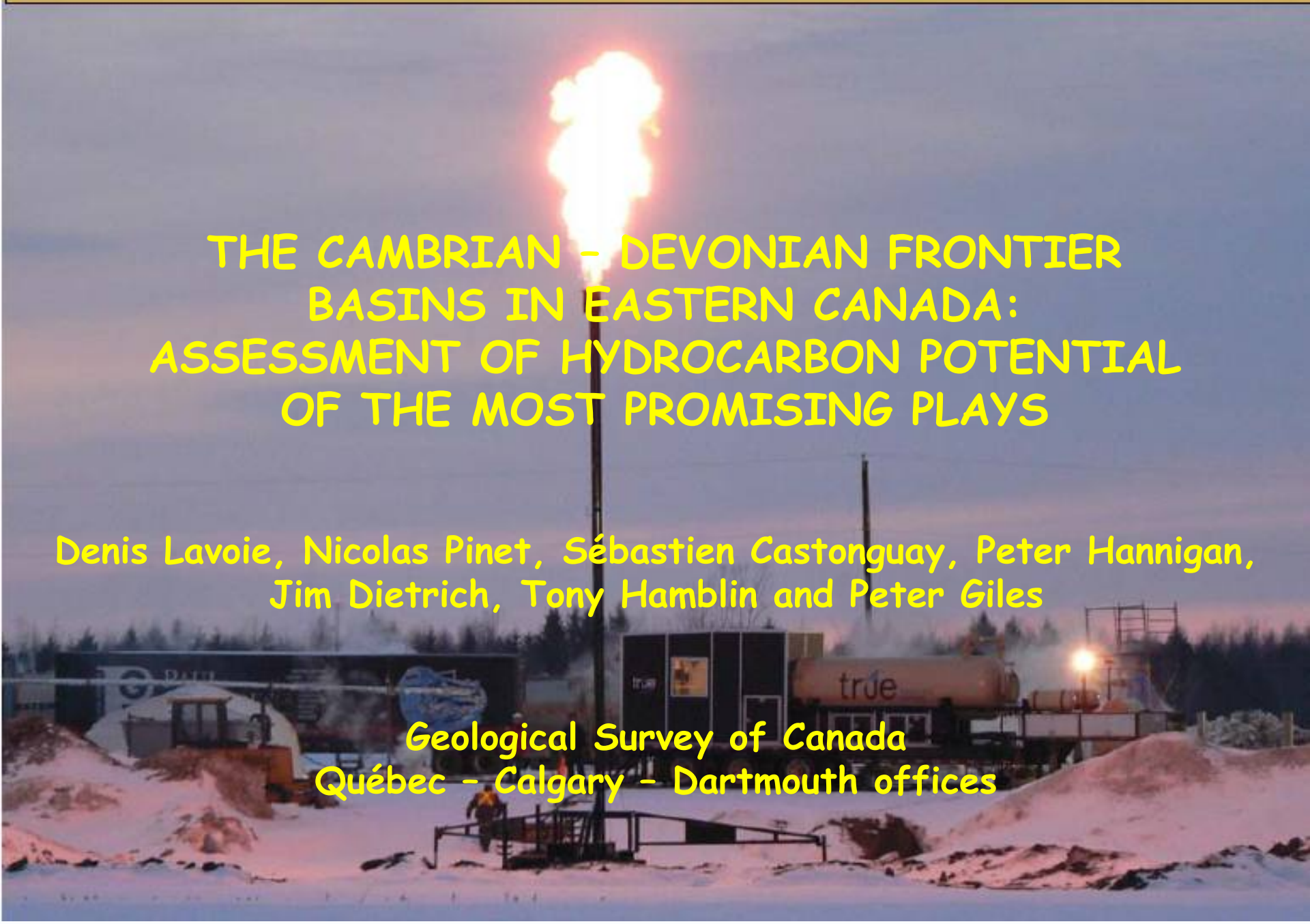


THE CAMBRIAN – DEVONIAN FRONTIER BASINS IN EASTERN CANADA: ASSESSMENT OF HYDROCARBON POTENTIAL OF THE MOST PROMISING PLAYS

Denis Lavoie, Nicolas Pinet, Sébastien Castonguay, Peter Hannigan, Jim Dietrich, Tony Hamblin and Peter Giles

Geological Survey of Canada
Québec – Calgary – Dartmouth offices

Natural Resources Canada | Ressources naturelles Canada

Canada

Outline

1. Previous works and regional setting

2. Cambrian-Ordovician
   - Geological setting
   - Hydrocarbon plays
   - Assesment of potential

3. Silurian-Devonian
   - Geological setting
   - Hydrocarbon plays
   - Assesment of potential

4- Ordovician shale gas (qualitative)

5- Conclusions

The Paleozoic basins of eastern Canada
Quebec – Maritimes segment

GSC paper 83-31 (1984), P50 estimates of

$17 * 10^6$ m^3 of oil in the St. Lawrence Platform

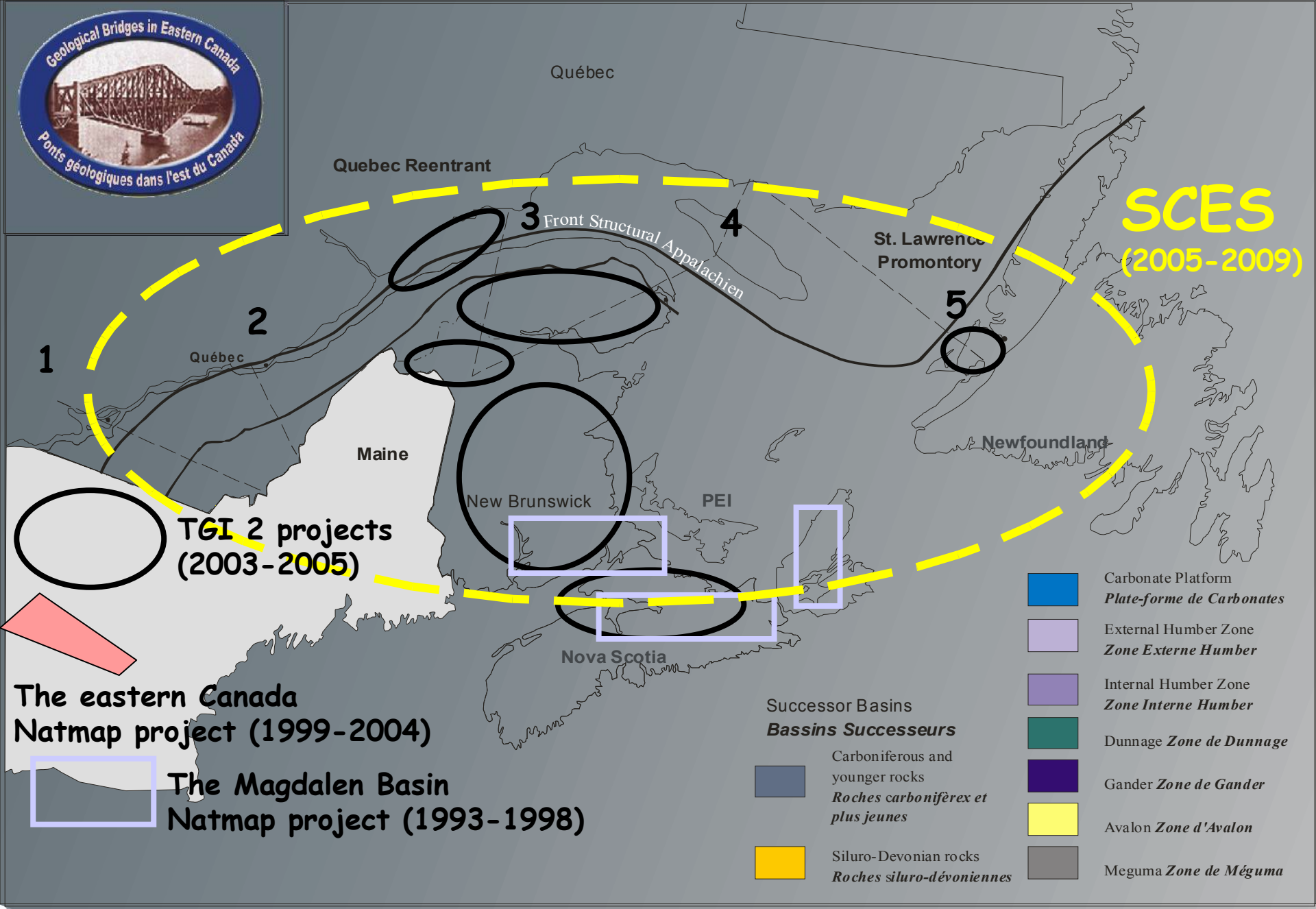
$20 * 10^6$ m^3 of oil in the Maritimes Basin

$60 * 10^9$ m^3 of gas in the St. Lawrence Platform

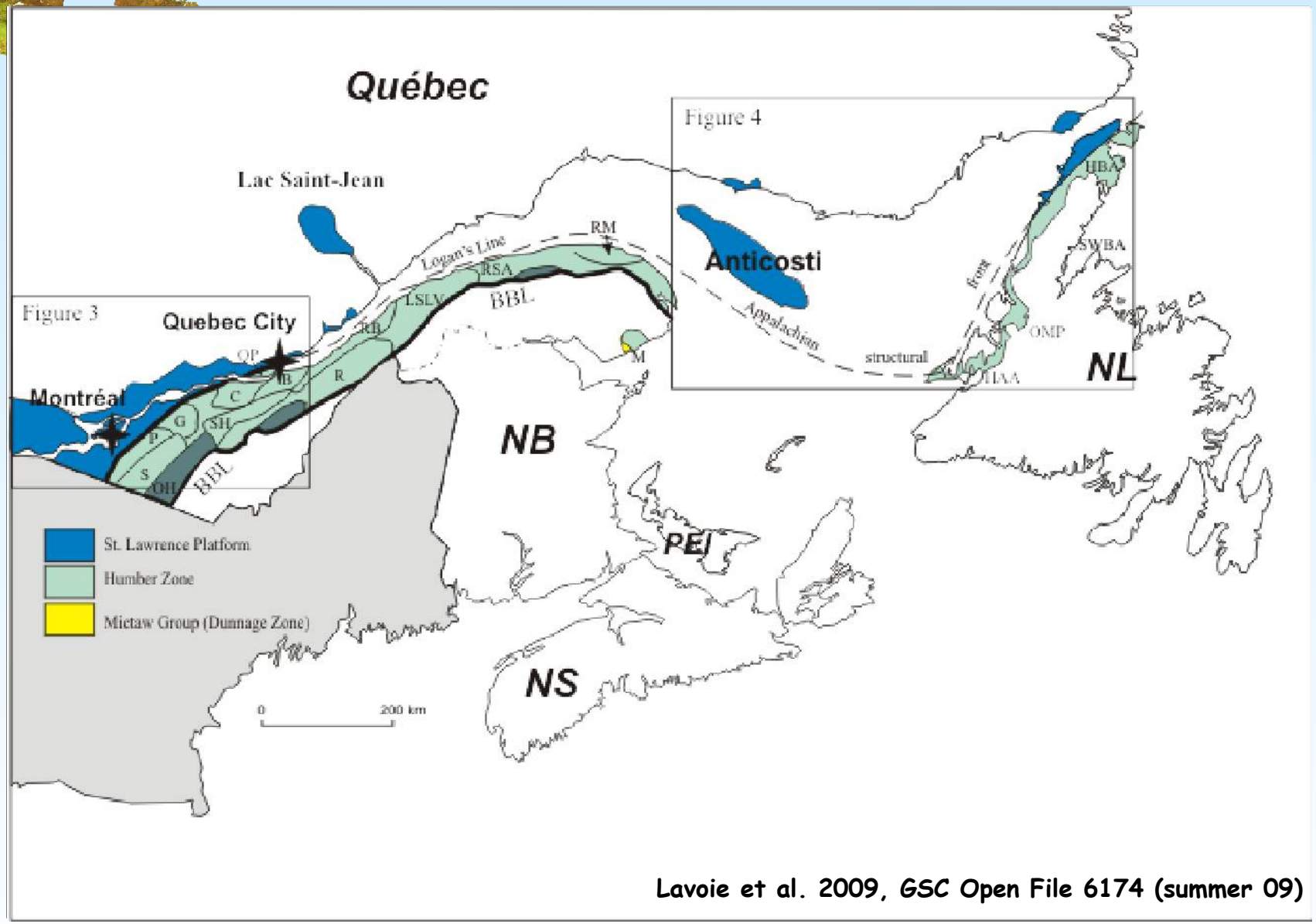
$40 * 10^9$ m^3 of gas in the Maritimes Basin

No evaluation for the Gaspé Belt and assessment from « minimum of geological data »

Procter, R.M., Taylor, G.C., and Wade, J.A., 1984. Oil and natural gas resources of Canada, 1983. Geological Survey of Canada, Paper 83-31, 59 p.


