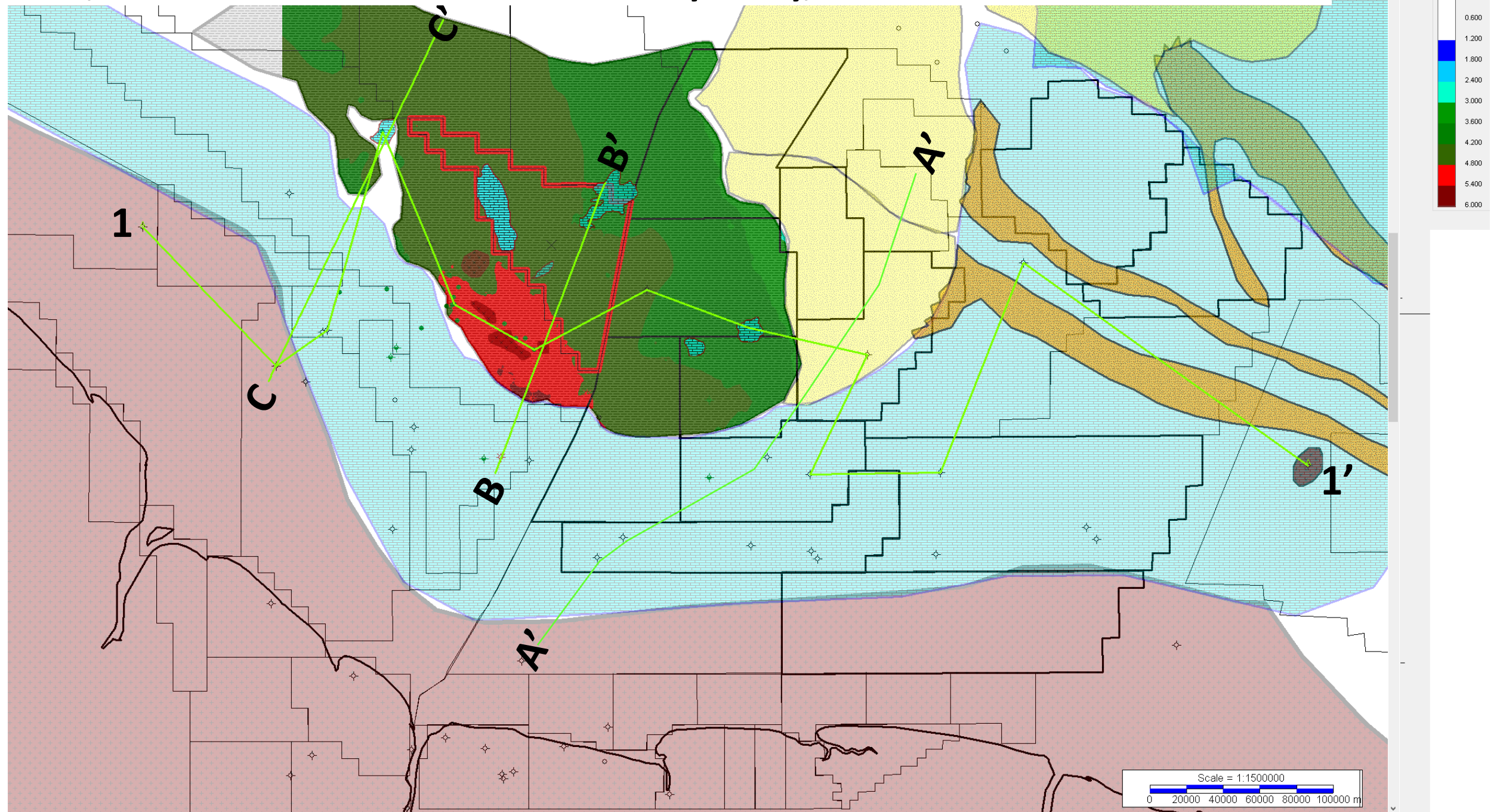
OAE-2 Canje, 90 Ma Turonian Source Maturity Today, Post Amazon Sediments



