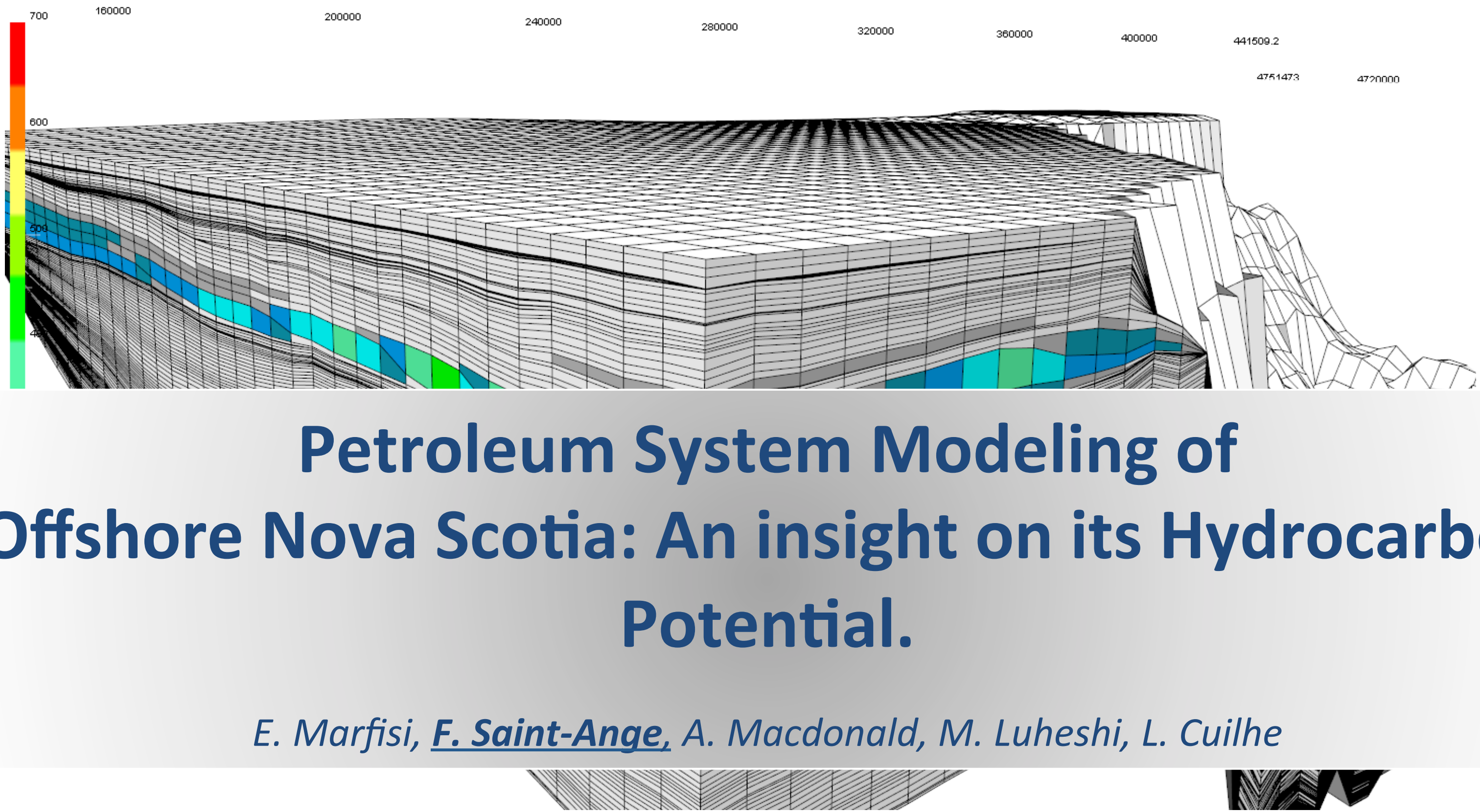

Petroleum System Modeling of Offshore Nova Scotia: An insight on its Hydrocarbon Potential.

