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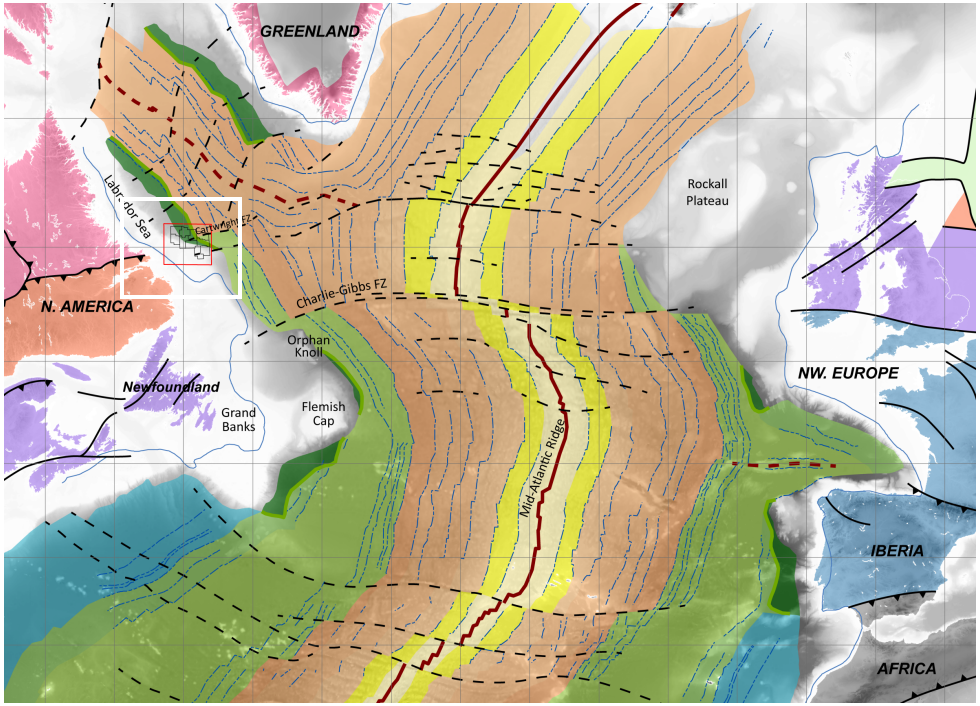
Play Elements of the Chidley Basin, offshore Newfoundland and Labrador Canada

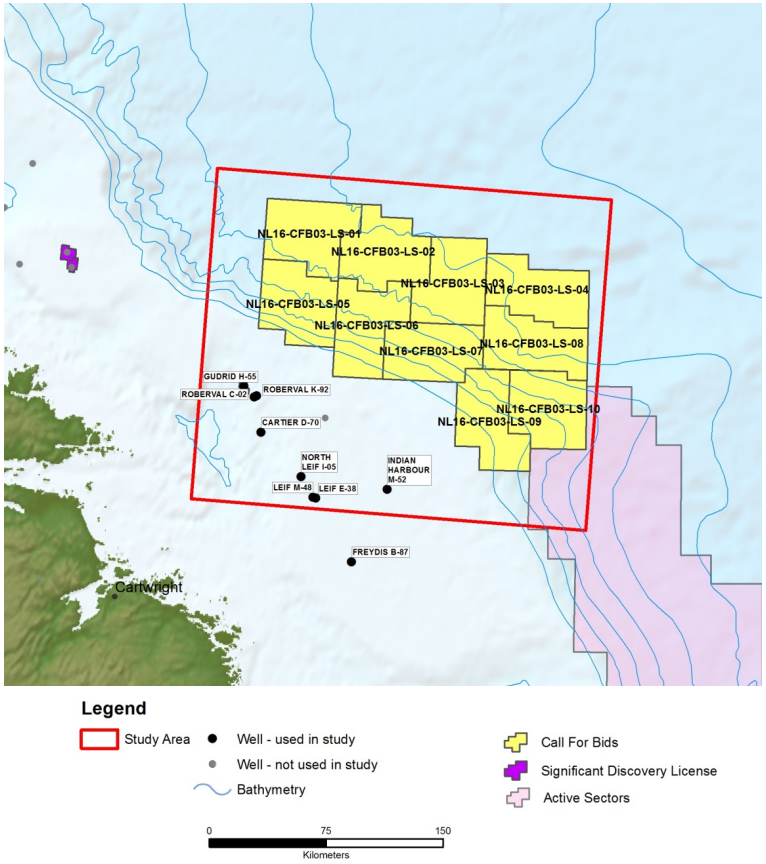
Erwan Le Guerroué[1], **Thibaud Pichot**[1], P. Jermannaud[1], P.-Y. Filleaudeau[1], G. Pérez-Drago[1], P.-Y. Chenet[1], E. Gillis[2], V. Mitchell[2], N. Montevecchi[2], R. Wright[2]

1. Beicip-Franlab, Rueil-Malmaison, France.
2. Nalcor Energy, St. John's, NL, Canada.

Chidley basin, Labrador

The Chidley Basin is a Mesozoic sedimentary basin located in the Labrador Sea. The Labrador Sea is an arm of the North Atlantic Ocean between Labrador and Greenland

