Forty years later

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Forty years later: High resolution continuous flow analysis of the Dye3 ice core

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The Dye-3 ice core was drilled to bedrock at the Southern part of the central Greenland ice sheet (65°11'N, 43°50'W) in 1979-1981. The southern location is characterized by high accumulation rates compared to more central locations of the ice sheet. Since its drilling, numerous analyses of the core have been performed, and the ice has since been in freezer storage both in the USA and in Denmark.

In October and November 2019, the remaining ice, two mostly complete sections covering the depths of 1753–1820m and 1865–1918m of the Dye-3 core, were melted during a continuous flow analysis (CFA) campaign at the Physics of Ice, Climate, and Earth (PICE) group at the University of Copenhagen. The data represents both Holocene, Younger Dryas and Glacial sections (GS 5 to 12).

The measured data consist chemistry and impurities contained in the ice, isotopes, as well as analysis of methane and other atmospheric gases.

The chemistry measurements include NH_4^+, Ca^{2+}, and Na^+ ions, which besides being influenced by transport, provide information about forest fires, wind-blown dust, and sea ice, respectively, as well as acidity, which aids in the identification of volcanic events contained in the core. The quantity and grain size distribution of insoluble particles was analyzed by means of an Abakus laser particle counter.

We compare the new high-resolution CFA record of dye3 with previous analysis and thus evaluate the progress made over 40 years. Further we compare overlapping time periods with other central Greenland ice cores and discuss spatial patterns in relation to the presented climate proxies.