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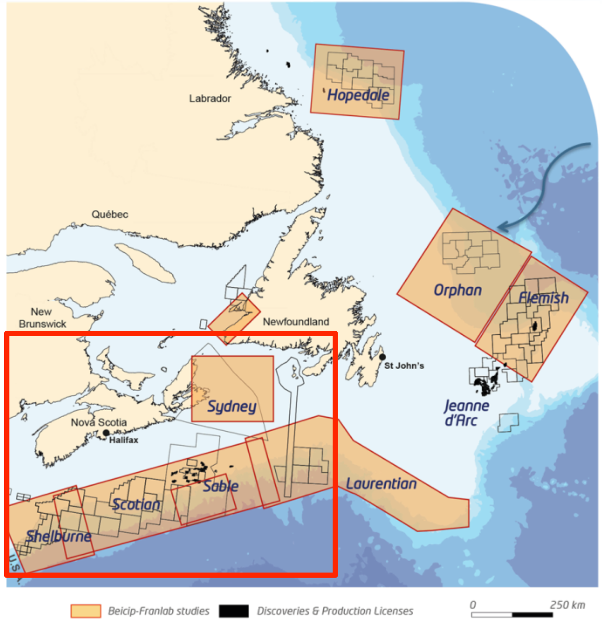
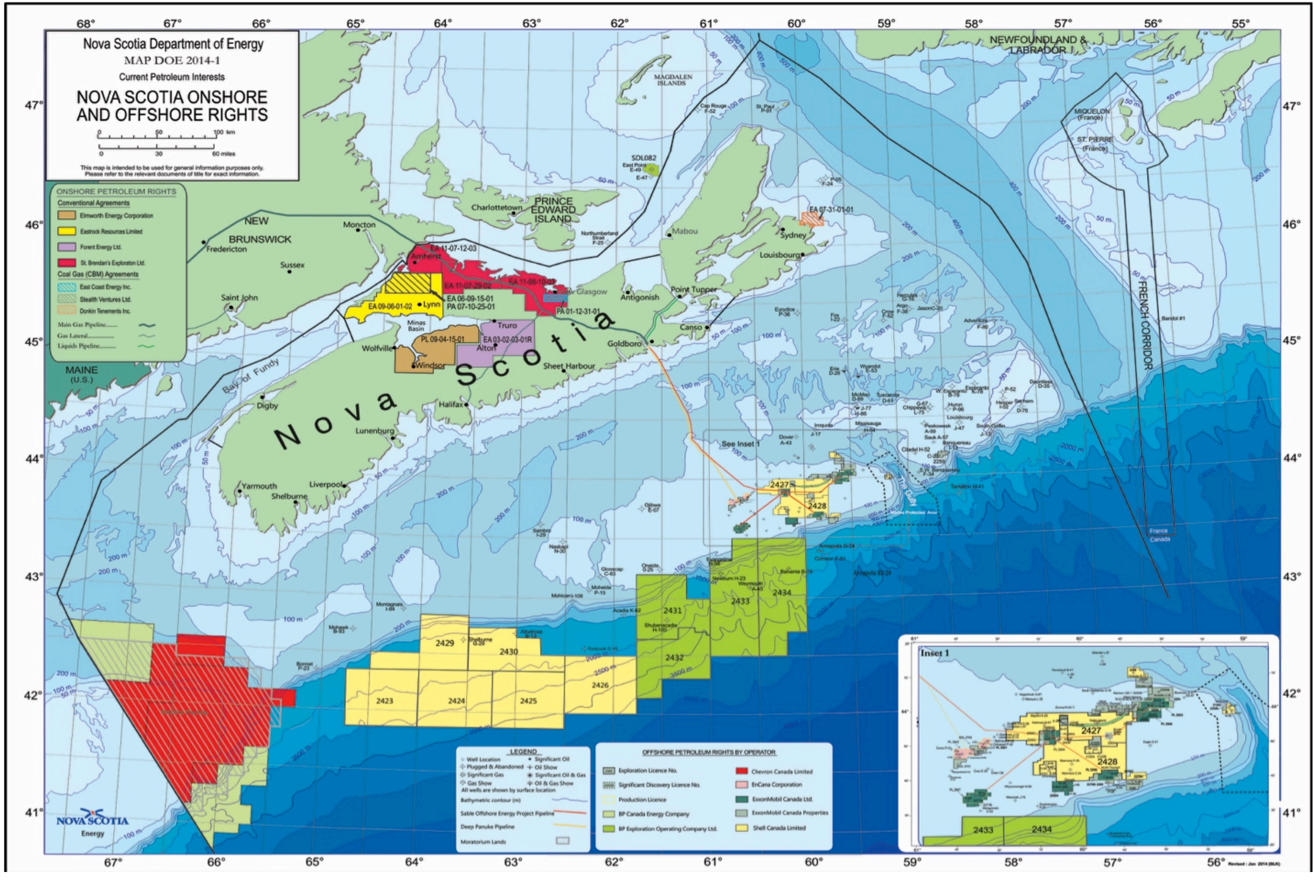
Study Area



- HC discovered in the CSS since 1967.
- 2011 PFA and subsequent local studies oriented to expose the HC potential of the scotian deep offshore and barely explored areas

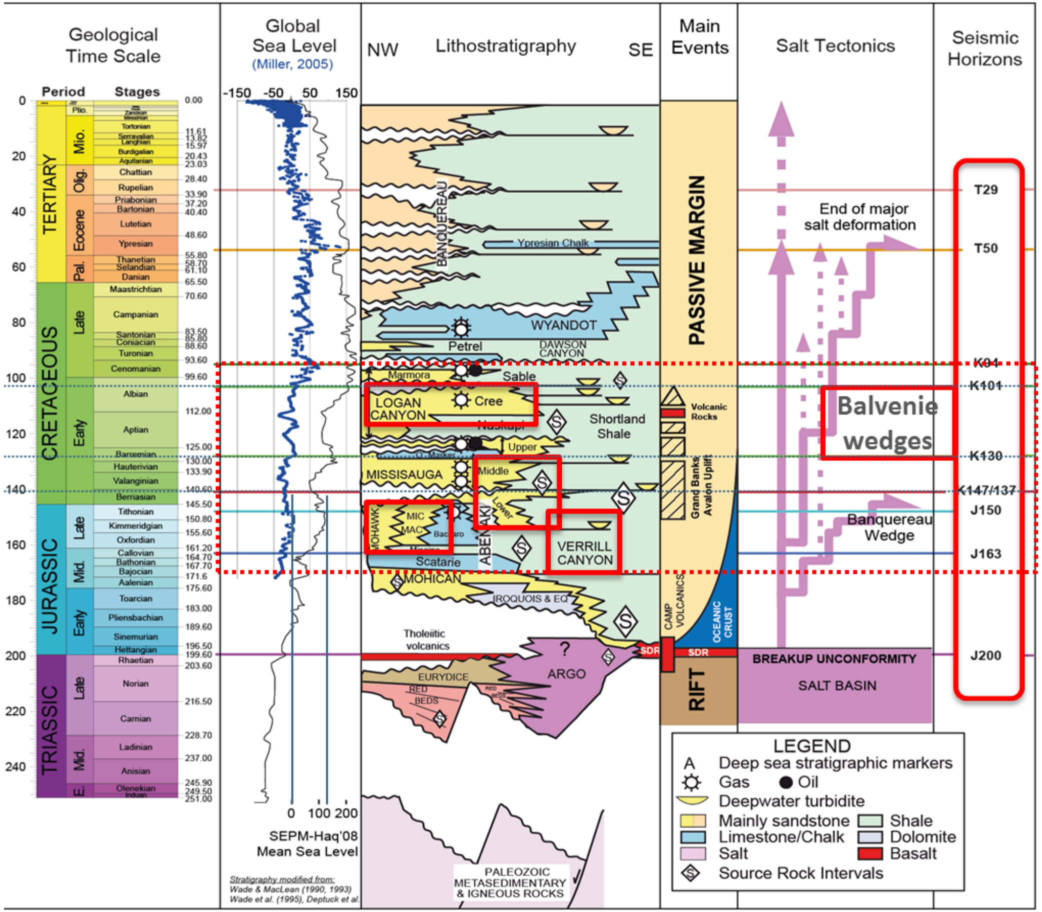
The Scotian Shelf and Deep Offshore Area