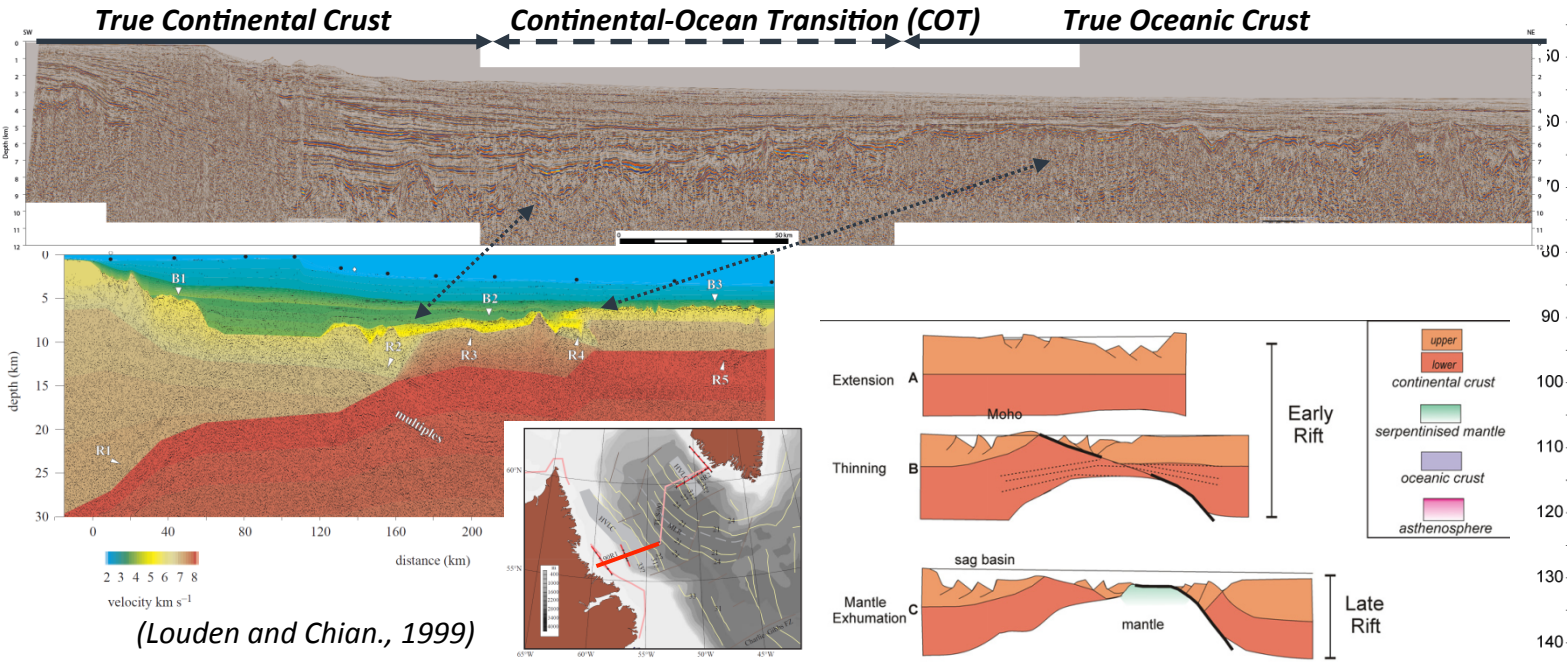




- On November, 2016 the C-NLOPB announced the Call for Bids NL16-CFB03 with closing date to be determined

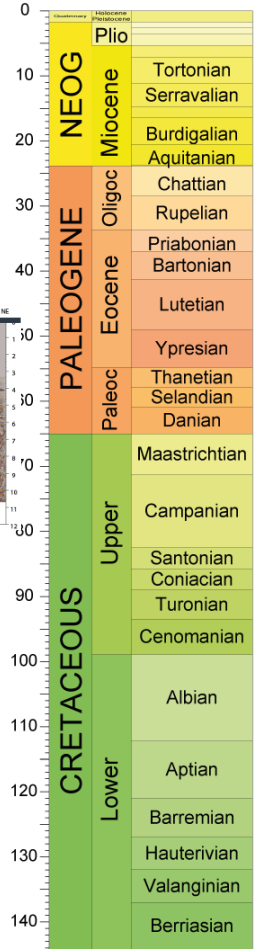
Geodynamic context

- Successive rift episodes associated with the northward opening of the North Atlantic Ocean continued toward the north in the Labrador Sea where extension occurred during Early Cretaceous:
  - Hyper extended rifted margin (140 Ma (syn-rift basalt of the Alexis Fm) to ~100 Ma)
  - Thin continental crust to exhumed mantle



(Louden and Chian., 1999)

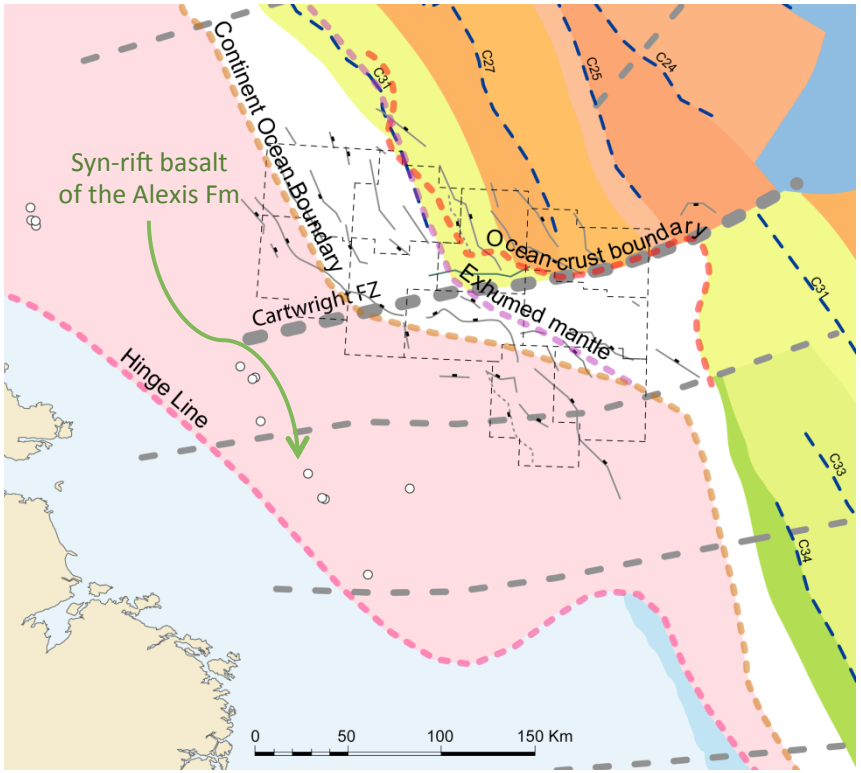
(Dickie et al., 2011)



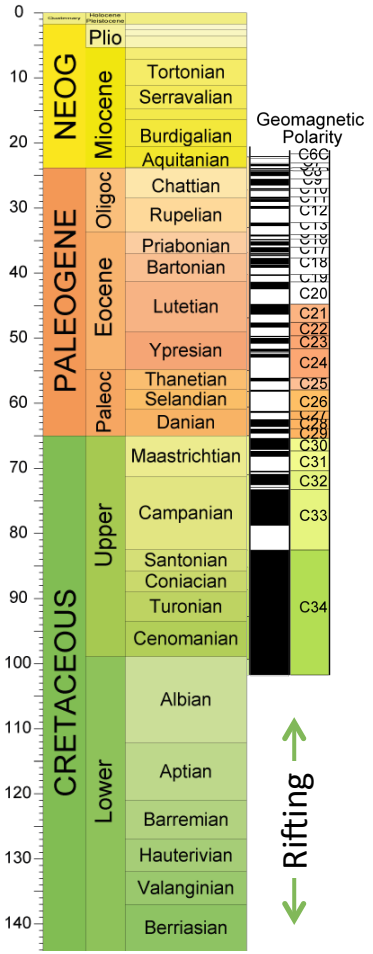
Geodynamic context

- Successive rift episodes associated with the northward opening of the North Atlantic Ocean continued toward the north in the Labrador Sea where extension occurred during late Cretaceous:
  - Hyper extended rift basin (140 Ma (syn-rift basalt of the Alexis Fm) to C34)
  - Thin continental crust to exhumed mantle

- The study area is crossed by Cartwright Fracture Zone
  - Segmenting the rifted basin by about 20Myrs (oceanic crust age)