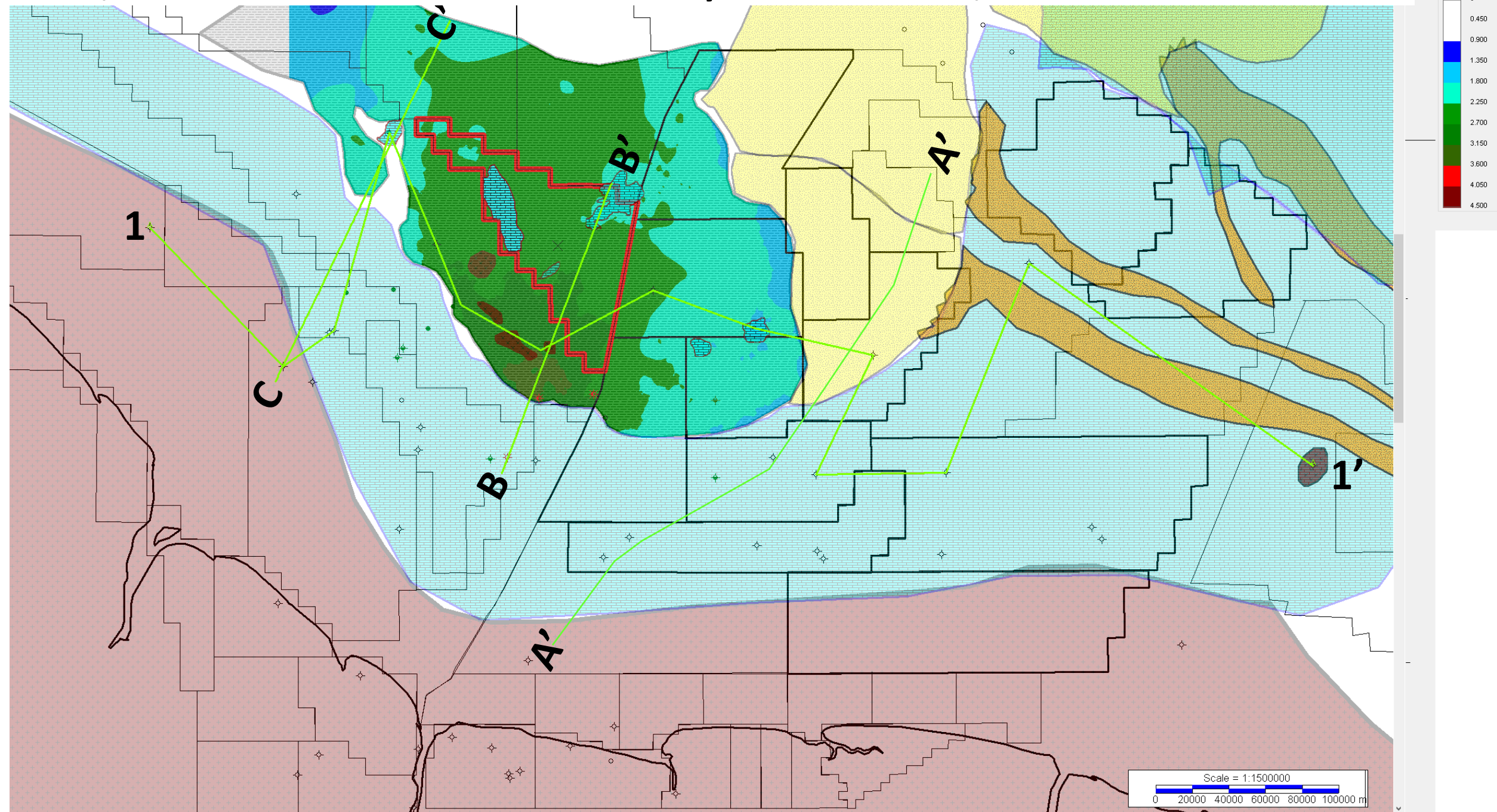
OAE-2 Canje, 90 Ma Turonian Source Maturity 10 Ma Miocene, Pre-Amazon Sediments



