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Is Global Anoxia an Alternative Cause for the Hirnantian Mass Extinction?

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Cooling and glacial episodes have long been considered the main driver of Late Ordovician-Silurian (mass) extinction events that coincide with δ13Ccarb excursions. However, emerging evidence for protracted cooling during most of the Ordovician and the misalignment between major regressions and faunal turnovers in the Upper Ordovician, suggests a more complex relation between glaciations and extinctions. Emsbo et al. (2010, GSA Abstracts with Programs) demonstrated dramatic enrichments in redox sensitive metals during the early Wenlock Ireviken extinction event and suggested ocean anoxia as an alternative kill-mechanism. Vandenbroucke et al. (2015, Nature Communications), built on this idea and recorded a similar increase of redox-sensitive metals at the onset of the mid-Pridoli extinction event, coinciding with peak abundances of malformed (teratological) fossil microplankton (acritarchs and chitinozoans). By analogy with metal-induced malformations in modern marine microplankton, teratology might serve as an independent proxy for monitoring changes in the metal concentration of the Palaeozoic ocean. These data from the Ireviken and Pridoli events are the foundation for the hypothesis that many, if not all, of these Late Ordovician-Silurian extinctions are caused by large-scale 'oceanic anoxic events'. Here, we are testing this hypothesis for the most devastating extinction event in this series, the Hirnantian mass extinction. Bulk rock samples spanning the Hirnantian strata of Anticosti Island were geochemically analysed. Our choice of sections is guided by the presence of teratological acritarchs (Delabroye et al., 2012, Rev. Pal. Pal.) that overlap the base of the extinction horizon. Revealing similar results as in our the previous studies, the new XRF data show distinct peaks in redox sensitive metals, supporting ocean anoxia and metal pollution as an important factor in the Hirnantian extinction, if not its fundamental cause.