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Middle Darriwilian carbon isotope excursion (MDICE) in the Ordos Basin, China and geochemical records of the Great Ordovician Biodiversification Event

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The Middle Ordovician Darriwilian Stage witnessed the worldwide positive carbon isotope excursion event–MDICE (Middle Darriwilian carbon isotope excursion) and the first acme of the Great Ordovician Biodiversification Event (GOBE). Evidently change on the seawater redox condition, paleoclimate and paloproductivity can be seen in this significant period. Here, we present an integrated geochemical analysis on the marine carbonates from the Ordos Basin, China to identify the MDICE and investigate the environmental change as well as organic matter burial conditions during this period. The MDICE record with the magnitude at ~1.5 ‰ is first documented from western part of the North China Plate-the Ordos Basin and is well-correlated with the global carbon isotope signatures (Figure 1)[1], [2],[3][4]. In the MDICE interval, enhanced paleoproductivity and nutrient input were traced by raised enrichment factors of P, Cu and Zn and gradually decreased $^{87}Sr/^{86}Sr$. The elevated ocean oxygenation indicated by RSTE (here: V, U, Mo, As) and bimetal ratios (U/Th, Ni/Co), as well as progressive cooling signal inferred by carbonate oxygen isotope are potentially driving factors of the major pulse of the GOBE (Figure 2). Combined with carbonate and organic carbon isotope signatures, an increased organic carbon burial fraction (f_{org}) was calculated during the MDICE, which might be primarily controlled by the influx of organic matter. As the first and major pulse of the GOBE, increased diversity in middle Darriwilian accompanied with the synchronous MDICE not only act as a prelude of the following significant diversification, but also shed light on the potential driving factors of the life-environment co-evolution event-GOBE.

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