Geophysical Research Abstracts
Vol. 14, EGU2012-6280-1, 2012
EGU General Assembly 2012

Temporal stability of soil water content in a small grassland head water catchment in western Germany observed by a wireless sensor network

W. Qu, H. Bogena, C. Montzka, and H. Vereecken
Forchungzentrum Juelich, IBG-3, Germany (w.qu@fz-juelich.de)

Soil water content plays a key role in soil-vegetation-atmosphere continuum process as well as the water, energy and CO_2 budgets. The knowledge of spatial variability and temporal stability of soil water content is useful for the development of ground truthing strategies of remote sensing data and hydrological modeling. For this study we employed the wireless sensor network SoilNet developed by the Forschungszentrum Jülich to detect high resolution soil water content pattern of a grassland headwater catchment in Western Germany within the framework of the TERENO initiative. Soil water content was measured using newly developed time domain transmission sensors, which were installed in three depths (5, 20 and 50 cm). The mean relative difference is currently the principal tool for temporal stability analysis, which is computed by the individual measurements of soil water content at different locations in time. Sensor locations with a small mean relative difference provide a good estimation of the areal average of soil water content, whereas a small standard deviation indicates a great tendency of being temporally stable. This study showed that several locations for each depth are temporally stable but no location was found where all depths are equally temporal stable. Soil depth, soil properties such as soil porosity and soil hydraulic conductivity, root water uptake of the growing plants, and the time scale affected the temporal stability at the test site. With increasing soil depth, the standard deviation was decreasing, with a mean of the standard deviation from 1.79% to 0.87%, and a variance of the standard deviation from 0.58% to 0.19% . By increasing the time scale from 1 to 24 hour, the standard deviation was increasing as well, with a mean of the standard deviation from 2.7% to 9.8% and a variance of standard deviation from 1.9% to 5.7%. These findings are of relevance for applications of geospatial surface SWC assimilation in hydrologic modeling when only point-scale observations are available, as well as, remotely sensing surface SWC calibration and validation studies.