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High-resolution Speleothem Records from Soqotra Island, Yemen: an approach to reconstruct Indian Ocean Monsoon Variability?

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Soqotra is an arid tropical island in the Indian Ocean, situated between the Horn of Africa and the Arabian Peninsula. There is a bi-annual rainy season, due to the passage of the inter-tropical convergence zone (ITCZ) twice each year, known as the Indian Ocean Monsoon system. Because neither lake sediments nor trees suitable for paleoclimate studies occur here, speleothems are the only high resolution continental proxies with the ability to record paleoclimate changes. Based on 12 TIMS $^{234}U/^{230}Th$ dating, two active speleothems from Hoq (S-STM1) and Kazekas Caves (S-STM5) have formed over the past 6 ka BP and the past 1 ka BP respectively. $\delta^{13}C$ and $\delta^{18}O$ measurements were carried out on a 1 mm to a 500 micrometer resolution. Regarding to the variations in growth rate we obtain a time resolution ranging between 2 and 7 years. In S-STM1 $\delta^{18}O$-values vary between -4.5permil and -1.5permil and $\delta^{13}C$-values between -10.5permil and -5.5permil; while for S-STM5 these values evolve respectively between -4permil and -2permil for $\delta^{18}O$ and between -7permil and -3permil for $\delta^{13}C$ (vs. VPDB). A clear co-variation (R^2= 0,7) between $\delta^{13}C$ and $\delta^{18}O$-values occurs throughout the complete time series, exhibiting long term (millennial) and short term (decadal) variations.

Layers of white porous calcite (WPC) (100-500 micrometer) alternate with layers of dark dense calcite (DDC) (10-100 micrometer) in both stalagmites, most probably due

to seasonal variations. The WPC shows more positive δ^{13}C and δ^{18}O-values, while the DDC has more negative values. Sampling at a 50 micrometers (monthly) resolution exhibits clear seasonal variations in the isotopic composition. To qualify the climatic significance of these records, adapted Environmental Data Acquisition Systems (EDAS) are installed in and near Hoq Cave to acquire information on the actual transfer functions between the environment and the proxies in our speleothems. Meteoric waters, vadose waters, cave drip waters and recent deposited calcite are analysed for their stable isotopic composition in order to understand the local carbonate-water interactions. Before a detailed paleoclimate interpretation can be made, the relative importance of SW versus NE Monsoon rainfall intensity and variability needs a better comprehension.