Petroleum System Elements

Reservoirs and Seals

- Logan Canyon/Cree.
- Upper/Middle and lower Missisauga.
- Mic Mac equivalent Sandstones/ Verrill Canyon.
- Late Jurassic carbonate of Abenaki Formation.
- Autochthonous – Autochthonous Salt Seals
- Nbr of pressure seals along the interval = MFS
- Retains HC with common overpressure compartment



Petroleum System Elements

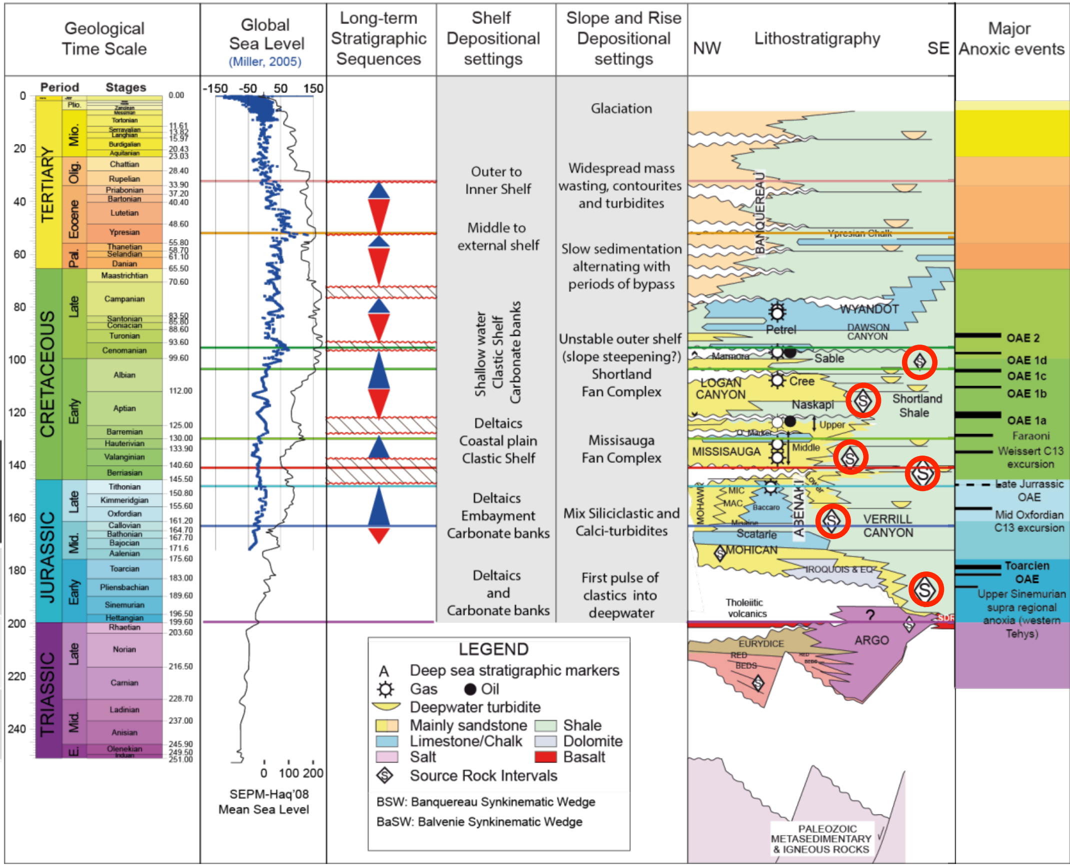
Source Rocks and Kerogens

- At least Four regional source rock intervals are known in the Scotian Basin, with a fifth – the Early Jurassic – speculative and based on very limited data.
- Jurassic SRs are potentially the major contributors.
- Valanginian to Aptian SRs have a more local contribution when mature.

Source Rock	Age	Type	TOC	IH
Tithonian	150Ma	TYII-III	5%	424mg/gC
Toarcian	182Ma	TYII	2,5%	600mg/gC
Pliensbachian	189Ma	TYII	2,5%	600mg/gC

