

## Log Petrophysics of the Lower Permian Chase Group in the Hugoton Gas Field of Southwestern Kansas.

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The wireline log database of the Chase Group in southwestern Kansas is one of the largest in the world and provides an almost unique opportunity to relate petrophysical measurements to geology and reservoir properties over a wide range of spatial scales. The nuclear logs of spectral gamma-ray, neutron porosity, density, and photoelectric factor are commonly available and show distinctive patterns that can be linked with lithological composition, as well as depositional and diagenetic signatures. The spectral gamma-ray uranium measurement distinguishes “hot” carbonates, where uranium has accumulated, primarily in diagenetic cements. Mathematical inversion of the nuclear logs transforms them to compositional profiles of pore volume, shale, dolomite, silica (quartz and/or chert), calcite, and anhydrite. These compositional transforms are validated by the “ground truth” from core, and the fine vertical resolution of the logs can be extended to detailed analyses of cyclic patterns and facies associations. Reservoir formation evaluation in the Chase Group is complicated by the extensive invasion that occurs in mud-drilled wells, with the result that saturations estimated from resistivity logs are commonly suspect. In addition, gas effects on porosity logs are highly variable but must be accommodated in the estimation of accurate porosity values. The drilling of foam-based wells and their use in comparative studies of invasion effects that have been published recently have been helpful in improving formation evaluation strategies of logs in the Chase Group.