

Reconstruction of paleo-environmental changes in the northern North Pacific region from an alpine ice core

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A 180.17-m ice core was drilled at Aurora Peak in the central part of the Alaska Range, Alaska, in 2008 to allow reconstruction of centennial-scale climate change in the northern North Pacific. The 10-m-depth temperature in the borehole was -2 °C, which corresponded to annual mean air temperature at the drilling site. In this ice core, there were many melt-refrozen layers due to high temperature and/or strong insolation during summer seasons. We analyzed stable hydrogen isotopes (δD) and chemical species in the ice core. The ice core age was determined by annual counts of δD and seasonal cycles of sodium ions, and we used reference horizons of tritium peaks in 1963 and 1964, major volcanic eruptions, and a large forest fire in 2004 as age controls. Here, we show that the chronology of the Aurora Peak ice core from 180 m to the top corresponds to the period from 1666 to the summer season of 2007, with a dating error of ± 3 years. Our results suggest that temporal variations in δD and annual accumulation rates are strongly related to shifts in the Pacific Decadal Oscillation index (PDOI). The remarkable increase in annual precipitation since the 1970s has likely been the result of enhanced storm activity associated with shifts in the PDOI during winter in the Gulf of Alaska.

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