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Mechanisms behind primary production distribution during the last glacial-interglacial cycle

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Reconstructions of past climates are possible through the analysis of organisms contained in marine and terrestrial sediments. Most of the paleorecords depend on biological processes, e.g. production of shells for coccolithophorids in the ocean, and these processes are sensitive to climate fluctuations from seasonal to orbital timescales. Consequently, depending on where and when the organisms that record climate conditions lived in the past, different factors may have influenced their abundance, their functioning, and thus it may bias interpretations of paleodata. In this context, it is necessary to evaluate the response of paleorecorders to climate variability at different timescales. In order to do so, we are using the coupled Earth System Model IPSLCM5A, which has a biogeochemical component PISCES that simulates primary production. We use 9 climate simulations of the IPSL-CM5A model, from -80kyr BP climate conditions to a preindustrial state. Thanks to different forcing conditions of these simulations we are able to disentangle the effects of precession changes from those of obliquity, sea level or gases concentrations. The objectives are to characterize the mechanisms behind the observed changes in primary production between the different time periods. The results of this modeling study will also be compared to reconstructed productions in the Indian, West and East Tropical Pacific Oceans obtained from core sediments with the method described in Beaufort et al. 1997. The early results on seasonal cycles show that, in the Indian Ocean, precession is not the main driver of changes in primary production. Indeed, we observe a grouping between simulations having the same sea level, which suggests that changes in primary production are more sensitive to parameters that define glacial-interglacial conditions such as ice sheets which affect oceanic circulation.