

Ice Core Records of Antarctic Warming Events in the Last Glacial Period

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During the last glacial period, twenty-five abrupt climate change events, which are called Dansgaard-Oeschger (DO) events, were discovered in Greenland ice cores (Dansgaard et al., 1993). Antarctic counterparts of all the DO events were recently identified in Antarctic ice cores, and were named Antarctic Isotope Maxima (AIM) (EPICA community members, 2006). Linkage between Antarctic and Arctic climate through the bipolar seesaw mechanism has been confirmed by this finding. More recently, sub-millennial scale climate variations in Greenland were also reported to be linked with those in Antarctica through the bipolar seesaw mechanism (Capron et al., 2010).

Here we present stable water isotope and ion records obtained from the Dome Fuji ice core, which was drilled on East Antarctic Plateau. The Dome Fuji stable isotope record displays several of unidentified AIM-like warming events, which are smaller in magnitude than previously identified ones. The stable isotope record along the Dome C ice core, which was also drilled on East Antarctic Plateau at a site more than 2000 km away from Dome Fuji, shows similar AIM-like events. This finding suggests that these unnamed millennial-scale warming events occurred across East Antarctic Plateau. Some of them may be linked to Greenland climate through the bipolar seesaw mechanism.

High resolution analyses of stable water isotopes and ions were carried out for AIM 3 and 4, which occurred about 27,000 – 30,000 years ago, along the Dome Fuji core. The stable isotope data indicate that centennial-scale climate variations with amplitudes similar to those of AIM were superimposed on AIM. During AIM3 and AIM4, sea-salt aerosol flux was anti-correlated with stable isotopes on multi-decadal scale, but not on millennial scale. On the other hand, terrestrial dust flux did not show a clear link with oxygen isotopes on multi-decadal scales but showed anti-correlation on millennial scale. Different behaviors of different climate/environment proxies on different time-scales would give us hints to understand the mechanisms of the climate and environmental changes.

References

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