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New early Pleistocene atmospheric carbon dioxide and methane data from the Allan Hills Blue Ice Area, Antarctica

Content

Previous work at Allan Hills identified discontinuous ice sections as old as 2.7 million years, based on ^{40}Ar -atm dating. Ongoing work on new cores from this area is expanding the number of samples older than ~1 Ma, allowing co-registered ^{40}Ar -atm dates and other atmospheric measurements. Preliminary new data from a core (CMC1) near the previous BIT-58 drill site has so far provided 11 samples with ages between 900,000 and 2.6 Ma, with more dating and measurements in progress. As in the previous work at Allan Hills (Yan et al., 2019, Nature) the old ice is present in a restricted depth range, in this case between 142 and 160 m. The current results show a restricted range of both CO_2 (224-250 ppm) and CH_4 (475-523 ppb) concentrations relative to that found over the ice age cycles of the last 800,000 years. These ranges are slightly smaller than found by Yan et al. for groups of samples dated to the time of the mid Pleistocene transition (0.8-1.2 Ma), 1.5, and 2.0 Ma. Two samples near the ice/bedrock interface have elevated concentrations that may indicate CO_2 production in basal ice, as also suggested by the Yan et al. data. Isotopic measurements are planned to investigate this possibility.

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Track Classification: The Oldest Ice challenge, and the preservation of climatic signals in the deepest ice