

Thermal Maturity Maps Based on Conodont CAI for the Central Appalachian, Illinois, and Michigan Basins, J.E. Repetski, R.T. Ryder, E.L. Rowan, J.A. East, M.H. Trippi, and D.J. Weary, U.S. Geological Survey, MS 926A National Center, Reston, VA 20192, jrepetski@usgs.gov; R.D. Norby and T.H. Shaw, Illinois State Geological Survey, Champaign, IL; C.B. Rexroad, Indiana Geological Survey, Bloomington, IN; and S.M. Bergström, The Ohio State University, Columbus, OH 43210

New thermal maturation maps have been constructed for Paleozoic rocks of the central part of the Appalachian Basin (New York to central Kentucky) and for the Michigan and Illinois Basins using conodont color alteration index (CAI). New CAI values were derived from drill cuttings from several hundred wells throughout the region and from outcrops along the edges of the Illinois Basin. Ordovician, Devonian, and Carboniferous carbonate intervals were chosen for CAI where they are within or near probable hydrocarbon source beds and oil and gas reservoir zones in these basins. The new maps show thermal patterns that are aligned with, and probably causally related to, structural/geophysical features such as the Rome Trough and selected basement fault systems. Also, the CAI isograds show differing levels of compatibility with known hydrocarbon accumulations, suggesting that accumulations originating from local migration may be distinguished from ones originating from longer-distance migration.

As in other paleothermal investigations, e.g., vitrinite reflectance (%Ro), the CAI isograds indicate higher paleotemperatures than can be explained by present burial depths over the region. Possible sources of additional heating vary from region to region but include burial and insulation of lower Paleozoic rocks by Devonian black shale and Pennsylvanian coal, migration of hot geothermal fluids, local emplacement of mantle-derived rocks along reactivated extensional structures during post-Paleozoic time, and crustal thinning. These data and maps will aid in resource assessments and the development of burial/thermal history, hydrocarbon generation, and fluid flow models for this region.