Glacial Antarctic Warm events as Captured by RICE ice cores

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Abstract

The last glacial period in Antarctica is punctuated by several episodes of warm events, when air temperature rose between 1-3 degree Celsius, which are referred to as 'Antarctic Isotope Maxima' (AIM) events. The correlation of high resolution Antarctic and Greenland ice core records show an out of phase relationship for AIM events with their Northern Hemispheric counterparts, the Dansgaard / Oeschger Events. This out of phase relationship is called the 'Bipolar seesaw' (Broecker,1998). Possible explanations include oceanic teleconnections via a shift in strength of the Atlantic Meridional Overturning Circulation (AMOC) and Antarctic Bottom Water (AABW) formation. A recent comparison between the WAIS Divide and NGRIP records identified a Northern Hemisphere lead of 218±92 years and 208±96 years for the onset and termination of Dangaard/Oeschger (DO) and AIM events adding to the argument of an important oceanic role in the inter hemispheric energy distribution.

Roosevelt Island is a local ice rise at the northern edge of the Ross Ice Shelf. A 764m deep ice core, the Roosevelt Island Climate Evolution (RICE) core, was obtained over two seasons in 2011/12 and 2012/13 field seasons. Due to its proximity to the Ross Sea, one of the major contributors of AABW, the RICE records have the potential to provide new insights into the drivers and consequences during the evolution of AIM events.

Here, we will present preliminary results of the major ion chemistry of RICE ice core for AIM events during 60-18 ka. The major ion chemistry of the core will be used to reconstruct the ocean conditions, including sea ice extent and primary productivity and changes in atmospheric circulation patterns, such as strength and latitudinal shift of circumpolar westerlies and the strength of katabatic winds in the Ross Sea region.

Keywords: Antarctic Isotope Maxima, Bipolar see saw, Roosevelt Island, Major ion record.

References: Broecker, W.S., 1998. Paleocean circulation during the Last Deglaciation: A bipolar seesaw? Paleoceanography, 13(2):, 119-121.