Hydrology of the Heinrich 1/Bølling-Allerød transition in a speleothem multi-proxy record from tropical Asia

A. HARTMANN[1*], E. EICHE[1], T. NEUMANN[1], A. SCHRÖDER-RITZRAU[2], D. RIECHELMANN[3], R. MERTZ[3], D. SCHOLZ[3]

[1]Institute of Applied Geosciences, Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany, arno.hartmann@kit.edu (* presenting author)
[2]Insitute of Environmental Physics, Heidelberg Academy of Sciences, 69120 Heidelberg, Germany
[3]Institute for Geosciences, Johannes Gutenberg University Mainz, 55128 Mainz, Germany

Speleothems have proven particularly useful in establishing and exploring the teleconnection between North Atlantic ocean circulation and the Asian Monsoon. While speleothem records from the East Asian Summer Monsoon (EASM) subsystem already exist [1], there is a notable lack of high-quality palaeo-records from the "combat zone" between the EASM and the Indian Summer Monsoon (ISM) subsystem. To elucidate how hydrology and vegetation in the EASM/ISM combat zone have responded to the abrupt climate change of the H1 to BA transition, we have analysed a stalagmite from a newly discovered cave in Northern Vietnam for stable isotopes, trace elements and fabrics.

The $\delta^{18}O$ values exhibit a distinctive 2‰ peak during the entire H1 and likely indicate reduced monsoon intensity causing decreased rainfall amounts in the West Pacific that again increase during the BA. Interestingly, the $\delta^{13}C$ values peak about 1,000 years later, at the onset of the BA, rising from -10‰ to -9‰. This decoupling may represent a lagged response of the regional vegetation to the reduction in precipitation during the H1, with decreased vegetation density and/or an increased C4/C3 plant ratio. The response may be lagged because this surface $\delta^{13}C$ signal was transmitted to the cave very slowly due to its mediation via an old underground organic matter source with slow turnover [2]. During the BA, the antecedent 1‰ $\delta^{13}C$ peak is more than offset, and vegetation density and/or the C3/C4 plant ratio seem to have returned to their pre-H1 state.

In conclusion, it appears that also in the EASM/ISM contact zone, the H1 to BA transition has led to an abrupt distinctive increase in monsoon rainfall, thus affecting vegetation density and/or composition.

[1] Carolin et al. (2013) *Science* **340**, 6140
[2] Wong & Breecker (2015) *Quaternary Sci Rev* **127**, 1-18