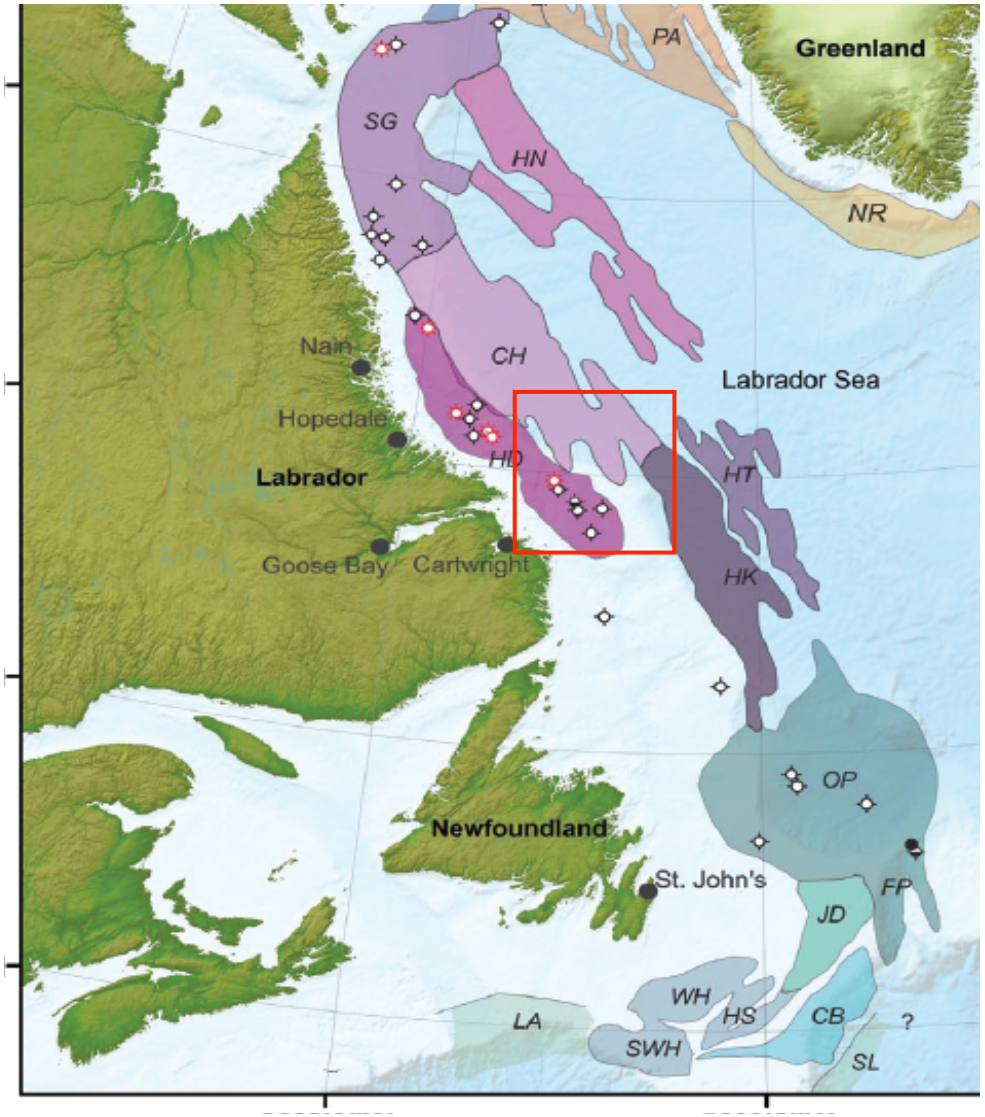
- Fracture zone
- Hinge line
- Continent Ocean Boundary
- Exhumed mantle limit
- Ocean crust boundary (this study)
- Ocean floor chrons
- Basement Fault (this study)
- Continental crust
- Transitional crust / exhumed mantle
- Oceanic crust



Based on Artemieva & Thybo, 2013; Hosseinpour et al. 2013; Lundin and Dore 2011; Doré & Lundin, 2015 and GeoArctic 2013).

Objective and settings

- The South Labrador margin is composed of the Hopedale Basin in the shelf and the Chidley basin in the distal part of the margin
- The major period of exploration on the Labrador margin was in the 1970s and 1980s.
- Five discoveries were made in the Hopedale Basin
- Marine shales are usually immature on the shelf but are buried at greater depths in the slope and deepwater regions.

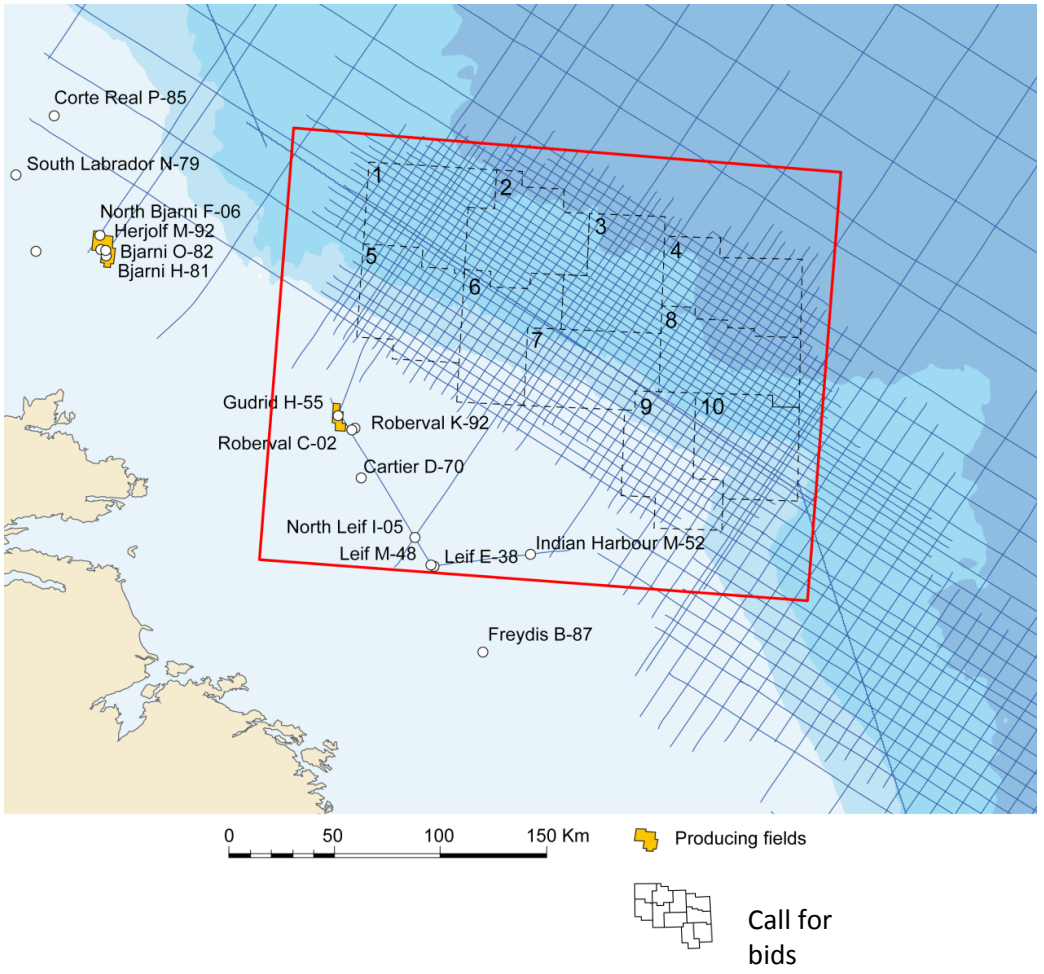


Objective and settings

- Test the prospectivity of the area through a reassessment of the potential play in the Cretaceous and Tertiary strata; offshore actual producing fields

