A transient Baltic extinction pulse paused the start of the Ordovician radiations regionally

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The Great Ordovician Biodiversification Event (GOBE) is well-documented during the Middle Ordovician globally. This prolific burst of life occurred within multiple clades at the lowermost taxonomic levels, filling niches rapidly within just a few million years, mainly concentrated around the Darriwilian Age. Therefore, considerable research has been done to understand the conditions affecting the ambient environment at this time and there is thus now broad consensus that climatic cooling was a major facilitator driving the GOBE.

A new and complete-bed-by-bed appraisal of conodont species richness in the Hällekis quarry, Kinnekulle, southern Sweden, has been conducted. The biotic data is integrated with previously unpublished conodont oxygen isotope ($\delta^{18}O$) data, sampled at ~10cm increments, and whole rock carbon isotope ($\delta^{13}C$) data, at ~3cm increments, to provide detailed information about environmental conditions. The collective high-resolution data show a continuously rising conodont richness curve up through the *Lenodus antivariabilis* conodont zone before an overall richness peak is reached in the lowermost part of the succeeding *Lenodus variabilis* conodont zone. Hereafter a richness plateau is observed before a two-phased richness drop occurs in the upper half of the *L. variabilis* zone.

The oxygen isotope data from Hällekis corroborates a previously published microfacies-derived sea level curve from the same section and suggests most of the studied interval to be deposited during a relatively cold climate. The data further show that both the richness plateau and the subsequent extinction pulse occurred during colder climate when sea level was at its lowest level. As the richness data is range interpolated, any effects of facies change due to fluctuating sea levels should be minimal. This suggests that the extinction pulse is a true biotic signal.

The Hällekis quarry succession also tells the fascinating tale of an enhanced influx of micro-meteorites to Earth starting about 467 Ma. This extra-terrestrial dust has been associated with the breakup of the L-chondrite parent body (LCPB), and the contemporary stratigraphical level recording this event has been identified in the Hällekis succession. The LCPB event has been suggested to have had a fundamental influence on the GOBE, but this remains debated. As the inferred LCPB-related level occurs just after the conodont extinction pulse, within an overall cooling phase, we discuss potential connections between the influx of micro-meteorites and the regional conodont richness variations.

Keywords: Darriwilian, GOBE, Hällekis, conodonts, oxygen isotopes.