



Temperature variations in Greenland from 10 to 110 kyr b2k derived from the NGRIP ice core

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During the last ice age dramatic temperature variations of up to 16 °C took place in Greenland which are now known as Dansgaard-Oeschger-events (DO-events). They most probably originate from the North Atlantic oceanic and atmospheric circulation system and are characterised by an abrupt warming within decades followed by a gradual cooling over hundreds to thousands of years. We have determined local temperature variations for DO-event 1 to 25 in Greenland based on $\delta^{15}\text{N}$ measurements from the NorthGRIP ice core, corresponding to the period from 10 to 110 kyr b2k. The record is a composite of measurements from two laboratories, Laboratoire des Sciences du Climat et de l'Environnement, Paris (DO 18 to 25) and the Climate and Environmental Physics Division of the Physics Institute of the University of Bern (DO 1 to 17) with new measurements from the beginning of the Holocene to DO 8. Temperature variations were reconstructed by reproducing the measured $15\text{N}/14\text{N}$ ratio of air enclosed in ice bubbles by the firn densification and heat diffusion model from Schwander. The reconstruction show temperature amplitudes for the DO-events ranging from 5 to 16 °C, thereby the corresponding rates of change can exceed 0.5 °C/decade. In order to get an agreement between measured $\delta^{15}\text{N}$, Δdepth and Δage values with their modelled analogues, a lower accumulation rate than the one associated with the used ss09sea06bm1 time scale had to be assumed. We had to reduce the accumulation rate time dependently by 0 to nearly 40% with a mean reduction over the whole time period of 16%. With these adjustments both the Δdepth and the Δage values agree between model and measurements.