Transactions of the 1995 AAPG Mid-Continent Section Meeting, 1996

Recognition of Sequence Boundaries in Pennsylvanian Outcrops of the Midcontinent: Abstract

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ABSTRACT

Subaerial exposure surfaces, and associated features are important and common components of shallow-marine Paleozoic sequences in the Midcontinent. Recognition and mapping of such surfaces are of economic importance because the distribution of reservoir facies is closely associated with subaerial exposure. The absence of strong evidence of subaerial exposure in these sequences (e.g., unambiguous petrographic and isotopic data) creates problems in stratigraphic correlation at both the reservoir and regional scales. However, exposure surfaces and associated paleo-water tables can be recognized by variations in the concentration of the three most commonly occurring radioactive elements (i.e., uranium, potassium and thorium). These variations in the concentration are readily detected in both the surface and subsurface using the spectral gamma-ray log.

Detailed field description, petrographic examination, and geochemical analysis were used to understand the relationship between the concentration of radioactive elements, and the style of alteration associated with subaerial exposure at the overlying sequence boundary in selected Pennsylvanian carbonate sequences. In several sequences distinctive change in uranium concentration is observed at the contact of the vadose and phreatic zones. On the basis of detailed examination, the uranium anomalies cut across primary sedimentary structures, and are proposed to be the result of selective inclusion of uranium in micrite cements and associated clays concentrated at the contact between the vadose and phreatic environments. Development of criteria to recognize this distinctive signature in both the surface and subsurface may assist in correlation of individual sequences and will aid in understanding genetic mechanisms that control reservoir development in similar shallow-marine Midcontinent reservoirs.

ACKNOWLEDGMENTS AND ASSOCIATED FOOTNOTES

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