

Microfacies and Trace Element Variation Across the Frasnian punctata Event Within the Bear Biltmore Drill Core (Alberta, Canada)

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ABSTRACT

Late Devonian oxygen isotope records show an increase in global sea surface temperature by as much as 9[°]C over the Frasnian stage (382.7-372.7 Ma), coincident with deposition of regional black shale horizons and global perturbation of the carbon isotope record. Previous studies of Devonian strata within the Western Canadian Sedimentary Basin have shown that pulses of terrestrial input during the mid-Frasnian punctata event are associated with increases in primary productivity and suboxic to anoxic marine conditions. Microfacies investigation and major and trace element measurement by XRF focused on understanding changes in sedimentation over 150ft of a single Frasnian section from northeastern Alberta. Unlike previously-studied Frasnian sections from western Canada, samples from the Bear Biltmore core (7-11-87-17W4) provide insight into more proximal reef to lower slope environments. Samples cover the middle to upper Frasnian within the Duvernay and Cooking Lake formations, including the globally recognized punctata carbon isotope excursion. Results show a transition from high reef influence to low reef influence, an increase in terrigenous input, and a deepening trend. In the lower part of the section, rounded to subangular, unlaminated reef-derived bioclastic wackestones to floatstones were deposited in a chaotic ramp environment. The section grades into a calm microbially-dominated ramp environment, concurrent with an increase in terrigenous input, primary productivity, and bottom water anoxia. After a brief change to primarily argillaceous sedimentation, the top of the section consists of largely unlaminated calcareous mudstone. While terrigenous input decreases, it does not return to the same low as at the start of the section.