

CONTROLS ON DOLOMITIZATION OF THE UPPER ORDOVICIAN TRENTON LIMESTONE IN SOUTH-CENTRAL KENTUCKY

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Abstract

The Late Middle Ordovician Trenton Limestone is a highly productive hydrocarbon reservoir across the eastern United States. Enhanced secondary porosity and permeability within the Trenton Limestone generated by hydrothermal dolomitization (HTD) in Michigan and New York have allowed for extensive hydrocarbon reservoirs to be developed. South-central Kentucky provides an exploratory region for post-depositional hydrothermal alteration due to its vicinity to the Appalachian-forming orogenic tectonism. This study tests the hypothesis that HTD within the Trenton Limestone of Kentucky may be more extensive in facies that exhibit high primary porosities and that HTD has influenced historically productive fields of south-central Kentucky.

Results from outcrop analyses indicate that HTD is preferential to low-porosity packstones with interbedded shales. Altered zones exhibit significant vuggy and interparticle porosity with distinct streaks of HTD extending laterally into unaltered host packstones. Cores from south-central Kentucky exhibit variable HTD in the form of saddle dolomite filling large, isolated vugs. Petrographical analysis with the use of Alizarin red S, blue-dyed epoxy, and Potassium-Ferricyanide allows for the development of detailed facies descriptions and for the determination of HTD extent through matrix-replacive dolomite.

Investigation of fluid inclusion freeze-thaw and stable isotope analyses allow for the determination of the nature and extent of HTD occurrences through comparisons to previous publications on northern portions of the Appalachian Basin where timing and sources of dolomitization are known. Results of the analysis may provide a new predictive tool to be utilized for hydrocarbon exploration through the southern Appalachian foreland.