1B.5: Withdrawn: Linking Latent Heat Fluxes to Column Water Vapor: Results from the North American Monsoon GPS Hydrometeorological Network Experiment 2017

WITHDRAWN
Monday, January 13, 2020
08:30 AM - 10:00 AM
Boston Convention and Exhibition Center - 253A

The disparity in spatial and temporal scales of soil moisture, latent heat fluxes (LHF), and water vapor (planetary boundary layer (PBL) and free tropospheric water vapor) from flux towers is one of the challenging aspects of evaluating and validating land-atmosphere interactions. The *North American Monsoon GPS Hydrometeorological Network 2017,* a ~3-month campaign of multiple Mexican and U.S. institutions, offers a suite of observations for linking surface conditions to the atmosphere Collocated GPS meteorological sites at three flux tower sites, at Rayón and Opodepe, in Sonora, Mexico, and at Walnut Gulch, in Arizona, provide high frequency (~5 minute), all-weather precipitable water vapor (PWV). Although the spatial disparity still remains (i.e., GPS PWV represents a cone of radius ~10 km vs ~1km flux tower LE), the temporal evolution of PWV is more than sufficient to correspond to LHF and PBL development. If the surface soil/vegetation characteristics are sufficiently homogeneous across this ~10 km scale, the effect of the spatial scale disparity is minimized.

Our results covering the period from the onset to the demise of the North American Monsoon (NAM) demonstrate little local water vapor flux contribution to PWV in the two study areas (Sonora and Arizona). In particular, comparing surface LHF integrated from 7 am to 3 pm (LT) to the change in PWV between these times demonstrates that locally derived surface moisture typically accounts for a small portion column integrated moisture change on diurnal time scales. The small contribution of local evaporative flux to PWV tendency in Sonora is supported by results from an intensive weeklong radiosonde campaign. These results suggest that larger-scale water vapor advection dominates PWV. Furthermore, considering the relationship between latent heat fluxes and diurnal convective triggering, as assessed with Vaisala GLD 360 lightning data, the observations indicate little connection between days with large local LHF and deep precipitating convection. In fact, there is evidence to suggest that very moist surface conditions are detrimental to NAM convection. This weak LHF forcing on sub-diurnal time scales has implications for local-scale moisture recycling, as well as terrestrial versus oceanic water vapor sources for the NAM region, a subject of great interest in recent years. Given its low cost, minimal energy needs, and durability with little or no maintenance, the use of GPS meteorology is extremely well-suited for providing long-term observations necessary to ensure the robustness of derived metrics of land-atmosphere interactions. We envision the development of new land-atmosphere coupling metrics leveraging these combined LHF/PWV/lightning data.

Authors

Benjamin R. Lintner
Rutgers Univ.
New Brunswick, NJ, USA

David K. Adams
Univ. Nacional Autónoma de Mexico
Mexico City, Mexico

Russell L. Scott
USDA-ARS Southwest Watershed Research Center
Tucson, AZ, USA

Enrique R. Vivoni
Arizona State Univ.
Tempe, AZ, USA

Eli Perez-Ruiz
Arizona State Univ.
Tempe, AZ, USA

Maria Isabel Gonzalez
Univ. Nacional Autónoma de Mexico
Mexico City, Mexico

Pieter Hazenberg
Univ. of Arizona
Tucson, AZ, USA

Carlos Minjarez
Universidad de Sonora
Hermosillo, SO, Mexico

Julio Cesar Rodriguez
Univ. of Sonora
Hermsoillo, Mexico

Yolande L. Serra
JISAO
Seattle, WA, USA

Jennifer S. Haase
SIO
La Jolla, CA, USA

Sarah Tannenbaum
Rutgers Univ.
New Brunswick, NJ, USA

Find Similar

View Related Events

Day: Monday, January 13, 2020