

PS A Re-Evaluation of Play Risks and Volumes Offshore Nova Scotia*

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Abstract

A systematic play fairway analysis (PFA) is used to evaluate the hydrocarbon potential of offshore Nova Scotia. This structured approach builds a detailed play assessment on the foundation of understanding the structural evolution of the basin.

Four main plays, as defined by reservoir, have been identified:

1. Upper Jurassic delta system
2. Mid/Upper Jurassic Carbonate bank
3. Hauterivian delta system
4. Albian delta system

The main hydrocarbon production and exploration to date has focused on the Albian delta system and Jurassic carbonate bank. Recent exploration has failed due to a lack of understanding of the sediment dispersal pathways from the shelf to slope. Therefore reservoir prediction is a critical element of the PFA project. A detailed well and seismic sequence stratigraphic analysis has been done, that establishes the evolution of the shelf slope break through time. This is used to predict sand channel systems from shelf to slope. Further amplitude modeling work supports reservoir prediction into the deep water.

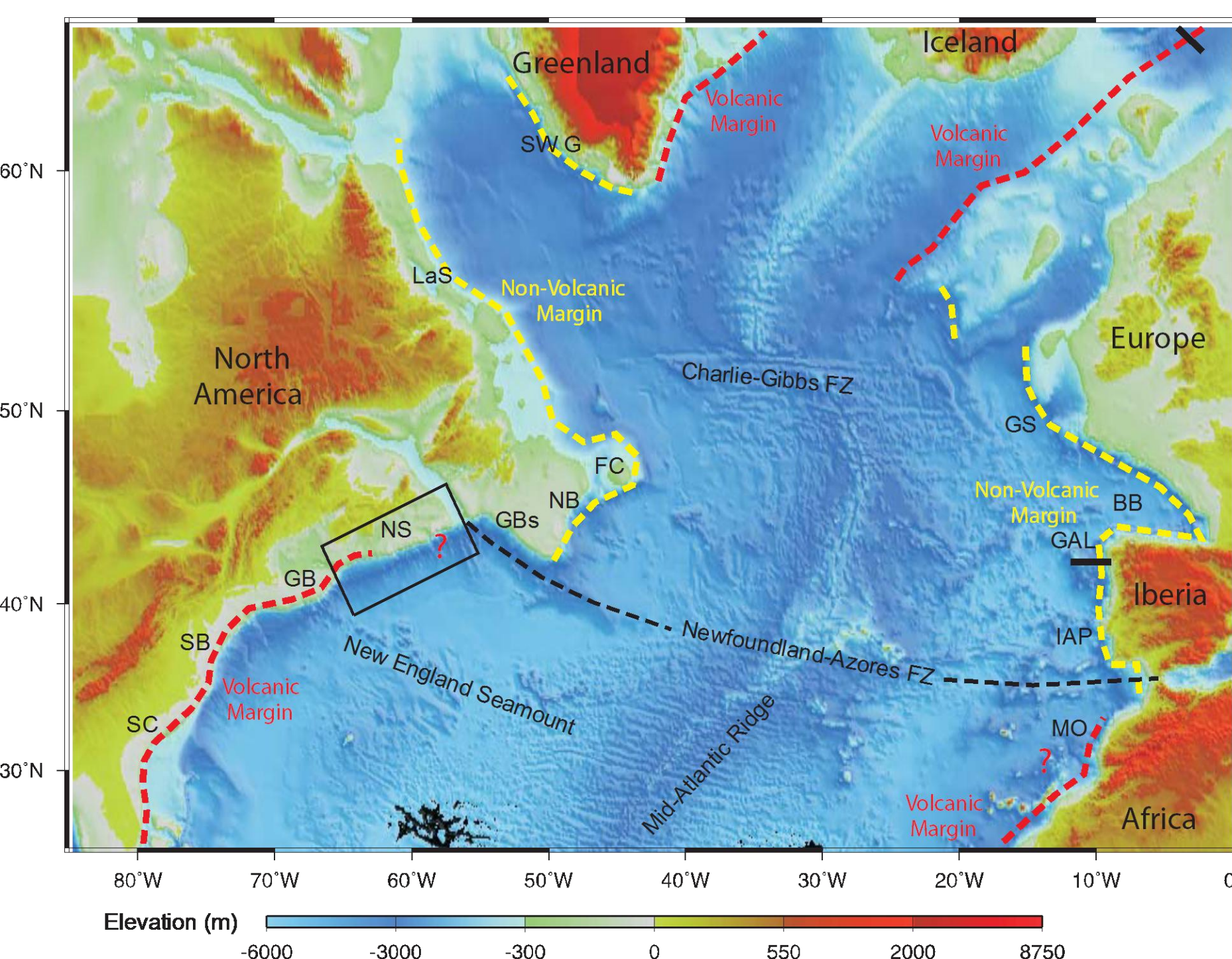
These plays are charged from two source models:

- 1) Terrigenous source horizons corresponding to maximum flooding surfaces in the Tithonian, Hauterivian and Albian. These source horizons are mature to over mature today and are likely to have sourced the hydrocarbons in the gas producing fields on the margin.
- 2) A regional Lower Jurassic syn- to early post-rift restricted marine source rock is postulated. This is supported by an evaluation of the rift mechanism, combined with oil typing from both Nova Scotia and Morocco. Oil seeps and traces in piston cores provide evidence for this regional source, outside the extent of the Jurassic and Cretaceous delta systems.

Petroleum systems modeling has confirmed hydrocarbon generation and timing for each of these source horizons and used to create charge risk maps. These maps have been combined with common risk segment (CRS) maps for reservoir and seal to produce composite common risk segment maps. Areas of high potential have been identified. The presentation will finish with YTF, risks and prospect size assessment for each play.