Geological Bridges in Eastern Canada
Ponts géologiques dans l'est du Canada
Québec
Quebec Reentrant
3
Front Structural Appalachien
4
St. Lawrence Promontory
SCES
(2005-2009)
5
2
1
Québec
Maine
New Brunswick
PEI
Newfoundland
Nova Scotia
TGI 2 projects
(2003-2005)
The eastern Canada Natmap project (1999-2004)
The Magdalen Basin Natmap project (1993-1998)
Successor Basins
Bassins Successeurs
Carboniferous and younger rocks
Roches carbonifèrex et plus jeunes
Siluro-Devonian rocks
Roches siluro-dévoniennes
Carbonate Platform
Plate-forme de Carbonates
External Humber Zone
Zone Externe Humber
Internal Humber Zone
Zone Interne Humber
Dunnage Zone de Dunnage
Gander Zone de Gander
Avalon Zone d'Avalon
Meguma Zone de Méguma

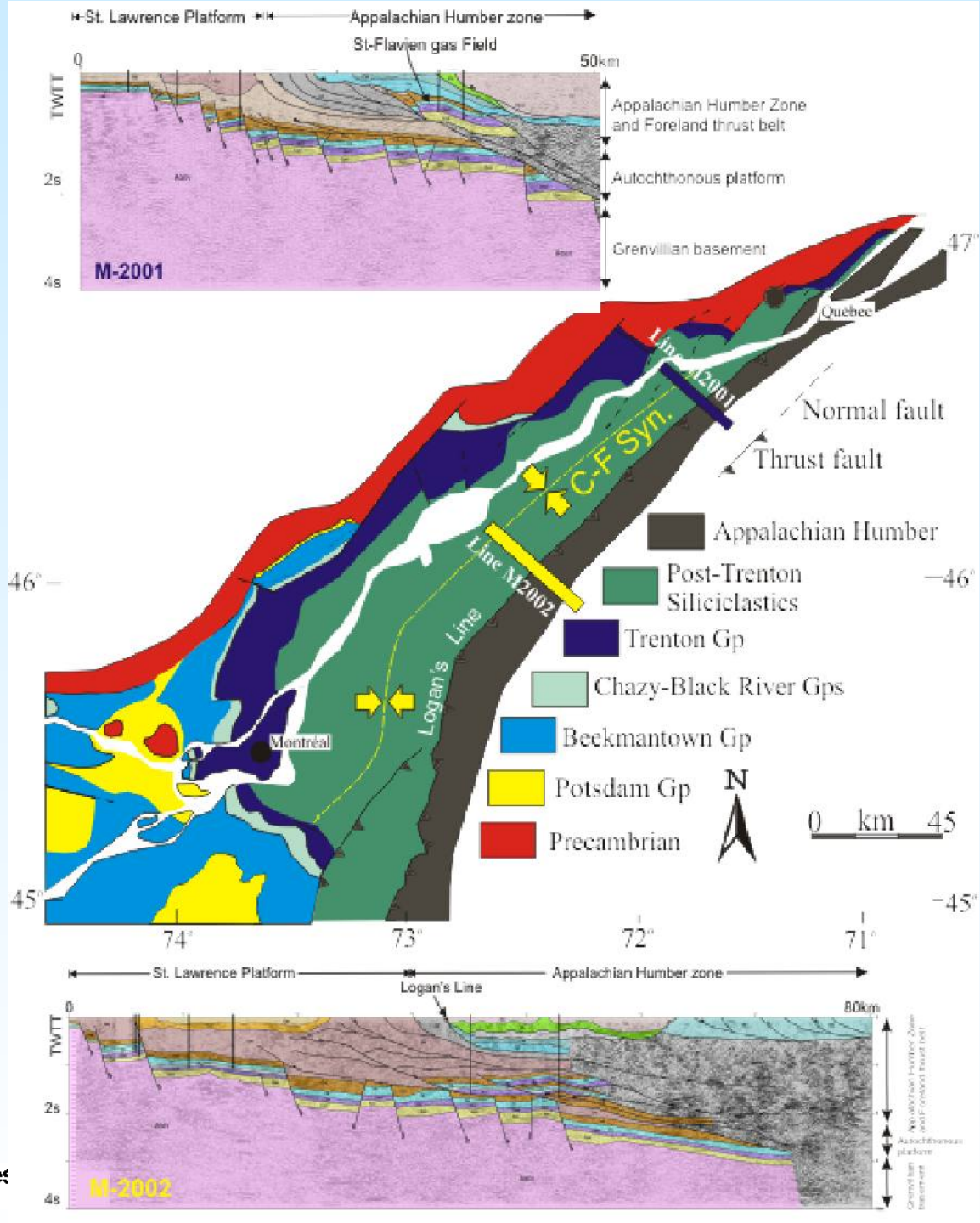
The Cambrian to end-Ordovician



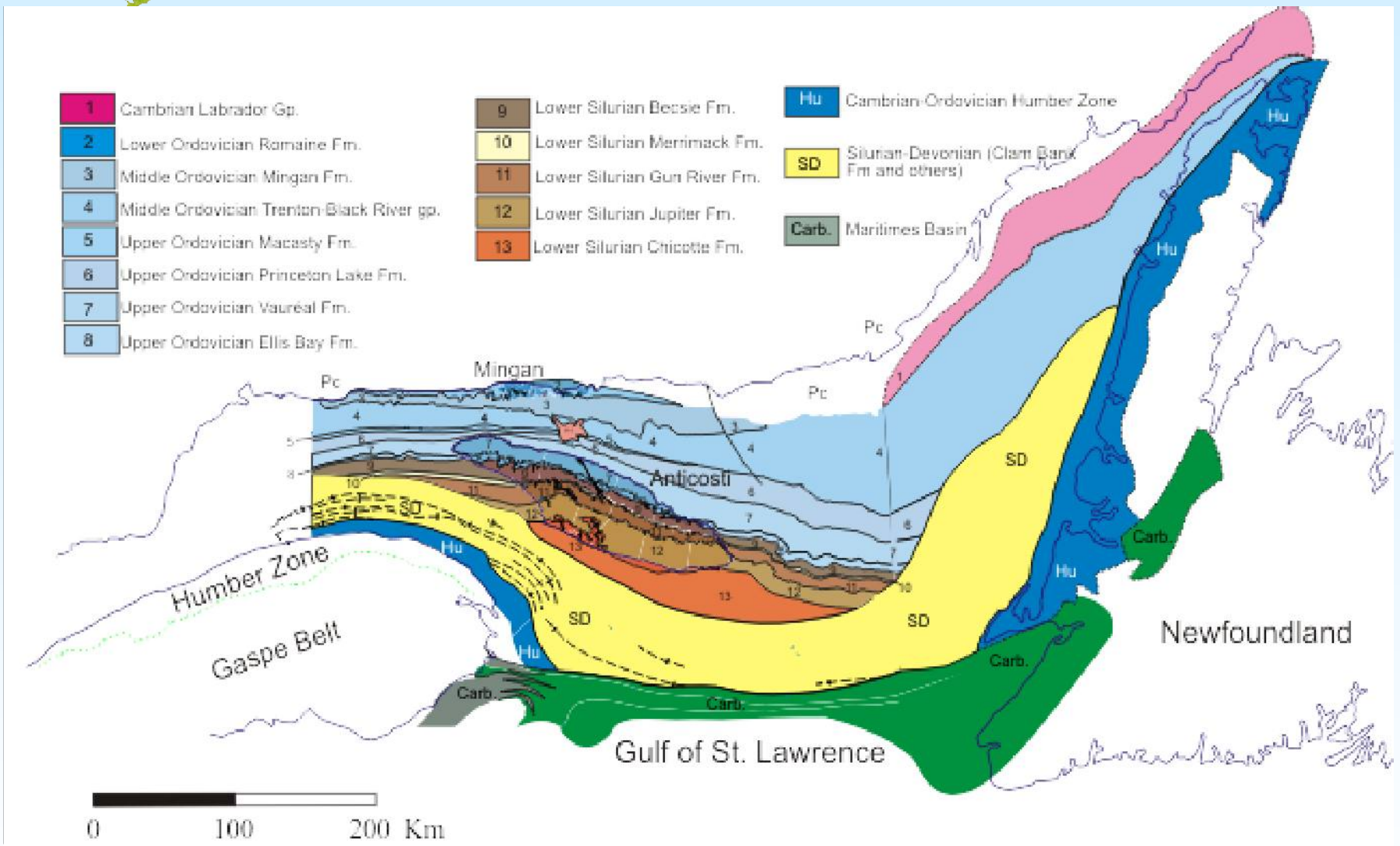
Lavoie et al. 2009, *GSC Open File 6174 (summer 09)*

The St. Lawrence Platform of southern Quebec:

Shallow marine Upper Cambrian to Upper Ordovician clastics and carbonates

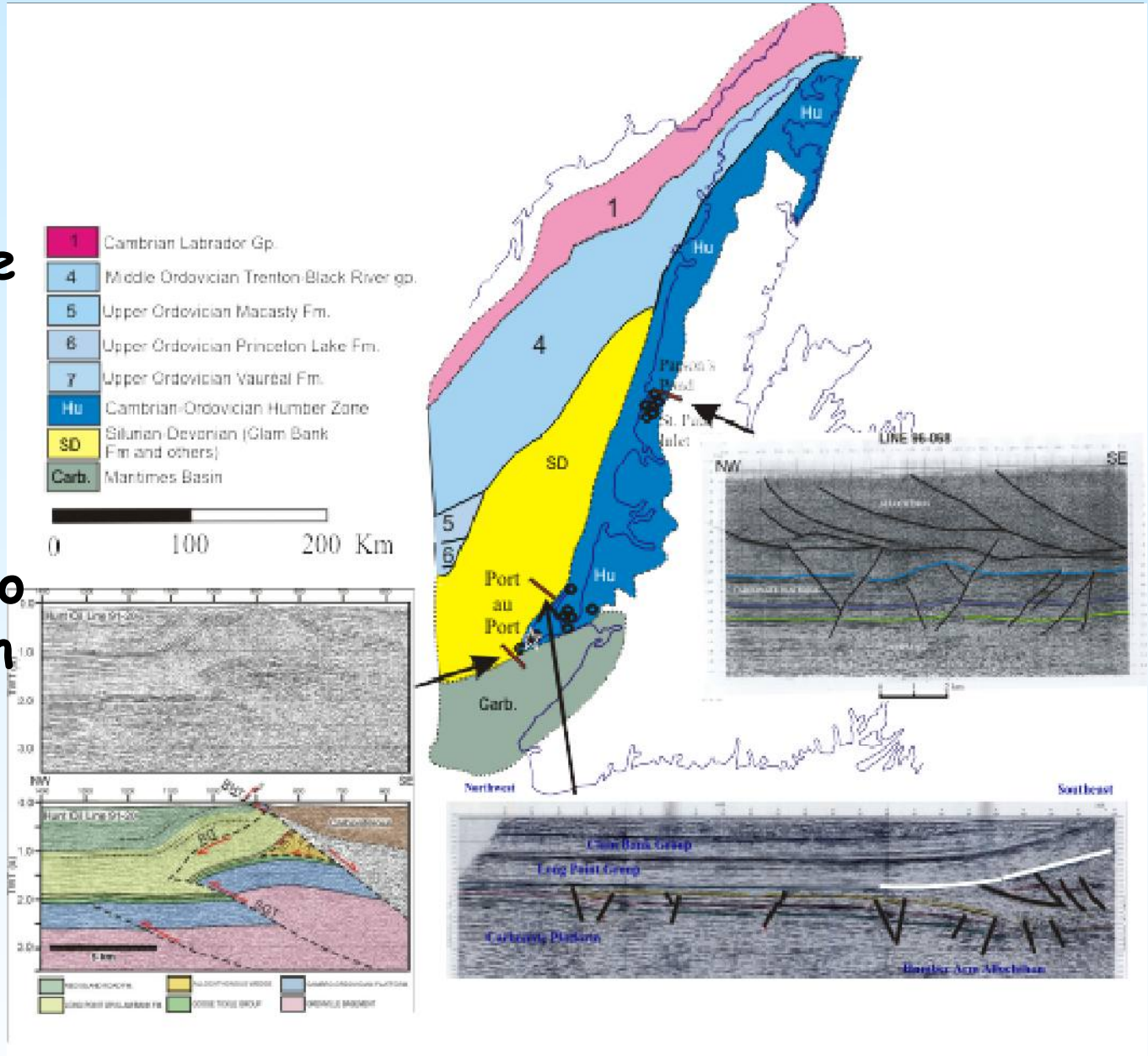


The St. Lawrence Platform
Anticosti and Gulf of St. Lawrence



The St. Lawrence Platform in Western Newfoundland

Lower Cambrian to Middle Ordovician carbonates and clastics.

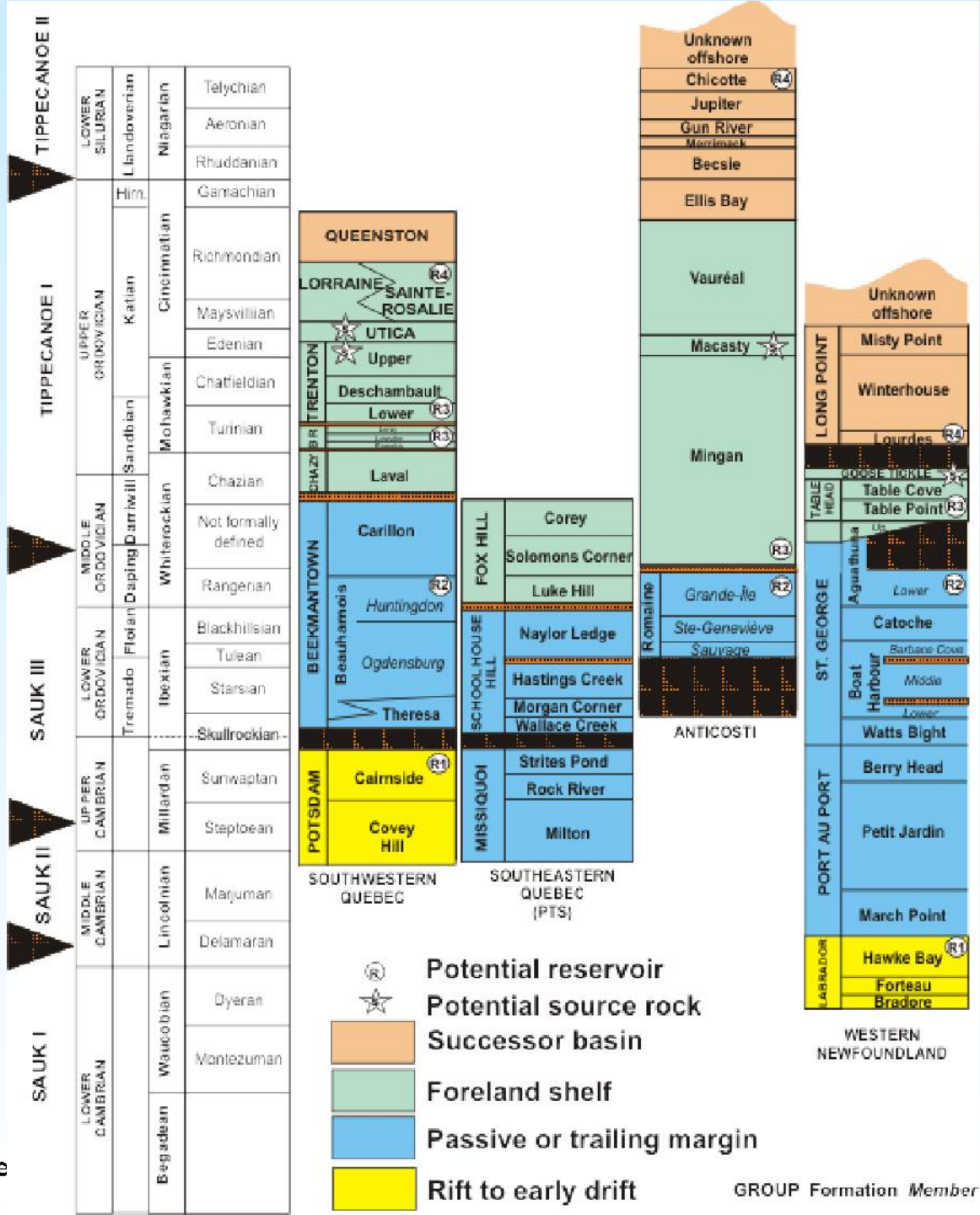


Late Ordovician to Devonian (?) successor basin

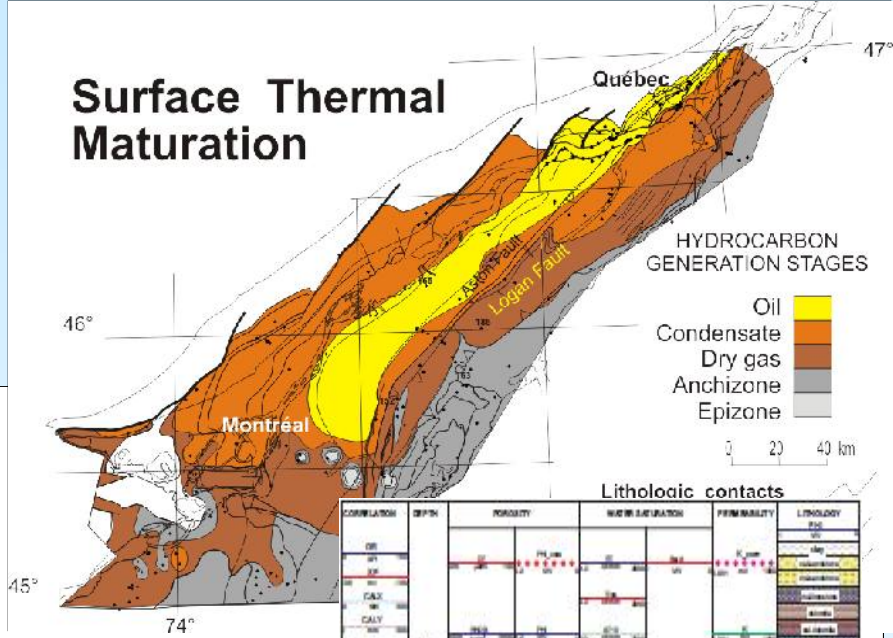
Middle / Upper Ordovician foreland basin

