Holocene Volcanism Recorded in Ice Cores from Taylor Dome and Siple Dome

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The volcanic signals identified in ice samples from the Taylor Dome and Siple Dome ice cores improves greatly the Holocene record of Antarctic volcanism. Using the sulfate and chloride time series, the volcanic time series has been developed at a 2-4 year resolution for the last 10,000 years. Concentrations of chemical species were measured with an ion chromatograph, while volcanic signals were developed using a robust spline best fit of the raw data. About 110 volcanic peaks in nss sulfate were identified as those with a 2 sigma above the mean positive residual of the spline fit. The initial search for volcanic glass was done on annual layers over the last 10,000 years using a petrographic microscope. Samples containing glass were then subjected to analysis by scanning electron microscope and electron microprobe to determine major oxide compositions of the glass for comparison with compositions from known volcanic eruptions. Probable source of the glass shards indicates that volcanoes within Victoria Land and the islands off its coast including Mt. Melbourne, The Pleaides and Buckle Island appear to be the most active suppliers of tephra material for Taylor and Siple Dome sites during the late Holocene.

Although glass that appears to originate from Antarctica volcanism has been found in several layers whose ages correspond to known equatorial or southern hemisphere eruptions, it is possible that part of the acidic signal could be from these larger, more distant eruptions. The largest sulfate signal (390 and 365 ppb) over the Holocene occurs at 2220 and 7690 years B.P. Large signals of volcanically-enhanced sulfate in the ice core record also occur around 670 years B.P. (1280 C.E.; 207-283 ppb)and 4670 years B.P. (270 ppb).

One of the main goals of the tephra work was to understand better the climatic impact of particular eruptions and to provide reliable time

lines to assist in developing the downcore chronology. This detailed record provides additional information on Southern Hemisphere atmospheric loading from volcanic eruptions during the Holocene.