Geophysical Research Abstracts
Vol. 19, EGU2017-11492, 2017
EGU General Assembly 2017

New high-resolution record of Holocene climate change in the Weddell Sea from combined biomarker analysis of the Patriot Hills blue ice area

Christopher Fogwill (1,2), Chris Turney (1,2), Andy Baker (1,2), Bethany Ellis (3), Alan Cooper (4), David Etheridge (5), Mauro Rubino (6), David Thornton (5), Francisco Fernando (7), Michale Bird (8), Niels Munksgaard (8,9)

(2) Climate Change Research Centre, University of New South Wales, Climate Change Research Centre, BEES, Sydney, Australia (c.fogwill@unsw.edu.au), (1) PANGEA Research Centre, University of New South Wales, Climate Change Research Centre, BEES, Sydney, Australia , (3) Research School of Earth Sciences, Australian National University, Canberra, Australia, (4) Australian Centre for Ancient DNA, University of Adelaide, 5005, Australia, (5) CSIRO Oceans and Atmosphere, Aspendale, Victoria, 3195 Australia, (6) Dipartimento di Matematica e Fisica, Seconda Università di Napoli, viale Lincoln, 5-81100 Caserta, Italy, (7) Univeridad Andres Bello, Vina del Mar, Chile, (8) Centre for Tropical Environmental and Sustainability Science, College of Science, Technology and Engineering, James Cook University, Cairns, Australia, (9) Research Institute for the Environment and Livelihoods, Charles Darwin University, Australia

We report preliminary analysis of biomarkers (including dissolved organic matter (DOM) and DNA) from the Patriot Hills blue ice area (BIA), from the Ellsworth Mountains in the Weddell Sea Embayment. Preliminary isotopic and multiple gas analysis (CO_2, CH4, N2O and CO) demonstrate that the Holocene comprises more than 50% of the 800m long BIA record, and in combination isotopic and biomarker analysis reveals a remarkable record of centennial variability through the Holocene in this sector of the Weddell Sea.
Analysis using a Horiba Aqualog - which measures the fluorescence of DOM by producing a map of the fluorescence through an excitation-emission matrix (EEM) - identifies the presence of two marine protein-like components in both modern snow pit samples and within the Holocene part of Patriot Hills BIA transect. Intriguingly, the modern seasonal trends in DOM, recorded in contemporary snow pits, have relatively low signals compared to those recorded in the mid-Holocene record, suggesting a reduction in DOM signal in contemporary times.
Given that the δD excess data suggests the source of precipitation has remained constant through the Holocene, the biomarker signal must relate to multi-year marine productivity signals from the Weddell Sea. The marked variability in DOM between the mid-Holocene and contemporary times can only relate to periods of sustained, enhanced biological productivity in the Weddell Sea associated with shifts in Southern Annular Mode, sea ice variability, changes in ventilation or polynya activity. Here we discuss the possible drivers of these changes and describe how this approach at this BIA could benefit conventional ice core records regionally.