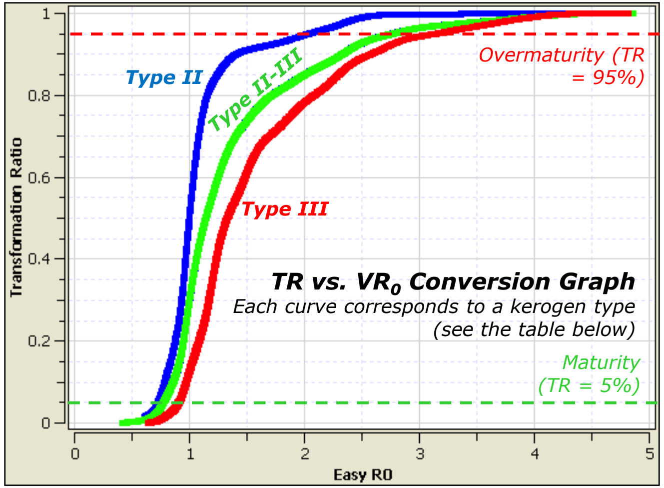
Late Jurassic → Tithonian

Early Jurassic Complex → Toarcian, Pliensbachian



Petroleum System Elements

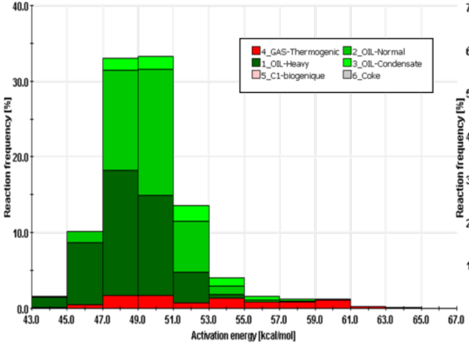
Source Rocks and Kerogens



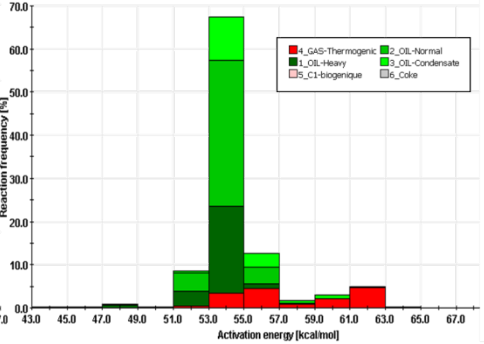
- IFP 6 classes Kinetic scheme – 5 mobile fractions, maturation of initial kerogens can generate six families of chemical components.
- Two gas families (thermogenic and biogenic if necessary), three oil families (from the heavier compounds to the lighter) and coke.

Relationship TR/Vitrinite	TR=5% Oil Window	TR=50%	TR=95% Overmaturity
Kerogen Type II	VR_0 = 0.7	VR_0 = 0.9	VR_0 = 2
Kerogen Type II-III	VR_0 = 0.75	VR_0 = 1	VR_0 = 2.7
Kerogen Type III	VR_0 = 0.8	VR_0 = 1.2	VR_0 = 3.2

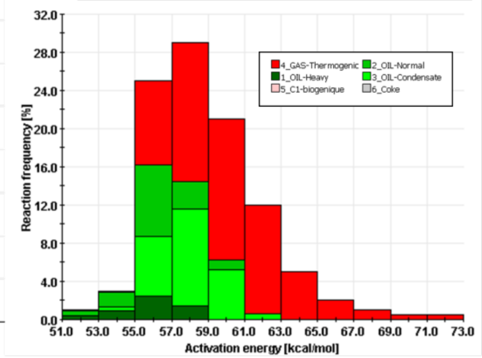
Type II-S Kerogen
(Monterey – Miocene, USA)



Type II Kerogen
(Mesnil-2 - Toarcian. France) - Behar et al. 1997



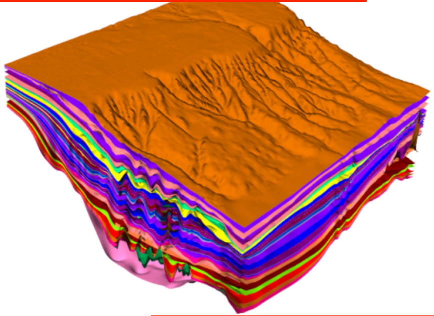
Type II-III Kerogen
Kerogen mixing between Type II and Type III kerogens

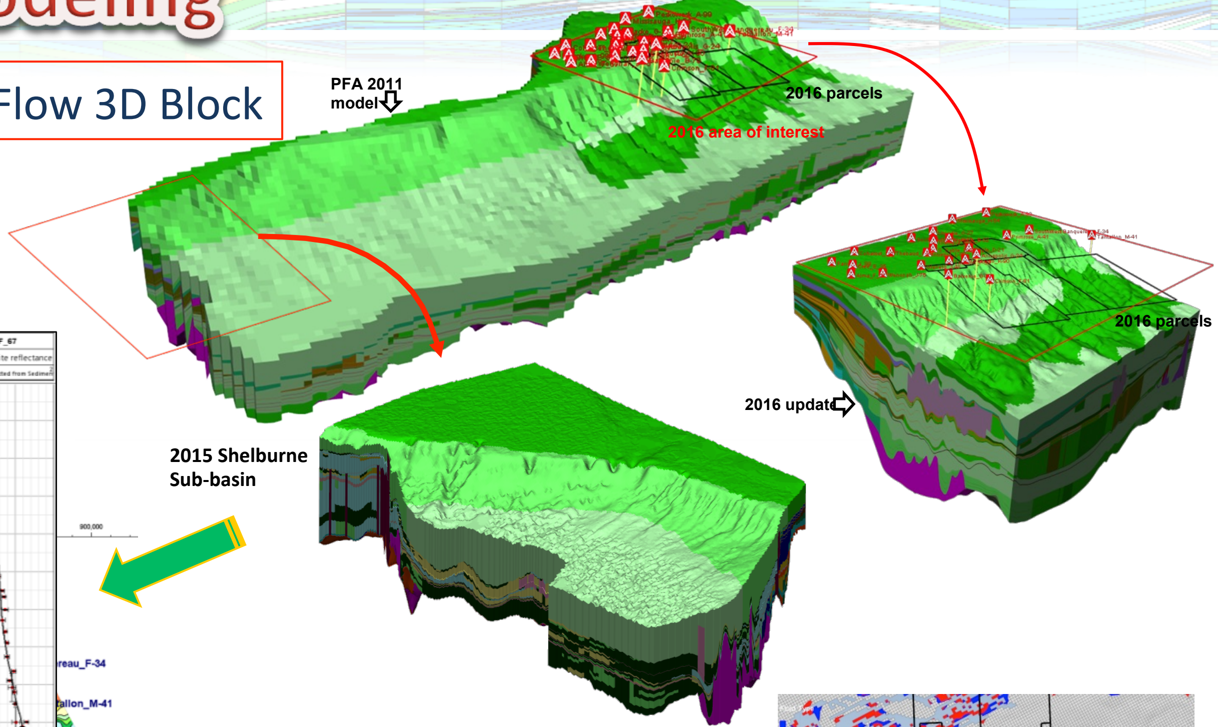


Name	Reference density[kg/m^3]
5_C1-biogenique	0.6678
4_GAS-Thermogenic	50.0
3_OIL-Condensate	780
2_OIL-Normal	860
1_OIL-Heavy	980

