Geophysical Research Abstracts
Vol. 12, EGU2010-5490, 2010
EGU General Assembly 2010

Real-Time Field-Based Water Vapor Isotope Measurements with a CRDS Analyzer: Probing Cropland Evapotranspiration

Aaron Van Pelt (1), David Williams (2), Leo Mayr (3), and Wei Sun (2)

(1) Picarro, Inc., Sunnyvale, United States (avanpelt@picarro.com), (2) Departments of Renewable Resources and Botany, University of Wyoming, Laramie, WY, USA (dgw@uwyo.edu), (3) FAO/IAEA Agriculture and Biotechnology Laboratory, Soil Science Unit, Seibersdorf, Austria (L.Mayr@iaea.org)

While stable isotope techniques have been previously applied to partition evapotranspiration (ET) fluxes in crops, it has only recently become possible to take in-situ, long-term, continuous (every 10 seconds) measurements of stable water vapor isotopologues. A Picarro water vapor isotope analyzer based on cavity ringdown spectroscopy (CRDS) was recently deployed at China's National Experimental Station for Precision Agriculture during the FAO/IAEA 2nd Research Coordination Meeting of a five-year Coordinated Research Project on "Managing Irrigation Water to Enhance Crop Productivity under Water-Limiting Conditions using Nuclear Techniques" involving the participation of 15 participants from 15 different countries. Measurements were conducted continuously over several days, sampling from five different heights above a corn field. The continuous measurements by the Picarro analyzer were complimented by additional measurements from the same sampling points, wherein the vapor was cryogenically trapped for later laboratory quantification of the water isotopologues. Stable isotope measurements were taken concurrently with conventional ET flux measurements. The isotope analyses can allow the partitioning of ET into its components: soil evaporation and leaf transpiration. Once daily, during the vapor measurements, liquid water isotope standards were measured by the Picarro analyzer using its included autosampler and subsequently used to calibrate the vapor-phase data. This presentation will describe the analyzer and sampling system in detail as well as discuss important factors that were incorporated into the data analysis to ensure accuracy. Field data will be presented along with these accuracy estimates as well as comparison of the vapor-phase results with the off-line liquid analysis of the cryogenically-trapped vapor.