

A petroleum system includes all the geologic elements and processes that are essential for hydrocarbon accumulation to occur. The essential elements of a conventional petroleum system include a petroleum source rock, a reservoir rock, and a seal rock. The essential processes are trap formation and sufficient burial resulting in the generation, the migration, and the accumulation of petroleum. The aim of this poster is to provide an overview of the petroleum systems of the imbricated Paleozoic sedimentary basins that form the Gulf of St. Lawrence and adjacent areas. The cross-section that is used for the illustration of geological parameters is schematic and does not show the complexity at the prospect scale. A more detailed description of petroleum systems of Paleozoic successions of eastern Canada, including the petroleum resource assessment of several exploration plays is provided by Lavoie et al. (2009) and Dietrich et al. (2011).

The Cambrian-Permian succession of eastern Canada belongs to three domains: 1) the Cambrian to Devonian (?) St. Lawrence Platform that corresponds to the autochthonous cover of the eastern North American craton; 2) the Appalachians, formed by Cambrian-Ordovician lithotectonic zones (including the Humber and Dunnage zones) partially unconformably overlain or in fault contact with Silurian-Devonian rocks (Gaspé belt and equivalent); 3) autochthonous Carboniferous-Permian rocks of the Maritimes Basin (Figures A, B and C).

Several deformation events or orogenies have shaped the Paleozoic succession of eastern Canada and have contributed to the formation of petroleum traps and burial of sedimentary strata and may have influenced the long-term sealing capacity of the system. These deformation events are variable both in time and space and the cross-sections illustrating their intensity (Figure D) should be considered as highly schematic. Some areas have been affected by several deformation events, whereas others recorded a single event.

