

Depth-age and temperature prediction at Dome Fuji station, East Antarctica

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Abstract

The geophysical metronome (Milankovitch components of the past surface temperature variations) and the isotope-temperature transfer function deduced from the borehole temperature profile at Vostok station, Antarctica, are applied to date the 2500 m deep ice core from Dome Fuji station, Antarctica, and to reconstruct paleoclimatic conditions at the drilling site on the basis of the local $\delta^{18}O$ isotope record. Special attention is paid to consistency of this depth-age relation with the mass-balance reconstruction and predictions of ice-flow modeling. The present-day ice mass-balance rate at Dome Fuji is estimated as 3.2 cm a⁻¹. The ice age at the borehole bottom (590 m above the bedrock) is around 335 ± 4.5 kyr and may reach 2000 kyr at about 3000 m depth. The difference in the ice-sheet surface temperatures between Holocene optimum and Last Glacial Maximum is found to be 17.8°C at the temporal isotope/temperature slope, about 30% lower than the modern geographical estimates. A good agreement between modeled and measured (preliminary data) borehole temperatures is obtained at the geothermal flux 0.059 W m⁻² and ice-fusion temperature (-2°C) at the ice-rock interface with minimum (zero) melt rates.
