

Spatial and Temporal Relations of Upper Pennsylvanian Black Shales in Kansas

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Pennsylvanian black shales in Kansas have been studied on outcrop for many years as the core unit of the classic Midcontinent cyclothem which now is considered to represent highstand condensed sections. In the subsurface, the black shales are correlated easily for long distances on gamma ray logs as "hot shales," although in places they grade laterally into less distinctive a gray-shale facies. Spectral gamma ray logs were analyzed for stratigraphic patterns in uranium, thorium, and potassium variability for twelve Pennsylvanian black shales as indicators of sea level changes and clay mineralogy. In addition, geostatistical analysis of the maximum gamma ray log values in the Heebner and Eudora shales was applied in a critical examination of spatial continuity and orientation, and their implications regarding the potential roles of depositional mechanisms, paleogeography, and diagenetic episodes. Maximum gamma ray values interpreted from logs in the Heebner are consistently higher than those for Eudora. The gamma ray radiation patterns in the Eudora are correlated spatially with the patterns for the Heebner, which is an indication that factors controlling deposition during Eudora time were repeated during Heebner time. The pattern similarity decreases toward the south, which is in agreement with other studies indicating difference in distance to nearshore affects. The particular value of these subsurface petrophysical studies is that they allow geological interpretations to be extended from the areally restricted outcrop to a regional framework.