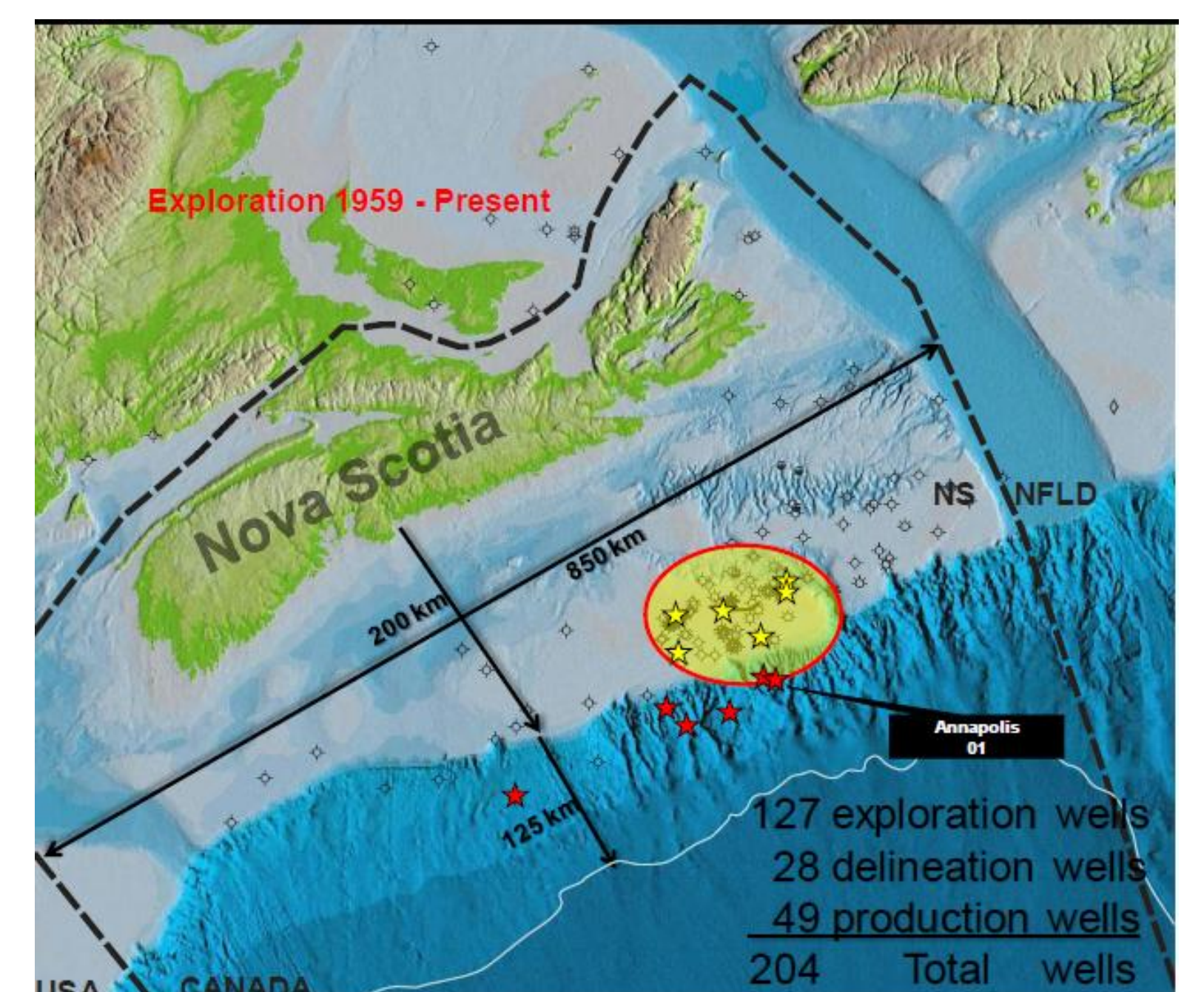
A RE-EVALUATION OF PLAY RISKS AND VOLUMES OFFSHORE NOVA SCOTIA

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A NON VOLCANIC PASSIVE MARGIN CONJUGATE WITH MOROCCO

- 2 BN BOE IN PLACE DISCOVERED
- ONE NON COMMERCIAL DEEP WATER DISCOVERY (ANNAPOLIS)
- SUCCESS RATE IN PROVEN PLAY 1:2

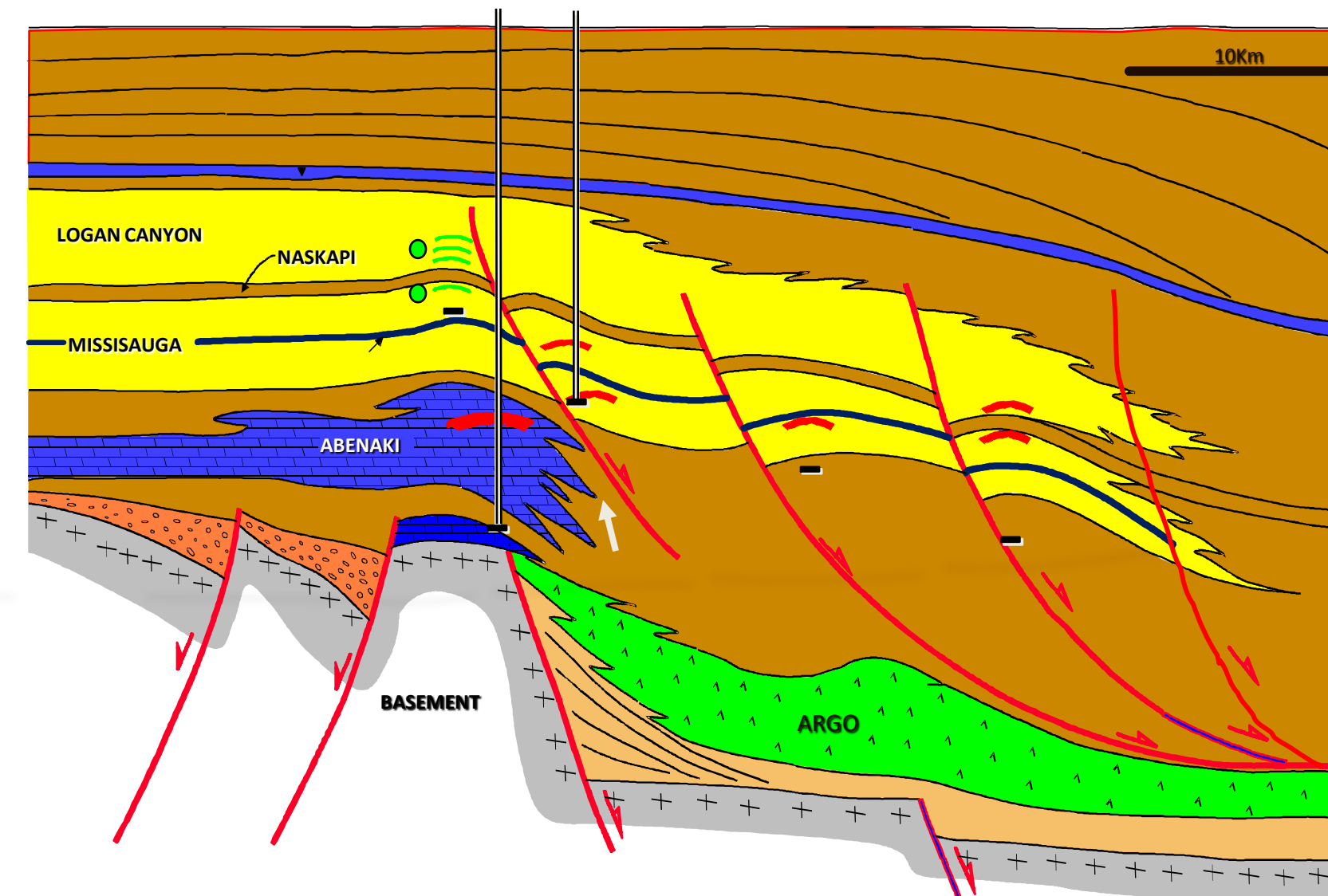


Proven play in Upper Jurassic and Lower Cretaceous delta top reservoirs sourced by co-eval type 2 source rocks. Trapping style in role over anticlines soling out on salt

Subsidence and restricted clastic supply led to carbonate deposition on rift shoulders on both sides of margin.

- Deep Panuke Gas field in Nova Scotia
- Cap Juby heavy oil discovery offshore Morocco

Schematic Dip Cross Section illustrating main play types



Late Triassic rifting leading to break up unconformity dated 200my by CAMP volcanics