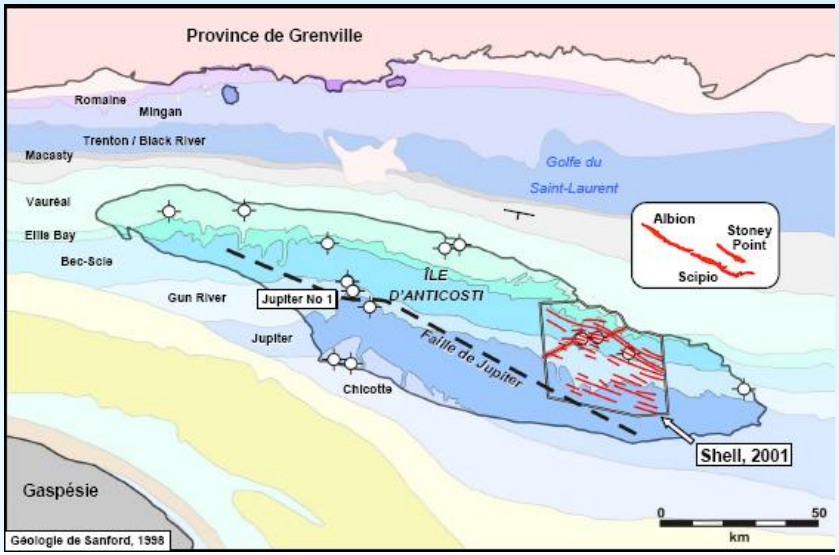
Lower Ordovician passive margin

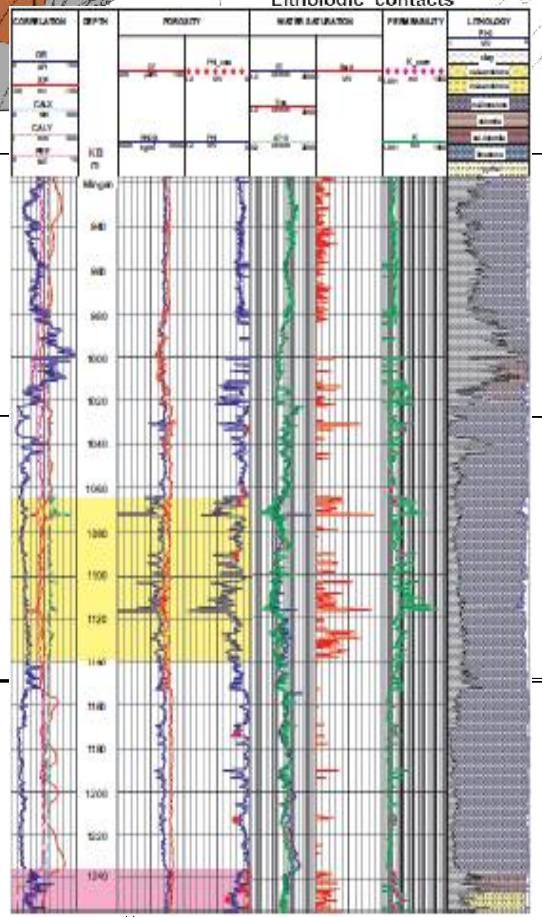
Cambrian rift and early drift

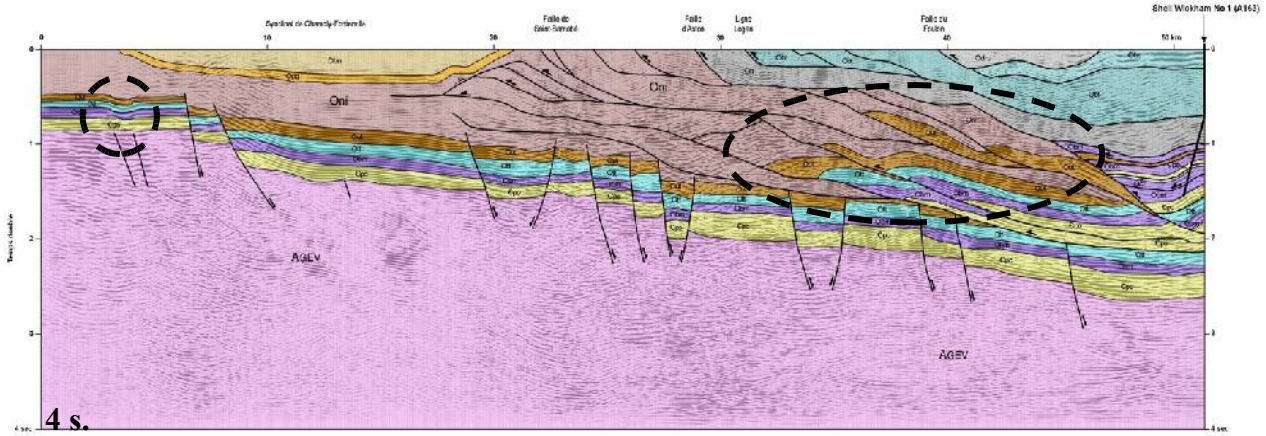


Data Integration

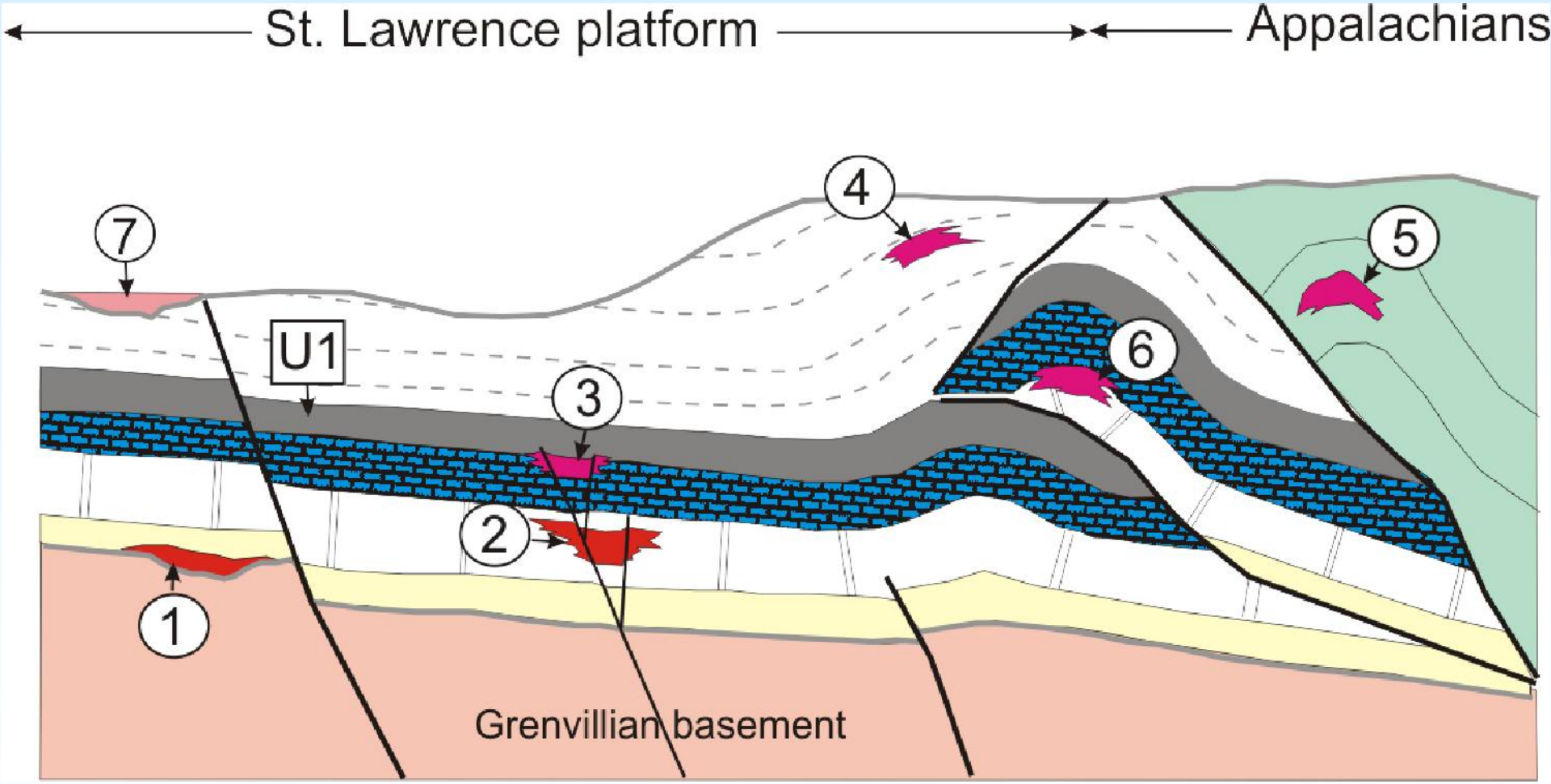




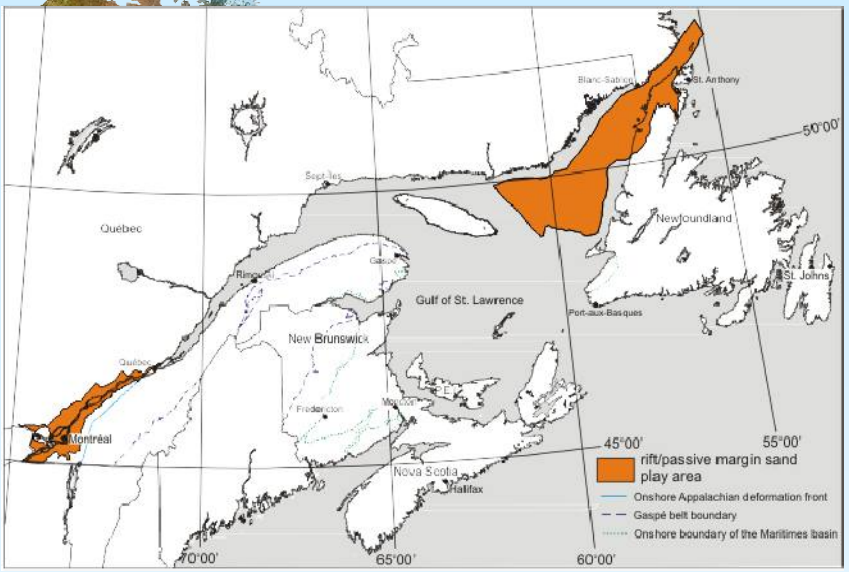


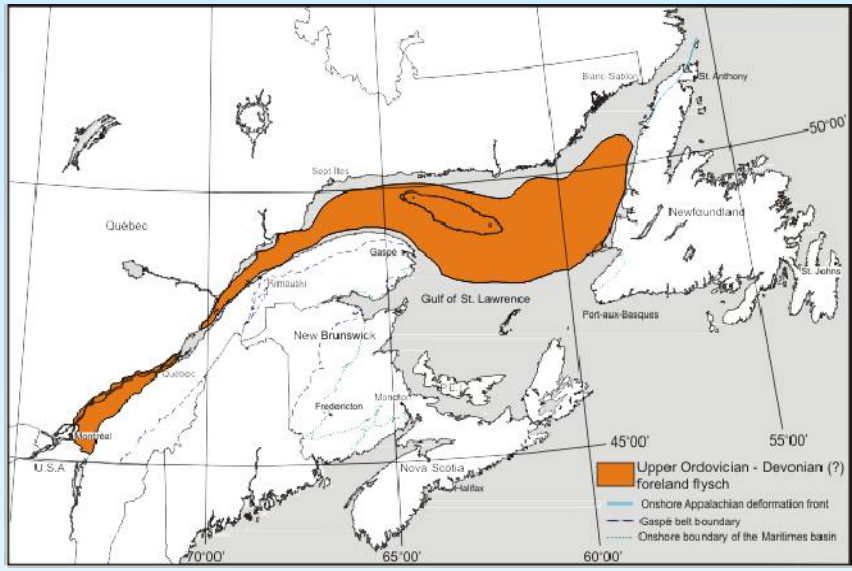


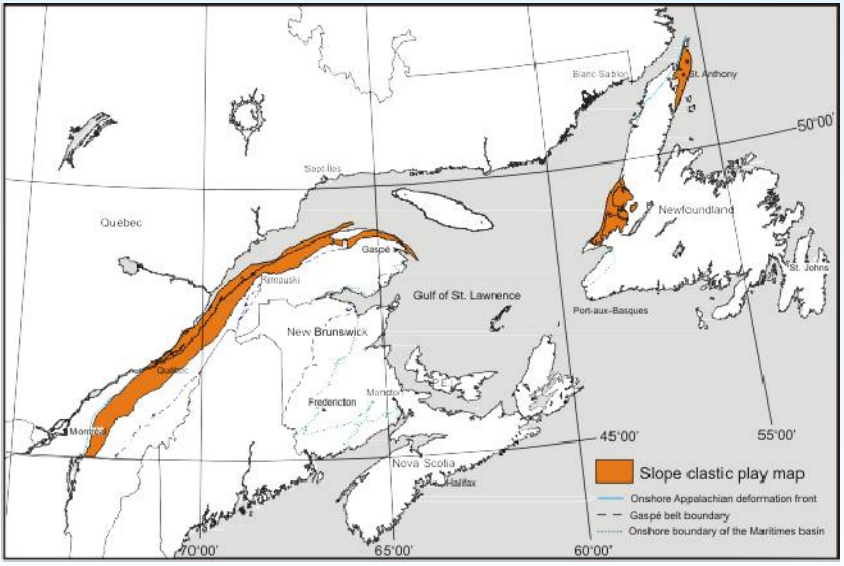
Cambrian-Ordovician plays in the St. Lawrence Platform and Taconian Appalachians

