Boron based reconstruction of atmospheric CO$_2$
during the Plio-Pleistocene

Elwyn DE LA VEGA $^{1}$, Robin GLEDHILL $^{1}$, Thomas B. CHALK $^{1}$, Paul A. WILSON $^{1}$, Gavin L. FOSTER $^{1}$

$^{1}$Ocean and Earth Science, National Oceanography Centre
Southampton, University of Southampton, Southampton
SO14 3ZH, UK

In the context of present global warming, understanding the response of climate to changes in atmospheric CO$_2$ is an urgent requirement. Investigating past climate conditions is necessary to explore how climate responded to CO$_2$ variations close to modern levels. To exploit this palaeoclimate archive, we need reliable methods for reconstructing CO$_2$ beyond the ice-core record into intervals during which global warmth approached that projected for the future (such as the warm Pliocene and the Early Eocene Climatic Optimum). The boron isotope proxy applied to foraminiferal calcite is one of the most promising proxies for reconstructing past CO$_2$ but it has been validated against the ice-core CO$_2$ record only in a few locations and at limited temporal resolution (typically lacking the full orbital cycles). The first step of this study is to rigorously test the performance of the boron isotope-CO$_2$ proxy against the ice-core record where past CO$_2$ is known with high confidence. Secondly, we aim to reconstruct CO$_2$ over a key period of global warmth: the mid Pliocene from marine isotope stages M2 to KM3 (3300-3150 ka). We present results of CO$_2$ data calculated from boron isotopes measured on the planktic foraminifer *Globigerinoides ruber* at different locations (ODP 871 and ODP 999) with the aim of generating a multi-site, sub-orbitally resolved boron isotope-based CO$_2$ record for the Plio-Pleistocene.