**Geological Controls on Mount Simon Sandstone Reservoir Quality and Geological Carbon Sequestration Potential in the Michigan Basin, USA: Conventional Core, Petrographic, and Petrophysics Analysis**

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The late Cambrian Mount Simon Sandstone is an important deep saline geological sequestration (GS) target throughout the Midwest, USA. Regional assessment and site characterization studies suggest that the Mount Simon may have total GS capacity in excess of 29 Gt in Michigan and the capacity for industrial scale GS in many areas. This study attempts to refine these regional GS capacity estimates and characterize geological controls on the variability of reservoir quality in the Michigan Basin. Spatial variation in primary depositional facies and mineralogical composition, and burial diagenesis influence reservoir quality in the Mount Simon. Three log facies are present in most areas: a lower feldspathic sandstone facies, a middle quartzose sandstone facies, and an upper feldspathic and argillaceous facies. These log facies vary in character and thickness from east to west across the basin. Sedimentary facies identified in core include basal fluvial facies, transitional to shallow marine, storm shelf and tidal flat deposits up-section, indicating an over all transgressive succession, but with local variations. Petrographic and conventional core analysis data compared to gamma ray (GR), neutron porosity (NPHI), and density porosity (DPHI) data are used to determine the relationships amongst formation log responses, primary mineralogical and textural properties, and reservoir quality. The Mount Simon in western Lower Michigan is predominantly well sorted, medium-grain, quartzose sandstone and has lower GR log response compared to the Mount Simon in eastern Lower Michigan. The increase in GR log response in the east is influenced by higher K-feldspar content but not significantly increased detrital clay content nor significantly decreased reservoir quality. The GR log is found to be a poor indicator of reservoir quality and may not be useful as a filter for net porosity calculations using averaged NPHI/DPHI to estimate net (effective) porosity. Our conclusions from this study are: (1) in many areas spatial variation of K-feldspar content is directly correlated to GR log response (2) GR log response is not clearly nor consistently related to reservoir quality (3) previous GS calculations eliminating prospective reservoir rock with high (above ~50 API) GR log response and high K-feldspar content significantly under estimate regional storage capacity in the Mount Simon Sandstone in Michigan.