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The double isotopic record (δ^{18}O ,δD) from the Cero Tapado, Northern Chile: A combined data/modelling analysis.

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Stable water isotope data allow an intriguing approach to regional climate variability and hydrology. The semi-arid Chilean Altiplano is marked by strong inter-annual variability linked to the ENSO climate phenomenon. In 1999 a 38-meter deep ice core was drilled on Cero Tapado and its double isotopic composition was measured along the entire core in sub-annual resolution. Dating was established by using a multi-proxy approach in counting annual cycles of several different tracers and identifying fix time horizons. Strong inter-annual variability has been observed in the water isotopes ($H_2^{18}O$, $HD^{16}O$) and in the scaled difference between the two isotopes, the deuterium excess. The isotopic record shows hardly a seasonal cycle and therefore we assume that the observed irregular and strong isotopic excursions are linked to inter-annual variability. We use here double modelling approach to verify this hypothesis: 1) In a simple approach we use a isotopic trajectory model (MCIM) in order to achieve a preliminary interpretation in terms of inter-annual temperature and humidity variations of the common signal (d18O and deuterium excess). 2) A high-resolution regional climate model, REMO, equipped with water isotope diagnostics is run in a nudged mode with the model's zoom located over South America. The nudging guarantees that the model's surface wind and pressure field are close to re-analysis data (here we use the ERA40 re analysis) and the model's resolution allows a good representation

of the steep orography in the Andes. The nudging technique has been demonstrated to improve considerably the model's precipitation compared to observation.

The final purpose of this study is the reconstruction of ENSO associated variability by applying the calibration established by this modelling approach on the isotope record from Cero Tapado, which provides sufficient temporal resolution back to the early 20^{th} century.