

High Resolution Oxygen and Carbon Isotope Stratigraphy of Ordovician-Silurian Boundary on Anticosti Island

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Abstract

The Ordovician-Silurian (O-S) transition approximately 444 million years ago was a critical time in Earth history and marks the occurrence of a major mass extinction and a period of continental glaciation. The Ellis Bay Formation on Anticosti Island represents more than 100 meters of relatively undisturbed, continuous, ancient low latitude shallow water carbonate ramp deposits that span the Hirnantian epoch and terminate with the O-S boundary. In this study approximately 400 samples of micritic limestones were collected from six different sections ranging from proximal basin margin to more distal basin center. $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ isotopic ratios were measured from these samples and integrated within the existing sequence stratigraphic and biostratigraphic framework of the Ellis Bay Formation. The measured $\delta^{13}\text{C}$ values show a positive excursion ($\sim 2\text{‰}$) in the lower Ellis Bay formation followed by a larger excursion ($\sim 4\text{‰}$) in the upper Ellis Bay Formation. The $\delta^{13}\text{C}$ profile of the Ellis Bay Formation on Anticosti Island exhibits a pattern similar to those of other $\delta^{13}\text{C}$ profiles in graptolite-rich Hirnantian basinal successions from the rest of the world. The $\delta^{18}\text{O}$ values are more difficult to interpret as they may have been altered after deposition, although the deeper water strata on the west (distal) side of Anticosti appear to be less prone to diagenetic overprinting, and may provide a more reliable proxy. Our analysis of the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ records on Anticosti Island hopes to shed light on some important regional and global questions concerning the events of the O-S transition.