

Petroleum Systems in Southern Ontario: A Geochemical Perspective

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Southern Ontario is a historic oil province with the commercial exploitation of petroleum dating back to the middle of the 19th century. Several informal petroleum systems can be defined in this region based on geochemical oil-source correlations. The first system is recognized within middle-upper Ordovician strata. It is most likely a self-sourcing system with both multiple source rock horizons and crude oils occurring mainly in the Trenton-Black River carbonate platform. These oils display characteristics unique worldwide for Ordovician-source oils and are primarily derived from thin, organic-rich shaly Trenton laminae. This system is not fully closed as some of the Ordovician oil has migrated to stratigraphically adjacent Cambrian and Silurian reservoirs. Oils found in the Middle Silurian reef reservoirs have a distinctly different geochemical composition suggesting a carbonate source rock deposited under hypersaline conditions. These oils belong to another petroleum system that operates within the Guelph-Salina reefal and inter-reefal carbonates and evaporites. A detailed geochemical analysis of organic-rich intervals occurring in close proximity to reefs indicates that the majority of the reef-hosted oils are locally derived from sources within the Salina A-1 carbonate.

A third petroleum system comprises oils from shallow Devonian Detroit River - Dundee reservoirs. These oils share some compositional similarities with the Ordovician oils but are likely derived from younger (Devonian) source rocks. The Marcellus and Kettle Point shales have good petroleum potential, but as these strata are only marginally mature in southern Ontario, outside sources located in more central parts of the Appalachian or Michigan basins, are more likely.