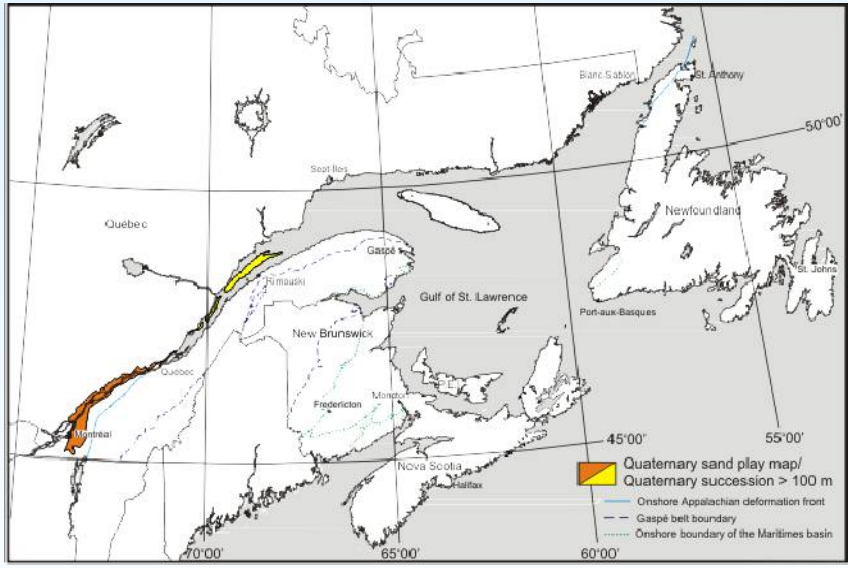


Cambrian-Ordovician plays - not assessed

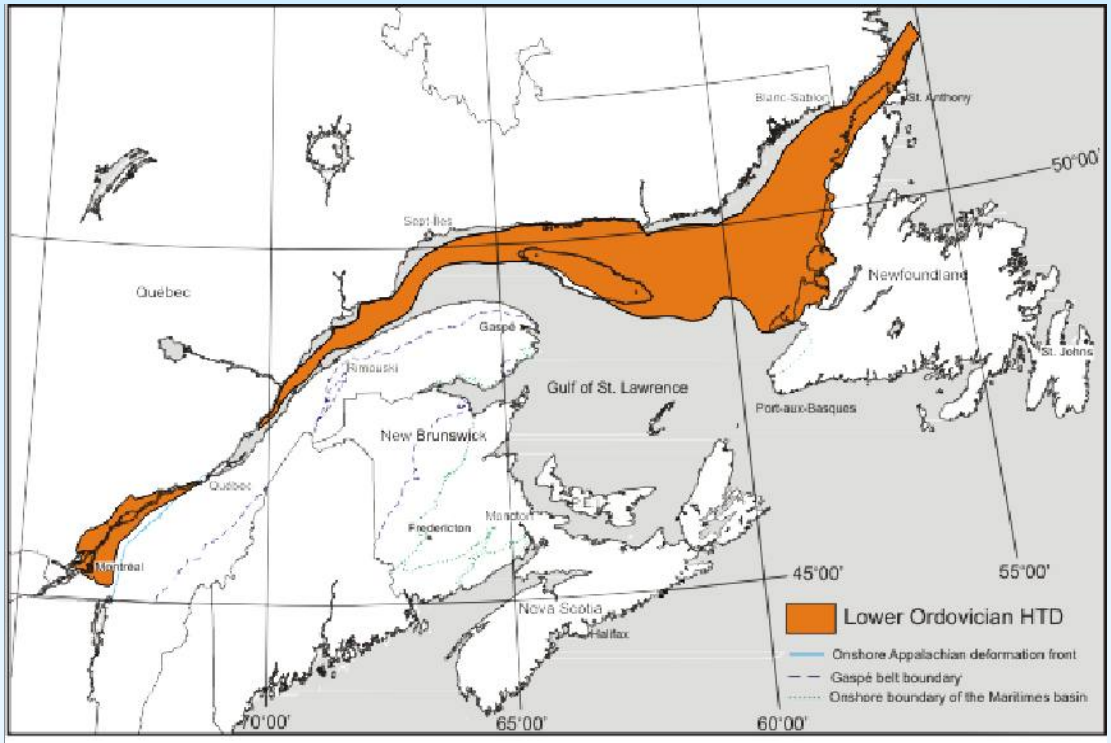


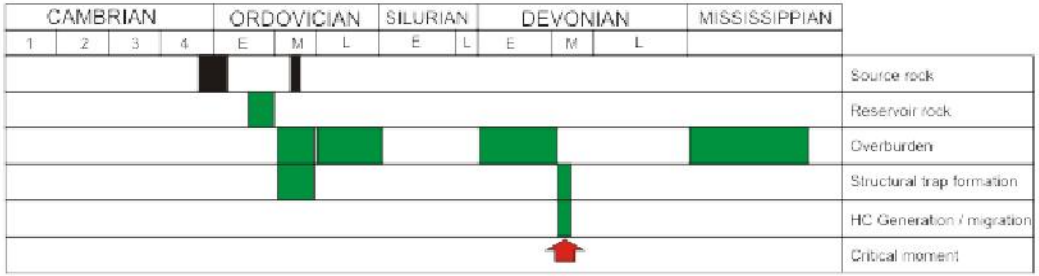


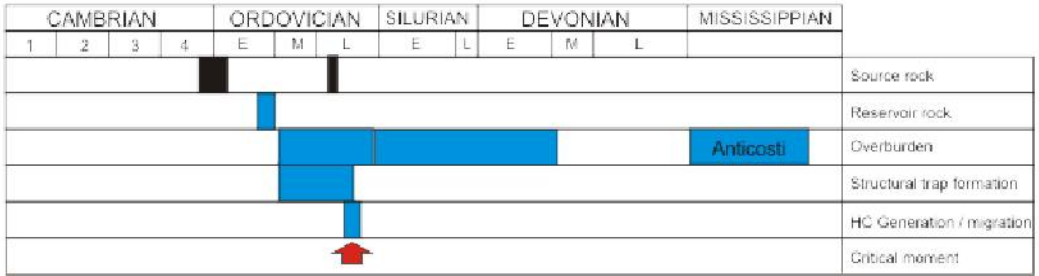




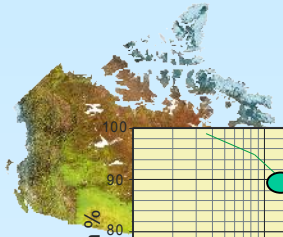
Lower Ordovician dolomites

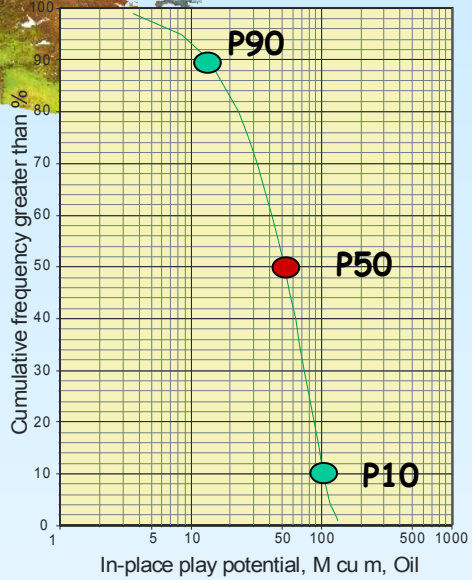


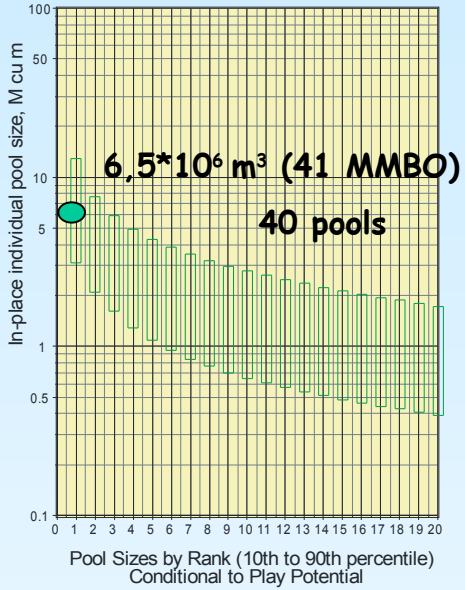




Lower Ordovician dolomites







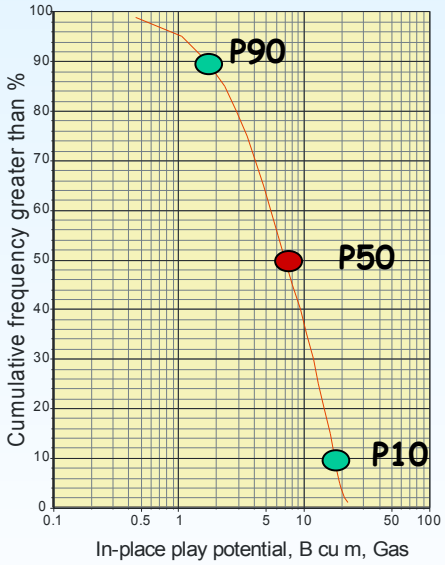
Oil

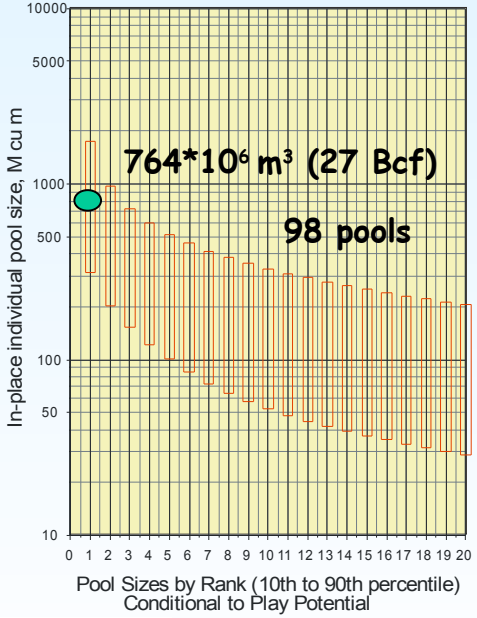
P10: $103*10^6$ m^3

P50: $52*10^6$ m^3

P90: $14*10^6$ m^3

(P50: 330 MMBO)





Gas

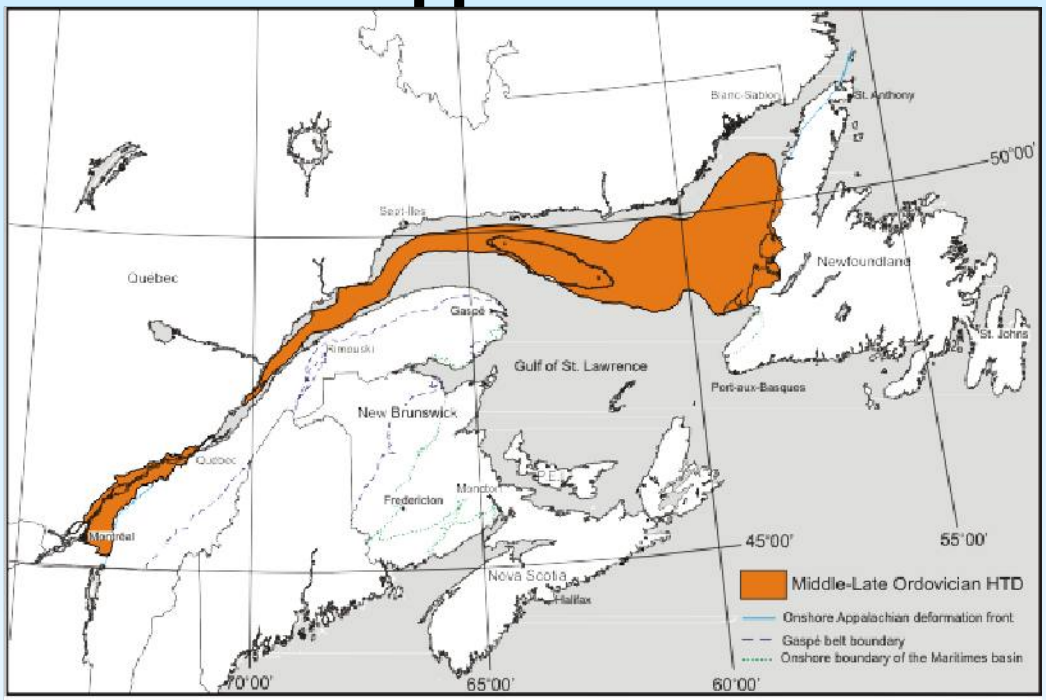
P10: $18*10^9$ m^3

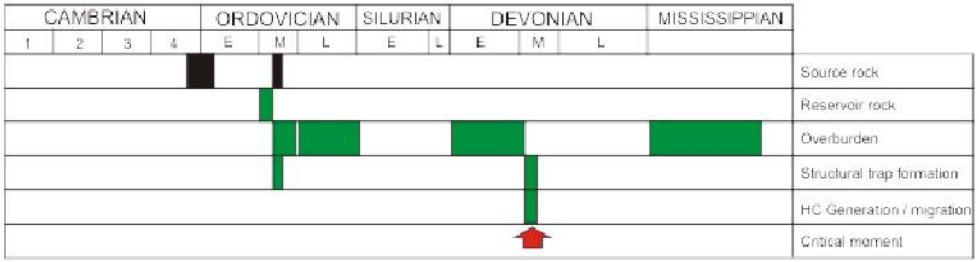
P50: $7*10^9$ m^3

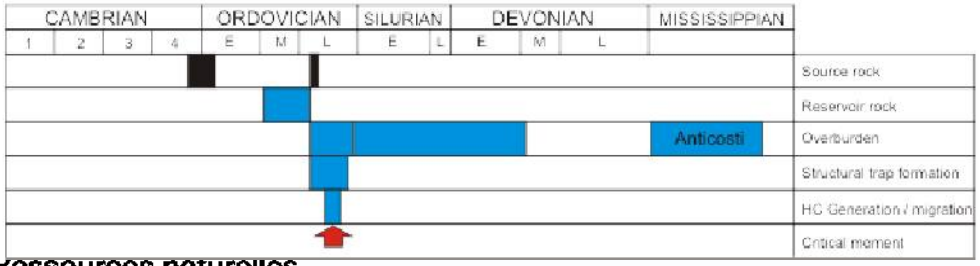
P90: $2*10^9$ m^3

(P50: 250 Bcf)

