800,000 years of stable export productivity across the Equatorial Pacific

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The large glacial to interglacial fluctuations in the atmospheric CO_2 concentrations during the late Pleistocene have been attributed to changes in the oceanic carbon system. In order to discern the coupling between ocean circulation, productivity and climate, numerous studies have attempted to estimate past ocean productivity and to develop proxies to reconstruct the history of ocean productivity from marine sediments.

One of the key areas is the Equatorial Pacific. The most prominent feature of the Equatorial Pacific is the upwelling of CO_2-rich subsurface water which creates the largest natural source for the net CO_2-flux from the ocean to the atmosphere. The rich nutrients brought up by the upwelling water promote phytoplankton growth, making it one of the major sites of organic carbon export to the deep sea. Export productivity in this region represents a significant part of the global ocean carbon cycle. Thus, the Equatorial Pacific has been suggested to have a major influence on global climate via feedbacks involving CO_2.

Conventionl wisdom holds that oceanic productivity was substantially greater during glacilas than during interglacials. This view is to a large extent based on age-model derived mass accumulation rates of productivity-indicating/biogenic sedimentary components.

Proxies with relatively constant input functions, such as excess Thorium-230 and extraterrestrial Helium-3, provide the opportunity to reconstruct the variability of past oceanic productivity independent from age-model derived mass accumulation rates. Here we present an overview of records of export productivity over the past 800kyr on a regional scale, from the eastern equatorial Pacific (ODP site 849), the central equatorial Pacific to the Ontong Java Plateau. The various records provide internally-consistent results, revealing relatively constant export productivity signals across the equatorial Pacific. In contrast to the conventional view, our constant flux proxy-based reconstructions support a scenario of relatively stable conditions throughout the entire late Pleistocene.