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Orbital forcing of early Eocene hyperthermal events: A new benthic foraminiferal record from the Indian Ocean, 50-51 Ma

Nicola Kirby[1], Sietske Batenburg[2], Melanie Leng[3], Tom Dunkley Jones[1], and Kirsty Edgar[1]
[1]Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom
[2]Department of Earth and Ocean Dynamics, Universitat de Barcelona, Barcelona, Spain
[3]NERC National Environmental Isotope Facility, British Geological Survey, Nottingham, United Kingdom

The early Eocene greenhouse climate is characterised by a series of 'hyperthermal' events, defined by transient negative excursions in marine carbonate carbon and oxygen isotopes. Proxy records of the larger magnitude hyperthermal events are consistent with massive carbon release to the ocean-atmosphere system and associated with global warming and ocean acidification. Such events therefore represent the best analogues for current anthropogenic climate change. However, the causes and nature of smaller early Eocene hyperthermals, particularly through the early Eocene Climatic Optimum (EECO), are less well understood. We know that hyperthermal events are paced by the 100 kyr (short) and 405 kyr (long) eccentricity cycles, indicating that Earth's orbital parameters play a key role in driving carbon cycle perturbations, but the precise forcing mechanisms remain unclear. Additionally, few continuous records of the smaller, orbitally-paced hyperthermals exist and there have been no published high-resolution climate records from the Indian Ocean so far from this interval. High-resolution records across the full spectrum of hyperthermal events and from multiple ocean basins are needed to fully identify their cause(s). Here, we constrain the nature and magnitude of environmental change during hyperthermal events O-T in the Indian Ocean using a new, high-resolution benthic stable isotope record from IODP Expedition 369 Site U1514, Indian Ocean, from 50-51 Ma. Using spectral analysis techniques, we identify the dominant periodicities in the benthic stable isotope record and investigate the phasing between stable isotopes and other environmental records from Site U1514, including sedimentary Ca/Fe. We compare the Site U1514 stable isotope record with environmental records across this time interval from other sites to determine the synchronicity of climate and carbon cycle changes between different ocean basins, aiming to further examine the forcing mechanisms of these early Eocene hyperthermal events.