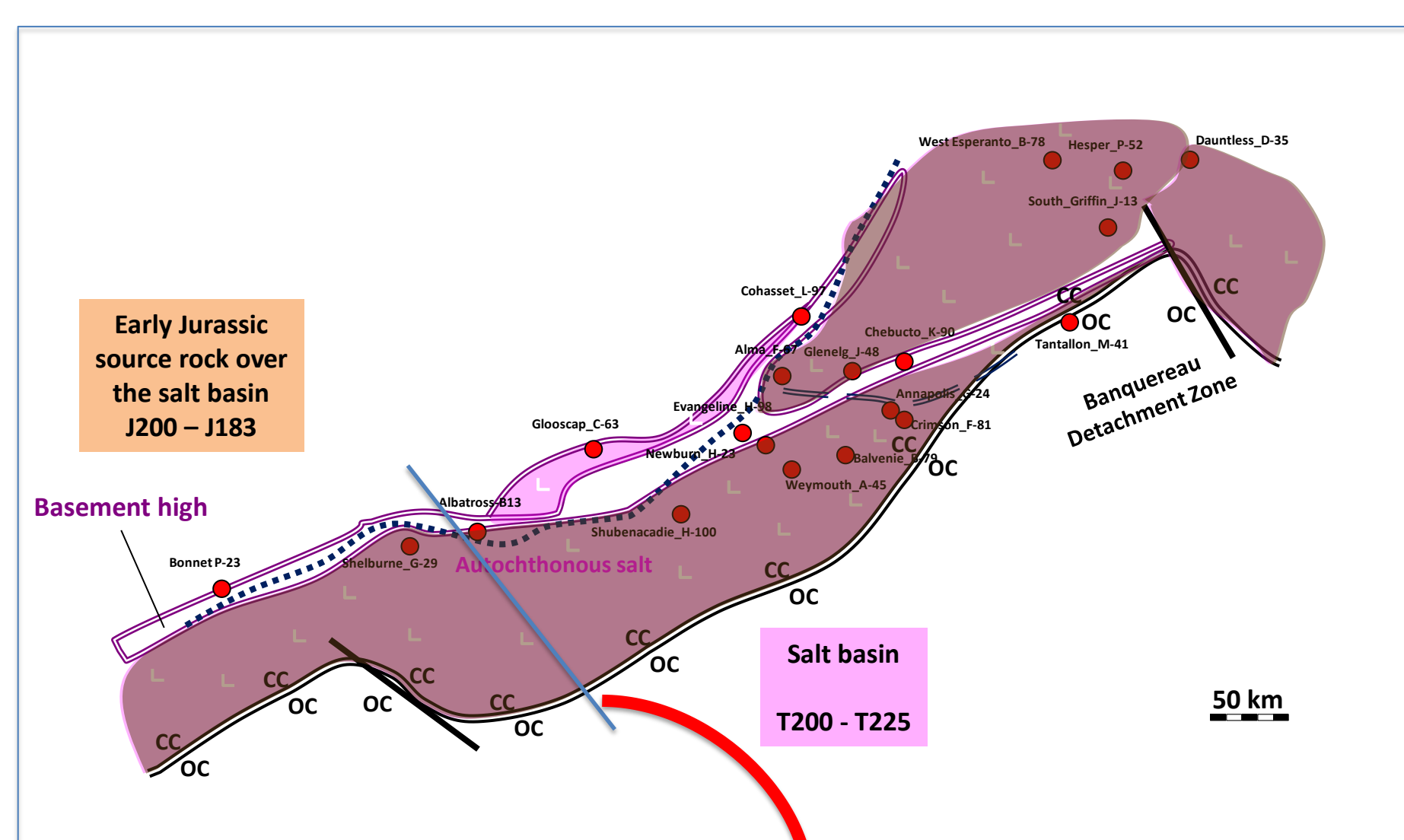
Shallow restricted marine Lower Jurassic environment leading to regional source rock as proved by 'GAMACERANE' biomarker

Syn to early post rift salt deposits. Remobilised salt controlled structures and slope reservoir distribution systems

Revised play concepts:

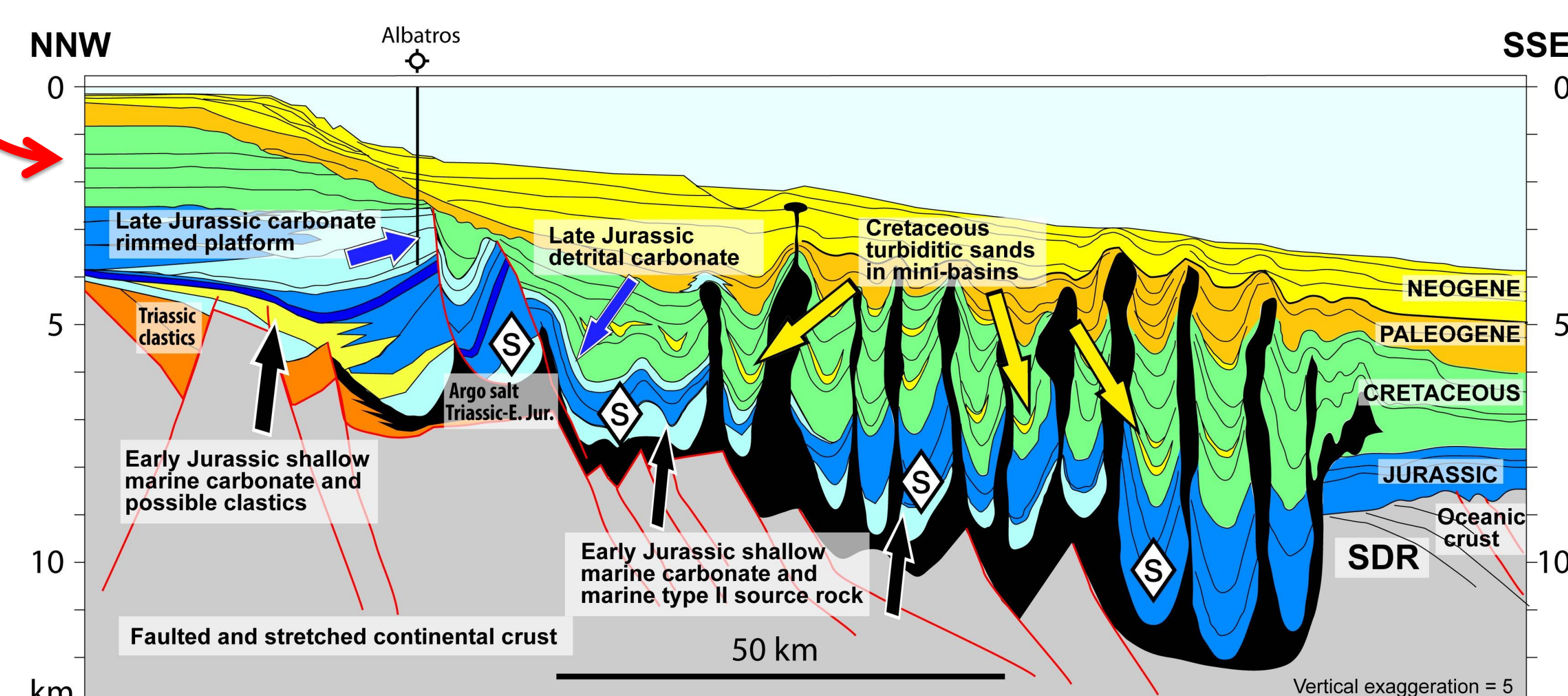
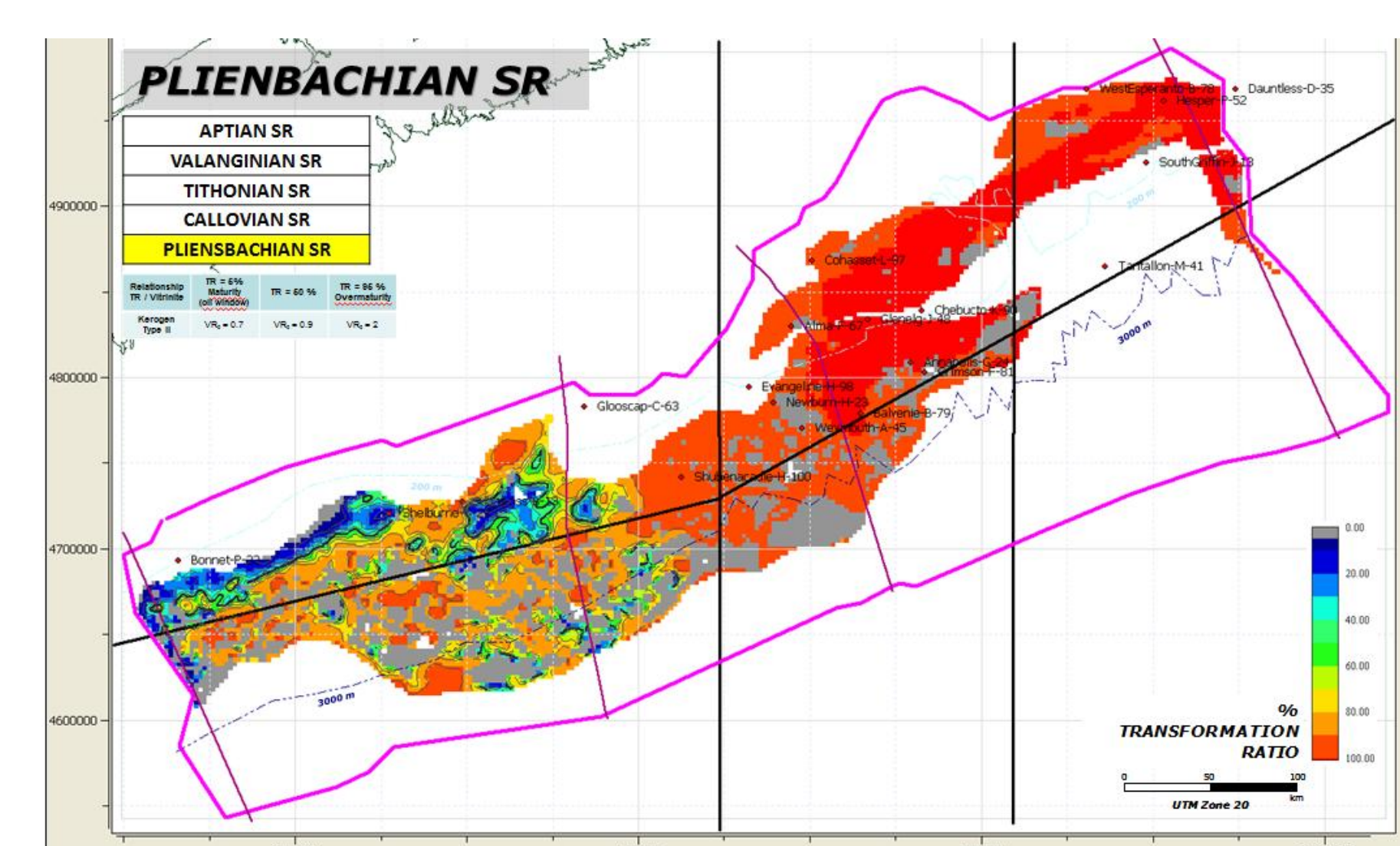
- 1) Proven Lower Cretaceous play extend to the North East of Sable and is not penetrated by a valid play test
- 2) Deep water oil play in South West from regional Lower Jurassic sourced oil into mainly Albian reservoirs