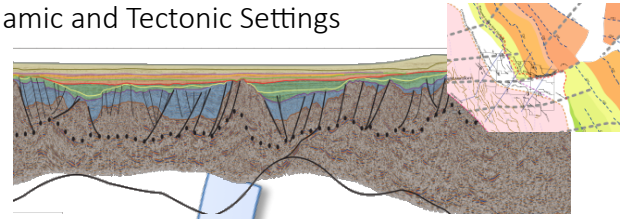
- The dataset includes
  - Nine wells
  - 2D seismic surveys
  - A set of ten seismic horizons

- Ultimately these plays will be tested for oil and gas potential within a petroleum system model



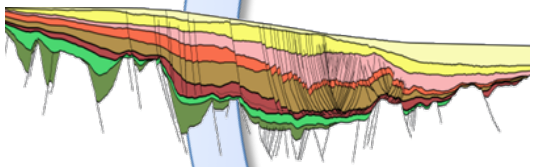
Beicip-Franlab and Nalcor Workflow

Geodynamic and Tectonic Settings

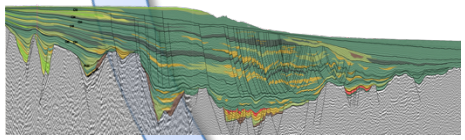


Fault and horizon picking

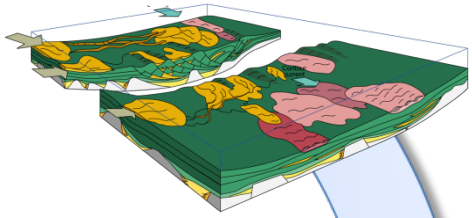
Structural reconstruction



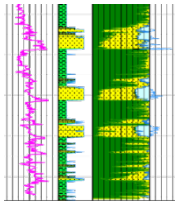
Seismic Stratigraphy

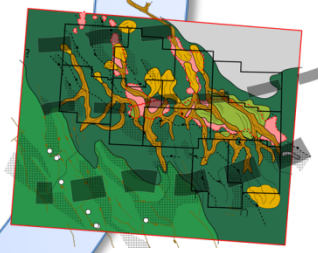


Sedimentology and Stratigraphy



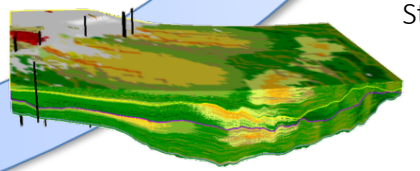
Petrophysical Evaluation





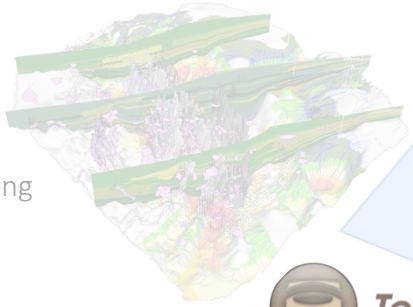
Gross Depositional Environment mapping

