

# Identification of Triggers for Organic Matter Accumulation of the Middle and Upper Devonian Horn River Shale, Canada

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The Horn River Shale is located in the Horn River Basin, a northwestern sub-basin of Western Canadian Sedimentary Basin, ranging from northwestern British Columbia to the Northwest Territories. The Horn River Group is deposited from the Givetian to early Frasian stage, time spanning 6 ~ 8 m.y. The Horn River Shale contains the Muskwa Formation, the Otter Park Member, and the Eive Member, unconformably underlain by the carbonate Keg River Formation.

We analyzed 78 core slabs from the EOG Tattoo core located in the distal area of the Horn River Basin and built a high-resolution geochemical database to identify triggers for organic matter (OM) enrichment in black shales. Because the normal sample spacing of drilled cores is ~ 1 m, whole-rock analyses may ignore geochemical signals of different thin lamina and are difficult to decouple the actual triggers for organic matter enrichment in shales from bulk geochemistry. Therefore, we applied ~ 1 – 2 mm resolution analysis by EDXRF from the nanoFab and hyperspectral imagery by Dr. Feng in our research.

Our work has led to high-resolution profiles based on EDXRF and hyperspectral imagery data. TOCs track consistently with biogenic Si or S/Fe in different sections (~ 8 – 12 cm) indicating that productivity or redox states affect organic richness. In some layers (less than 1 cm thick), dilution predominates during OM burial usually demonstrated by abrupt shifts to higher Al concentration with reducing TOC and biogenic Si concentration. Within some sections, Al concentration and ratios of K/Al and Ti/Al fluctuate sharply marking detrital sources change. A comparison of biogenic Si and S/Fe with TOC also uncovers interplays between productivity and redox conditions.

We are testing 100 more samples via EDXRF and hyperspectral imagery and will explore a correlation between the triggers for OM accumulation and the relative sea-level change.

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