Lower Jurassic Source Rock Distribution



Lower Jurassic source rock in oil window today as evidenced by PISTON CORE OIL SAMPLES in South West

Lower Jurassic Source Rock Transformation Ratio



Trapping Styles and main illustrative play types

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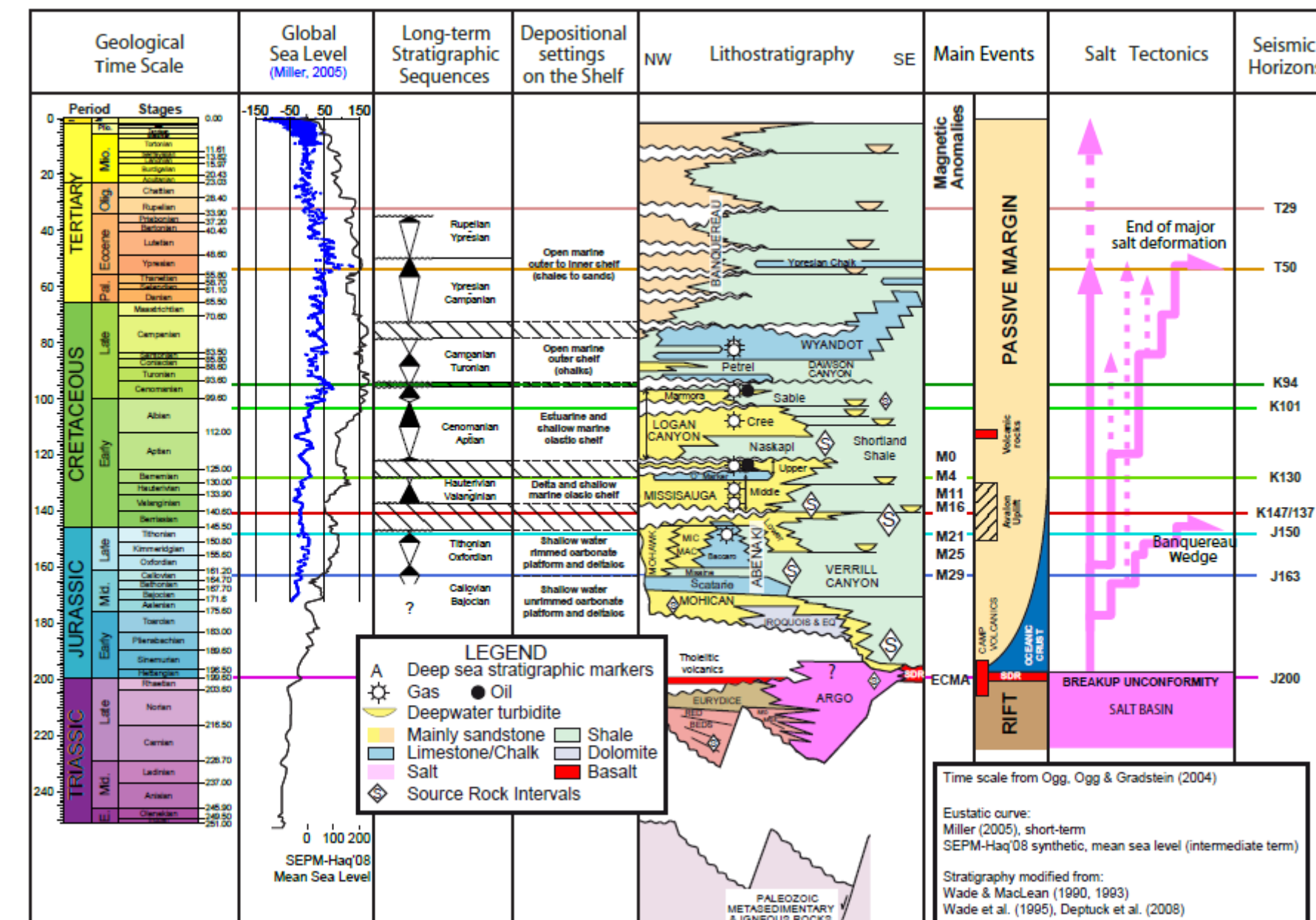
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PLAY DEFINITION RESERVOIR, SEAL AND SOURCE

