B02-O07

TRACING ARCTIC HYDROLOGY WITH OBSERVATIONS OF WATER VAPOR ISOTOPES FROM IN SITU, AIRBORNE, AND SATELLITE PLATFORMS

Jessica Cherry *(University of Alaska Fairbanks, United States)*
Eric Klein *(University of Alaska Anchorage, United States)*
Robert Herman *(NASA Jet Propulsion Lab, Pasadena, United States)*
Jessica Young *(University of Alaska Fairbanks, United States)*
Josh Leffler *(University of Alaska Anchorage, United States)*
John Worden *(NASA Jet Propulsion Lab, Pasadena, United States)*
Jeffrey Welker *(University of Alaska Anchorage, United States)*

Jessica.Cherry@alaska.edu

During 2013, a multi-scale campaign was undertaken on Alaska's North Slope to characterize the sources and mixing of water in the atmosphere, surface waters, and ecosystems through the use of water vapor isotopes. A 3-m micrometerological tower was installed at the Toolik Lake Field Station in Northern Alaska in late winter that collected continuous measurements of (δ^2H and $\delta^{18}O$) at four levels (surface, in canopy, above canopy, and at 3 m) from early May to late August using a Picarro laser spectrometer. A second Picarro instrument flew onboard a research aircraft, sampling water vapor at altitudes from 100 to 5000 m during three campaigns (June, July, August). These campaigns were coordinated with special collections from the Tropospheric Emissions Spectrometer (TES) onboard the Aura satellite. Finally, water isotopes from a database of measurements of surface waters and vegetation were also used to describe a climatological isoscape. Measurements were compared across spatial and temporal scales and numerical weather model trajectories were used to help analyze vapor source regions and modes of variability. There were three critical findings: a) *in situ,* continuous water vapor isotope δ^2H, $\delta^{18}O$ and d-excess values reflected the diurnal patterns of transpiration by moist tussock tundra and the daily to weekly variation in synoptic climatology associated with switching meteoric moisture sources; b) aircraft measurements suggested that the traceable isotopic signature of the ecohydrosphere may be limited to near ground measurements in the Arctic; c) simultaneous TES water vapor isotope values were significantly recalibrated by the aircraft measurements, showing a prior algorithms need adjusting in the Arctic. Collectively, this 3-tier approach reflects the temporal and spatial complexity of the Alaskan water isotope cycle and the value of stationary and mobile research platform coordination.