Pushing the proxies: Preservation, precision, & processes

C.H. Lear[1], A. Kennedy-Asser[2], S. Conn, E. Gasson[3], E. John[1], D. Liebrand[4], S, Slater[1], A. Thomas-Sparkes[1], V. Taylor[5], T. van Peer[6], P. A. Wilson[7], Z. Yang[1]

[1]School of Earth and Environmental Sciences, Cardiff University, Cardiff, UK
[2]School of Geographical Sciences, University of Bristol, Bristol, UK
[3]School of Geography, University of Exeter, Penryn, UK
[4]Department of Earth and Environmental Sciences, The University of Manchester, UK
[5]Department of Earth Science and Bjerknes Centre for Climate Research, University of Bergen, Bergen, Norway
[6]School of Geography, Geology and the Environment, University of Leicester, Leicester, UK
[7]School of Earth and Ocean Sciences, University of Southampton, Southampton, UK

Future sea level change is one of the most serious, and yet poorly constrained, impacts of anthropogenic climate change. One of the issues is the lack of observational data of very slow, glacial processes, which makes them difficult to parameterise accurately in ice sheet models. Some attempts have therefore been made to "tune" ice sheet models using palaeoclimate records, and to use these tuned models to project future sea level rise. However, these projections are somewhat controversial, largely because of the uncertainties associated with the past sea level reconstructions. One way to reconstruct past changes in ice volume is through paired δ^{18}O-Mg/Ca paleothermometry, but the uncertainties in this approach have been estimated to be equivalent to half the mass of the modern Antarctic Ice Sheet, severely limiting the usefulness of this technique. Here I present our recent work improving the Mg/Ca palaeothermometer, which has reduced these uncertainties several fold. I also present some intriguing geochemical data and modelling results from the Oligocene-Miocene Transition (~23 million years ago), which casts some doubt on the traditional way we view the evolution of Earth's Cryosphere as a simple progression from greenhouse to unipolar icehouse, to bipolar icehouse conditions.