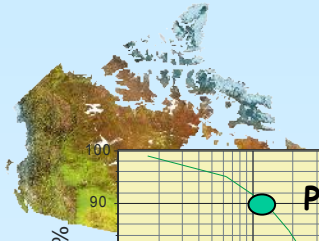
Middle / Upper Ordovician HTD

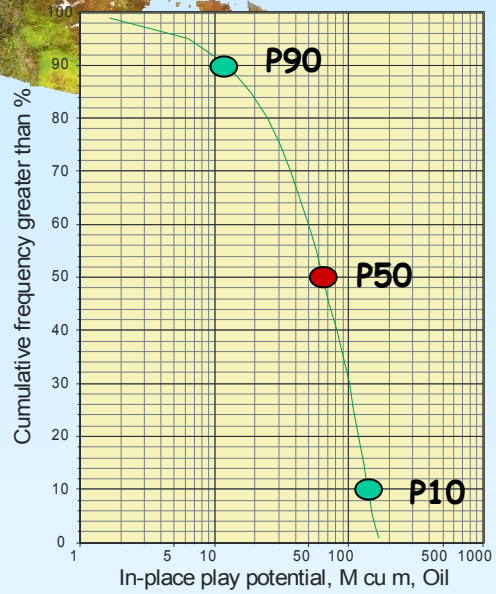


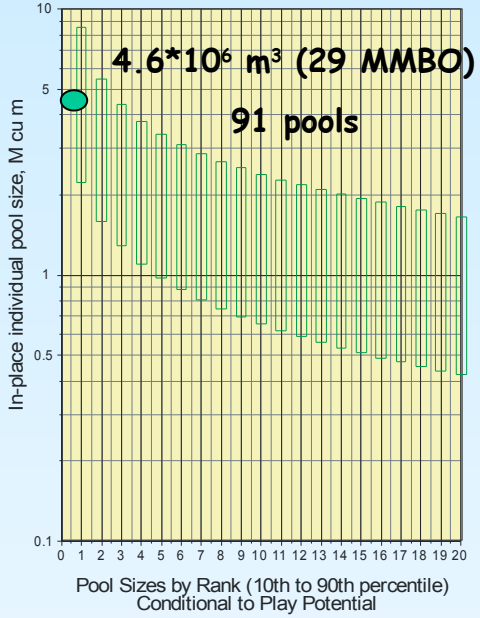




Middle / Upper Ordovician HTD







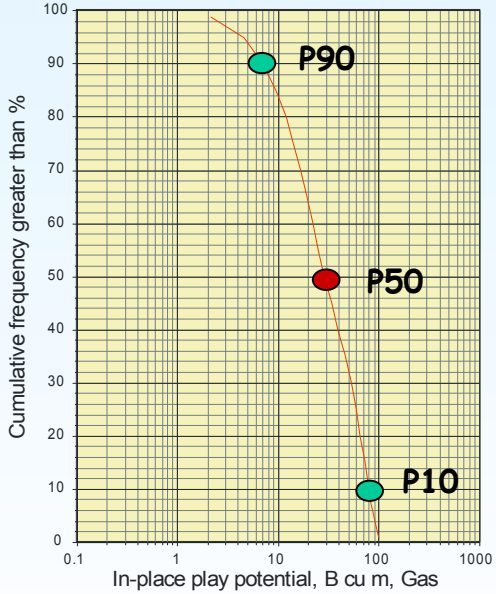
Oil

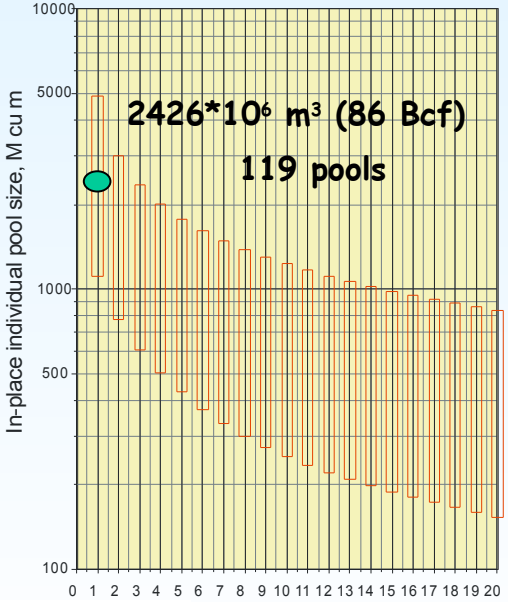
P10: 138*10⁶ m³

P50: 64*10⁶ m³

P90: 13*10⁶ m³

(P50: 400 MMBO)





Gas

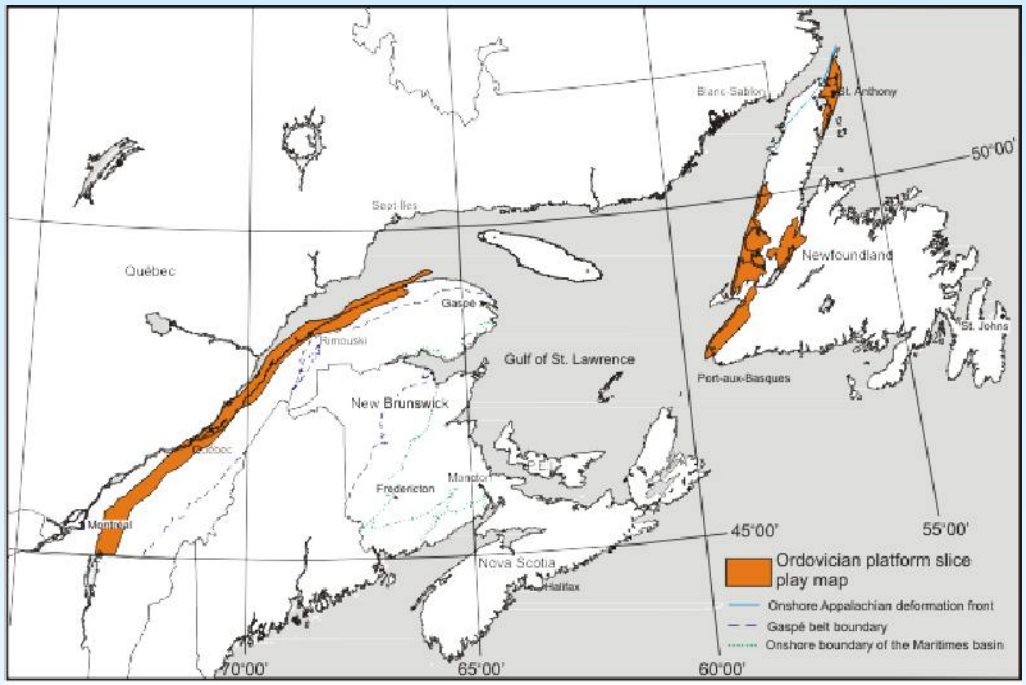
P10: 79*10⁹ m³

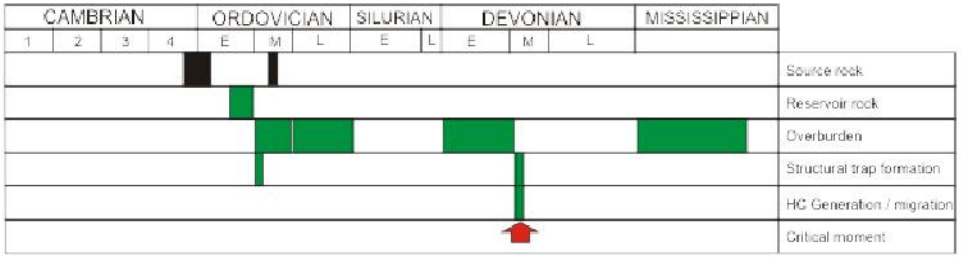
P50: 29*10⁹ m³

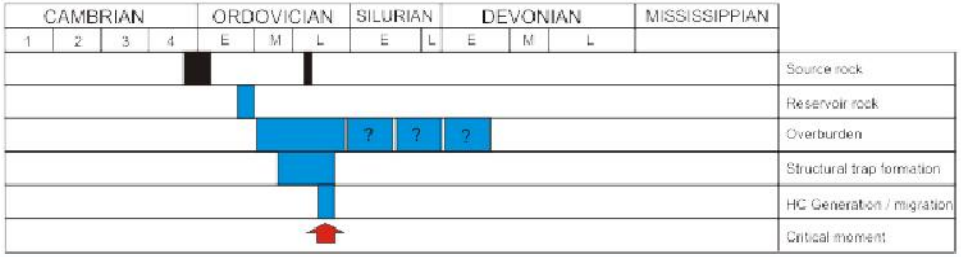
P90: 7*10⁹ m³

(P50: 1023 Bcf)

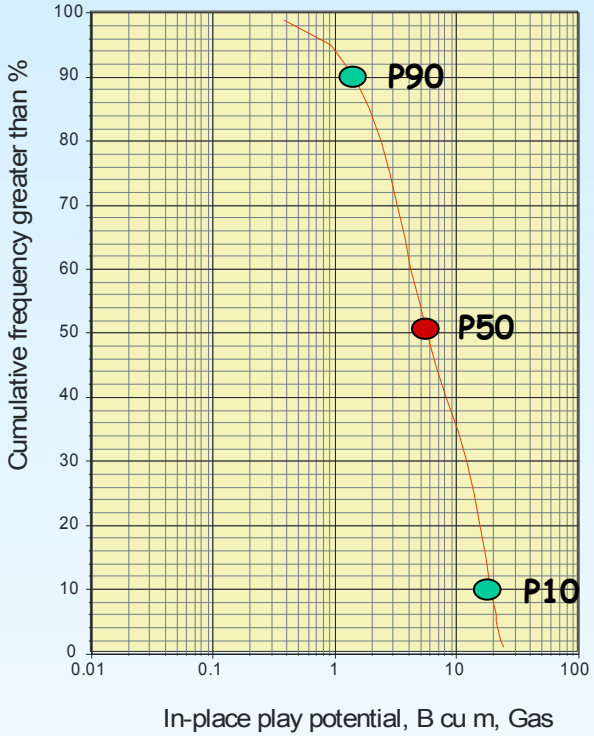
Lower Ordovician carbonate thrust slices

