EGU25-8417, updated on 20 Jan 2026
https://doi.org/10.5194/egusphere-egu25-8417
EGU General Assembly 2025

Dual clumped isotopes of speleothems: unveiling Late Miocene paleotemperatures for the High Arctic

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The Late Miocene (11.63 to 5.33 million years (Ma)) has drawn attention as a potential analogue for future anthropogenic warming. During this time the global climate was warmer than present, with atmospheric CO_2 concentrations at or above current levels, covering the same range as the IPCC emission scenarios. Despite its relevance for future climate scenarios, terrestrial Arctic climate variability during the Late Miocene remains poorly understood, mainly due to the scarcity of continuous, absolutely-dated proxy records.

Here we present a multi-proxy climate record derived from radiometrically dated speleothems from two caves located in eastern North Greenland (80°N). Today these caves are situated at altitudes of 604 and 660 m above sea level, in an area characterised by continuous permafrost and an annual precipitation of ca. 200 mm. Speleothem deposition provides evidence for several episodes of warmer and more humid climate conditions during the Late Miocene compared to today. We utilized dual clumped isotope thermometry to quantify these temperature changes, providing the first continental temperature record for the eastern North Greenland during the Late Miocene.