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A high-resolution CO_2 record for the late Pliocene intensification of northern hemisphere glaciation

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The intensification of Northern Hemisphere Glaciation (iNHG), ~3.0-2.5 million years ago, marks the beginning of the recent massive bipolar glaciations that have characterized Quaternary climate. iNHG represents the culmination of Cenozoic cooling and is marked by the development of ice sheets in the northern hemisphere that waxed and waned with changes in insolation. Recent evidence suggests that changes in atmospheric CO_2 were the primary driver of iNHG but the precise nature of its role is unsettled. Published records are of insufficient resolution to adequately assess the relationship between changes in orbit, CO_2, and global climate cycles. The boron isotope pH proxy has shown promise when it comes to accurately estimating past absolute CO_2 concentrations and success at reconstructing the relative changes in CO_2 outside of the ice core records (Hain *et al.* 2018). Here we present a new high-resolution record of atmospheric CO_2 (1 sample per 3 kyr) change from Ocean Drilling Program Site 999 (12.74˚N, -78.74 ˚E) spanning ~2.3-3.0 Ma based on the boron isotope ($\delta^{11}B$) composition of planktic foraminiferal calcite from *Globingerinoides ruber* (senso stricto, white). We find that $\delta^{11}B$ values of *G. ruber* describe a clear glacial-interglacial cyclicity and exhibit a substantial reduction in CO_2 ~2.7 Ma. Our new record demonstrates the importance of CO_2 in amplifying the effects of astronomical forcing on climate associated with the development in the northern hemisphere of large ice sheets that advanced into the mid-latitudes during glacials and provides new insight into the drivers and consequences of natural CO_2 change.