Geophysical Research Abstracts
Vol. 18, EGU2016-3106, 2016
EGU General Assembly 2016

Integration of soil moisture and geophysical datasets for improved water resource management in irrigated systems

Catherine Finkenbiner (1), Trenton E. Franz (2), William Alexander Avery (3), and Derek M. Heeren (4)

(1) School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE, United States (c.finkenbiner@gmail.com), (2) School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE, United States (tfranz70@gmail.com), (3) School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE, United States (avery@huskers.unl.edu), (4) Department of Biological Systems Engineering, University of Nebraska-Lincoln, Lincoln, NE, United States (derek.heeren@unl.edu)

Global trends in consumptive water use indicate a growing and unsustainable reliance on water resources. Approximately 40% of total food production originates from irrigated agriculture. With increasing crop yield demands, water use efficiency must increase to maintain a stable food and water trade. This work aims to increase our understanding of soil hydrologic fluxes at intermediate spatial scales. Fixed and roving cosmic-ray neutron probes were combined in order to characterize the spatial and temporal patterns of soil moisture at three study sites across an East-West precipitation gradient in the state of Nebraska, USA. A coarse scale map was generated for the entire domain (12^2 km^2) at each study site. We used a simplistic data merging technique to produce a statistical daily soil moisture product at a range of key spatial scales in support of current irrigation technologies: the individual sprinkler ($\sim 10^2$m^2) for variable rate irrigation, the individual wedge ($\sim 10^3$m^2) for variable speed irrigation, and the quarter section (0.8^2 km^2) for uniform rate irrigation. Additionally, we were able to generate a daily soil moisture product over the entire study area at various key modeling and remote sensing scales 1^2, 3^2, and 12^2 km^2. Our soil moisture products and derived soil properties were then compared against spatial datasets (i.e. field capacity and wilting point) from the US Department of Agriculture Web Soil Survey. The results show that our “observed” field capacity was higher compared to the Web Soil Survey products. We hypothesize that our results, when provided to irrigators, will decrease water losses due to runoff and deep percolation as sprinkler managers can better estimate irrigation application depth and times in relation to soil moisture depletion below field capacity and above maximum allowable depletion. The incorporation of this non-contact and pragmatic geophysical method into current irrigation practices across the state and globe has the potential to greatly increase agricultural water use efficiency at scale.