
7-14 - LITHOLOGICAL & GEOCHEMICAL ANALYSIS OF THE MIDDLE TO UPPER DEVONIAN ANTRIM SHALE, MICHIGAN BASIN: INSIGHTS INTO DETRITAL INPUT DYNAMICS



Sunday, 21 April 2024



1:30 PM - 5:30 PM



Grand Ballroom, Oasis CC (Oasis Hotel & CC)

Booth No. 19

Abstract

The Middle to Upper Devonian is distinguished by global biotic events attributed to marine anoxia (black shale) and perturbations in the carbon cycle. While previous studies had documented these events in the North American Appalachian Basin, less attention has been directed toward discerning analogous global biotic occurrences within the neighboring Michigan Basin. This investigation aims to reconstruct the organic carbon isotopic composition of Middle to Upper Devonian sediments within the Antrim Shale, from the Krock 1-17 and State Chester Welch 18 drill cores located in the north-central Michigan Basin. Since black shale organic matter (OM) is a combination of marine and terrestrial sources, the first step is to utilize elemental proxies for sedimentation to understand terrestrial OM input to the basin.

Elemental analysis was performed on powdered core samples at approximately three-foot intervals across the (oldest to youngest) Norwood, Paxton, and Lachine members of the Antrim Shale. Initial pXRF analysis shows similar trends in sedimentation rate proxies between the two core locations, suggesting that basin-fill dynamics are spatially consistent. In the Norwood, Si%, Si/Al, and K% mostly correspond suggesting predominantly clay mineral deposition, though an anomalously high interval of Si%, Si/Al, and TOC (and low K%) is interpreted as high paleoproductivity and biogenic silica production (radiolarians). In the Paxton, all elemental proxies for sedimentation are relatively consistent through time, indicating minimal detrital flux changes. In the Lachine, the overall trend of increasing Si% and Si/Al and corresponding decreasing K and TOC suggests increased detrital input through time. These trends provide the necessary baseline for future work interpreting organic carbon isotopic data.

A detailed understanding of local detrital fluxes into the Michigan Basin and potential terrestrial organic carbon input to marine settings is necessary to place the Michigan Basin carbon isotopic profile within the global framework. This study will provide valuable insights into deciphering global events within the stratigraphic succession of the Michigan Basin. The anticipated outcome is an enhanced understanding of the localized manifestations of Middle to Upper Devonian global events.

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