



Climate variability during MIS 7, MIS 5 and the Holocene recorded in a stalagmite from western Germany

D. Scholz (1,2), D. Hoffmann (1), C. Spötl (3), A. Mangini (2), D.K. Richter (4), and S. Niggemann (5)

(1) Bristol Isotope Group, School of Geographical Sciences, University of Bristol, BS8 1SS Bristol, United Kingdom (denis.scholz@bristol.ac.uk), (2) Heidelberger Akademie der Wissenschaften, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany, (3) Institut für Geologie und Paläontologie, Leopold-Franzens-Universität, Innrain 52, 6020 Innsbruck, Austria, (4) Institute for Geology, Mineralogy and Geophysics, Ruhr-University Bochum, Universitätsstr. 150, 44801 Bochum, Germany, (5) Dechenhöhle und Höhlenkundemuseum, Dechenhöhle 5, 58644 Iserlohn, Germany

We present high-resolution stable isotope (i.e., $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) and trace element profiles for stalagmite HBSH-1 from Hüttenbläuserschachthöhle, western Germany. The cave was discovered in 1993 and is one of the biggest caves of the giant cave system of Iserlohn with a length of 4360 m. Other caves of this system are the nearby Dechen-, Bunker- and B7-Höhle, and stalagmites from these caves already provided important insights into past climate variability in Germany (Niggemann et al., 2003a; Niggemann et al., 2003b; Kluge et al., 2008). Stalagmite HBSH-1 was collected deep inside the cave, is about 55 cm long and shows a clearly visible lamination.

The U-content of the stalagmite is rather high (i.e., between 4 and 12 $\mu\text{g/g}$), which allows both determination of very precise $^{230}\text{Th}/\text{U}$ -ages and analysis of very small sample sizes (i.e., between 1 and 2 mg of calcite) with the MC ICPMS technique. Thus, it is possible to determine the beginning and end of individual growth phases very precisely.

Our stalagmite record covers the important climate phases of Marine Isotope Stage (MIS) 7 and 5 as well as the Holocene. $^{230}\text{Th}/\text{U}$ -dating shows so far that HBSH-1 started growing at ~ 215 ka, which is in agreement with the beginning of (MIS) 7.3 in the Austrian Alps (Spötl et al., 2008). During the remainder of MIS 7 the stalagmite shows intermittent growth until ~ 189 ka, in agreement with the timing of the end of MIS 7.1 (Spötl et al., 2008). Stalagmite growth reinitiated after a long-lasting hiatus at ~ 131 ka, which marks the beginning of MIS 5.5. The corresponding growth phase has a length of approx. 25 cm and, thus, represents the largest part of the sample. It also exhibits the highest growth rate of ~ 12 $\mu\text{m/a}$ and, thus, has a very high resolution. At ~ 113 ka the stalagmite shows a short hiatus of approx. 4 ka. Growth reinitiated at ~ 109 ka and continued uninterruptedly (i.e., also during the cold interstadial MIS 5.2) until ~ 78 ka, albeit with a slower growth rate of 5.6 $\mu\text{m/a}$. The top 5 cm of the stalagmite grew during the Holocene. The timing of this growth phase has not been precisely determined yet.

The high U-content of our sample and the fact that it also grew during relatively cold phases will allow a precise determination of the timing and duration of the climate phases recorded in HBSH-1. We compare our stalagmite record with local and European proxy records as well as with precisely dated climate records on a global scale.

References

- Kluge, T., Marx, T., Scholz, D., Niggemann, S., Mangini, A., and Aeschbach-Hertig, W., 2008. A new tool for palaeoclimate reconstruction: Noble gas temperatures from fluid inclusions in speleothems. *Earth and Planetary Science Letters* 269, 407-414.
- Niggemann, S., Mangini, A., Richter, D. K., and Wurth, G., 2003a. A paleoclimate record of the last 17,600 years in stalagmites from the B7-cave, Sauerland, Germany. *Quaternary Science Reviews* 22, 555-567.
- Niggemann, S., Mangini, A., Mudelsee, M., Richter, D. K., and Wurth, G., 2003b. Sub-Milankovitch climatic cycles in Holocene stalagmites from Sauerland, Germany. *Earth and Planetary Science Letters* 216, 539-547.
- Spötl, C., Scholz, D., and Mangini, A., 2008. A terrestrial U/Th-dated stable isotope record of the Penultimate Interglacial. *Earth and Planetary Science Letters* 276, 283-292.