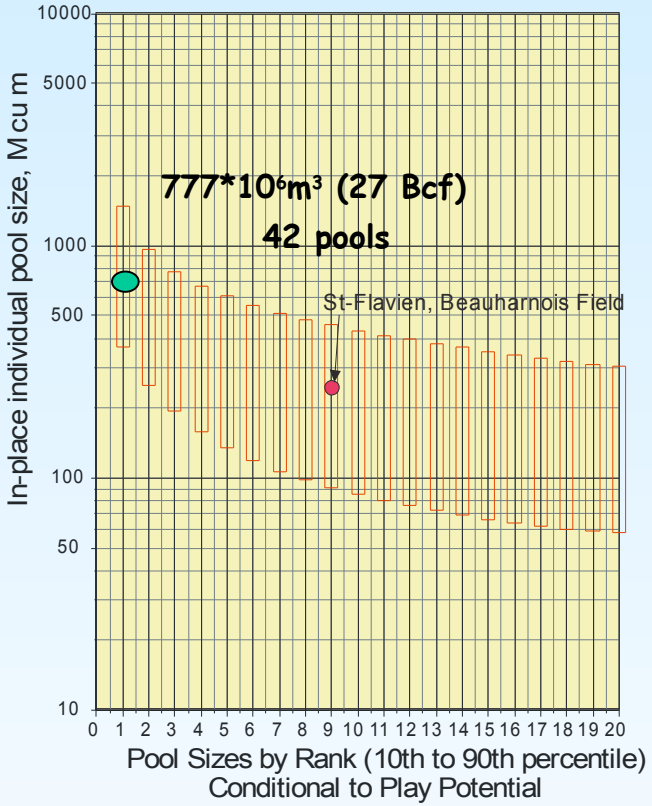






Lower Ordovician carbonate thrust slices





Gas

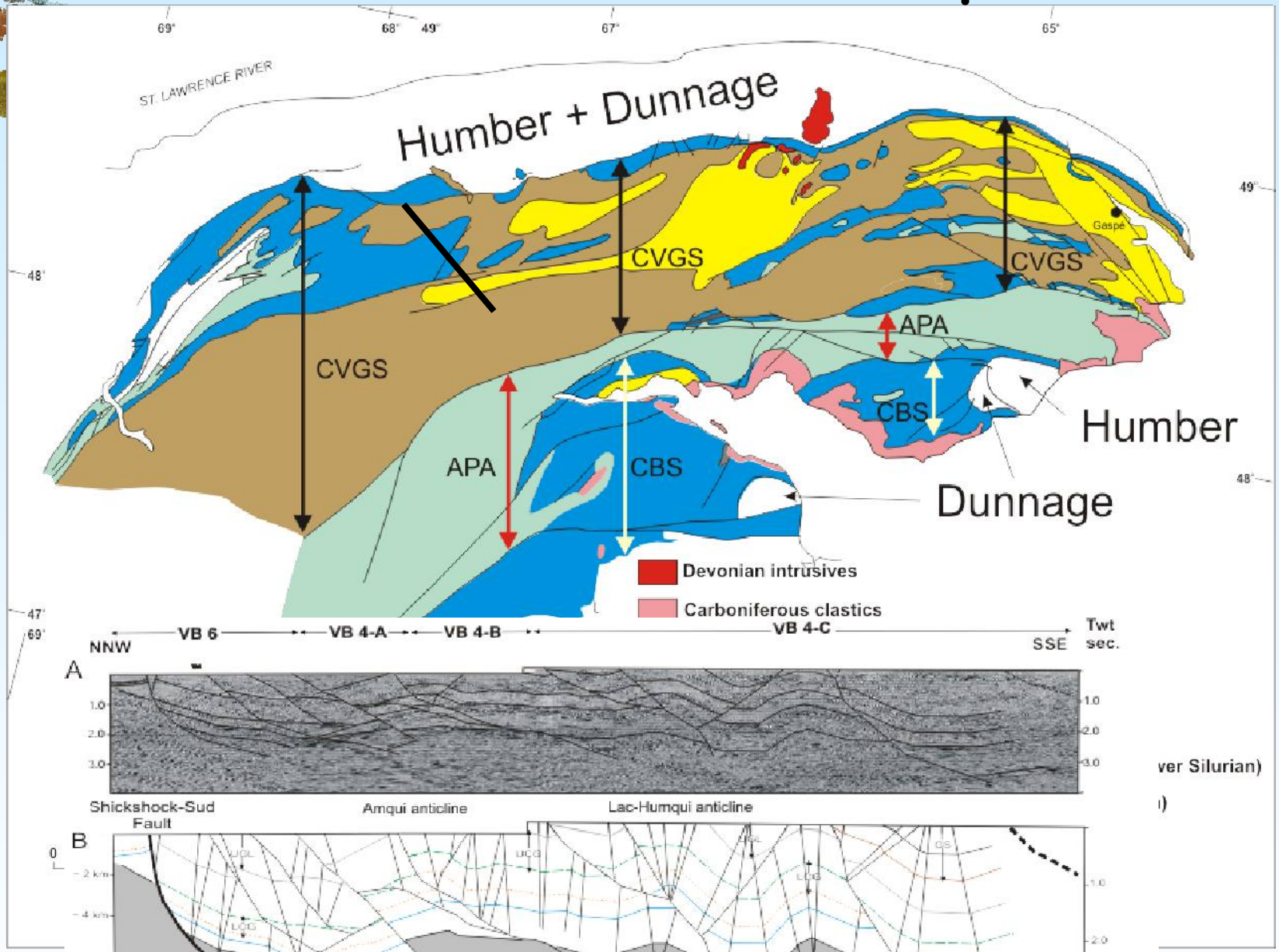
P10: $19*10^9$ m^3

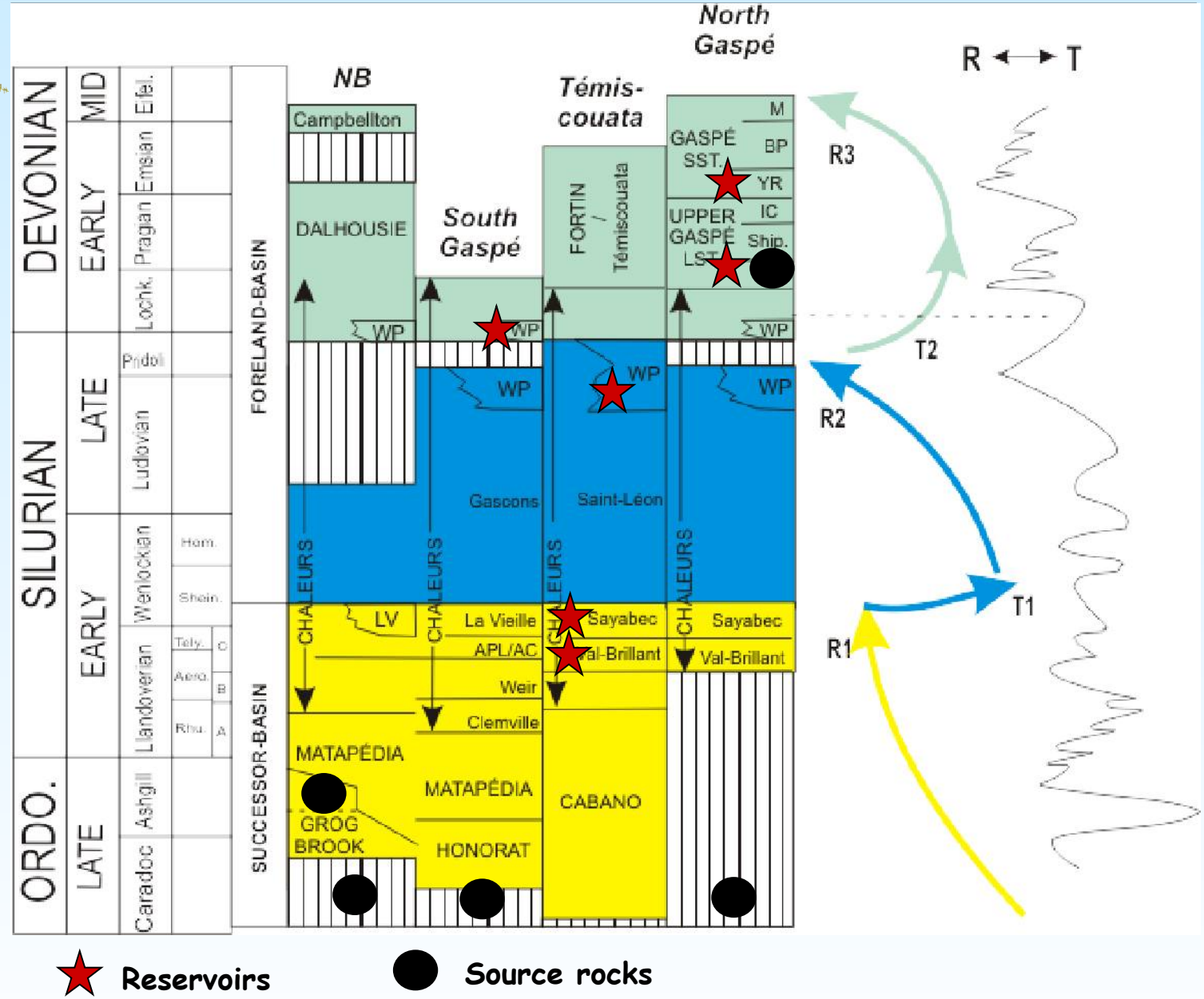
P50: $6*10^9$ m^3

P90: $1*10^9$ m^3

(P50: 212 Bcf)

