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Timing and cause of increased water availability in arid South-of-Atlas region - reconstruction from cave stalagmites

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Fossil stalagmite growth, from modern-day arid regions, is a powerful archive for reconstructing the timing and characteristics of past wet periods. Stalagmite-carbonate only forms with infiltrating water and surface vegetation, so absolute U-Th dates provide accurate chronology of wet periods in the past. Isotopic and trace-element proxies provide valuable additional information about the environment in and above the cave.

Here we report on stalagmite-based reconstructions of periods of increased paleo-rainfall from sites close to the north-western boundary of the Sahara (~30°N) [1] that has a current lack of paleo-hydrology (e.g., lake presence) records. The combined assessment of chronology and oxygen isotopes from these new inland cave sites, along with coastal Wintimdouine cave records [2], existing palaeo-hydrology records from the south-west Sahara, and terrestrial dust flux records from marine cores, demonstrates that a separate rainfall-mechanism from the West African Monsoon is required to explain a period of peak increased rainfall in the South-of-Atlas subtropics at 8.8-4.3 kyr BP. Increased rainfall in this region is of added significance because of the increased recharge to rivers flowing south through the Sahara.

This study [1] paves the way to an increasingly detailed assessment (e.g., use of Ca-isotopes for a more detailed palaeohydrology reconstruction) of this South-of-Atlas environment during a key period in the development of land use and animal production [3].

[1] Couper et al. (in review). North-West Saharan Holocene rainfall driven by interhemispheric temperature differences. [2] Sha, Ait Brahim et al., How far north did the African Monsoon fringe expand during the African Humid period? *Geophysical Research Letters*, 93-102 (2019). [3] Dunne et al., Timing and pace of dairying inception and animal husbandry practices across Holocene North Africa. *Quaternary International* 471, 147-159 (2018).