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Competing influence of the South American summer monsoon and the Southern Hemisphere westerlies on the mid-latitude Argentine Andes over the last 15,000 years as recorded in speleothems from Las Brujas Cave

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The Brujas cave is located in the eastern flank of the subtropical Andes, in the boundary between two major components of the climate system that drives precipitation variability over the South America: The South American monsoon system (SAMS) domain and the Southern hemisphere westerlies (SHW). As a result, the long-term hydroclimate variability in this region can be complex. Paleorecords from lake sediments and ice cores surrounding the area show meridional fluctuations of either the SAMS or the SHW, yet without long and high-resolution records, this area remains poorly constrained.

The deglacial and Holocene are interesting periods in this regard, providing valuable information about the atmospheric circulation in the western sector of SAMS in response to millennial-scale events of the last glacial. Moreover, changing climate forcings associated with ice volume and greenhouse gases can impact hydroclimate at these latitudes by reorganizing atmospheric circulation during the onset of the interglacial boundary conditions. For instance, the expansion of the Hadley cell under current global warming severely affects the regional hydroclimate of the mid-latitudes. Yet, our knowledge of this region is limited compared to what we know about the core SAMS region or the SHW in southernmost South America. New records from this transitional zone can provide clarity on the extent of variability in space and intensity of the SAMS and the SHW, serving as useful benchmarks to assess the performance of climate models in such a sensitive

zone, right in interphase between two systems.

Here we present preliminary results from a stalagmite record (15,000 to 3,000 years) from Las Brujas cave, on the northern edge of the SHW domain. The westerlies transport moisture from the Pacific Ocean to the continent, where the Andes barrier induces orographic convection so that intense precipitation falls on the uphill side of the cordillera, over the Chilean Andes. The limited moisture that crosses the Andes and reaches the downslope area, produces precipitation over Las Brujas cave site during the cold months (April-September). Immediately north of Las Brujas cave, precipitation is concentrated in the warm season, produced by the South American low-level jet (SALLJ), a main component of the SAMS that transports moisture from the Amazon to northwestern Argentina. Given the proximity of both systems to our cave, precipitation contribution of either source is likely to have occurred in the past. Our multiproxy record can potentially show periods of rainfall dominated by the SAMS or the westerlies and the relationship unveil local temperature variations. We find evidence of a slight trend from dryer to wetter conditions from the mid-Holocene onwards and a large shift from dry to wet from the deglacial to the early Holocene.