High-resolution $\delta^{13}C_{carb}$ records from the Tarim Basin, northwestern China providing new insight into the Great Ordovician Biodiversification Event

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The Great Ordovician Biodiversification Event (GOBE) began ~470 Ma ago during the Early Ordovician, which was followed by the great Ordovician mass extinction (GOME) at the end of the Ordovician, ~ 444 Ma ago. The GOBE witnessed a spectacular increase in marine biodiversity at all taxonomic levels largely within the phyla established much earlier during the Cambrian Explosion. Usually, it is proposed that the GOME may have been triggered by climatic changes associated with the late Ordovician glaciation. In contrast, the cause of GOBE still remains unclear. According to the oxygen isotopic thermometry recorded in conodonts, it is suggested that climatic cooling after a super green house environment could trigger the GOBE in the Early Ordovician. If so, how did climatic cooling result from the green house environment in the Early Ordovician? We report patterns of isotopic variation in high-resolution $\delta^{13}C_{carb}$ records those were well preserved in drill-core samples from the Tarim Basin, northwestern China. Those data may provide new insights into the Ordovician global carbon cycle and climate changes related to the GOBE.

Based on oxygen isotope compositions, the strongly diagenetic alternation can be exclusive. The high-resolution carbon isotopic data from the Tarim Basin showed four positive excursions of $\delta^{13}C_{carb}$ values for the Ordovician. The positive $\delta^{13}C_{carb}$ excursions occurred in the Early-Middle Floian, the Early-Middle Dapingian, the Early Darriwilian, and the Middle-Late Katian, respectively. We find that the C-isotopic chemostratigraphy of the Tarim basin carbonate profiles can be correlated with C-isotopic records from contemporaneous sections globally, suggesting large perturbations of the global carbon cycle during the Ordovician. The positive $\delta^{13}C_{carb}$ excursions of ~2‰ in the Floian and the Dapingian were interpreted to have resulted from the enhanced burial rate of organic matter during the Early-Middle Ordovician that may have contributed to climatic cooling and played an important role in triggering the GOBE. Likewise, the $\delta^{13}C_{carb}$ increase of ~ 6‰ in the Darriwilian to Katian suggests another episode of elevated organic carbon burial rates in the global carbon cycle during the late Middle and early Late Ordovician.