Icehouse orbital climate variability and biotic response

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During the Miocene, the Earth's climate transitioned from an extended phase of global warmth (mid Miocene climatic optimum) into a colder mode with the establishment of a permanent and stable East Antarctic Ice Sheet (EAIS). Despite extensive studies of benthic foraminifera, existing planktonic foraminiferal records for this interval are scarce and/or of low resolution. Consequently, the impact of global warming and cooling on tropical surface waters and the propagation of orbital cycles in the Earth System are unknown. Integrated Ocean Drilling Program Expedition 320/321 recovered lower-middle Miocene sediments from the eastern equatorial Pacific Ocean with high sedimentation rates (30m/myr), continuous recovery, and orbital cyclicity. At Site U1338 planktonic foraminifera are abundant and diverse in the lower and middle Miocene sediments and exceptionally well preserved. Scanning electron microscope studies revealed open pore spaces, little evidence of calcitic overgrowth on the wall surface (Fox and Wade, 2013). Here I present the first high-resolution (3 kyr) astronomically-tuned stable isotope record of planktonic foraminifera for the eastern equatorial Pacific Ocean (16.5–13.5 Myr). These data provide exciting new information on sea surface conditions and primary productivity changes in the tropics during the middle Miocene and sheds new light on the middle Miocene climatic transition (MMCT), associated carbon-isotope excursion and biotic response (Fox et al., in preparation).