# Discontinuous ice from the 40k world in the Allan Hills Blue Ice Area, Antarctica

YUZHEN YAN[1], ANDREI V. KURBATOV[2], MICHAEL L. BENDER[3*], PAUL A. MAYEWSKI[4], JEFFREY SEVERINGHAUS[5], EDWARD BROOK[6], AND JOHN A. HIGGINS[7]

[1]Department of Geosciences, Princeton University, Princeton, NJ 08544, USA (yuzheny@princeton.edu)

[2] Climate Change Institute & School of Earth and Climate Sciences, University of Maine, Orono, ME 04469, USA (akurbatov@maine.edu)

[3]Shanghai Jiao Tong University, Shanghai, China, and Department of Geosciences, Princeton University, Princeton, NJ 08544, USA (*correspondence: bender@princeton.edu)

[4] Climate Change Institute, University of Maine, Orono, ME 04469, USA (paul.mayewski@maine.edu)

[5]Scripps Institution of Oceanography, UC San Diego, San Diego, CA, 92093, USA (jseveringhaus@ucsd.edu)

[6]College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331, USA (brooke@geo.oregonstate.edu)

[7]Department of Geosciences, Princeton University, Princeton, NJ 08540, USA (jahiggin@princeton.edu)

The ice core record is a pillar of paleoclimate knowledge, but the stratigraphically continuous record currently ends at 800 ka. In the Allan Hills Blue Ice Area (AH BIA), East Antarctica, the Transantarcic Mountains guide ancient ice to the surface. We have cored AH BIA and, from samples' Ar isotope composition, have dated ice to 2 Ma and beyond. We present measurements of the isotopic composition of the ice; $\delta^{18}O$, $\delta^{15}N$, and $O_2/N_2/Ar$ composition of the air; Xe/Kr for the calculation of mean ocean temperature; and $CO_2$ and $CH_4$ concentrations. These samples extend the range of ice core observations, discontinuously, well back into the 40k world. On plots of $CO_2$ vs. $\delta D$ and $CH_4$ vs. $\delta D$, most samples fall within the fields defined by the 800-kyr ice core record. Our results are largely compatible with the idea, derived from the benthic foram record, that interglacials of the 40k world were similar to interglacials of the 100k world, whereas glacial times were considerably less cold in the 40k world.