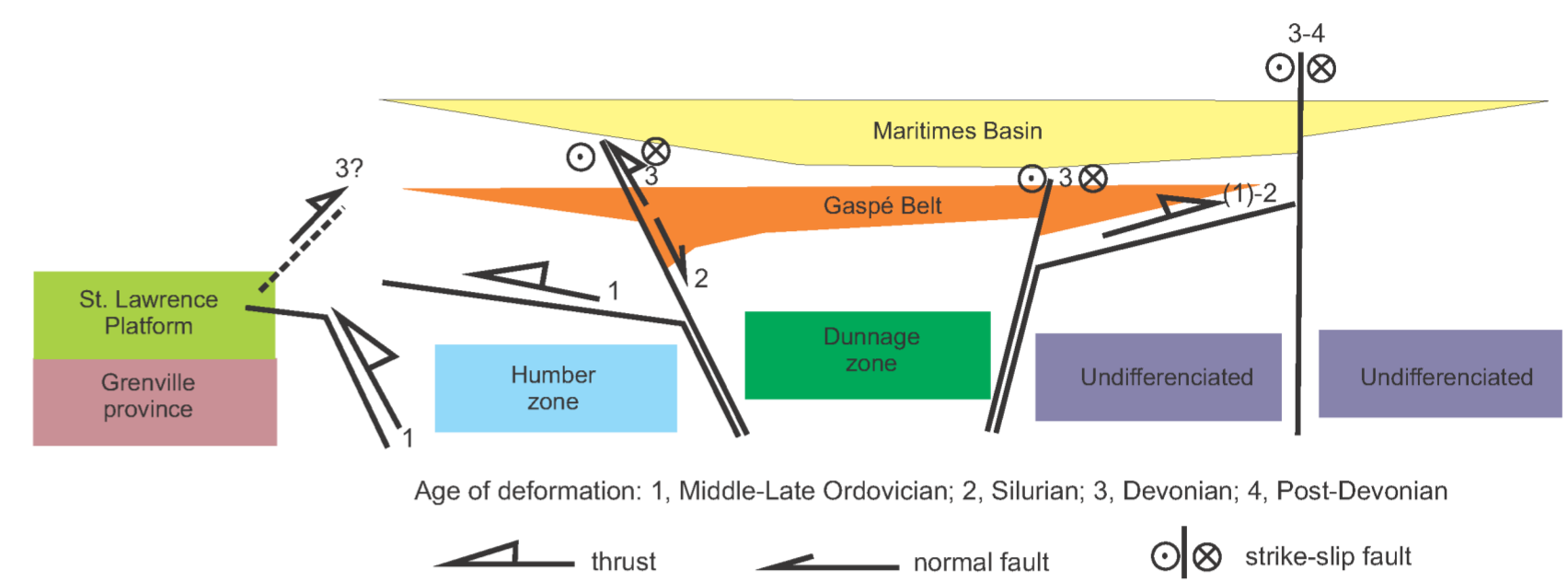
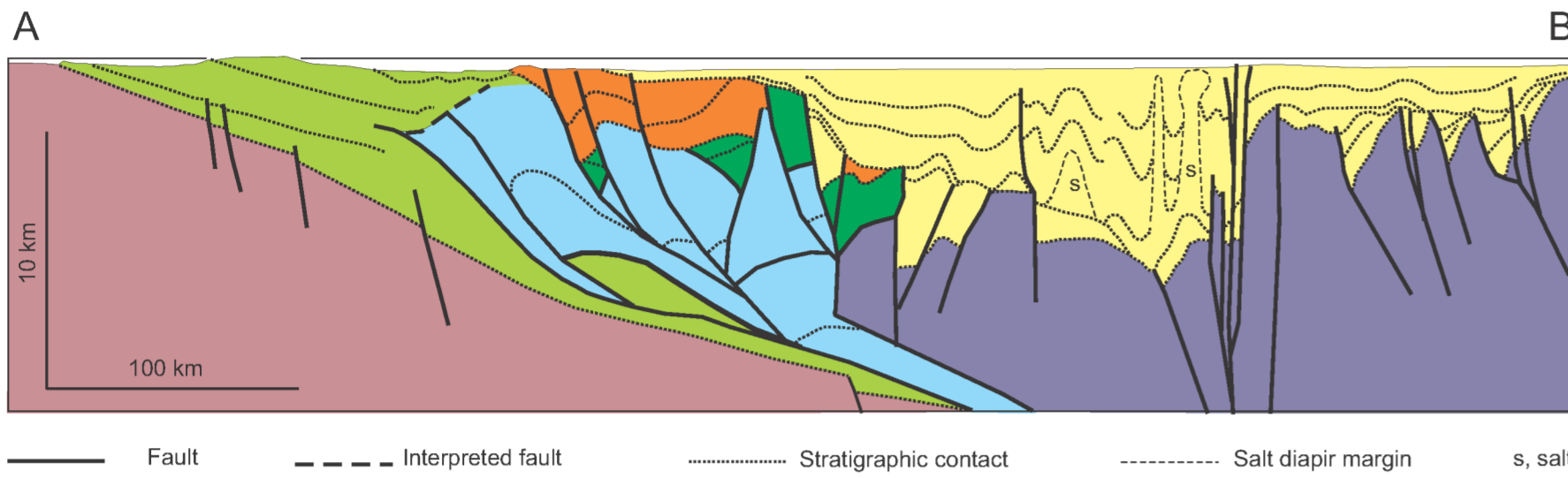
Onshore, studies of organic matter reflectance of surface and/or well samples help to constrain the thermal maturation level of the Paleozoic succession (Figure E). Offshore, studied samples are restricted to a few wells and regional maturation patterns are poorly known. Regionally, thermal maturation data suggest a complex thermal history including significant but variable amounts of erosion.

The main source rock intervals are Ordovician (S1, S2 and S3 in Figure F) or Carboniferous (S4, S5 and S6 on Figure F) in age. Along the cross-section, reservoir intervals (R/r on Figure F) are known (R1 to R5) or inferred (r1 to r3) in locally porous and permeable sedimentary units of Ordovician to Carboniferous age.