Stratigraphic/Lithological 3D Modelling



Play definition

DionisosFlow™



Petroleum system modelling Resources Assessment

TemisFlow™

2018 Conjugate Margins Conference

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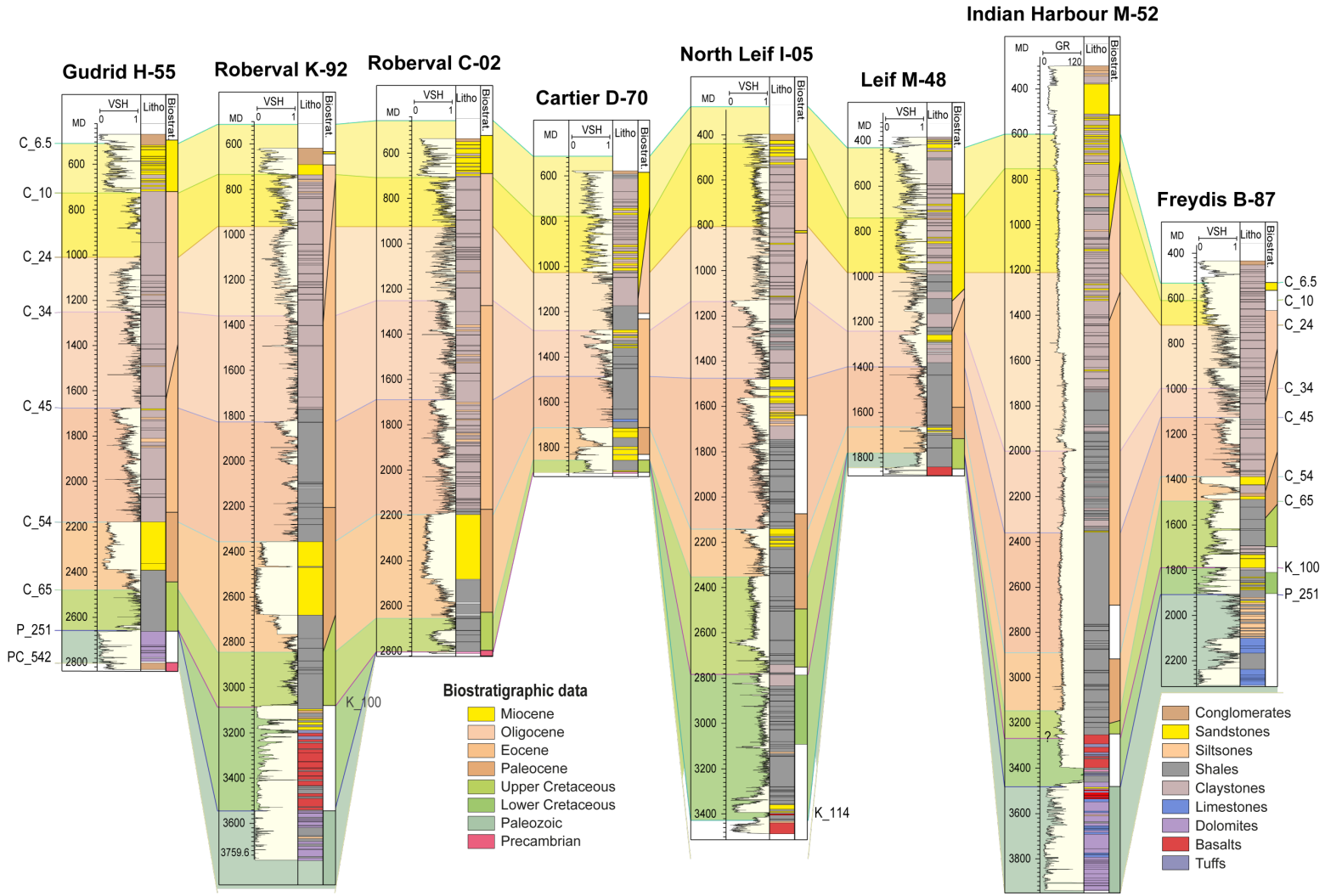
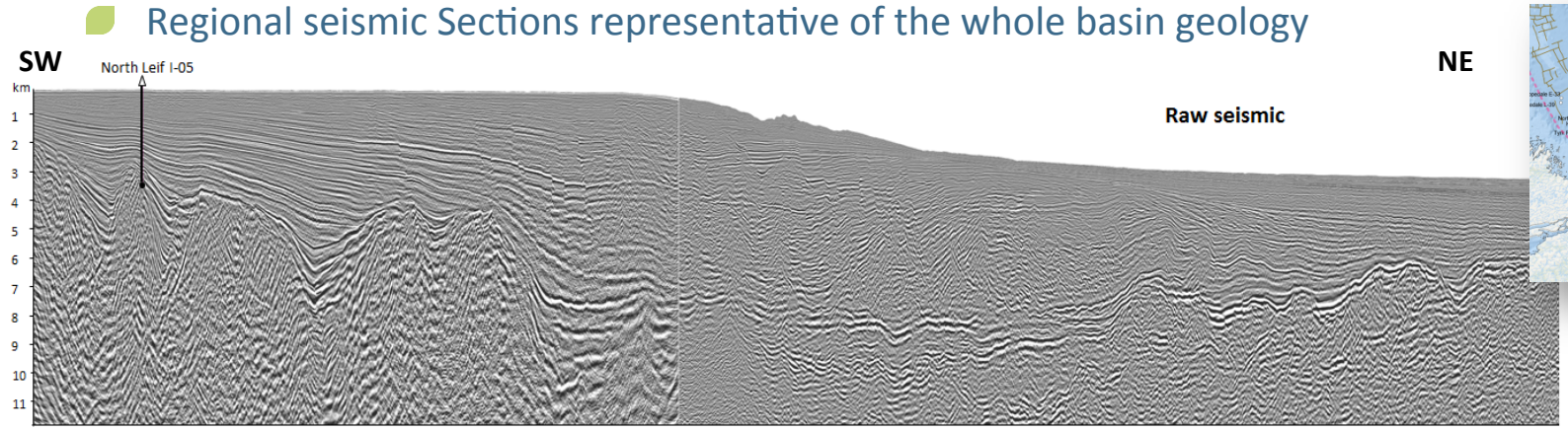
Well stratigraphy

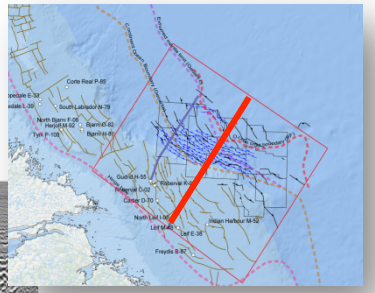
- All geological information (markers, well reports and well logs) were integrated and interpreted in terms of sedimentology and petrophysics in order to provide a consistent stratigraphic framework



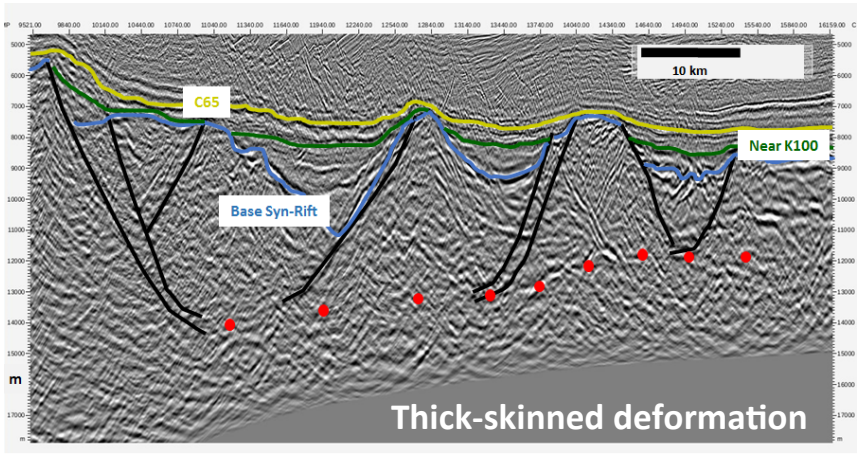
2D stratigraphic & facies analysis

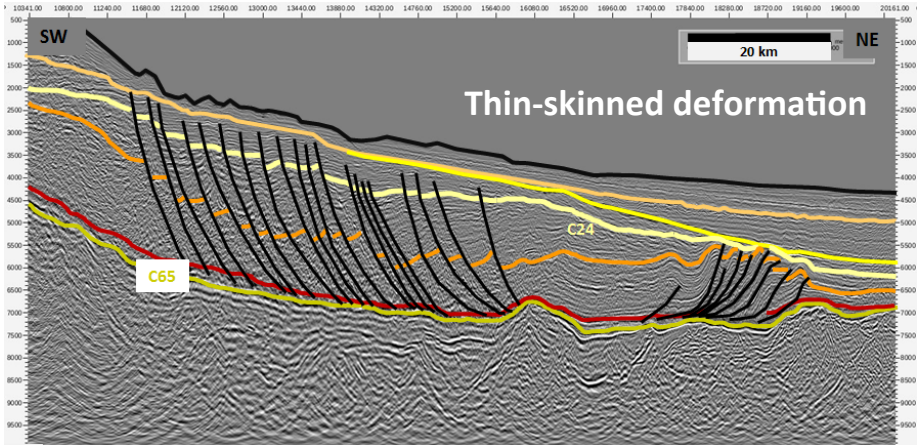
- Regional seismic Sections representative of the whole basin geology



