Geophysical Research Abstracts
Vol. 12, EGU2010-12971, 2010
EGU General Assembly 2010

High-resolution observations of stable oxygen and hydrogen isotopes in Northern California rainfall events

Randy Apodaca (1), Nabil Saad (1), Eric Crosson (1), Kevin Simonin (2), and Todd Dawson (2)

(1) Picarro, Inc., Sunnyvale, United States (rapodaca@picarro.com), (2) University of California Berkeley, Berkeley, United States

The regulation of Earth's climate and its ability to sustain life are critically linked to water as it exists in all three of its phases (gas, liquid, and solid). Earth's water cycle, its movement between the hydrosphere, biosphere, and the atmosphere, and how it undergoes phase changes, is incredibly complex. While we continue to gain insight into the water cycle, there remains considerable uncertainty in predicting the impacts of future climate change on fresh water supplies and the welfare of life on our planet. This uncertainty exists, in large part, because of a scarcity of highly-resolved spatial and temporal observations of Earth's hydrology. One proven tool for observing the dynamics of the water cycle on our planet is stable isotope analysis of water. Differences in the thermodynamic properties of the isotopologues of water lead to differences in the isotope ratios ($^{18}O/^{16}O$ and D/H) in different environmental water reservoirs. Variations in isotope ratios, in conjunction with meteorological observations, can be used to trace water as it is cycled and to characterize and identify condensed water sources.

Here, we present an accurate and easy-to-deploy technique for making real-time, high-resolution, multi-source water isotope measurements during rainfall events. The measurement technique combines high-precision isotope measurements, made by a commercially available cavity ring-down spectrometer (CRDS), with an environmental interface capable of sampling water vapor, surface water, and precipitation. The environmental interface, coupled with the CRDS analyzer is compact, light-weight, and ideally suited for making mobile measurements. Additionally, we present detailed analysis of spatially and temporally resolved isotope ratios of water observed during rainfall events in Northern California. Lastly, we utilize the high-resolution water isotope observations to shed light on the origin and history of the precipitation and discuss the great potential for using such observations for parameterizing and interpreting isotopic equilibration models, catchment-scale hydrologic models, and global climate models.