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Early Oligocene glaciation and productivity change in the eastern equatorial Pacific

Helen Coxall (1,2) and Paul Wilson (3)

(1) School of Ocean and Earth Sciences, Cardiff University, Cardiff, UK (coxallh@cardiff.ac.uk), (2) Department of Geology and Geochemistry, Stockholm University, Stockholm, Sweden (helen.coxall@geo.su.se), (3) National Oceanographic Centre, University of Southampton, Southampton, UK (paw1@noc.soton.ac.uk)

We have exploited the exceptional Eocene-Oligocene (E-O) deep sea sediment record from Ocean Drilling Program Site 1218 in the eastern equatorial Pacific (EEP) to generate new and improved climate proxy records to help better understand the timing and interplay of ocean, biosphere and climate system responses associated with the Eocene-Oligocene transition. A new infaunal benthic foraminifera (*Oridorsalis umbonatus*) stable isotope record confirms the robustness of the $\sim$1.6‰ amplitude increase in benthic δ^{18}O close to the E-O boundary reported previously based on epifuanal benthics (*Cibicidoides* spp., Coxall et al., 2005). Offsets between infaunal and epifaunal isotopic records are not consistent and show a progressive $\sim$0.4‰ decrease in $\Delta\delta^{18}$O and 0.5‰ increase in $\Delta\delta^{13}$C from the late Eocene through the early Oligocene, implying contemporaneous changes in pore water chemistry driven by climatically induced fluctuations in organic flux to the seafloor and/or changes in porewater carbonate ion concentration. Our new benthic foraminifera accumulation rate (BFAR) record for the study interval suggests a 2-3 fold increase EEP productivity that began during the E-O transition and culminated during peak early Oligocene glacial conditions. Close correlation of the Site 1218 BFAR record with published records of opal accumulation from the Southern Ocean suggests that the two are related. One explanation for the observed link is that increases in EEP productivity reflect variations in the nutrient chemistry of upwelling subsurface water derived from a subantarctic source. Therefore, forcing by high latitude rather than local (low latitude) processes may have driven productivity variations in the eastern equatorial Pacific. Alternatively, or in combination, Southern Ocean and EEP upwelling could have been driven by global increases in upwelling strength due to the intensification of circumpolar and equatorial winds during the glacial maximum. If the inferred change in supply and/or chemistry of upwelled water included an increase in the delivery of CO_2 charged deep water, upwelling changes in the EEP may have contributed to the temporary rise in atmospheric CO_2 associated with the initiation of Antarctic glaciation (Pearson et al., 2009).