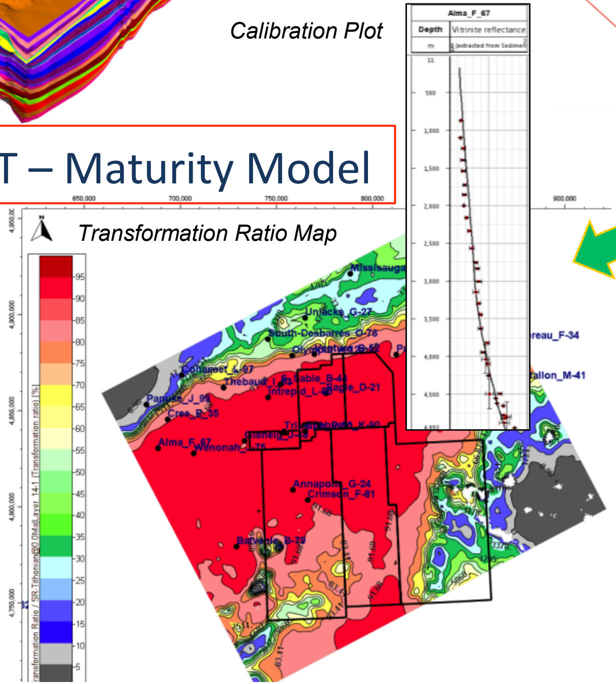
Petroleum System Modeling

Seismic Horizons → TemisFlow 3D Block

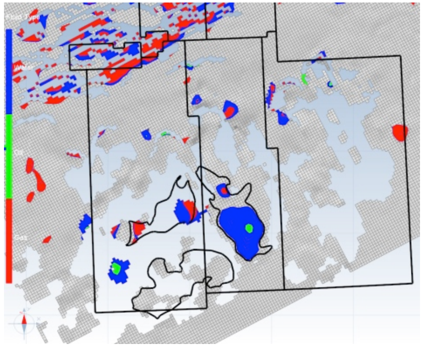




P-T – Maturity Model



→ HC Migration Model

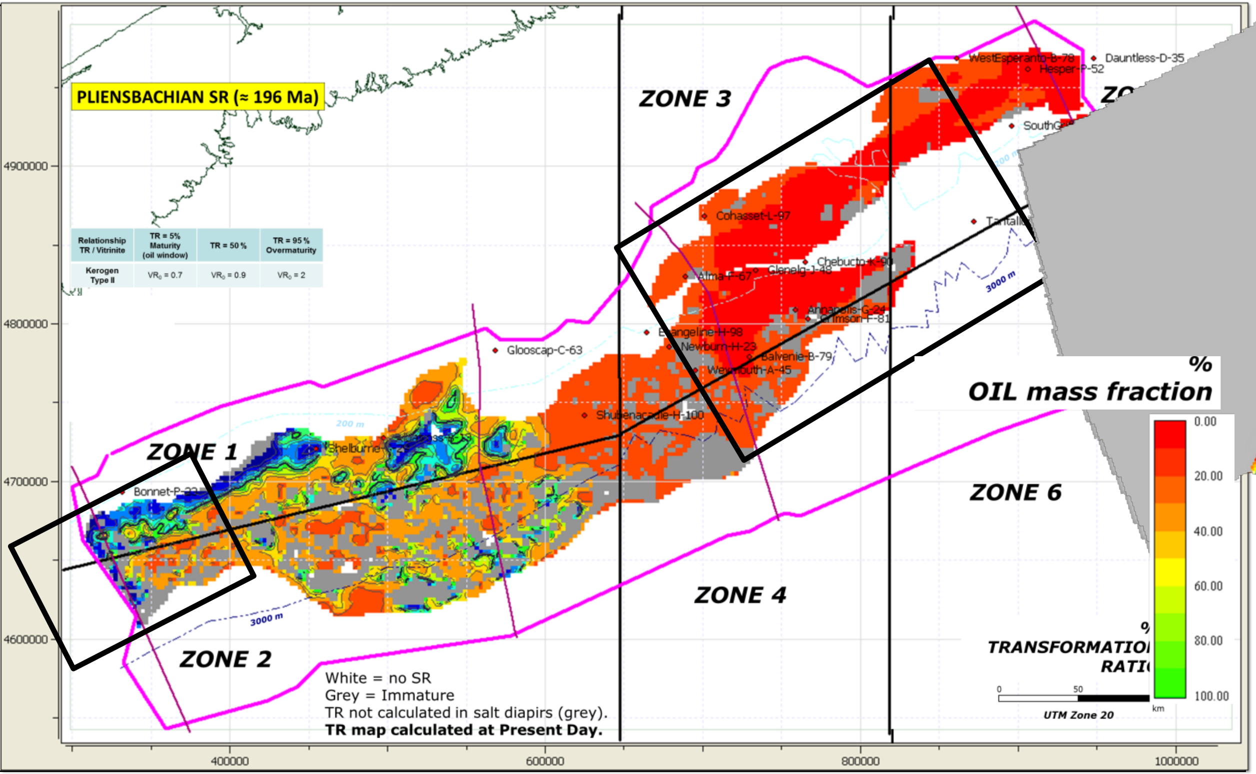


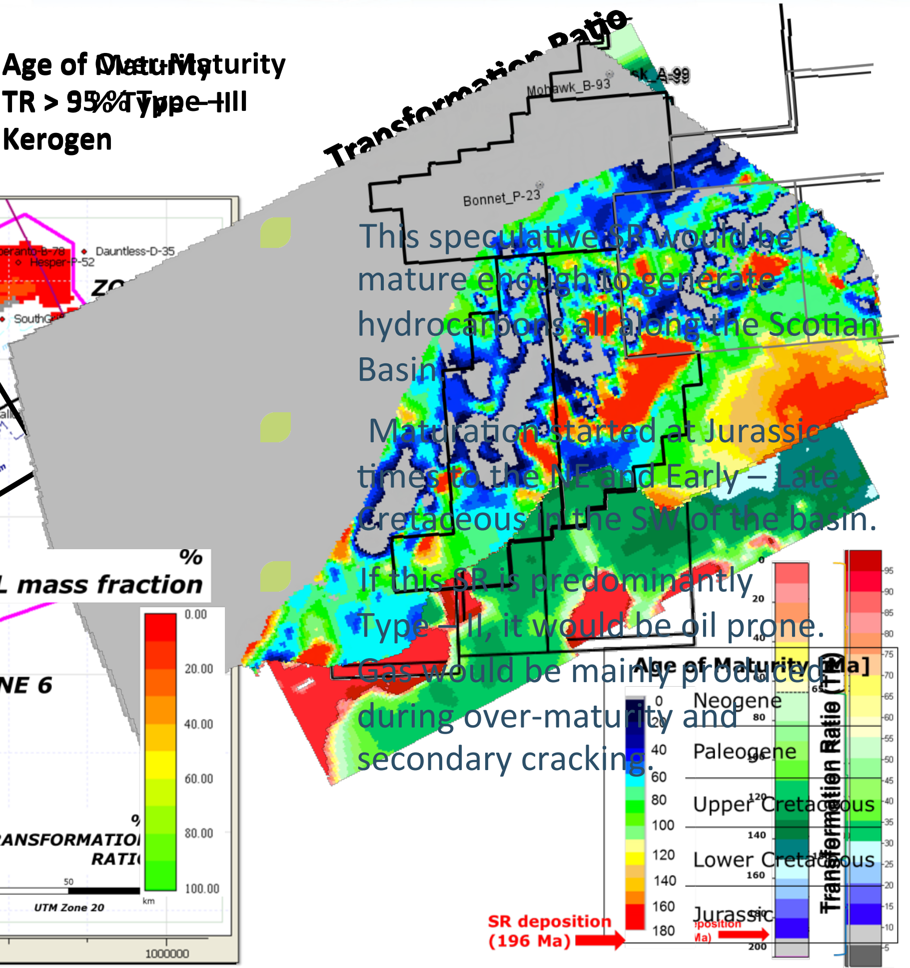
Petroleum System Modeling

Early Jurassic

Pliensbachian SR

Age of Over-Maturity
TR > 95% Type III Kerogen





