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# 7-13 - CHARACTERIZING THE ELLSWORTH FORMATION OF THE MICHIGAN BASIN USING LITHOSTRATIGRAPHY AND CHEMOSTRATIGRAPHY



Sunday, 21 April 2024



1:30 PM - 5:30 PM



*Grand Ballroom, Oasis CC (Oasis Hotel & CC)*

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**Booth No. 18**

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## Abstract

The Ellsworth Formation is a Late Devonian gray-green silty shale found in the Michigan Basin. The relationship between the Ellsworth Formation and the underlying/interfingering Antrim Formation black shale is variable within the literature, and the delta that delivered this sediment to the basin is poorly constrained. This study aims to better understand the lithostratigraphic and chemostratigraphic variation of the Ellsworth among two drill cores: one located on the basin margin and the other more basinal. This work will help constrain the stratigraphic and paleoenvironmental aspects of the Ellsworth in different parts of the basin, providing a better understanding of Ellsworth delta construction.

Elemental (pXRF) and mineralogical (XRD) analyses demonstrate a distinct difference between the cores. The Ellsworth Formation on the edge of the basin contains larger amounts of K-feldspar, quartz, and dolomite. In contrast, more basinal settings contained higher amounts of clay minerals as well as organic matter. Additionally, a high-resolution lithostratigraphic study of the basin-margin core was undertaken. Generalized linear models were used to measure lithologic trends throughout the Ellsworth Formation in this core, ultimately showing a coarsening upward sequence overprinting cyclical deposition of detrital sediments. Furthermore, sub-millimeter oscillating grain size variations were observed in cuttings at a microscopic scale. Together, these observations indicate that the sediment source for the Ellsworth Formation delta complex was likely to the modern day north-northwest, as suggested by previous studies, and that the delta deposits transitioned from shallower water feldspathic silty shale to organic-rich clay-dominated strata in basinal settings. Future work should focus on deciphering the causes of cyclicity observed at microscopic, centimeter, and decimeter scale.

Ultimately, this study shows that there are distinct chemical and lithologic differences between the basin edge and central basin portions of the Ellsworth Formation, and these differences can be used to further understand the stratigraphy and paleoenvironmental history of the Michigan Basin.

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