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High resolution CO2 record of the great Plio-Pleistocene glaciations using boron isotopes

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The intensification of Northern Hemisphere glaciation (iNHG) at 3.4-2.5 million years ago (Ma) represents the last great transition in Cenozoic climate state with the development of large scale ice sheets in the Northern Hemisphere that waxed and waned with changes in insolation. Declining atmospheric CO_2 levels are widely suggested to have been the main cause of iNHG but the CO_2 proxy record is too poorly resolved to provide an adequate test of this hypothesis. The boron isotope-pH proxy, in particular, has shown promise when it comes to accurately estimating past CO_2 concentrations and is very good at reconstructing relative changes in CO_2 on orbital timescales. Here we present a new orbitally resolved record of atmospheric CO_2 (1 sample per 3 kyr) change from Integrated Ocean Drilling Program Site 999 (12.74˚N, -78.74 ˚E) spanning ~2.6–2.4 Ma based on the boron isotope ($\delta^{11}B$) composition of planktic foraminiferal calcite, *Globingerinoides ruber* (senso stricto, white). We find that $\delta^{11}B$ values of *G. ruber* show clear glacial-interglacial cycles with a magnitude that is similar to those of the Mid-Pleistocene at the same site and elsewhere. This new high-resolution view of CO_2 during the first large glacial events of the Pleistocene confirms the importance of CO_2 in amplifying orbital forcing of climate and offers new insights into the mechanistic drivers of natural CO_2 change.