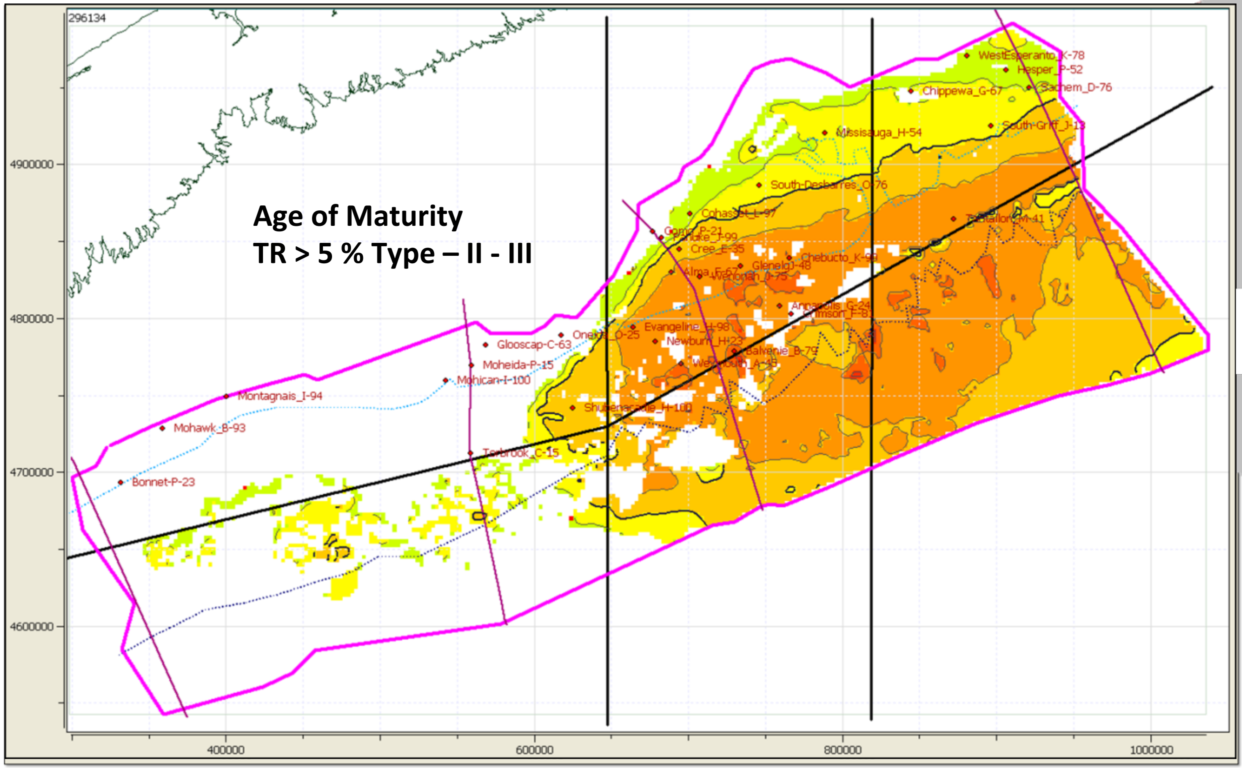
- This speculative SR would be mature enough to generate hydrocarbons all along the Scotian Basin.
- Maturation started at Jurassic times to the NE and Early – Late Cretaceous in the SW of the basin.
- If this SR is predominantly Type – II, it would be oil prone. Gas would be mainly produced during over-maturity and secondary cracking.

