

Provenance of Oil on the Findlay Arch Based on Geochemistry and Basin Modeling (Illinois, Appalachian, and Michigan Basins), Elisabeth L. Rowan, Joseph R. Hatch, Robert T. Ryder, and John E. Repetski, U.S. Geological Survey, Reston, VA 20192, erowan@usgs.gov, jr hatch@usgs.gov, rryder@usgs.gov, jrepetski@usgs.gov

Geochemical analyses of oils produced from the Ordovician Trenton Formation on the Findlay Arch in northeastern Indiana indicate a Middle–Upper Ordovician age for the hydrocarbon source rock. Regional-scale, reconnaissance, multi-1D modeling, calibrated with CAI data, provides burial/thermal histories for the potential Ordovician oil source rocks. The Upper Ordovician Maquoketa Shale (Illinois Basin) and its approximate stratigraphic equivalents, the Utica Shale (Appalachian Basin) and Collingwood Shale (Michigan Basin), are thermally immature to marginally mature on the Findlay Arch in northwestern Ohio and northeastern Indiana and thermally mature in adjacent deeper parts of the Illinois, Appalachian, and Michigan Basins.

Thermally mature Middle–Upper Ordovician strata in the Michigan Basin have generally higher total organic carbon (TOC) contents than equivalent strata in the Appalachian Basin; TOC data are not available for equivalent strata in the eastern Illinois Basin. While richer source rocks would favor the Michigan Basin as an oil source, the saturated hydrocarbon and tricyclic terpane ($m/z=191$) distributions in oils produced from the Findlay Arch in northeastern Indiana are similar to distributions in oils produced in central Ohio, suggesting an Appalachian Basin provenance, and are dissimilar to distributions in Ordovician oils produced in the southern Michigan and eastern Illinois Basins. Evidence for topographically driven westward regional fluid flow out of the Appalachian Basin at approximately maximum burial (mid-Permian) further supports an Appalachian Basin provenance. Hydrodynamic drive would enhance migration by buoyancy, particularly in areas of shallow dip.