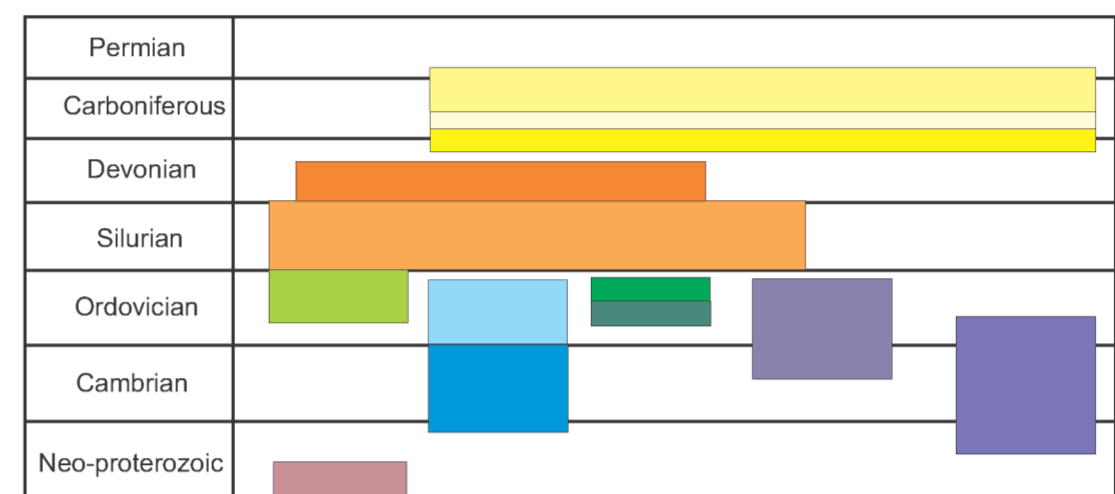
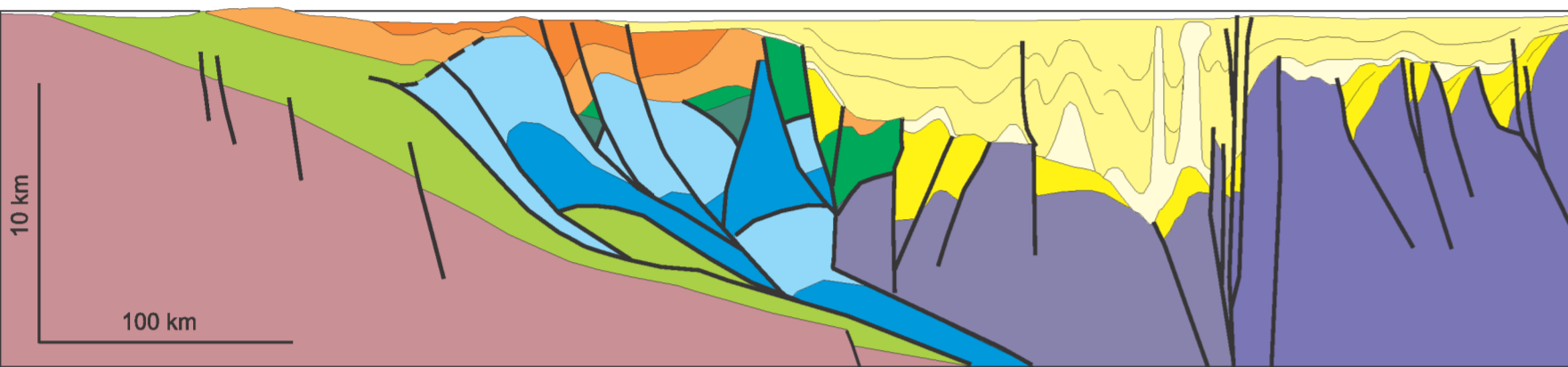
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Dietrich, J., Lavoie, D., Hannigan, P., Pinet, N., Castonguay, S., Giles, P., Hamblin, T., 2011. Geological setting and resource potential petroleum plays in the Paleozoic basins in eastern Canada. *Bulletin Canadian Petroleum Geology*, v. 59, p. 54-84.
Lavoie, D., Pinet, N., Dietrich, J., Hannigan, P., Castonguay, S., Hamblin, T., Giles, P.S., 2009. Hydrocarbon resource assessment, Paleozoic basins of eastern Canada, Open File 6174, 274 p.