Main Source

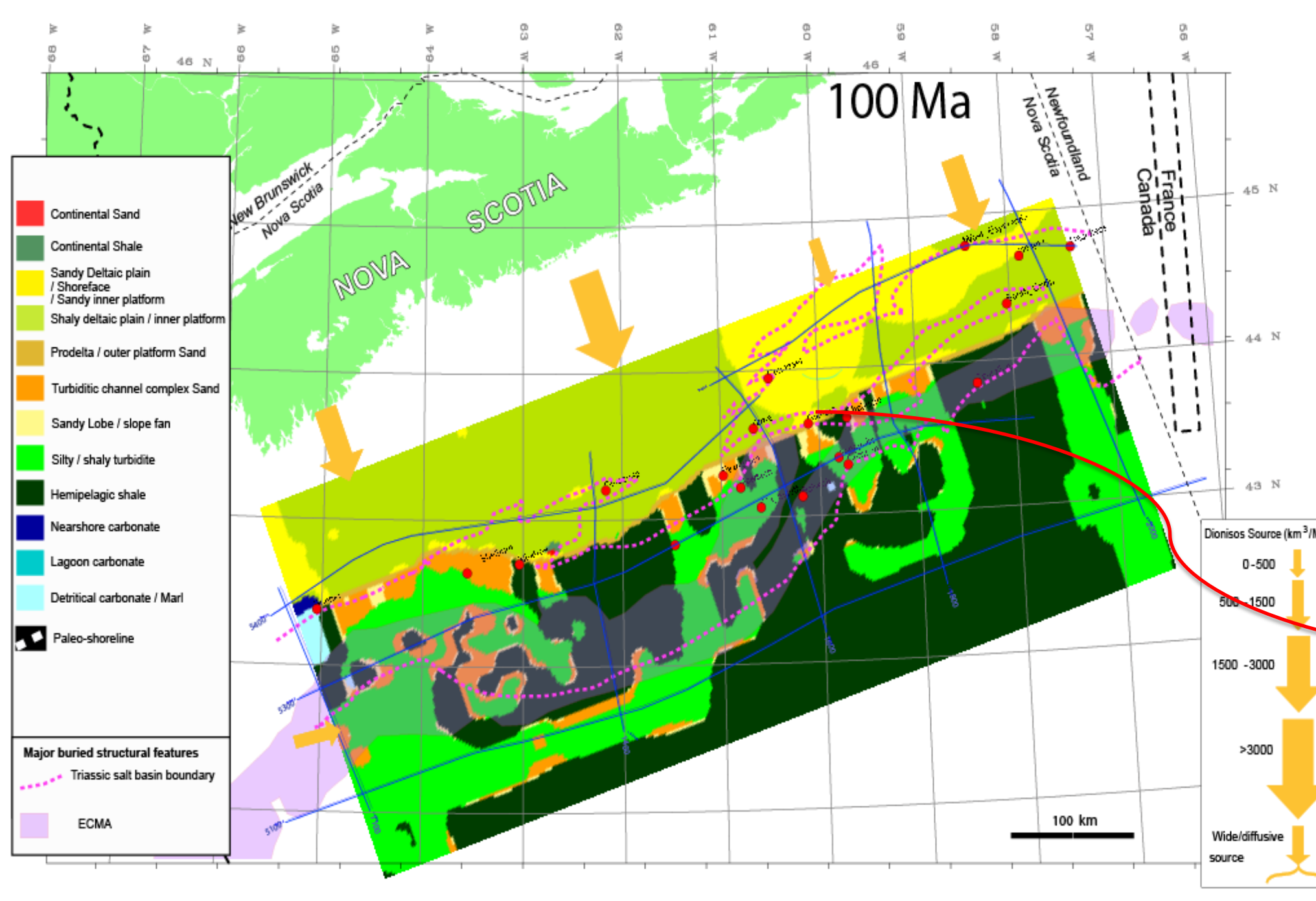
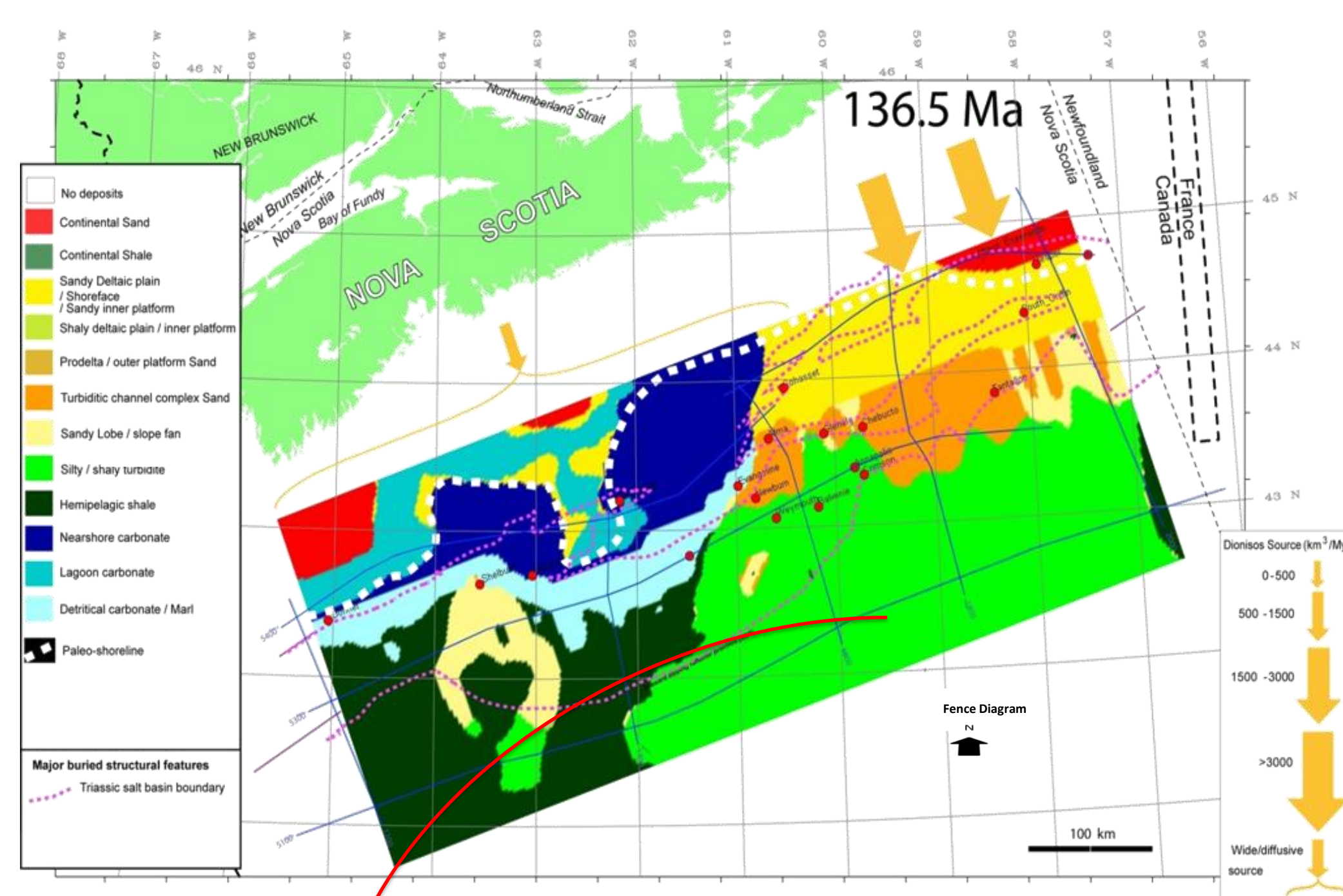
1. Lower Jurassic restricted Marine
2. Upper Jurassic Tithonian, terrestrial



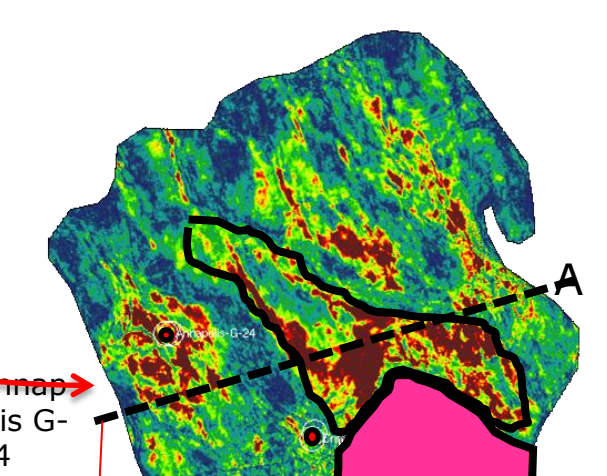
Main Reservoirs

1. Lower Cretaceous delta top on the shelf and Sable Sub basin
2. Lower Cretaceous, and in particular Albian slope and deep water channel/fan systems

