Geophysical Research Abstracts
Vol. 20, EGU2018-17073, 2018
EGU General Assembly 2018


# Scale effects in estimation of water budgets in semi-arid irrigated agricultural plots

Deepti Upadhyaya (1), Sekhar Muddu (), Sudhakar Rao (), and Laurent Ruiz ()

(1) Department of Civil Engineering, Indian Institute of Science, India (upadhyaya19@gmail.com), (2) Department of Civil Engineering, Indian Institute of Science, India (sekhar.muddu@gmail.com), (3) Department of Civil Engineering, Indian Institute of Science, India (msrao@gmail.com), (4) Indo-French Cell for Water Sciences, IISc, Bangalore, India (ruizkaniang47@gmail.com)

Soil moisture forms a key component reflecting the effect of complex soil, crop and environmental interactions. As it often displays a high spatial and temporal variability, the scale at which soil moisture is measured is critical. Many studies have explored the influence of spatial scale on estimated soil hydraulic parameters (Hopmans 1987, Warric et al, 1977, Jana et al, 2012). However, fewer investigations were made analysing scale effects on soil water budgets especially in tropical systems. In recent times, opportunity to measure or retrieve soil moisture at different spatial scales (cm to several tens of km) is feasible through a combination of sensors and remote sensing platforms. For example, Cosmic-ray based sensors can provide soil moisture over hectometre scales. Similarly, remote sensing platforms based on active and passive microwave sensors can offer soil moisture over decametre to tens of kilometre scales. In this study, the soil moisture derived from different ground based sensors and remote sensing were used to estimate fluxes (i.e. potential recharge and evapotranspiration) at scales and compared.

The study site is in the Berambadi Experimental watershed in Southern India (Sekhar et al, 2016) belonging to Kabini Critical zone Observatory (BVET, Ambhas). We measured soil moisture with i) soil moisture sensors at point scale – Steven's Hydra Probe, ii) soil moisture sensor at larger footprint of about 250m radius using COSMOS sensor of Hydroinnova, iii) soil moisture retrieved from microwave remote sensing at 0.5 km to 10 km scales (Tomer et al., 2016). Water budgets at such different scales were modelled using the hydrological model Hydrus- 1D (Simunek et al, 2008) coupled with the crop model STICS (Brisson et al, 1998). The complex process of crop soil interaction was captured using these two models and the results were compared to get the scale effects in estimation of water budgets for two cropping seasons in the year 2016, South West monsoon (kharif) and North East monsoon (rabi). The changing crop cover and soil hydraulic properties are accounted in upscaling to match soil moisture at higher scales (COSMOS and remote sensing). Results suggest that although the main patterns of water fluxes are well correlated across scales, irrigation effects are more accurately depicted with point scales observations while COSMOS or remote sensed data are more sensitive to rainfed conditions.