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Middle to Late Eocene Carbonate Accumulation Events in the Equatorial Pacific – new geochemical records from IODP Exp 320/321 and ODP Leg 199

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During the late Eocene seven Carbonate Accumulation Events (CAEs) at ODP Site 1218 and 1219 in the equatorial Pacific have been identified, each characterized by high-carbonate burial, a relatively deep Carbonate Compensation Depth (CCD), and oxygen isotope values demonstrating relatively cool global conditions. The main driver for the CAEs was interpreted to represent different carbon reservoirs in the carbon cycle interacting with climate (Lyle et al., 2005, Proc. ODP, Sci. Results, 199). However, the data resolution was limited and a precise age model was still lacking both essential to unravel the ultimate causes of the CAEs as well as their potential relation to orbital cycles.

Here we present Ca and Fe intensity data from XRF core scanning of more than 1200 meters of sediment from IODP Exp. 320 (Sites U1331-U1334) and ODP Leg 199 (Sites 1218-1220) spanning magnetic polarity chrons C13n to C20n (34 to 44 Ma). Ca elemental intensity data have been transferred into carbonate records using $CaCO_3$ values analyzed on discrete samples. This comprehensive dataset proofed to be ideal to reconstruct carbonate content at unprecedented resolution. The depth transect including seven sites significantly contributes to an improved spatial view of the CAEs in the equatorial Pacific and reveals a highly dynamic middle to late Eocene environment. The CAEs are expressed as sharp carbonate concentration fluctuations at $\sim$35, 37.5, 39, 41, 44, 46 Ma across Sites U1331-U1334 and 1218, followed by a sharp transition into much higher carbonate accumulation rates from the Eocene into the Oligocene. In combination with a newly developed cyclostratigraphic age model our new depth transect indicates that the CAEs might be related to fluctuations in the very long eccentricity cycle suggesting a close connection to long-term variations in the carbon cycle.