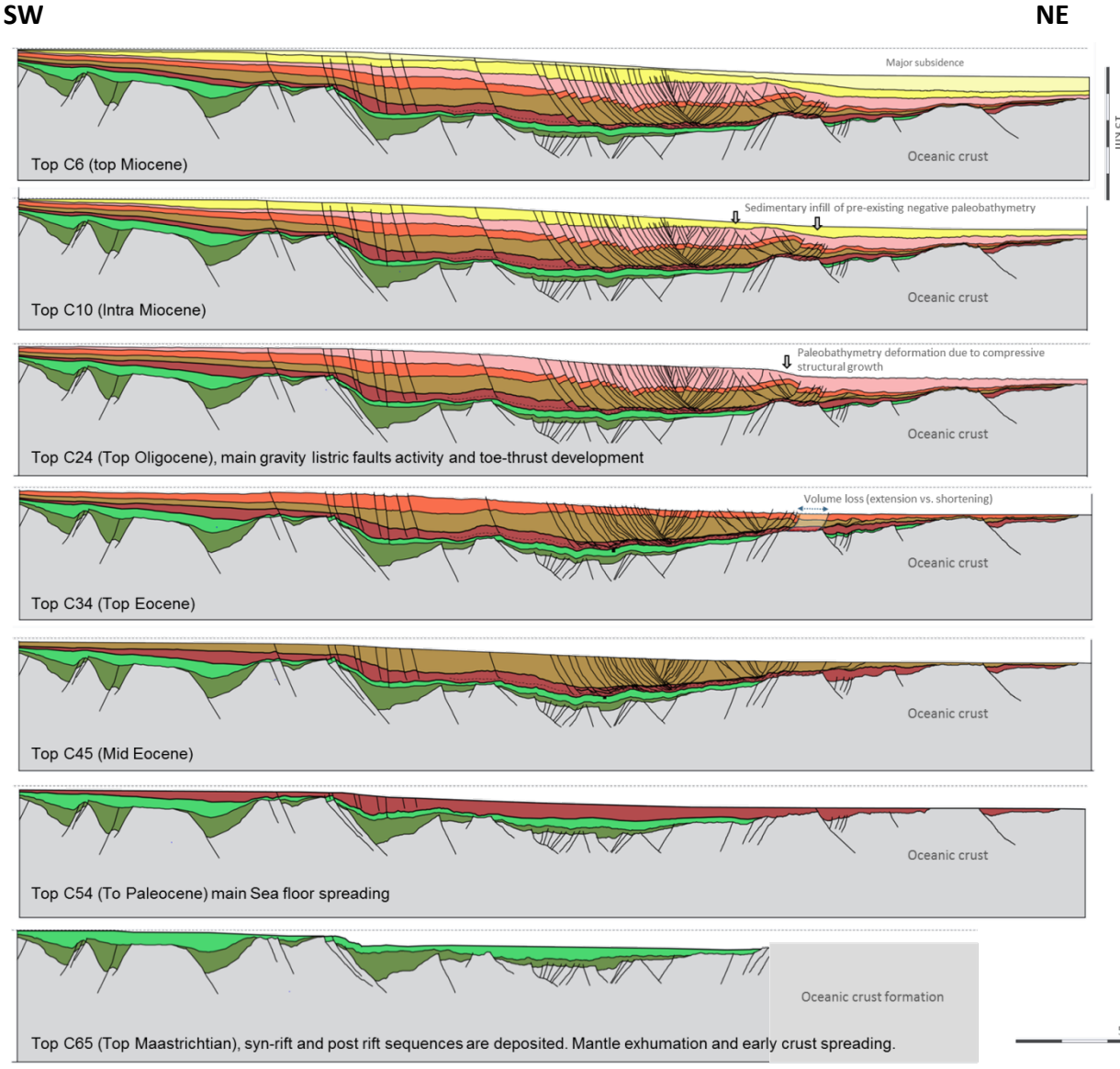


- Structural interpretation performed:



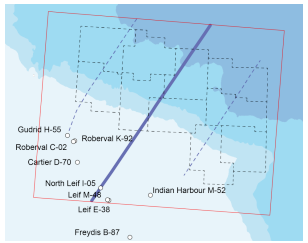


Tertiary structural reconstruction



- Validates the structural and time horizon interpretation
- Constrains Paleo-bathymetries used in the sedimentary model

- A major detachment within C54 layer (Paleocene shales)
- A listric faults and toe-thrusts system detached on the Paleocene level
- Gravity-driven system active between 34 Ma and 24 Ma



