Insights on WAIS history from a high-resolution Eemian record collected at the Allan Hills Blue Ice Area, Antarctica

Spaulding, Nicole E.[1], Kurbatov, Andrei V.[1], Higgins, John A.[2], Mayewski, Paul A.[1], Bender, Michael L.[2] and Introne, Douglas S[1].
1: Department of Earth Sciences and Climate Change Institute, University of Maine, Orono, Maine, USA
2: Department of Geosciences, Princeton University, Princeton, NJ, USA

The Allan Hills Blue Ice Area (AH BIA), located on the western flank of the Convoy Range of the Trans-Antarctic Mountains, has been suggested on the basis of meteorite terrestrial ages and ice flow modeling to contain ice of great antiquity. Here we present the first direct evidence that ice from the last (MIS 5 - Eemian) and penultimate (MIS 7) interglacials is exposed at the surface of the icefield. Ice age in the AH BIA was determined through stratigraphic correlation of two stable water isotope (δD) records from the area with established deep core records like EPICA Dome C (EDC). The first AH BIA δD record consist of measurements from samples collected every 10 m, from 5-7 cm depth, along an ~ 5.5 km transect through the main icefield; the second δD record is composed of 15 cm resolution measurements from a 225 m core drilled at the mid-section of the same transect. The correlation between these records and EDC is supported by trapped gas measurements, including $^{40}Ar_{atm}$ ages and $d^{18}O$ measurements from both the 225 m core and a series of ~15 m ice cores collected along the transect.

Preliminary glaciochemical data from four locations along the transect suggest that the chemical characteristics of glacial/interglacial climates has also been preserved in the ice. Trace element (S, Al, Ca, Mn, Fe, Co, Cu, Zn, Cd, La, Ce, Pr, Nd, Sm, Eu, To, Dy, Ho, Er, Yb, Lu, Pb) concentrations are highest in the sample collected near the glacial extreme of MIS 6 and lowest in the sample from MIS 7. Major ions ratios (SO_4^{2-}/Na^+, Ca^{2+}/Na^+, Cl^-/Na^+) from these samples also show differences that may be indicative of changing sea ice cover. The glaciochemical patterns, as well as secondary trends within the δD record, have the potential to increase our understanding of changes in Eemian sea ice extent and atmospheric circulation.