Geophysical Research Abstracts
Vol. 16, EGU2014-14226, 2014
EGU General Assembly 2014

Noble gas paleotemperatures and humidity during the last Glacial – Interglacial transition in Switzerland - first application of the CVCS system to a stalagmite grown under cool climatic conditions

Nadia Vogel (1,2), Simon Figura (1), Dominik Fleitmann (3,4,5), Colin Maden (2), Rainer Wieler (2), Rolf Kipfer (1,2)

(1) Eawag, Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland, (2) ETH Zurich, Institute of Geochemistry and Petrology, Zurich, Switzerland, (3) Institute of Geological Sciences, University of Bern, Switzerland, (4) Oeschger Center for Climate Research, University of Bern, Switzerland, (5) present address: Department of Archaeology, University of Reading, UK

Stalagmites represent excellent multi-proxy paleoclimate archives as they cover long timescales and can be dated with high precision [1]. We determine noble gas temperatures (NGTs) using the CVCS (Combined Vacuum Crushing and Sieving) technique, which enables to preferentially reduce the air content of stalagmite samples, such that temperature information can be deduced from the noble gases dissolved in the stalagmite's water inclusions [2]. The system allows accurate temperature determination from Ne, Ar, Kr, and Xe, as shown in a cross-calibration study on a stalagmite from Borneo [3,4]. We have now applied the CVCS technique to samples of stalagmite M2 from Milandre Cave (Swiss Jura Mountains), covering the transitions Bølling-Allerød – Younger Dryas (YD) – Preboreal [5]. So far, we have determined three preliminary NGTs, indicating cave temperatures before the onset of the YD of $\sim$3°C, and dropping to $\sim$1°C at the onset of the YD. These temperatures compare well with theoretical mean annual Milandre cave temperatures inferred from summer temperatures deduced from sediments of Gerzensee [6], located south of Milandre.
We also determined in 12 M2 samples water contents, which, for samples grown under hot and rather dry climatic conditions provide information about drip water availability [7]: higher water contents point to irregular, low drip rates and vice versa. In M2, water contents increase strongly at the onset of the YD, suggesting a progressively dryer climate. Towards the end of the YD water contents drop again and are very low at the onset of the Preboreal, indicating a return to more humid conditions. The same conclusion was drawn from a M2 carbon isotope record, reflecting reduced discharge and vegetation density due to dryer conditions during the cold period [8]. Our data emphasize the applicability of the water content as a drip rate proxy also for stalagmites grown under cool climatic conditions.

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