Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.7345

The interglacial-glacial sequence of events at the Agulhas Plateau: Antarctic icebergs lead ocean circulation into ice ages and across the Mid-Pleistocene Transition

AIDAN STARR[1], IAN R. HALL[1], STEPHEN BARKER[1], SIDNEY HEMMING[2], THOMAS RACKOW[3], XU ZHANG[3], H.J.L VAN DER LUBBE[4], GREGOR KNORR[3], MELISSA BERKE[5], GRANT R. BIGG[6], ALEJANDRA CARTAGENA-SIERRA[5], FRANCISCO JIMENEZ-ESPEJO[7], XUN GONG[3], JENS GRUETZNER[3], NAMBIYATHODI LATHKA[8], LEAH LEVAY[9] AND MARTIN ZIEGLER[10]

[1]Cardiff University
[2]Columbia LDEO
[3]AWI
[4]Vrije Universiteit Amsterdam
[5]University of Notre Dame
[6]University of Sheffield
[7]University of Granada
[8]NCAOR
[9]Texas A&M University
[10]Utrecht University

Presenting Author: StarrA1@cardiff.ac.uk

Palaeoceanographic evidence suggests that glacial periods of the Mid to Late Pleistocene were characterized by markedly different global ocean circulation patterns to modern; in the Atlantic basin, deep waters of Southern Ocean origin increased in volume while above them the core of the North Atlantic Deep Water (NADW) shoaled. Whilst proxy records and modelling efforts continue to clarify this picture, an evidence alluding to the origin of this phenomenon remains elusive. Because of this, our understanding of the sequence of events leading to global glacial conditions remains incomplete. Here we present multi-proxy evidence showing that northward shifts in Antarctic iceberg melt in the Indian–Atlantic Southern Ocean (0–50°E) systematically preceded deep-water mass reorganizations by 1-2 thousand years during Pleistocene-era glaciations. With the aid of iceberg-trajectory model experiments, we demonstrate that such a shift in iceberg trajectories during glacial periods can result in a considerable redistribution of freshwater in the Southern Ocean. This, in concert with increased sea-ice cover, may have enabled positive buoyancy anomalies to effectively escape into the ‘upper’ Atlantic overturning circulation limb, providing a teleconnection between surface Southern Ocean conditions and the formation of NADW. Furthermore, we observe a distinct obliquity pacing of Antarctic iceberg melt both preceding and following the Mid-Pleistocene Transition, become obscured during this interval. With new and existing data we investigate the evolution of orbital forcing at the Agulhas Plateau, considering the implications for ‘Southern Escape’ of freshwater as a key feedback in the transition to the ‘100-kyr world’.