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Changes in the Style of Neritic Carbonate Production in the Tropics during the End-Ordovician Hirnantian Glaciation : atypical limestone facies from the Anticosti succession, eastern Canada

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During the End-Ordovician (Hirnantian) glacial maxima, carbonate platforms in the tropics were exposed extensively and their own diverse endemic faunas, displaced to the continental margins, suffered massive extinction. One of the best exposed and most complete stratigraphic records from a paleotropical area spanning the Ordovician/Silurian (O/S) boundary is on Anticosti Island in eastern Canada. The Anticosti sequence developed within a far-field Taconic foreland basin along the eastern margin of Laurentia under the influence of high tectonic subsidence and sustained carbonate sediment supply. Our biostratigraphically well-controlled δ13C curves and depth sensitive facies analysis allow us to recognize a distinctive Hirnantian stratigraphic architecture and its related sea level curve at the Milankovitch-cyclicity scales. The sudden appearance of abundant oncolites and calcimicrobial-coral reefs marks the Anticosti succession near the O/S boundary at the same time of a major faunal turnover (conodont, chitinozoan, acritarch, shelly faunas). These microbial limestones, a prominent regional marker unit on Anticosti Island known as the Laframboise Member, formed mainly during the peak interval and falling limb of the main Hirnantian positive isotopic carbon excursion. A comparison with the sequence stratigraphy of Morocco suggests that the Laframboise limestones correspond to the Late Ordovician glacial climax (middle to upper Hirnantian in age), characterised by a continental-scale ice sheet. A comparison between the Laframboise succession and other coeval shallow-water tropical successions in Laurentia, Avalonia, Baltica, Siberia and South China shows that the style of carbonate production changed from one derived largely from various carbonate secreting organisms to one dominated by widespread microbial and/or oolitic production. In contrast to the normal marine shelly faunas of pre- and post- extinction Hirnantian strata, shallow water tropical carbonates appear to be dominated by the widespread occurrence of microbial and/or abiotic deposits at a time of abrupt changes in oceanography, climate, and global carbon cycle during the Hirnantian interval.