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SE Pacific carbonate, carbon and oxygen isotope evolution over the past 1 Ma and its global implications

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Observations of carbon and oxygen stable isotopic compositions of planktonic and benthic foraminifera in addition to calcium carbonate and TOC contents in a one Ma record from the SE Pacific (GeoB 3388-1, 25˚S, 75˚W, 3560 m water depth) provide insights into the shallow and deep-water characteristics from this part of the world ocean as well as in the long-term trends in the oceanic carbon reservoir.

Both planktonic and the benthic foraminiferal carbon isotope records show a 100 kyr cyclicity after the Mid-Pleistocene Transition (MPT), with lower glacial values prior to the Mid-Bruhnes Event (MBE, 350-550 ka, MIS 10-13), and highest glacial-interglacial fluctuations during the MBE. The strong correlation between the planktonic and the benthic foraminiferal carbon isotope records traces the oceanic carbon reservoir and the carbonate ion concentration on a glacial-interglacial timescale. After the onset of the MBE, lower carbon isotopic difference ($\Delta\delta^{13}$C) between planktonic and benthic foraminifera points to a better ventilation of the ocean indicative for a stronger NADW production after the MBE. Comparison of our benthic foraminiferal carbon isotope data with ODP cores from the Eastern and Western Equatorial Pacific (ODP 846, 849, 806), Southern Ocean (ODP 1090) and North Atlantic (ODP 607) supports this indication, with increasing deviation of the Pacific values and the North Atlantic values after 450 ka. In addition, lower $\Delta\delta^{13}$C between SE Pacific and North Atlantic during glacials and between SE Pacific and Southern Ocean during interglacials reflect the variations in the strength of the NADW on a glacial-interglacial scale. After 220 ka, the $\Delta\delta^{13}$C between SE Pacific and other Pacific cores dropped to values around zero pointing to a basin-wide expansion of the modern Pacific Deep

Water. Interestingly, the timing of all the above-mentioned changes falls within the periods of weak orbital forcing.

Whilst the benthic oxygen isotopic record shows a 100 kyr cyclicity, the planktonic oxygen isotopic record and the calcium carbonate content illustrate a 200-250 kyr periodicity. The calcium carbonate contents show a continuous decrease towards the present, with increasing values during glacials and decreasing values during interglacials. These findings imply that carbonate preservation and compensation respond strongly to sea-level-induced changes.