2D stratigraphic & facies analysis

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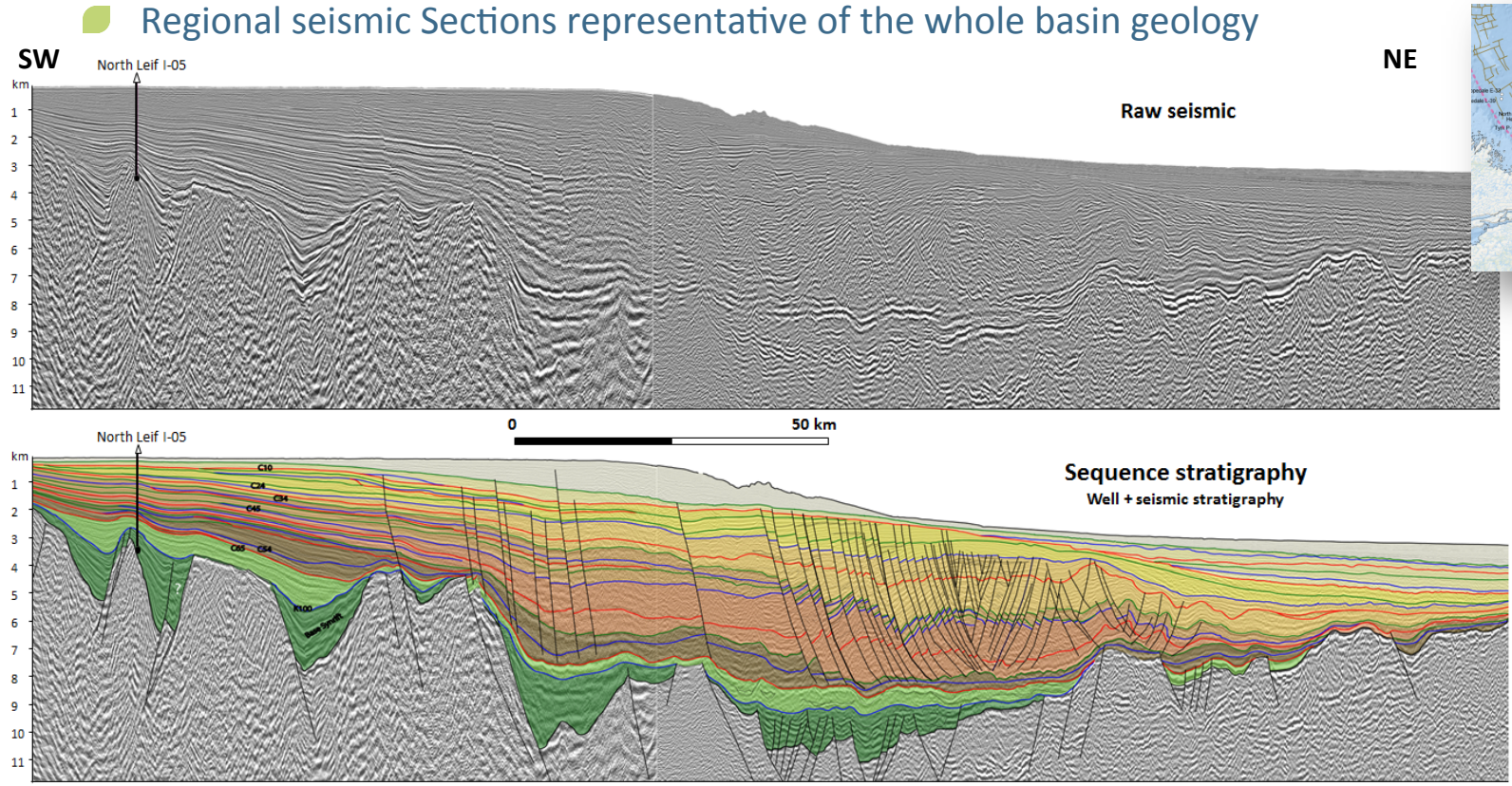
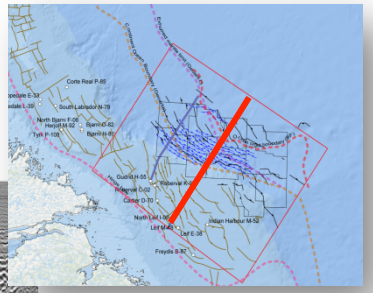
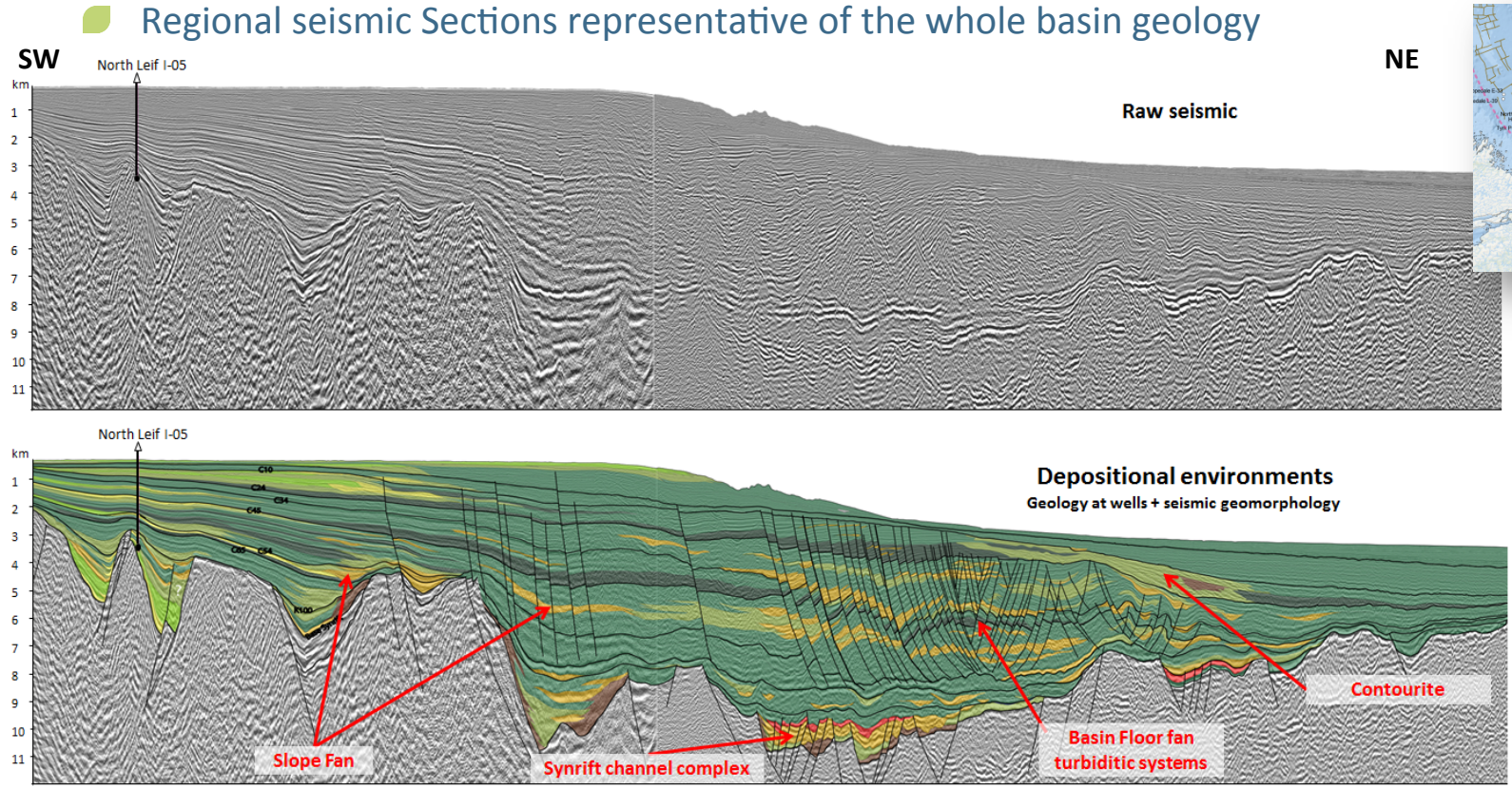


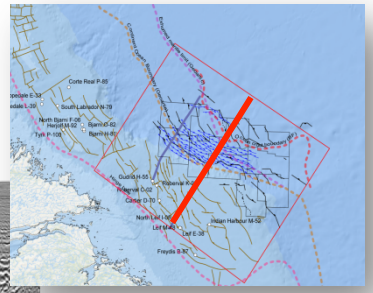


- Key stratigraphic surfaces by recognizing successive offlap break position & truncation geometries
- successive systems tracts bounded by key stratigraphic surfaces
- successive sequence packages using available biostratigraphic markers
- Regional sequences with alternating regressive and transgressive trends