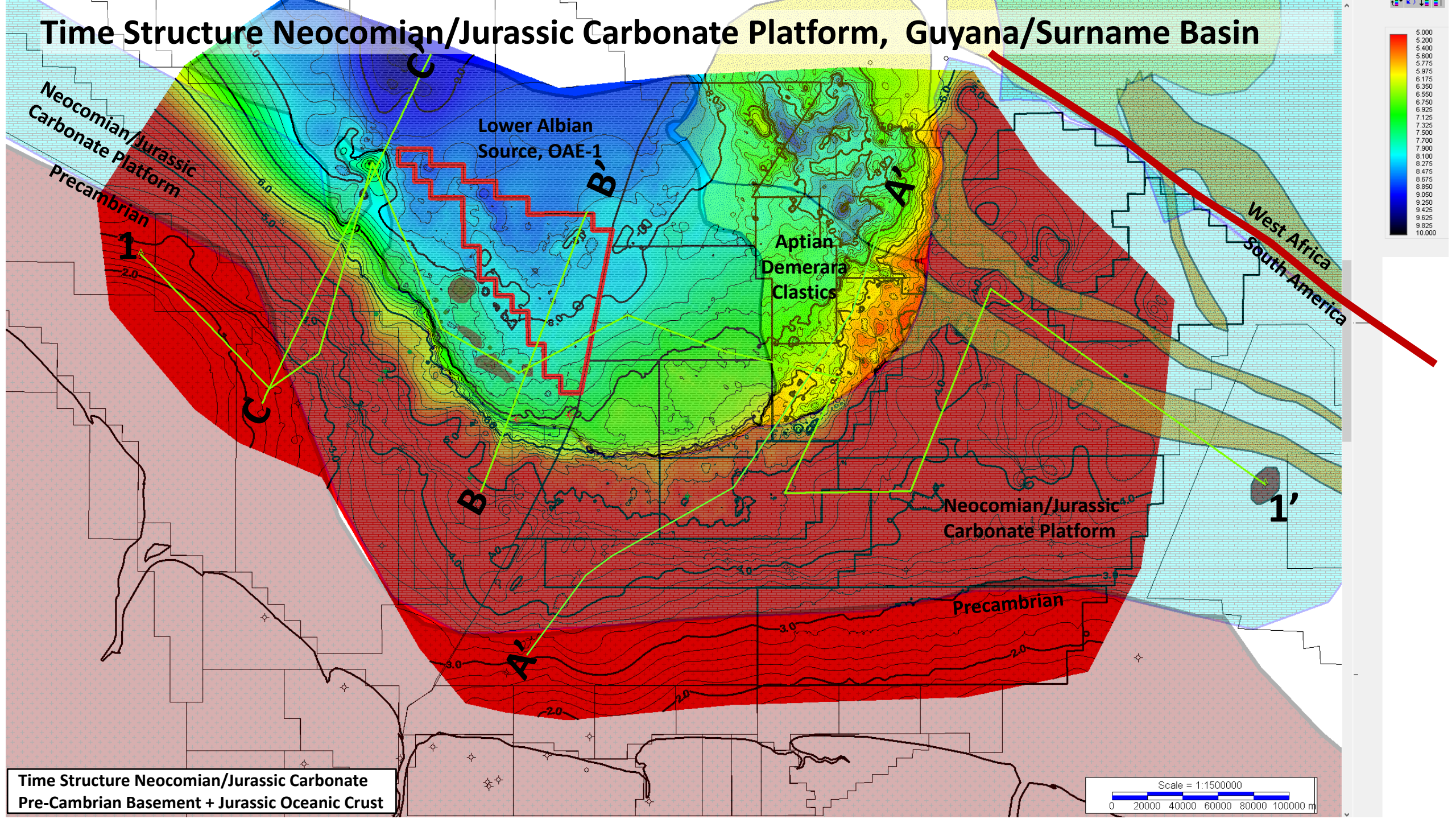
OAE-1, 108 Ma Lower Albian Source Maturity Today, Post Amazon Sediments



OAE-1, 108 Ma Lower Albian Source Maturity 10 Ma Miocene, Pre-Amazon Sediments



Time Structure Neocomian/Jurassic Carbonate Platform, Guyana/Surname Basin



Hydrocarbon System and Major Tectonic Events of the Guyana Basin

Three Rivers and Two Source Rocks

River Systems:

Demerara Aptian, 110 Ma

Berbice Upper Cretaceous, 87 Ma

Amazon Miocene/Pliocene, 10 Ma

Source Rocks:

OAE-1 Lower Albian, 108 Ma

OAE-2 Turonian Canje, 90 Ma

- Demerara Clastics + Neocomian Carbonate Platform Confines OAE-1 Source to the Deepwater of Eastern Guyana + Western Suriname
- Berbice Overburden Matures OAE-1 Source + Provides Excellent Campanian + Maastrichtian Reservoirs
- Amazon Overburden Matures OAE-2 Source + Preserves Reservoirs for AVO, Flat Events + Down Dip Conformance at Water Depths that Current Technology Can Develop