

Little Ice Age Aridity in the Central Andes Despite Enhanced South American Summer Monsoon

By Jarunetr (Nadia) Sae-Lim, Bronwen L. Konecky, Neil Michelutti, Jack Hutchings, Christopher Grooms, John P. Smol, Mathias F. Vuille, Isla S. Castañeda

Abstract:

The Common Era history of effective moisture in the Central Andes is poorly understood, as most Andean proxy records reflect large-scale atmospheric circulation over the South American lowlands rather than localized precipitation vs. evaporation. Here we present 1800-year leaf wax hydrogen and carbon isotope sedimentary records from Lake Chacacocha (13.96°S, 71.08°W, 4,860 m asl.) in the Central Andes. Leaf wax $\delta^2\text{H}$ from different chain lengths offers information about large-scale atmospheric conditions and local-scale effective moisture. Our leaf wax $\delta^2\text{H}$ data record a gradual intensification of the South American summer monsoon (SASM) beginning around ~1250 CE, prior to the external forcings of the Little Ice Age (LIA). Despite peak SASM intensification, our leaf wax $\delta^{13}\text{C}$ data reveal a locally arid interval between ca. 1600 and 1800 CE. The arid interval was most likely driven by enhanced evaporation and reduced local precipitation, as indicated by the hydrogen isotope fractionation between mid- and long-chain *n*-alkanes as well as by climate model simulations. Our results help to reconcile conflicting interpretations of the SASM, glacial, and lake-level histories in the Central Andes during the Common Era.