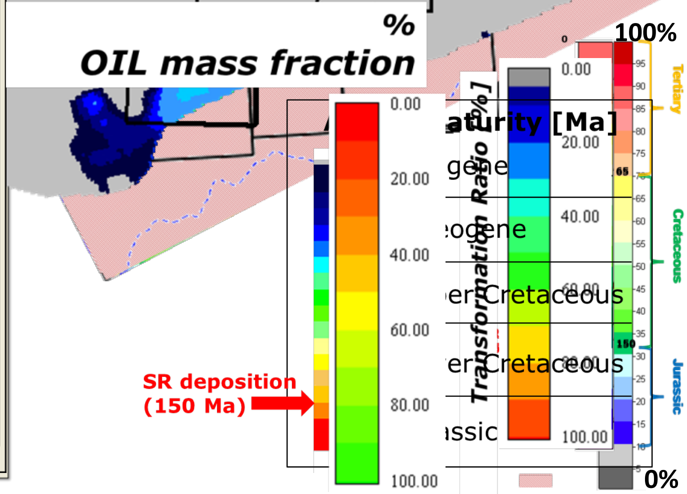
Petroleum System Modeling

Late Jurassic

Tithonian SR

- This SR is mature enough to generate hydrocarbons all along the NE side of the basin and more locally to the SW.
- Maturation started at Cretaceous times to the NE and Late Cretaceous - Paleogene in the SW of the basin.
- This SR generated oil and gas.

