

Resolution of environmental variation by detailed analysis of YM85 shallow ice core in Antarctica

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Abstract

An ice core with a length of 77.71 m water equivalent (w. e.) obtained in January 2002 from YM85 in East Dronning Maud Land, Antarctica, has been subjected to detailed analysis. The ice core is dated at 767 years (1233–1999 A.D.) on the basis of the tritium concentration and volcanic signal time markers and by annual layer counting. Large volcanic eruptions such as those of Tambora in 1815 and Kuwae in 1453 are likely to have caused the decrease in the temperature at YM85. During 1453–1816 A.D., the surface mass balance at YM85 was significantly lower than that observed prior to and subsequent to this period. This is thought to be because of LIA (little ice age) and the hiatus in snow deposition. Observation of the annual surface mass balance from 1816 A.D. to 1998 A.D. shows that it decreases sharply from the 19th century to the 20th century. The correlation coefficient between the five-year average values of $\delta^{18}\text{O}$ and those of the annual surface mass balance is positive ($R=0.62$) for the period 1816–1998 A.D. The decrease in the Na^+ concentration with an increase in the temperature is inferred to be a consequence of the diluting with a large amount of snowfall.