Geophysical Research Abstracts
Vol. 17, EGU2015-10604, 2015
EGU General Assembly 2015

Pliocene ice sheet collapse in the Aurora Subglacial Basin, East Antarctica?

Yvonne Smith (1), Daniel Hill (1), Aisling Dolan (1), Alan Haywood (1), and Carys Cook (2)

(1) School of Earth and Environmental Sciences, University of Leeds, Leeds, UK, (2) Geological Sciences, University of Florida, Gainesville, FL, USA

The Aurora Subglacial Basin (ASB) is a deep basin underlying the East Antarctic Ice Sheet (EAIS), which remains below sea level even if the ice is removed. Although the EAIS is generally considered to be stable, models suggest that the ASB is one of the more vulnerable areas of East Antarctic ice. New marine evidence is emerging of ice sheet collapses in vulnerable marine basins of East Antarctica during warm periods of the Pliocene (5.3 – 2.6 million years ago), specifically the Wilkes Subglacial Basin and the ASB. This contrasts the long-standing terrestrial evidence from the Dry Valleys and wider Transantarctic Mountains, showing landscape and climatic stability since the middle Miocene. This terrestrial evidence has been used to infer that the EAIS has been large and in a similar state to today for at least 10 million years.

Local geomorphology evidence suggests that the ASB experienced significant periods of erosion and deposition, with at least 2 stable ice sheet configurations with large grounding line retreats. However, whether these configurations were experienced after the large scale advance of the ice sheet in the Miocene is unclear from the remotely sensed data. Fortunately, further evidence of a fluctuating EAIS is found in marine cores. Ice rafted debris (IRD) carries a chemical signal from the iceberg source area to the site at which it is deposited in the marine sediments. Plio-Pleistocene IRD at ODP Site 1165, in the Prydz Bay region, has been found to contain both a local provenance signal and one originating from the Wilkes Land sector of the EAIS, which contains the ASB. A relatively high resolution section of the record from the early Pliocene shows high levels of variability from nearly 40% of IRD from Wilkes Land to no Wilkes Land signal.

Increases in sea surface temperature and iceberg melting could account for much of the late Pliocene variability, but this is significantly less than that of the early Pliocene. Here we present new coupled climate – iceberg modelling of a series of Pliocene EAIS retreat scenarios and their impact on the provenance of icebergs reaching ODP Site 1165. Modest retreat scenarios produce little impact on the volume of icebergs reaching the Prydz Bay region, suggesting either large scale retreats of the ice sheet or the loss of the calving front over a large area of the Wilkes Land coastline.