Board 0880: A 1,800-year Air Temperature Record from the Tropical Andean Highlands based on Branched GDGTs from Lake Chacacocha, Peru

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Late Holocene air temperature of the tropical Andean highlands is poorly constrained. Most inferences of past temperature from this region are either qualitatively inferred from environmental proxies such as pollen, moraines, and XRF, or derived from proxies with multiple climatic drivers such as ice core oxygen isotopes. Historical temperature records are either short or nonexistent. Here we present a quantitative reconstruction of air temperature based on branched Glycerol Dialkyl Glycerol Tetraethers (br-GDGTs) derived from sediments of Lake Chacacocha, southeastern Peru (13.96 S, 71.08 W; 4,860 m asl). Chacacocha's catchment and lake remain above freezing for most of the year. Thus, we interpret calibrated temperatures to reflect mean annual air temperature, though potentially with a bias towards months with more water column mixing. The Chacacocha br-GDGT record suggests a cooling trend after the first millennium, beginning prior to the cooling recorded in global temperature reconstructions. However, a multi-centennial cooling event between 400-600 CE appears to be the strongest centennial-scale cooling of the Common Era, unlike global temperature but in agreement with regional pollen and other paleoenvironmental proxies. The Chacacocha br-GDGT record exhibits striking similarity to a diatom-inferred lake stratification reconstruction and bulk carbon isotopes from the same sediment core, suggesting that the aquatic ecosystem and the surrounding environment responded to air temperature changes. We also compare and contextualize our lacustrine br-GDGT record using br-GDGTs from nearby peatlands and soil, isoprenoid GDGTs from nearby Lake Sibinacocha, and the hydrogen and carbon isotope composition of leaf waxes from the same sediment core. Our results help to illuminate long-term temperature change and its impacts on tropical Andean environments.