2D stratigraphic & facies analysis

- Regional seismic Sections representative of the whole basin geology



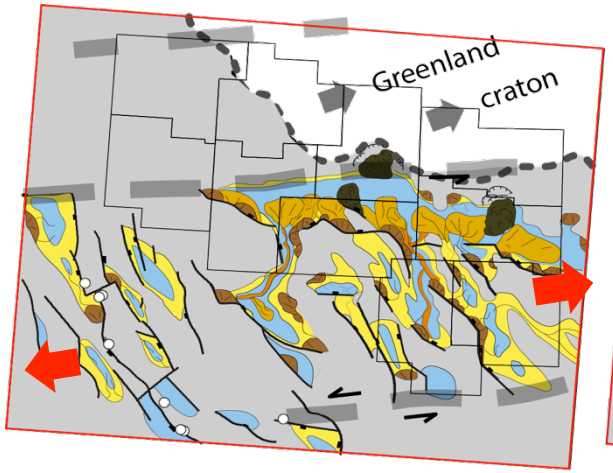


- Facies dress-up using combined well information and seismic geomorphological elements

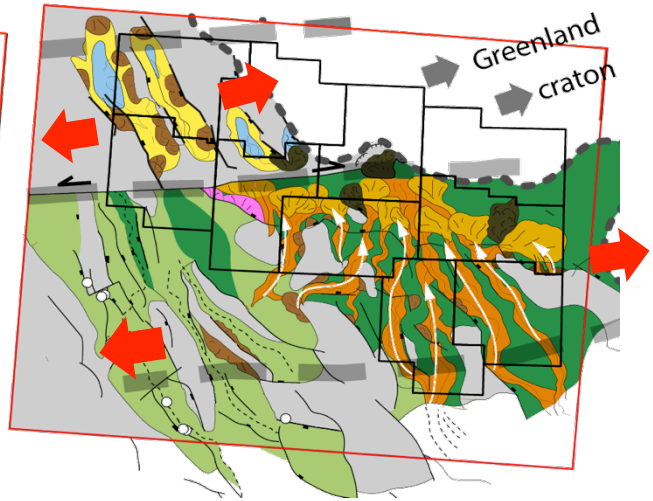
Gross Depositional Environment maps

Syn-rift phase (diachronous)

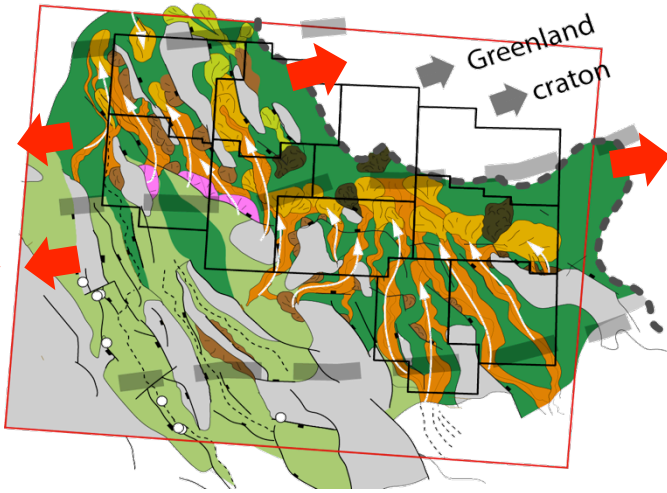
Stage1 (Berriasian)
(non marine)



Stage 2 (Valanginian-Barremian)
North CFZ Opening (marine to the south)



Stage3 (Aptian-Albian)
Marine transgression to the North



- Rift related Lacustrine/fluvio-deltaic environments transitioning to distal turbidite complexes with progressive marine transgression
- Channel systems have a broad NW flow direction and are sourced by local horst erosion

Alluvial plain
Lake
Alluvial fan
Transitional deltaic
Transitional to neritic
Slope shaly deposit
Basinal shaly deposit

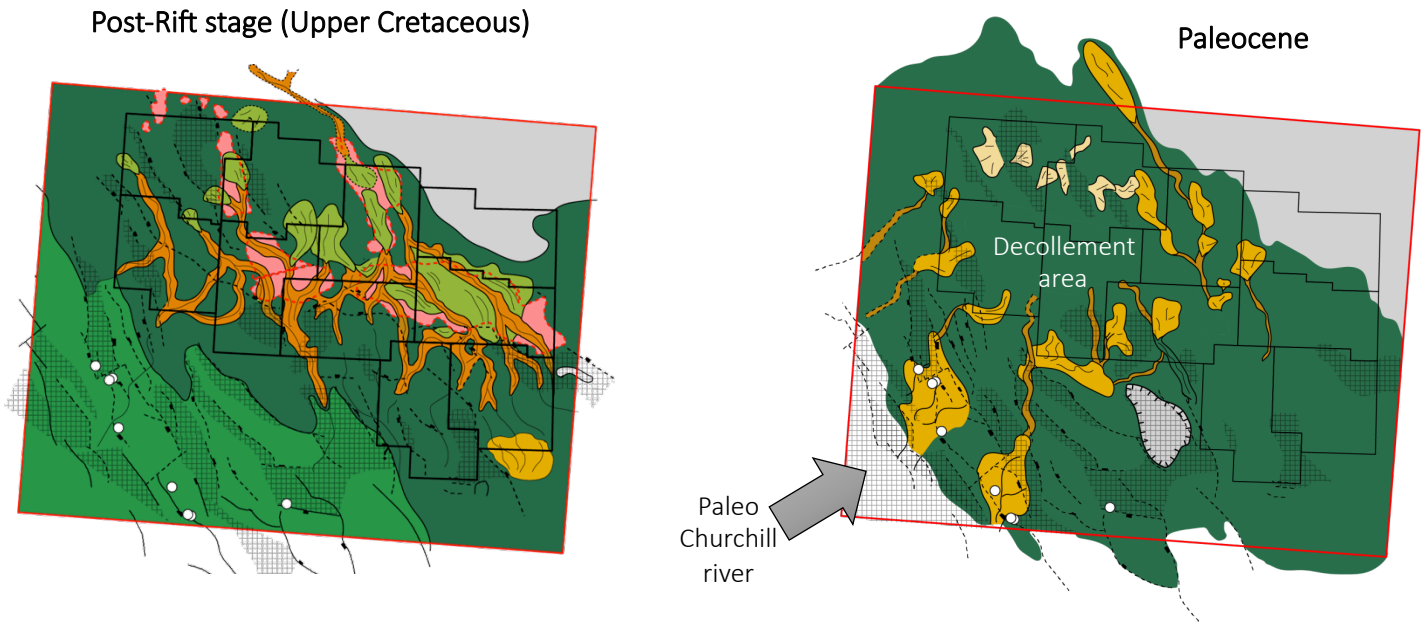
No deposit/bypass/erosion
No data / low resolution
Structural high
Volcano-clastics

Alluvial fan
Silty lobe
Sandy lobe
Erosive channel/canyon
Sedimentary pathway/channel
Hypothetical sedimentary pathway
Slump / debris flow

Future oceanic crust boundary
Transform fault zone
Normal faults
Reverse faults
Well
Flow direction

Gross Depositional Environment maps

Post-rift phase



- Progressive burial of rift horst structures and overall marine transgression
- From the Paleocene main sediments are sourced from the paleo Churchill river with associated slope and distal turbiditic lobes deposition