Middle Mississauga GDE, based on seismic mapping and Dionisos modelling



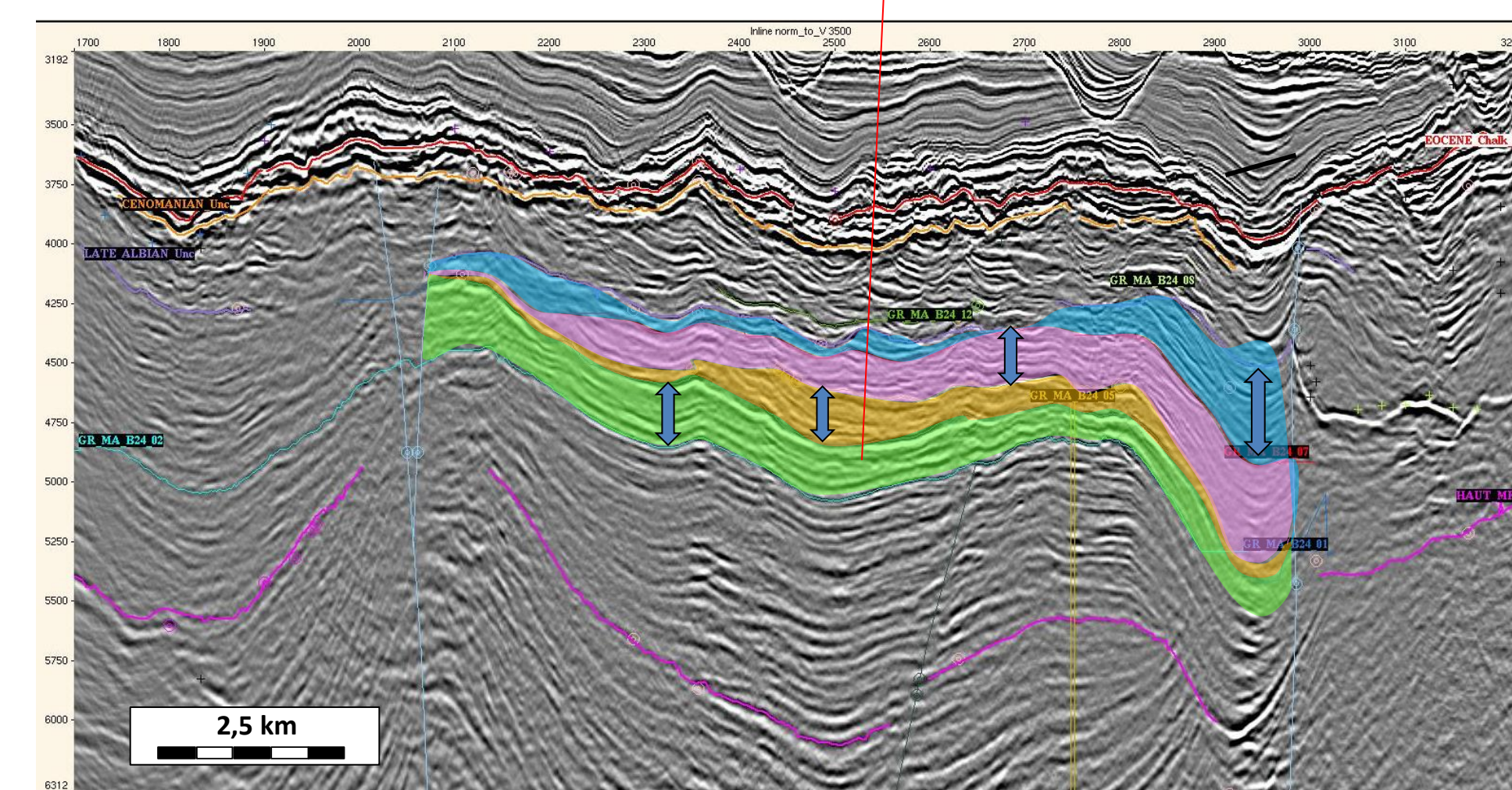
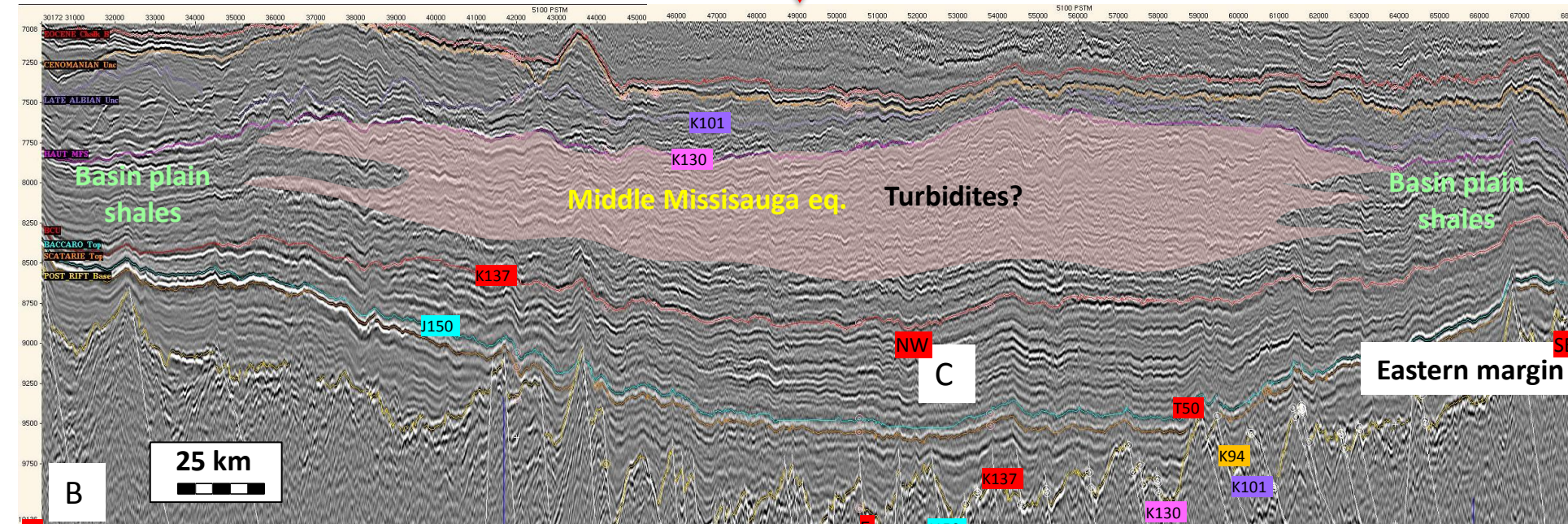
Late Albian low stand GDE



