Revisiting Cenozoic deep ocean temperatures using clumped isotope thermometry

V.E. Taylor[1], A.N. Meckler[1]

[1]Department of Earth Science, Bjerknes Centre for Climate Research, University of Bergen, Bergen, Norway

To understand how the Earth system will operate under higher-than-present-day atmospheric carbon dioxide concentrations we must look to the geological record. On multi-millennial and longer timescales, deep-sea temperatures are thought to provide good indications of global climate. Yet, reconstructing reliable deep-sea temperatures throughout the Cenozoic is challenging. Our current understanding relies heavily on proxy records such as benthic foraminiferal stable oxygen isotopes, which reflect not only temperature, but are also affected by changes in the composition of seawater. Here we present records of deep-sea temperature change using clumped isotope thermometry, which permits explicit temperature reconstructions independent of seawater chemistry. We focus on pivot points in Cenozoic climate history, such as the abrupt onset of large-scale Antarctic glaciation approximately 34 million years ago, where the effects of non-thermal influences on more classical palaeothermometers are most acute. Many of our clumped isotope-derived temperature estimates suggest that deep-sea temperatures may have been warmer, and more spatially and temporally variable, than previously suggested. Clumped isotope thermometry thereby provides new opportunities to gain better insights into the evolution of ocean temperature and ocean circulation through time.