B- LITHOTECTONIC DOMAINS AND ZONES

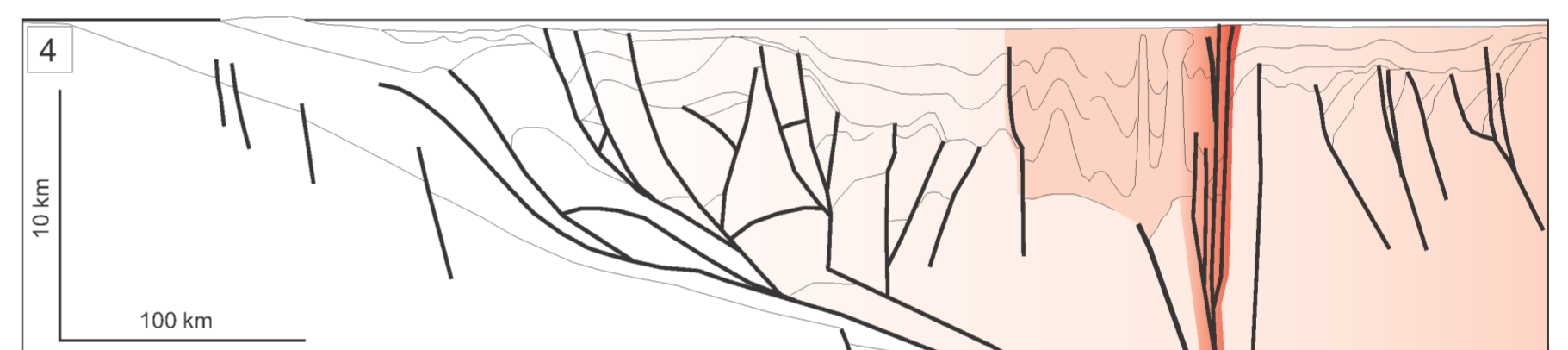
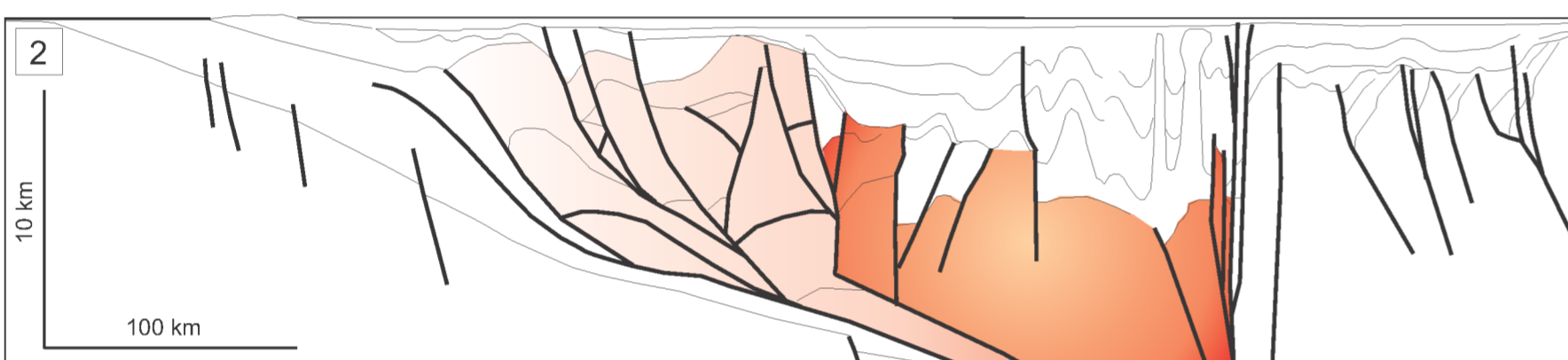
