Influence of Southern Ocean Intermediate Water on productivity in the eastern equatorial Pacific on orbital timescales

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The eastern equatorial Pacific (EEP) is one of the key areas for studying oceanic processes that control atmospheric CO_2 concentrations. Southern-sourced water masses (SOIW) are thought to stimulate the biological pump in the EEP and hence contributed to the CO_2 drawdown during glacial times. Orbital forcing in combination with local feedback mechanisms are assumed to be the main driver for this water mass advection. Newest studies, however, question the capability of SOIW to stimulate primary productivity during Marine Isotope Stage 2 (MIS2), as nutrients are rather utilized in the Southern Ocean. Instead, nutrient-rich Glacial North Pacific Intermediate Waters (GNPIW) seem to be a major component of water masses upwelled in the EEP to enhance productivity in the EEP during MIS2.

We present changes in biological productivity in the EEP over the last 190 ka derived from surface-dwelling planktic foraminifera *Globigerinoides ruber* and deep-dwelling planktic foraminifera *Globorotaloides hexagonus* (ODP Site 1240). The $\delta^{13}C$ gradient between surface and sub-thermocline ($\Delta\delta^{13}C_{rub\text{-}hex}$) has been used to assess export production in that area. We compare this with variations in the nutrient gradient ($\Delta\delta^{13}C_{hex\text{-}SOIW}$) between sub-thermocline equatorial waters (~350 m) and SOIW. The $\Delta\delta^{13}C_{hex\text{-}SOIW}$ variability is dominated by 100 kyr and 23 kyr cycles. This implies a strong response to changes in orbital precession and internal climate forcing related to major changes in ice volume. At times of low precession the difference between the nutrient concentrations of EEP waters and nutrients delivered via SOIW differ substantially, thus indicating that SOIW is not providing sufficient nutrients to stimulate productivity in the EEP. This scenario is most prominent during MIS2 and MIS6. Following the interpretation by Max et al. (submitted) we speculate that similar to MIS2, nutrients were trapped in the Southern Ocean also during MIS6 leaving northward-advected SOIW rather nutrient-depleted. Similar to MIS 2, we assume a greater contribution and hence, influence of nutrients from GNPIW on the productivity of the EEP during MIS6. A switch from GNPIW to SOIW influence of water masses upwelled in the EEP is recorded during glacial terminations.