Geophysical Research Abstracts
Vol. 20, EGU2018-11586, 2018
EGU General Assembly 2018

Subseasonal variations of stable water isotopes in tropical Andean precipitation

Heather Guy (1), Anton Seimon (1), L. Baker Perry (1), Maxwell Rado (2), Ronald Winkelmann (3), and Marcos Andrade (3)

(1) Appalachian State University, Boone, NC, United States, (2) Universidad Nacional de San Antonio Abad del Cusco, Peru, (3) Universidad Mayor de San Andrés, La Paz, Bolivia

A network of citizen scientist observers in the Andean region of southern Peru and northern Bolivia has been collecting daily measurements and samples of precipitation since 2013. The stable water isotope composition (HD, δ^{18}O) of these samples allows us to examine the subseasonal variability of water isotopes in precipitation with a high spatial and temporal resolution over a multi-year period. From these data, we identify two key modes of subseasonal variability in precipitation δ^{18}O superposed upon the broader seasonal cycle. Mode A are high-frequency variations of up to 20‰ that occur over 2-5 days. Mode B are oscillations with a magnitude of 10-20‰ and a periodicity of 20-40 days. We use observations from weather stations, satellites and ERA-Interim reanalysis to investigate the meteorological factors responsible for these variations. Initial results indicate that Mode A reflects a relationship between δ^{18}O and precipitating system type, where low δ^{18}O is typically associated with stratiform precipitation and high δ^{18}O is associated with isolated convective storms. Mode B records region-wide climatic signals that are spatially coherent across our observer sites and also observed in δ^{18}O from annual layer snowpits sampled on high Andean glaciers within the region. These findings suggest that the sub-seasonal variations in the isotopic composition of snow, that are subsequently preserved in glacial ice, are closely related to the isotopic composition of precipitation that in turn is indicative of region-wide climatic conditions. This result implies that is possible to develop subseasonal paleoclimate reconstructions from stable water isotopes and other tracers in annually-resolvable tropical Andean ice cores that could improve understanding of Holocene climatic variability and changes from deep in the tropics.