Seismic evidence for deep water fan systems

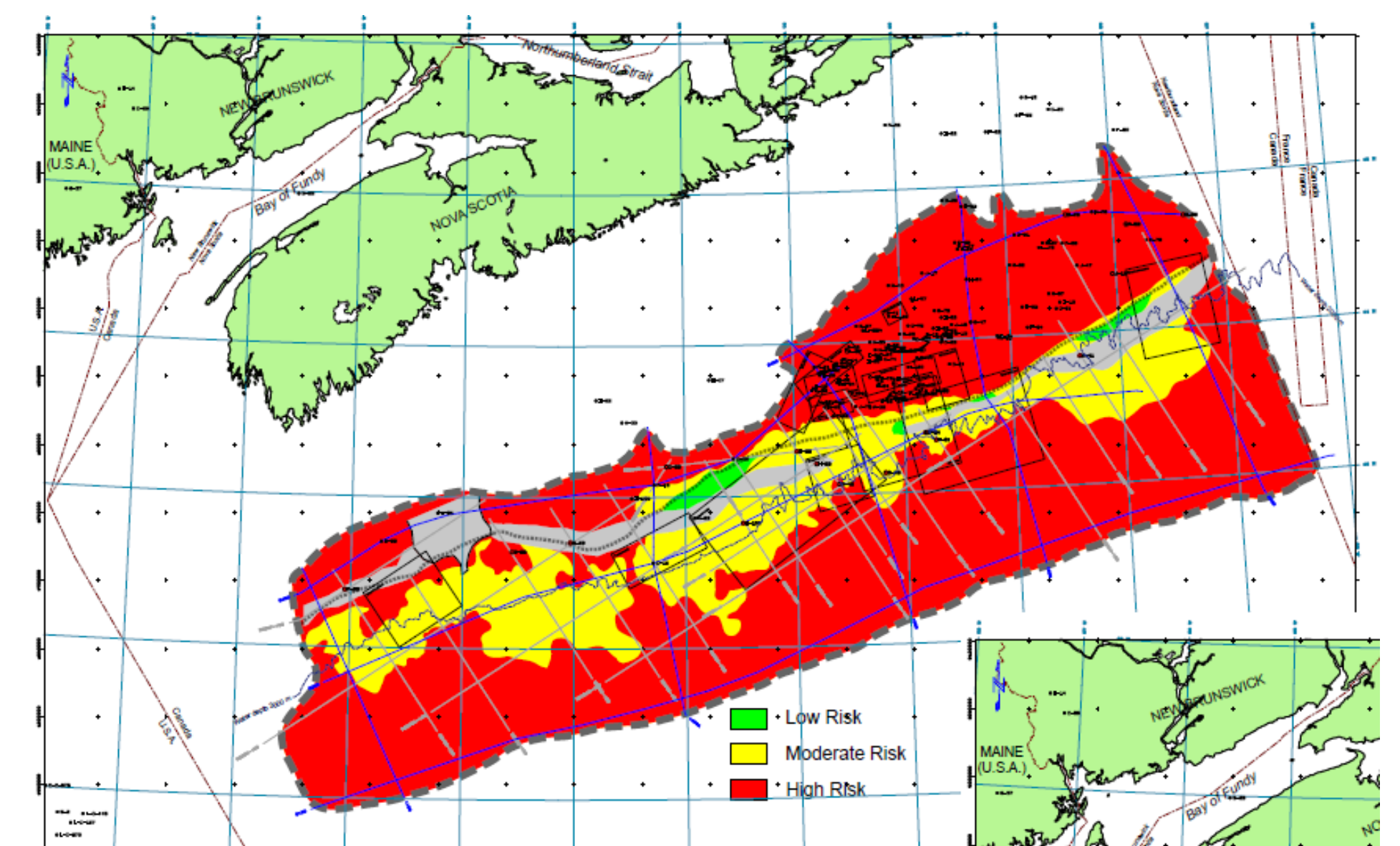
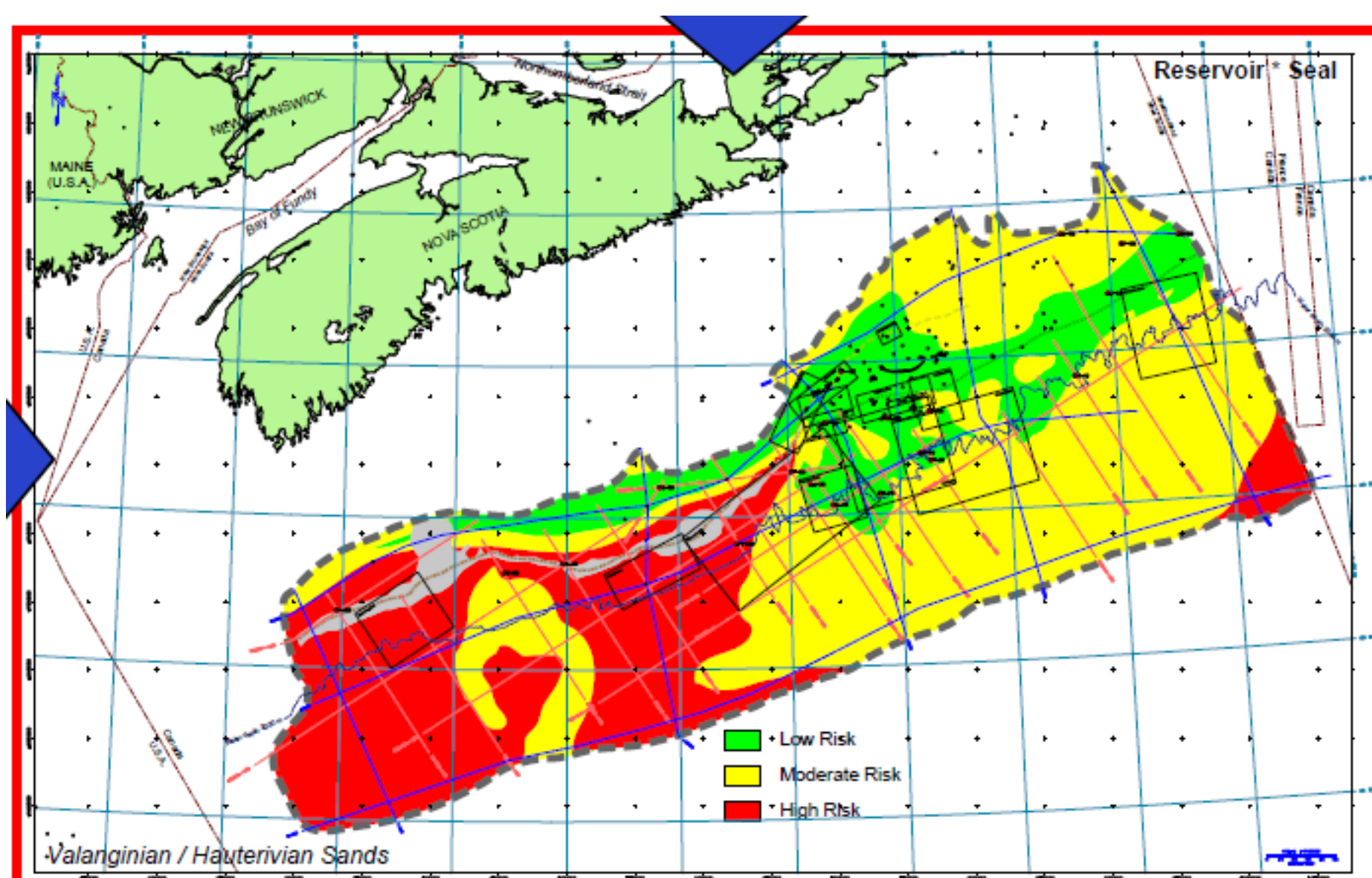
Seismic evidence channel systems

