Can chitinozoan biostratigraphy of the Maquoketa Group (Illinois Basin, USA) help unravel the order of events leading up to the Late Ordovician mass extinction?

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Dynamic oceanographic changes during the Late Ordovician culminated in the second largest of the Phanerozoic's big five mass extinctions, eradicating greater than 85% of marine species. Marine sedimentary rocks from this interval feature a stable carbon isotope excursion with values exceeding 5‰, implicating a major perturbation to the global carbon cycle. Yet, a deep understanding of the mechanisms that drove this ancient event remain heavily debated. A detailed knowledge of the order of events and their environmental and biological characteristics is central to advancing understanding about this mass extinction.

The pristine nature and accessibility of the little studied Upper Ordovician Maquoketa Group in the US midcontinent offers an unparalleled opportunity to advance understanding of the Late Ordovician mass extinction. Deposited in the tropical Illinois Basin of interior Laurentia, the Maquoketa Group records a complex succession of facies changes that have thwarted previous stratigraphic studies. Yet, the abundant shales of the Maquoketa Group, now available from across the basin due to recent advances in access to subsurface drill cores, yield exceptionally well preserved organic-walled microfossils. In particular, chitinozoans provide great opportunity for improving biostratigraphic age assessment.

Currently thirty-six samples from the IGWS-440 drill core from northwestern Indiana (Newton County) are being analyzed for chitinozoan species distributions. The samples are producing a rich assortment of well-preserved chitinozoans, including a number of key species. The preliminary results show intriguing similarities and differences to other recently studied cores from closer to the basin margin. These data demonstrate tangible advances in revising the age assessment of the Maquoketa Group and are enabling coupled studies on the sequence stratigraphy, geochemistry and paleobiology of this interval to step closer unlocking the drivers of the Late Ordovician mass extinction.

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