Geophysical Research Abstracts
Vol. 19, EGU2017-5241, 2017
EGU General Assembly 2017

Indian Summer Monsoon dynamics during Termination II and MIS 5e

Matthias Magiera (1), Andrea M. Erhardt (2), Adam Hartland (3), Ola Kwiecien (1), Hai Cheng (4,5), Adrian Immenhauser (1), Alexandra Turchyn (6), and Sebastian F.M. Breitenbach (1)

(1) Ruhr-Universität Bochum, Geology, Mineralogy & Geophysics, Sediment- and Isotope Geology, Bochum, Germany (sebastian.breitenbach@rub.de), (2) Department of Earth & Environmental Sciences, University of Kentucky, Lexington, KY 40506, USA, (3) Environmental Research Institute, University of Waikato, Hamilton, New Zealand, (4) Institute of Global Environmental Change, Xi'an Jiaotong University, Xi'an 710049, China, (5) Department of Earth Sciences, University of Minnesota, Minnesota 55455, USA, (6) Department of Earth Sciences, University of Cambridge, UK

The interpretation of speleothem oxygen isotope ratios ($\delta^{18}O$) as proxy for Indian Summer Monsoon (ISM) dynamics is ambiguous, due to multiple influencing factors. Here we combine $\delta^{18}O$ and calcium isotope $\delta^{44}Ca$ analyses with elemental data to delineate regional shifts in moisture source, local rainfall amount, and changes in ISM intensity and length during Termination II and MIS 5e. Oxygen isotope ratios reflect a mixed signal of moisture source dynamics and rainfall amount; $\delta^{44}Ca$ and Mg/Ca ratios are interpreted as proxies for local effective moisture and prior calcite precipitation (PCP) in the epikarst. The age of stalagmite MAW-3 from Mawmluh Cave, NE India, is constraint by six U-series dates. 108 samples, obtained at 0.4 mm resolution from the 70 mm long speleothem sample, have been analysed for $\delta^{18}O$, $\delta^{44}Ca$ and Mg/Ca. Oxygen isotope ratios were measured on a ThermoFisher Scientific MAT 253 at Ruhr-University Bochum. Elemental ratios were measured on a quadrupole ICP-MS at Waikato University. Calcium isotope ratios were analyzed on a ThermoFisher Scientific Triton at University of Cambridge. MAW-3 grew from 136 kyrs BP to 96 kyrs BP, covering Termination II and MIS 5e. Oxygen isotope values are high (ca. +0.91 ‰) during Termination II, reach a minimum during MIS 5e (-3.5 ‰), and rise again to -0.2 ‰ at the end of MIS 5e. Calcium isotope ratios range from -0.32 ‰ to -0.70 ‰ and show a positive correlation (R^2= 0.7) with $\delta^{18}O$. High $\delta^{18}O$ values during Termination II reflect reduced atmospheric circulation and/or a proximal moisture source (Bay of Bengal), implying lowered ISM intensity. A positive correlation of $\delta^{18}O$ with $\delta^{44}Ca$ suggests concurrent changes of moisture source location and local rainfall amount, with a proximal moisture source and reduced effective rainfall during periods of weak ISM. Elevated Mg/Ca ratios at such intervals corroborate PCP occurrence, which reflects dry conditions. The beginning of MIS 5e (ca. 132 kyrs BP) is marked by a rapid change to lower $\delta^{18}O$ and $\delta^{44}Ca$, suggesting increased local infiltration with increasing ISM rainfall, and a concurrent change to a more distal moisture source. The MAW-3 multi-proxy record compares well with reconstructions from China and northern India, the latter being more depleted, due to Rayleigh fractionation. We suggest that multi-proxy analyses of $\delta^{18}O$, $\delta^{44}Ca$ and Mg/Ca greatly help to delineate regional circulation pattern and local effective moisture dynamics in monsoonal settings.