AGU 100 FALL MEETING
Washington, D.C. | 10-14 Dec 2018

H11A-07: Response of Coupled Water-Energy-Carbon Dynamics to North American Monsoon in Three Woodland Ecosystems: Results from GPS Hydrometeorological Network 2017

Monday, 10 December 2018
09:30 - 09:45
Walter E Washington Convention Center - 145A

The North American Monsoon (NAM) is characterized by a dramatic shift in meteorological conditions that affect coupled ecohydrological dynamics. To study the coupling of water-energy and carbon (W-E-C) fluxes, a dense network of sensors was deployed in Sonora, Mexico, from May to October 2017 as part of the GPS Hydrometeorological Network 2017. Three eddy covariance (EC) systems were placed in close proximity (~20 km) within a subtropical scrubland (STS), mesquite woodland (MW) and oak savanna (OS) to quantify net ecosystem exchange (NEE), evapotranspiration (ET), latent heat flux (LE) and sensible heat flux (H), among other variables. Four different periods were analyzed according to the temporal evolution of the NAM: a) Pre-Monsoon (PrM), b) Early Monsoon (EM), c) Late Monsoon (LM), and d) Post-Monsoon (PoM). Results showed differences in timing, magnitude and amplitude of fluxes at the beginning of the monsoon, the evolution of dry periods within the NAM and changes at the end of the rainy season, as well as differences in the response of each period and ecosystem to discrete precipitation pulses. During PrM, all ecosystems showed values of NEE, LE and ET close to zero, except for NEE at OS with slightly negative values (carbon uptake). H had daily average values around 120 W m^{-2} in all cases. In EM, ecosystems had a sudden change to positive values of NEE (carbon release) with maximum daily values between 20-30 g CO_2 m^{-2} day^{-1}, H decreased in all ecosystems to daily averages around 80 W m^{-2}, while LE increased to daily averages around 100 W m^{-2} and daily ET reached a maximum up to 4 mm day^{-1}. During LM, NEE became gradually negative until it reached its minimum, with values close to -15 g CO_2 m^{-2} day^{-1}, LE and ET reached their maximum values of 170, 140 and 150 W m^{-2} and 6, 5 and 5.5 mm day^{-1} for STS, MW and OS, respectively. Finally, in PoM, all variables had values similar to PrM, except for OS, where NEE values remained considerably negative until the end of the period. The observed response of the W-E-C fluxes for these periods and ecosystems demonstrates, for the first time through ground-measurements, the varying nature of plant adaptations to seasonal water availability. The understanding gained from these observations will be critical for determining the contribution of these ecosystems to precipitation recycling in the NAM region.

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