

Comparison of the Organic Thickness of the Marcellus Shale: An Analysis Between the Thick and Thin Organic-Rich Facies and Their Depositional Histories

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ABSTRACT

Currently, no geological model exists to explain the variability and distribution of organic-rich facies in the Marcellus Shale. Within the central Appalachian basin, there are two “sweet spots”, one in Northeast Pennsylvania and another in Southwest Pennsylvania/North-Central West Virginia. In these areas, the Marcellus Shale contains thick accumulations of organic matter and are highly productive for natural gas. In contrast, many studies and production reports have shown that there is a region in Clearfield County, Pennsylvania where the Marcellus shale is relatively organic-poor. One possible explanation for the lower organic content is that detrital dilution was greater in this area compared to surrounding regions. This hypothesis will be tested by analyzing the provenance of inorganic detritus in the Marcellus Shale. Recent study of the MSEEL (Marcellus Shale Energy and Environmental Laboratory) well in north-central West Virginia revealed input from the Superior Craton decreased and input from the Acadian mountains increased as TOC in the Marcellus decreased up-section. A comparison will be made between the West Virginia well to a well in the Clearfield County. Facies classifications and provenance interpretations will be made in the Marcellus shale intervals based on well log data, XRD mineralogy and XRF/ICP-MS major/trace element geochemistry. These data will be combined with Sm-Nd analysis and, SEM thin section analysis to further constrain provenance. Raman spectral analysis will be used to evaluate the thermal maturity. Ultimately, these data will be used to model the depositional environments and their sediment provenance to explain the variation in organic matter content in Clearfield County and north-central West Virginia.