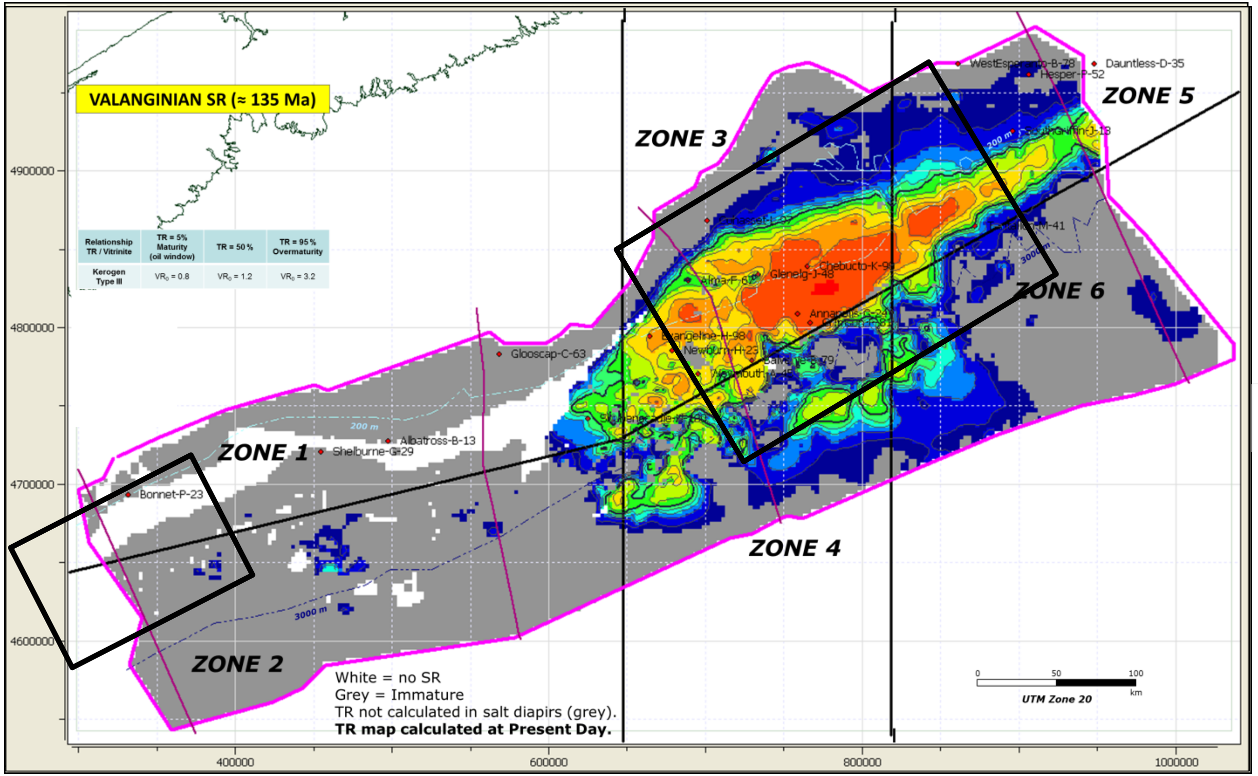




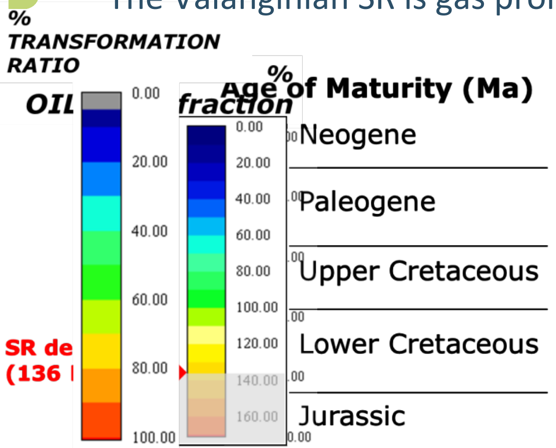
Petroleum System Modeling

Early Cretaceous

Valanginian SR



- Source rock mature enough to generate hydrocarbons in the NE of the Scotian Basin.
- Maturation of the Valanginian SR started early after its deposition (Lower Cretaceous) in the NE part of the basin.
- Restricted over-mature kitchen in the Glenelg – Annapolis area since 110 Million years ago.
- The Valanginian SR is gas prone.

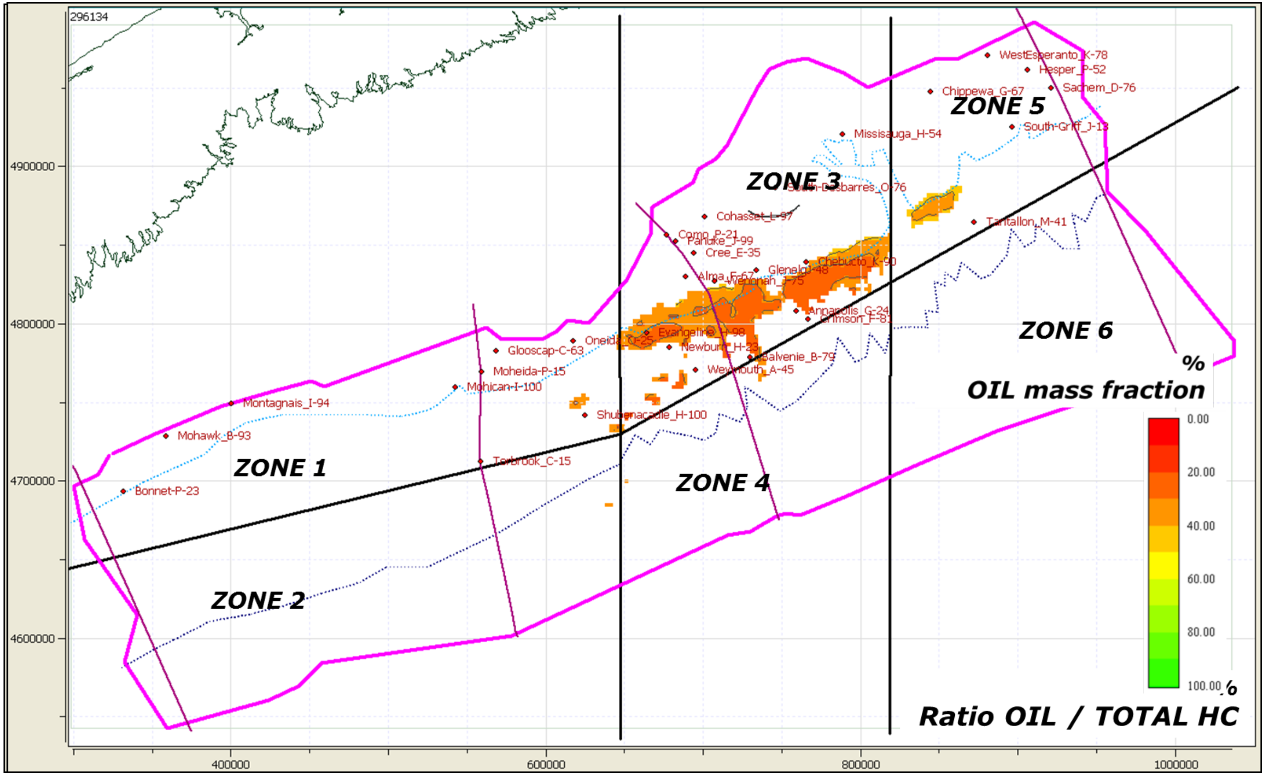


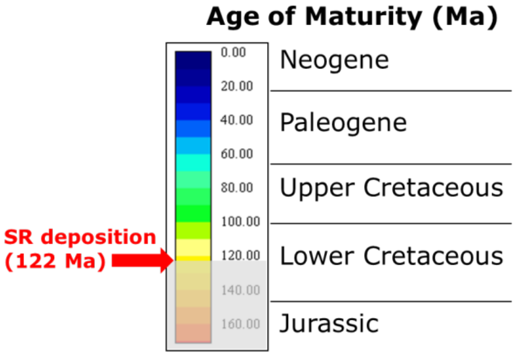
Petroleum System Modeling

Early Cretaceous

Aptian SR

- Source rock mature very locally in the NE of the Scotian Basin.
- Maturation of the Aptian SR started in the Late Cretaceous in local kitchens in NE part of the basin.
- The Aptian SR is gas prone.





Conclusions

- Suitable HC generation conditions for Jurassic SRs are present in the Scotian Basin and locally for early Cretaceous sources.
- The presence of a Pleinsbachian to Toarcian SR would increase the volume of prospective resources in the basin in particular to the SW.
- The volume and composition of the expelled HCs is linked to the type/mass of kerogen and thermal maturity of SRs.
- The reservoir and seal levels are well known in the CSS and the accurate prediction of their extension to the slope and deep sea areas represent still a challenge.

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