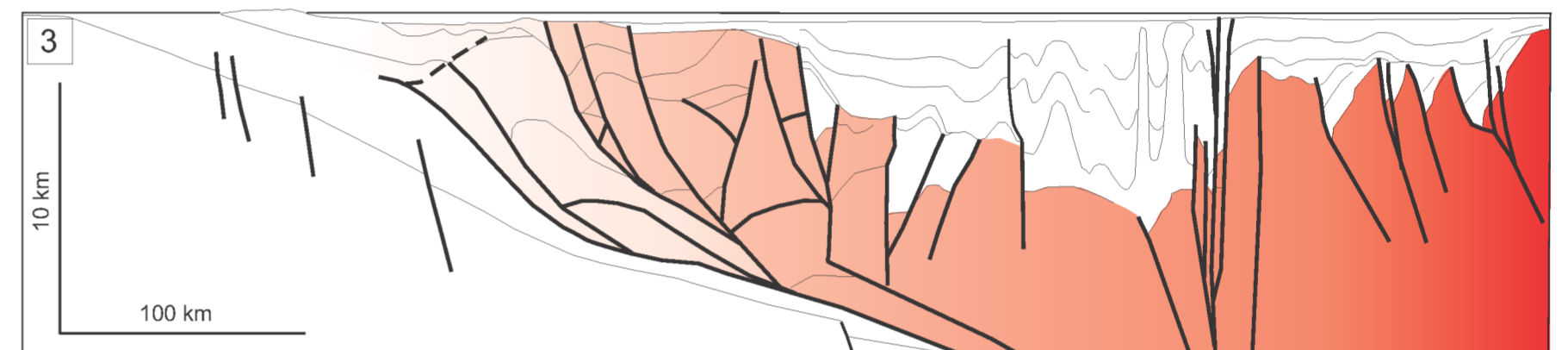
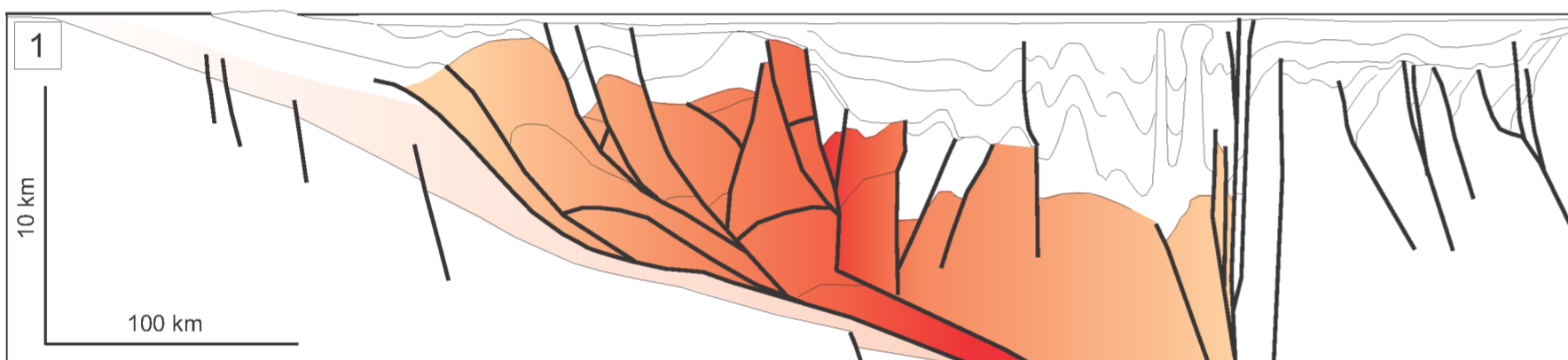