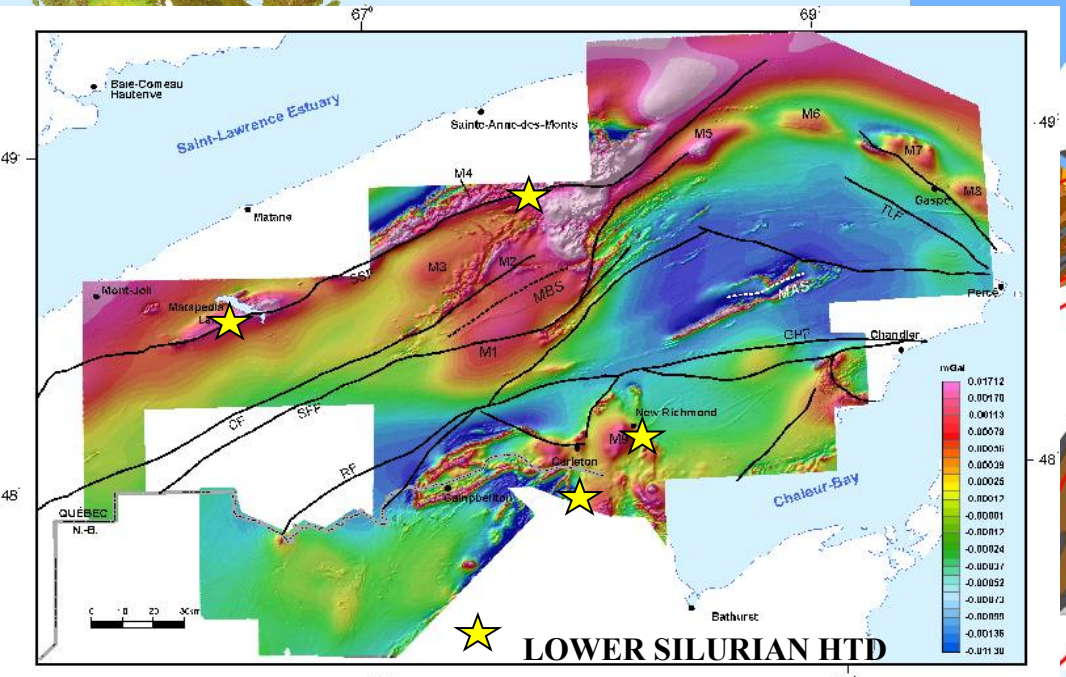
The Silurian-Devonian Gaspé Belt

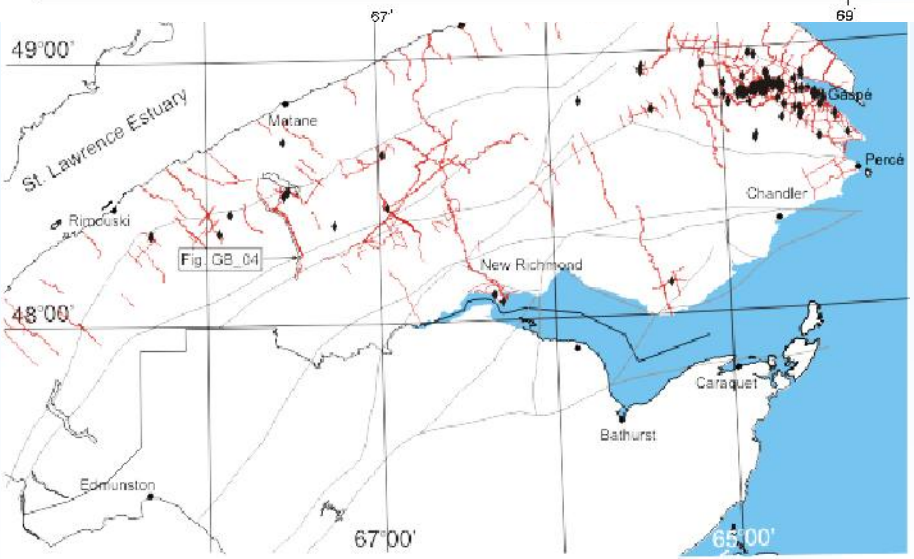


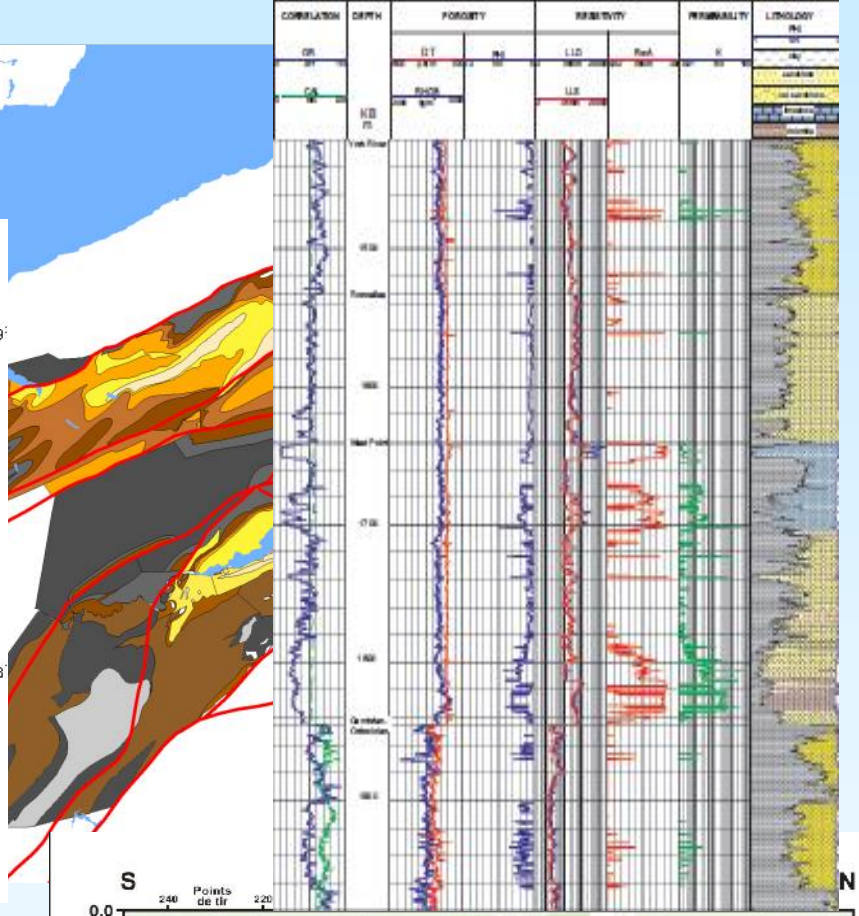


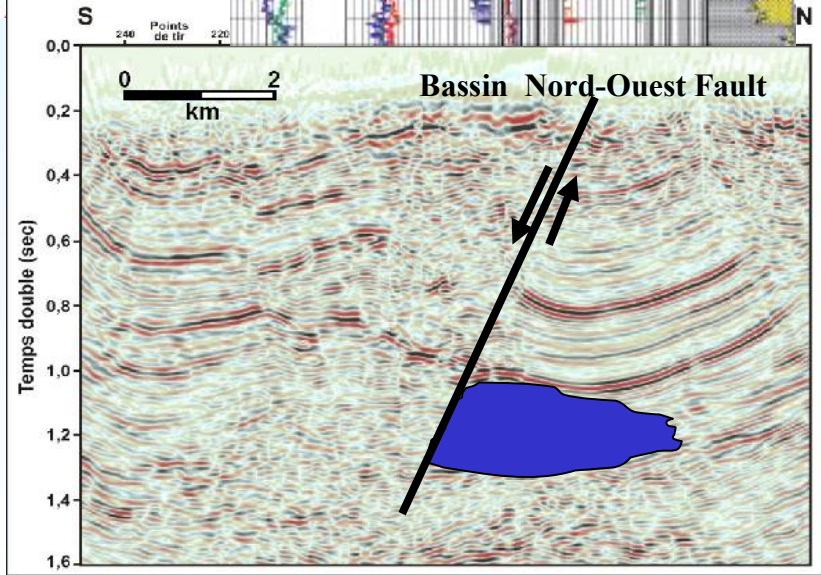
★ Reservoirs ● Source rocks

Data Integration

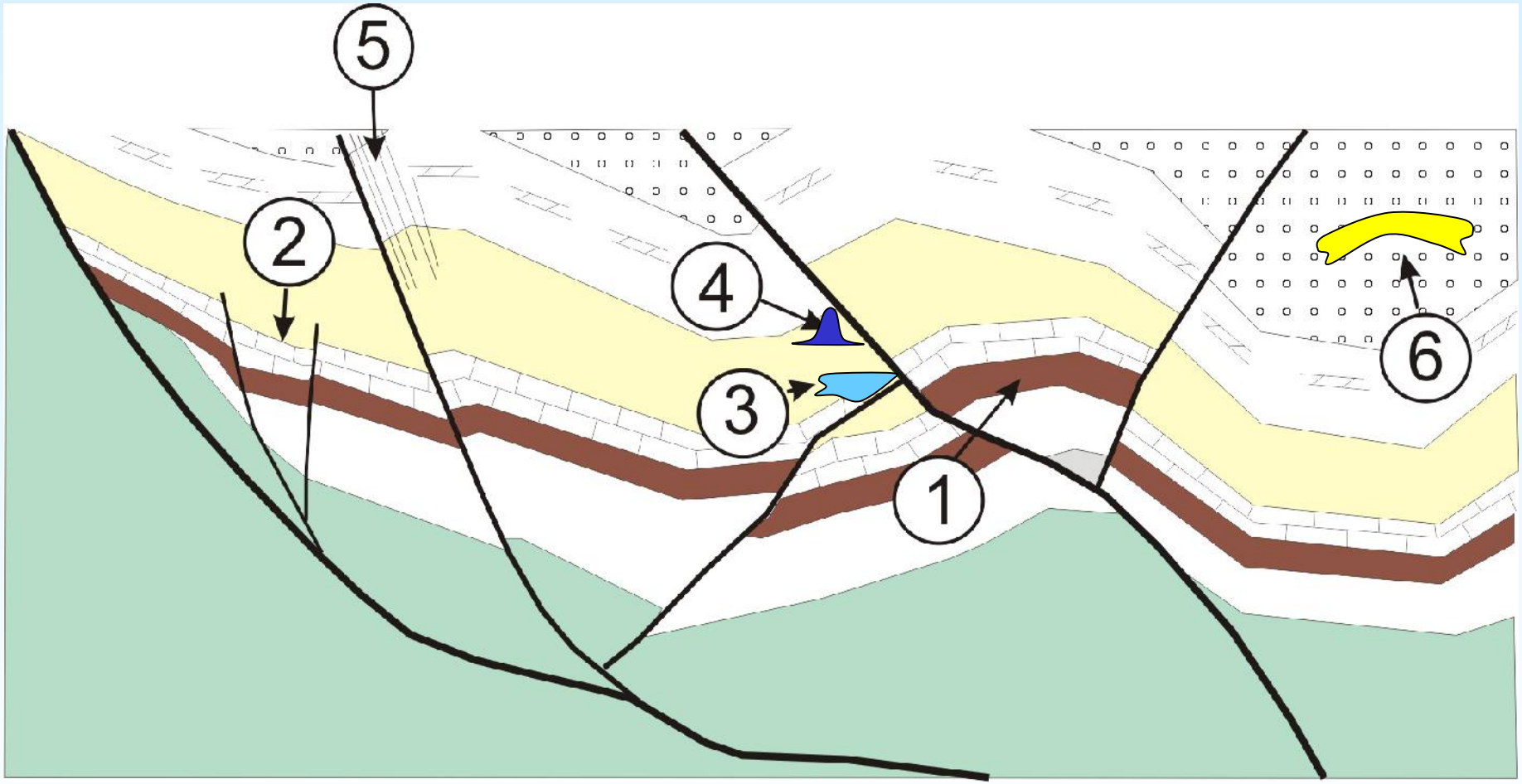


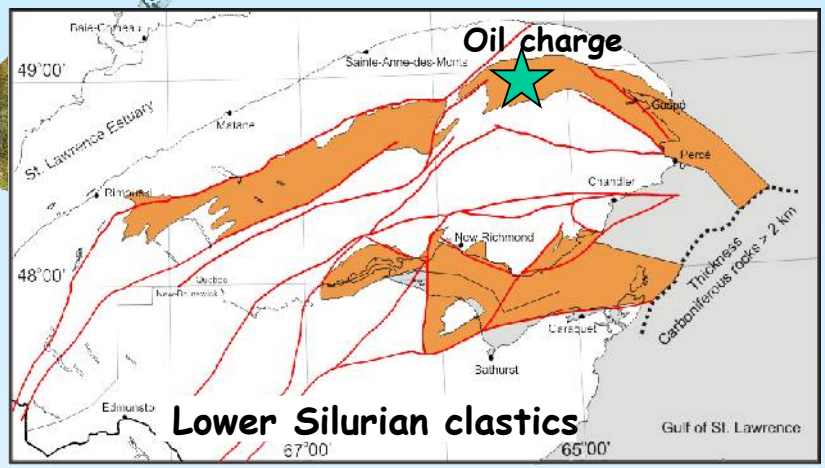


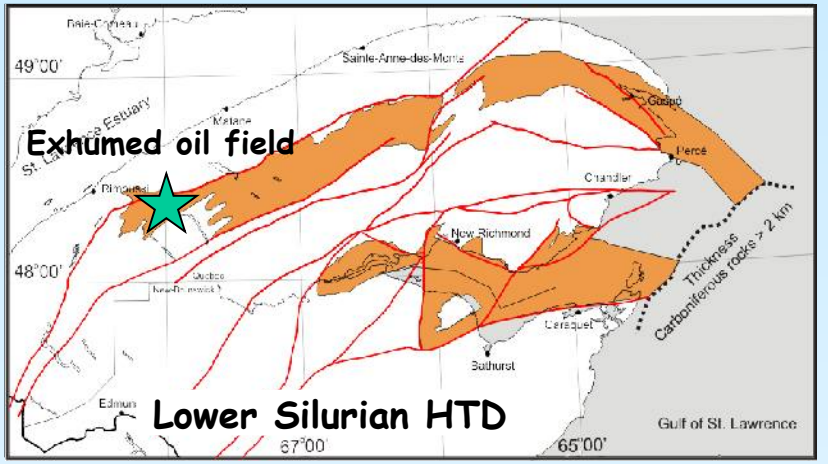


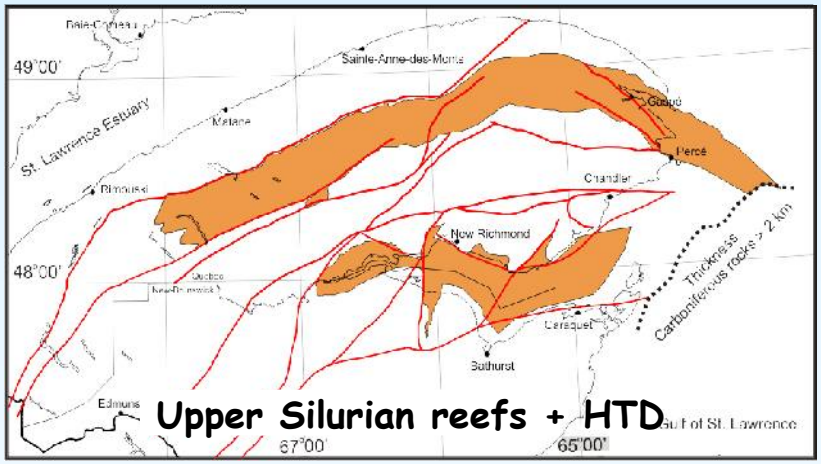


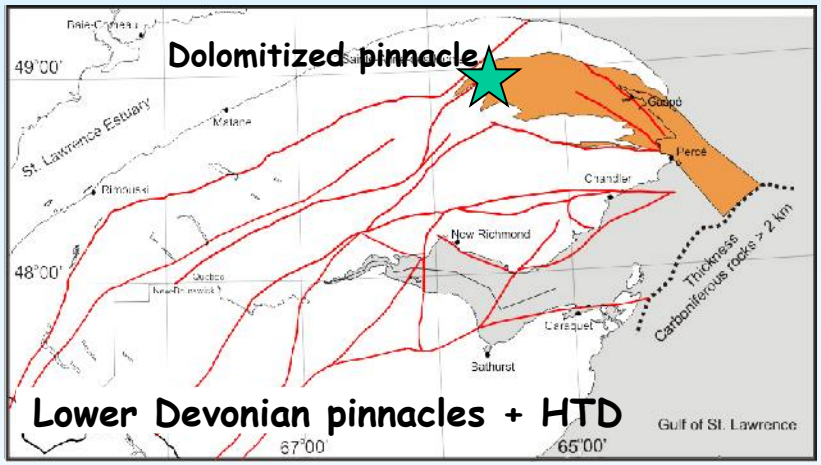
Silurian-Devonian plays in the Acadian Gaspé Belt

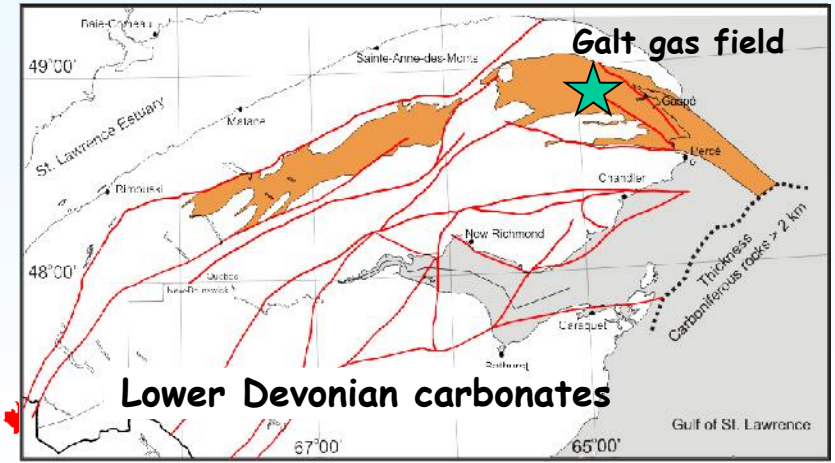












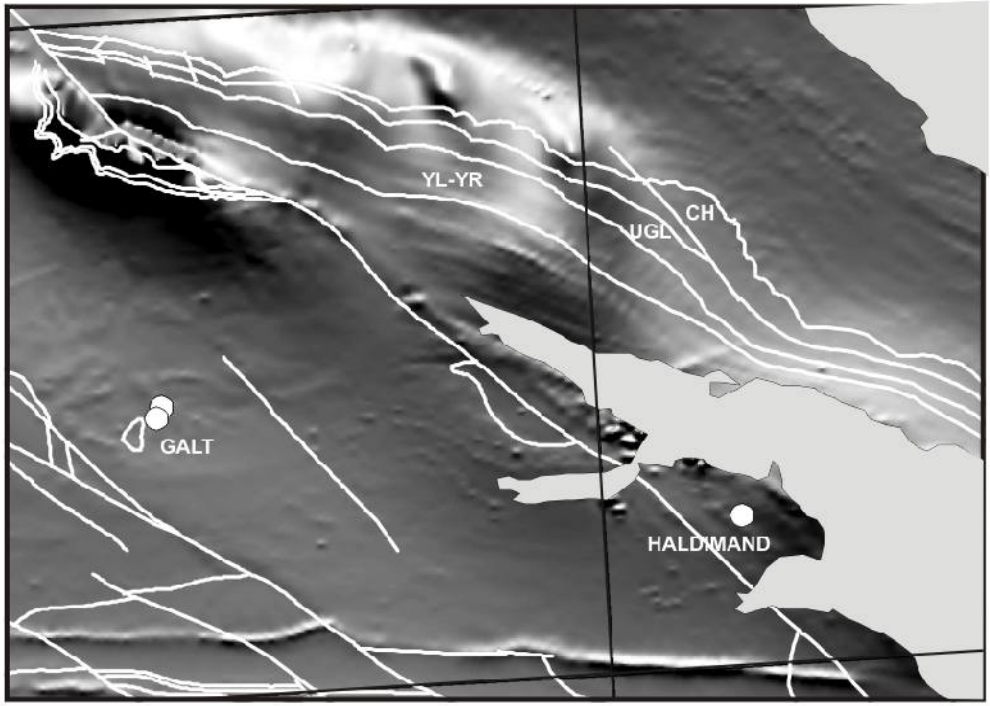
Silurian-Devonian plays not assessed

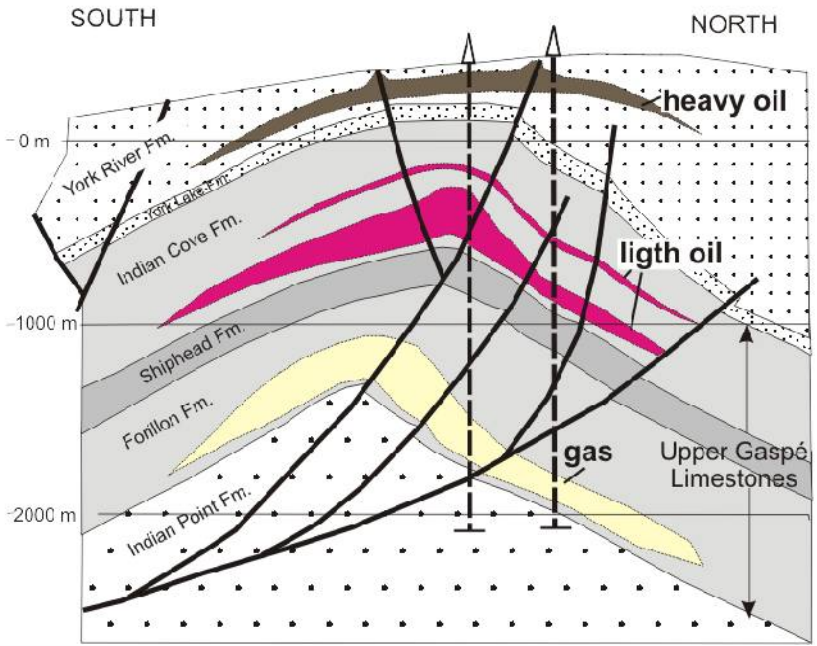
Canada

The Lower Devonian Galt gas field

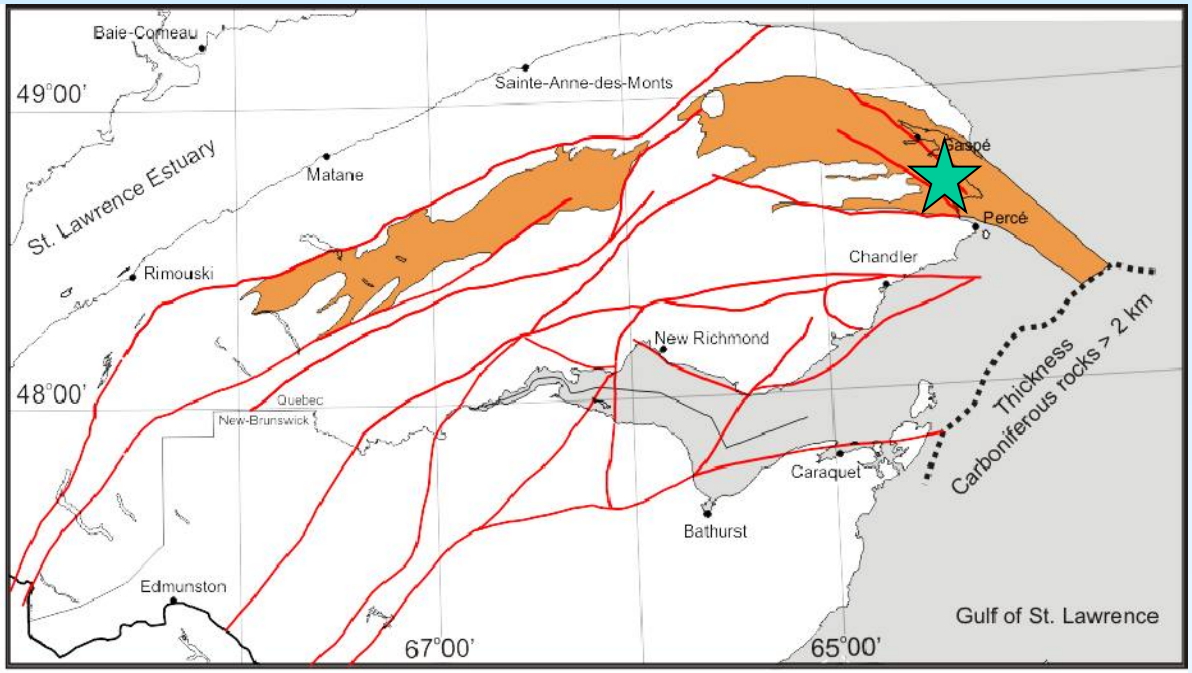
Fractured and dolomitized carbonate reservoir