CRS Mapping

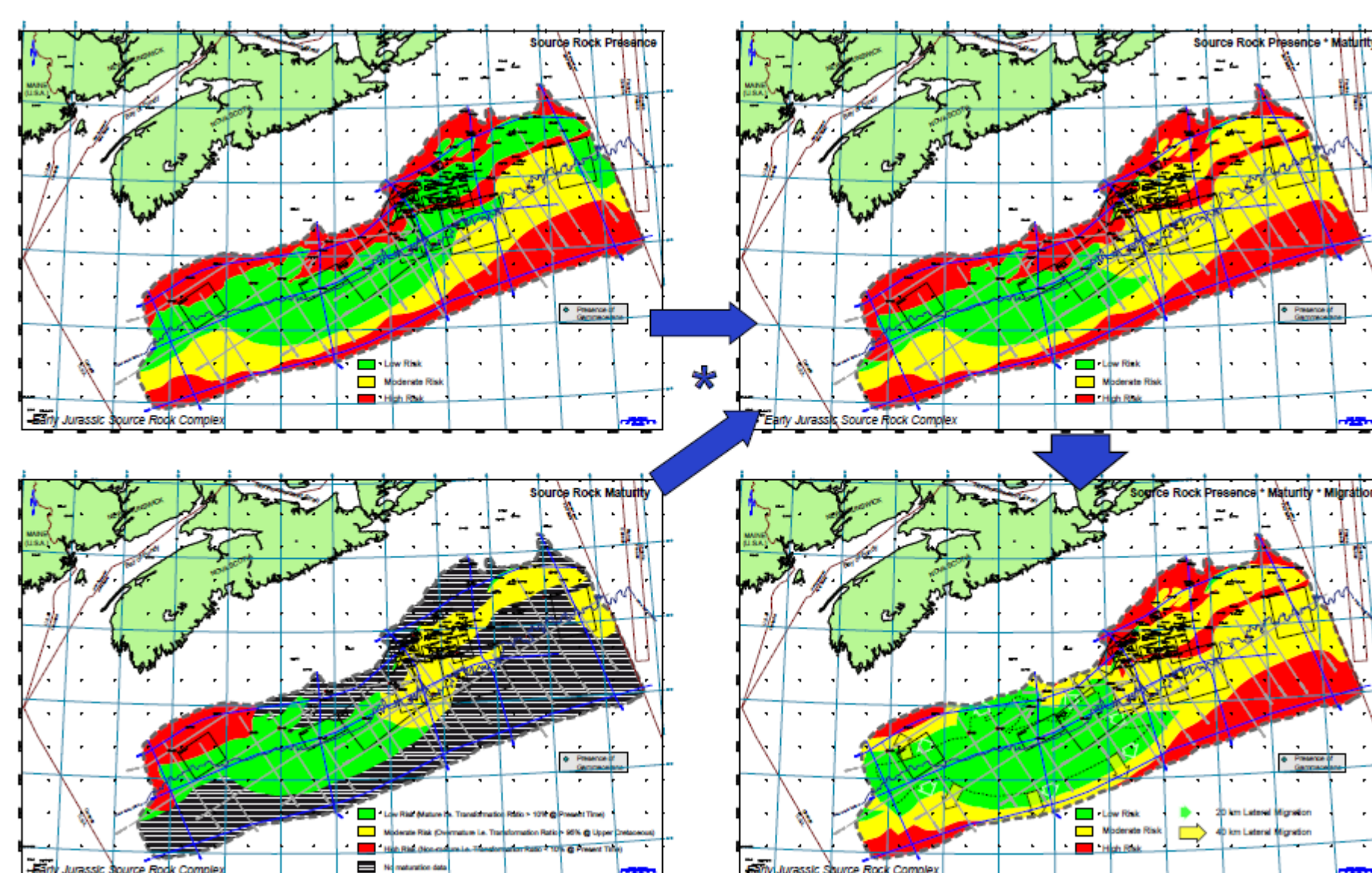


Late Albian Lowstand sands play (1)

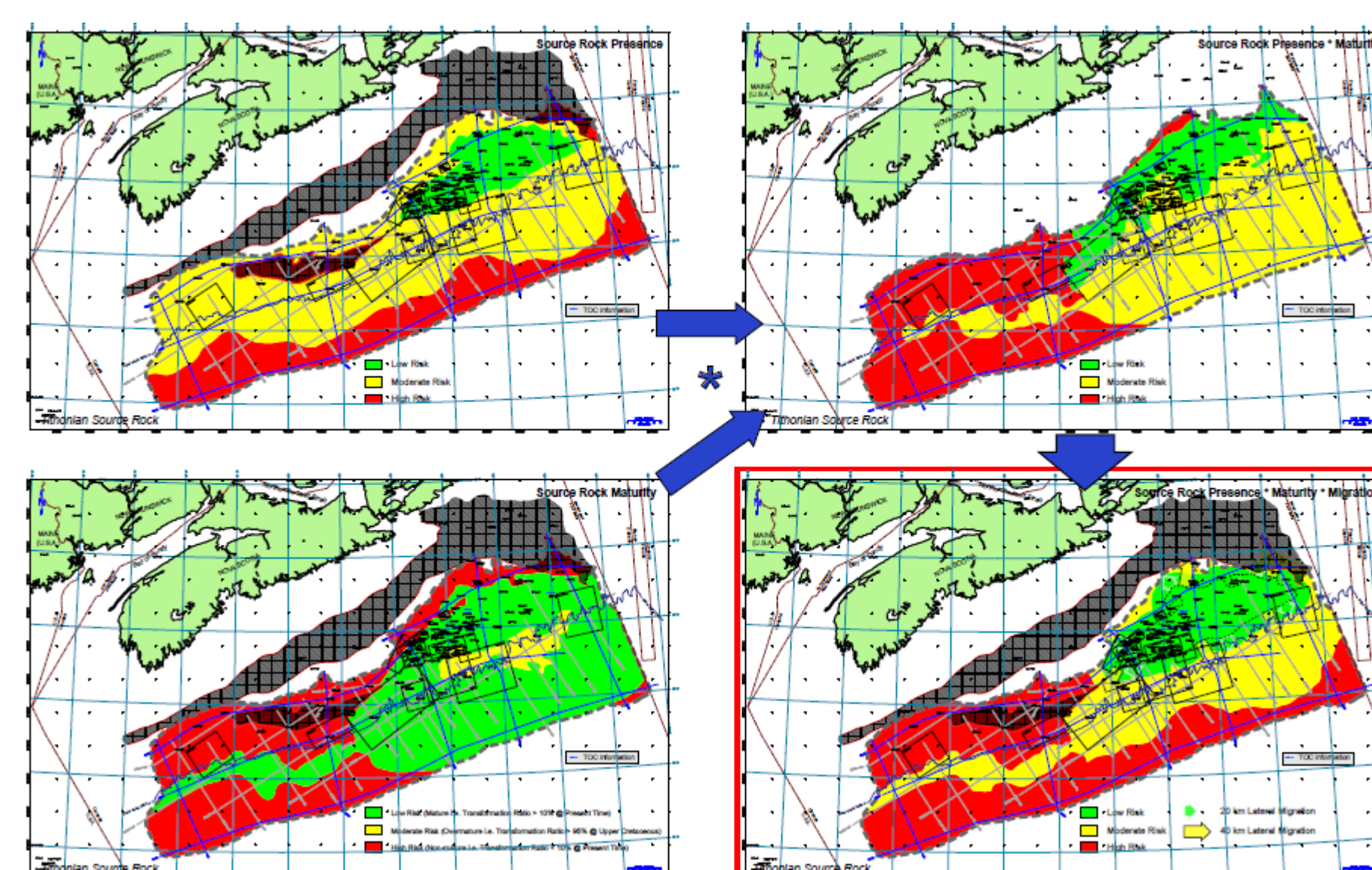
Combined CRS maps for the Middle Mississauga and Logan Canyon illustrate the distribution of reservoirs from the delta top/shore face facies and into deeper water



Lower Jurassic Source rock CRS maps



Tithonian source rock CRS maps



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