



Promising Oldest Ice sites in East Antarctica based on thermodynamical modelling

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To resolve the mechanisms behind the major climate reorganisation which occurred between 0.9 and 1.2 Ma, the recovery of a suitable 1.5 million-year-old ice core is fundamental. The quest for such an Oldest Ice core requires a number of key boundary conditions, of which the poorly known basal geothermal heat flux (GHF) is lacking. We use a transient thermodynamical 1D vertical model that solves for the rate of change of temperature in the vertical, with surface temperature and modelled GHF as boundary conditions. For each point on the ice sheet, the model is forced with variations in atmospheric conditions over the last 2 Ma, and modelled ice-thickness variations. The process is repeated for a range of GHF values to determine the value of GHF that marks the limit between frozen and melting conditions over the whole ice sheet, taking into account 2 Ma of climate history. These threshold values of GHF are statistically compared to existing GHF data sets. The new probabilistic GHF fields obtained for the ice sheet thus provide the missing boundary conditions in the search for Oldest Ice. High spatial resolution radar data are examined locally in the Dome Fuji and Dome C regions, as these represent the ice core community's primary drilling sites. GHF, bedrock variability, ice thickness and other essential criteria combined highlight a dozen major potential Oldest Ice sites in the vicinity of Dome Fuji and Dome C, where GHF allows for Oldest Ice.