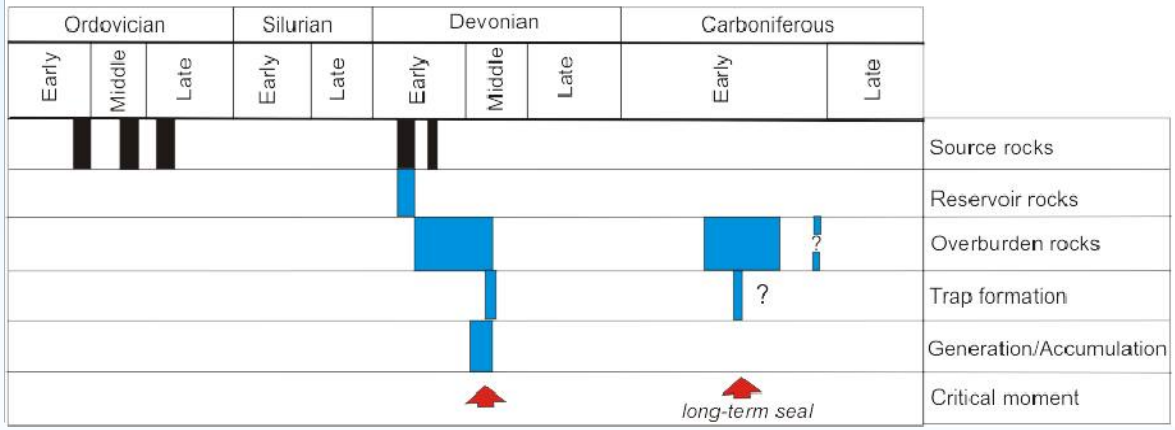
187 * 10^6 m^3 (6.6 Bcf)



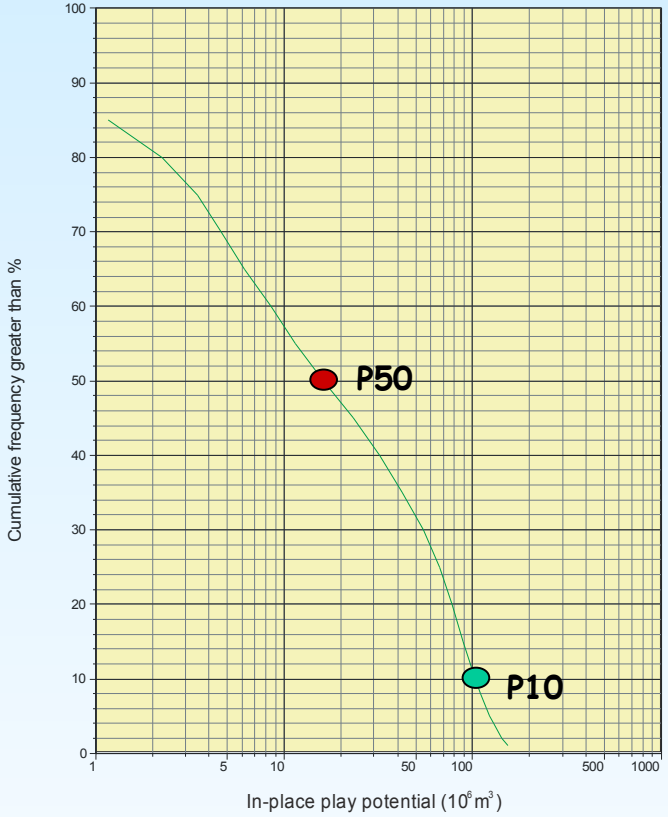


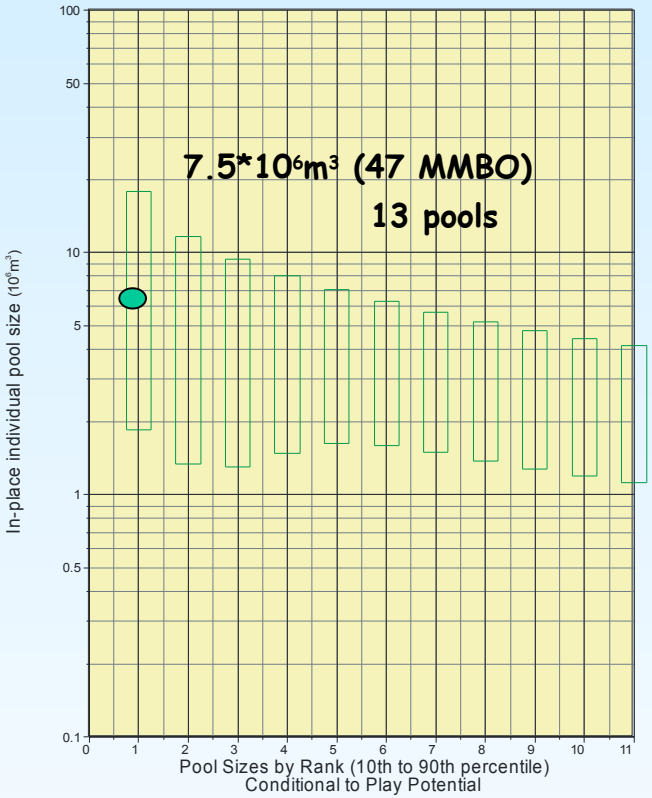
Lower Devonian sandstones - Haldimand oil field





Lower Devonian sandstones - Haldimand oil field





Oil

P10: $104*10^6$ m^3

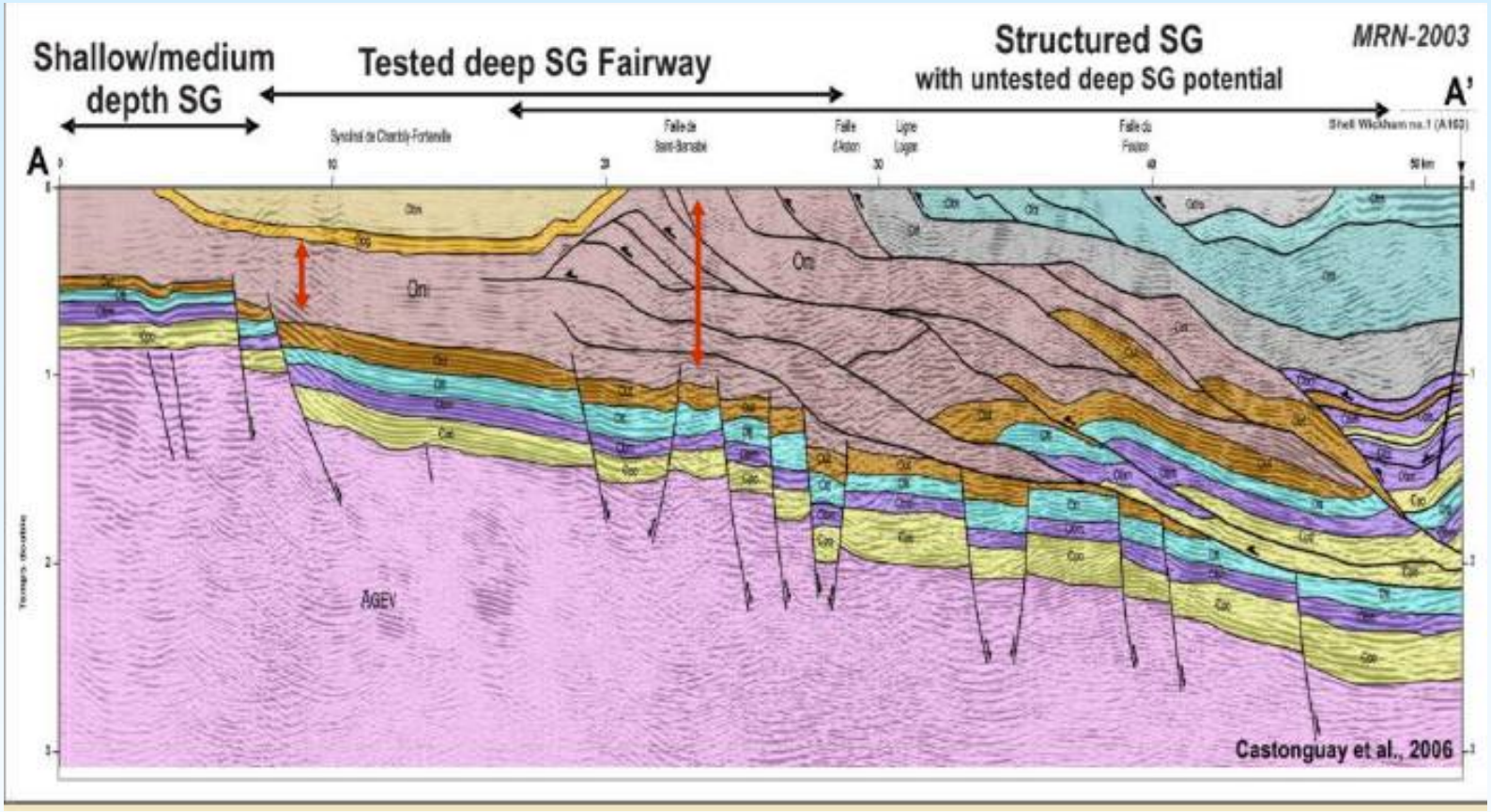
P50: $16*10^6$ m^3

P90: N/A

(P50: 100 MMBO)

Unconventional gas – Upper Ordovician Utica and flysch

Unconventional gas – Upper Ordovician Utica




St-François du Lac;
1 MMcf/d, vertical well
40 Tcf recoverable ?

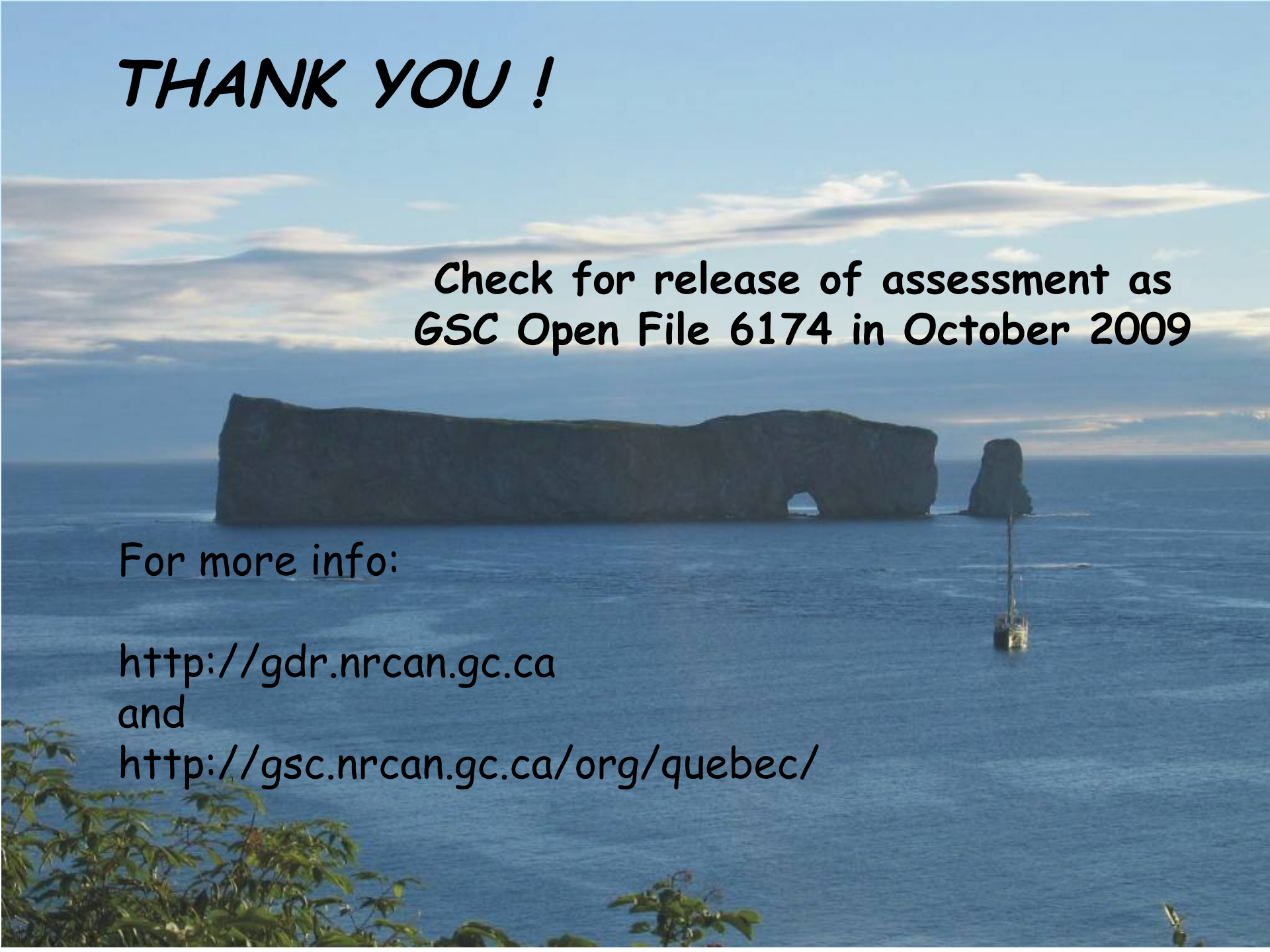
Conclusions

12 conventional plays have been proposed and described
Of these only 4 have enough data for PRIMES analysis

Ordovician carbonates have a total potential (P50) of
$41 * 10^9$ m^3 of gas (1.5 Tcf)
$116 * 10^6$ m^3 of oil (730 MMBO)

Devonian sandstones have a potential (P50) of
$16 * 10^6$ m^3 of oil (100 MMBO)

Unconventional gas has not been quantitatively assessed.
However, multi-Tcf of recoverable resources have been announced from initial testing and fracturing



THANK YOU !

Check for release of assessment as GSC Open File 6174 in October 2009

For more info:

http://gdr.nrcan.gc.ca
and
http://gsc.nrcan.gc.ca/org/quebec/