Precipitation changes in the South Pacific Convergence Zone during the last 2,000 years using dinosterol hydrogen isotopes from freshwater lake sediments

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Tropical moisture dynamics are centrally important to global climate. Observational records are short so it is unknown if recent tropical precipitation changes are within the range of natural variability. Rainfall in the western tropical Pacific is difficult to reconstruct due to a dearth of high-resolution and continuous archives. Here we present a spatially extensive picture of Late Holocene precipitation variability in the South Pacific Convergence Zone using molecular fossil hydroclimate reconstructions from the hydrogen isotopic composition of the dinoflagellate lipid biomarker dinosterol. Our network of records consists of 14 freshwater lake sediment cores from 10 lakes on 6 islands in the Solomon Islands, Vanuatu, Wallis, and Samoa. Together the records indicate wet Modern (1850-present) hydroclimate conditions, and widespread dry conditions during the LIA (1450-1850) and MCA (950-1250), potentially due to a less intense or equatorward-shifted SPCZ. Replicate records from each region generally agree with each other with the exception of duplicate records from two lakes on Wallis. Calculated precipitation rates were estimated from a $\delta^2H_{dinosterol}$ core-top transfer function. LIA precipitation rates were approximately 0.6-0.9 mm d^{-1} lower than Modern in the Solomon Islands, Vanuatu, and Samoa. During the MCA the SPCZ had a more spatially heterogeneous hydrological pattern. These precipitation records are important for understanding SPCZ natural variability during the Late Holocene.