C- AGE



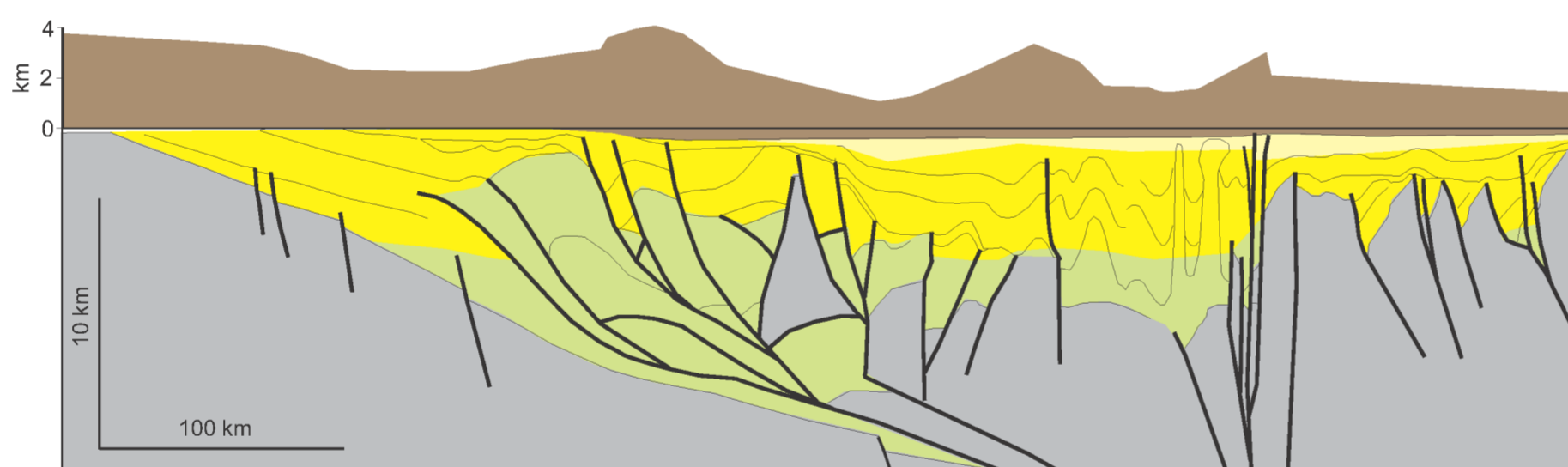
D- INTENSITY OF DEFORMATION

low ————— high



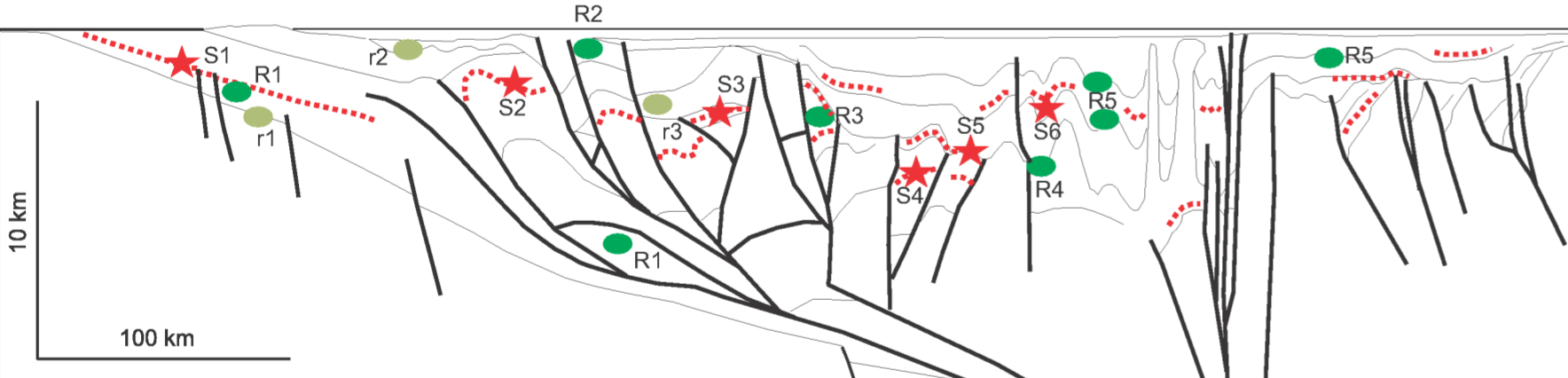
E- THERMAL MATURATION

← highly variable exhumation ? →



Thickness of eroded succession
Immature rocks
Petroleum prospective zone
Low-grade metamorphic rocks
Higher-grade metamorphic rocks

F- SOURCE AND RESERVOIR ROCKS



SOURCE ROCKS:

- S1, Macasty Formation (Upper Ordovician)
- S2, Rivière-Ouelle Formation and correlative (Lower to Middle Ordovician)
- S3, Mictaw Group and equivalent (Middle Ordovician)
- S4, Horton Group (Lower Carboniferous)
- S5, Windsor and Mabou groups (Lower Carboniferous)
- S6, Cumberland and Pictou groups (Upper Carboniferous)

RESERVOIR ROCKS

- R1, Hydrothermally dolomitized Ordovician carbonates
- R2, Lower Devonian fractured limestones and clastics
- R3, Lower Carboniferous clastics
- R4, Lower Carboniferous carbonates
- R5, Upper Carboniferous clastics

POTENTIAL RESERVOIR ROCKS

- r1, Rift-drift clastic rocks at the base of the St. Lawrence Platform succession
- r2, Upper Ordovician to Devonian foreland sandstones and limestones
- r3, Lower Silurian clastics and hydrothermally dolomitized carbonates/ upper Silurian-Lower Devonian reefal units

EXAMPLES OF RESERVOIR ROCKS

- 1- Porous dolomitic zones within the Lower Silurian Sayabec Formation (Chaleur Group), Gaspé Peninsula
- 2- Porous dolomitic zone within the Lower Devonian Forillon Formation (Upper Gaspé Limestone Group), Gaspé Peninsula
- 3- Lower Devonian sandstone of the York River Formation (Upper Gaspé Sandstone Group), Gaspé Peninsula. Width of the photograph is 4 m.
- 4- Alternating beds of organic shales (source rock; dark-coloured) and sandstones (reservoir rock; lighter-coloured) of the Lower Carboniferous Horton Group near the McCully gas field, New Brunswick.
- 5- Permian red bed sandstones, Prince Edward Island



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CONVENTIONAL PALEOZOIC PETROLEUM SYSTEMS OF THE GULF OF ST. LAWRENCE AND ADJACENT AREAS

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