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North Atlantic teleconnection reflected in a Mid-Holocene Ecuadorian speleothem

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Paleoclimate reconstructions in northern tropical South America are scarce and hindered due to the small temperature fluctuations. In particular, the potential of records to study past climate variability close to the Equator (0° 0’ 0”) and at the periphery of the Amazon basin has been unexplored. The reason obeys to the complex orography of the Andes and the direct influence of the Intertropical Convergence Zone (ITCZ) and the South American Monsoon features (i.e., low level jets) which overlap at the so called “monsoon trough” and masks a clear annual seasonality.

In this contribution, we present a newly constructed speleothem record (Dino-1) from Central Ecuador based on 14 U-Th Ages from 6849±51 to 5469±62 yr (Mid-Holocene) for studying the evolution of the hydrology during centennial to millennial scales. For the calibration of the archive, we undertook a 4-year monthly monitoring of stable isotopes in precipitation (δ^2H and $\delta^{18}O$) and temperature in the vicinity and inside the cave.

Results show that the rainfall lowest $\delta^{18}O$ values occur during austral autumn (AMJ) and spring (ON), while higher values are found in summer (DJFM) and winter (JAS), displaying a strong negative correlation with the bimodal rainfall pattern. Lagrangian back trajectory analysis (2015-2022) indicates that moisture is seasonally advected from the Tropical North and South Atlantic. At centennial scale, the Dino-1 $\delta^{18}O$ time series seems to capture the variability of Bond event 4 (abrupt cold ice-raft inputs from the North Atlantic), coherent with other paleoarchives (e.g., speleothems, lacustrine sediments, ice cores) in the same timeframe. On the other hand, at millennial scale, our record (although short) is in line with previous studies indicating that the ITCZ has been the main system modulating the climatology in Northern South America driven by the increment in the solar forcing input.