B046-0014 - Linking watershed water balance dynamics to carbon fluxes in two woody-plant encroached ecosystems in the southwestern US

Thursday, 10 December 2020

04:00 - 20:59

View Poster

Abstract

Woody plant encroachment is the increase of shrubby plants in grasslands and is typically associated with ecosystem degradation and typically entailing an increase in bare soil connectivity and erosion that can modify land surface-atmosphere interactions. As woody plants become more dominant, biophysical processes in the water and carbon budgets are affected, including an increase in water losses and a decrease of water availability for plant activity. In this study, we analyze the effect of the daily, seasonal, and inter-annual variability of water balance components on the carbon balance of two woody-plant encroached ecosystems of the southwestern US. The sites are two heavily-instrumented watersheds, a mixed shrubland of the Chihuahuan Desert (US-Jo2) and a mesquite savanna of the Sonoran Desert (US-SRS). Long-term measurements of water (evapotranspiration, *ET*) and carbon (net ecosystem exchange, *NEE*) fluxes were obtained using the eddy covariance technique. Data also included measurements of water balance elements, including rainfall (*R*), soil moisture (*s*), and runoff (*Q*), as well as estimates of channel percolation (*P*). During the study period, both ecosystems acted as a net sink of carbon, ranging from -192 to -92 g C m^{-2} in US-Jo2 and from -270 to -80 g C m^{-2} in US-SRS, with annual sums of *ET* and *R* ranging from 206 to 370 mm and 193 to 330 mm at US-Jo2, and from 349 to 460 mm and 306 to 555 mm at US-SRS. Annual *ET* and *NEE* exhibited inter-annual fluctuations that were not entirely explained by *R*. Both sites showed a high dependence of carbon and water fluxes to *R* input during the summer, however, a decoupling between carbon and water fluxes was noted during the spring, with high carbon uptake despite the low *R* and *ET*. In general, an increase of water losses by *Q* and *P*, due to high precipitation intensity and frequency, were related to smaller annual sums of *ET* and *NEE* in US-Jo2, with a higher dependence of the carbon balance on spring activity, while US-SMS had a higher dependence on summer *R* variability. Results show a contrasting response of water and carbon fluxes to the variability of water balance elements, particularly with respect to the role played by watershed water losses.

Authors

Eli R R Perez-Ruiz
Arizona State University

Enrique R Vivoni
Arizona State University

View Related

B046 - Advances in Understanding Water–Carbon Interactions III Posters ›

New Brunswick, Fredericton, NB, Canada, (3)USDA-ARS, Beltsville, MD, United States, (4)USDA, ARS, Beltsville, United States, (5)USDA, ARS, Beltsville, MD, United States

Linking advanced spring phenology with growing season plant water stress.

***Sander Olivia Denham** and Kimberly A Novick, Indiana University Bloomington, Bloomington, IN, United States*

Impacts of Watershed Glacier Coverage on Interannual Variability in Watershed Organic Matter and Nutrient Concentrations and Fluxes

***Croix Fylpaa**[1], Eran W Hood[2], Jason Fellman[2], David V D'Amore[3] and Emily Whitney[2], (1)University of Alaska Fairbanks, Fairbanks, AK, United States, (2)University of Alaska Southeast, Juneau, AK, United States, (3)Pacific Northwest Research Station, USDA Forest Service, Juneau, AK, United States*

Comparing Fluxes of Dissolved Organic Carbon During Throughfall and Stream Events in a Forested Catchment

***Kevin A Ryan**[1], Thomas Adler[2], Julia N Perdrial[2], Ann Chalmers[3], James B Shanley[4] and Aron Stubbins[5], (1)Northeastern University, Boston, MA, United States, (2)University of Vermont, Department of Geology, Burlington, VT, United States, (3)USGS New Hampshire/Vermont Water Science Center, Pembroke, NH, United States, (4)USGS, Montpelier, VT, United States, (5)Skidaway Institute of Oceanography, University of Georgia, Savannah, GA, United States*