Geophysical Research Abstracts
Vol. 17, EGU2015-13980, 2015
EGU General Assembly 2015

Monitoring of soil moisture dynamics and spatial differences in an agricultural catchment

Sascha Oswald (1), Gabriele Baroni (1), Peter Biro (1), and Martin Schrön (2)

(1) University of Potsdam, Earth and Environmental Science, Germany (sascha.oswald@uni-potsdam.de), (2) UFZ - Helmholtz Centre for Environmental Research, Leipzig, Germany

A novel method to observe changes in soil moisture and other water pools at the land surface is non-invasive cosmic-ray neutron sensing. This approach by its physical principles is placed between in-soil measurements and remote sensing, and retrieves values for an intermediate spatial scale of several hectars, which can be used to quantify stored water at the land surface. It detects variations in the background of neutrons, induced initially from cosmic-rays hitting the atmosphere, and this can be related to interesting quantities at the land surface, such as soil moisture, but to some degree also snow water equivalent and changes in the biomass of vegetation.

In a small catchment being used as a long-term landscape observatory of the TERENO initiative we retrieved cosmic-ray neutron measurements for several years, for up to four adjacent sites. The terrain was hilly with some slopes being partly used for agricultural fields, partly grassland. Here, after atmospheric corrections and a calibration procedure soil moisture dynamics could be observed for integral soil depths of several decimeters, clearly responding to precipitation events and offering a comparison to various local and non-local soil moisture measurements there. For winter periods with frost and snow, also the water mass stored in the snow cover can be retrieved. Furthermore, observed spatial differences can be related to vegetation, terrain and soil moisture state. Also, the relation to parameters representing crop biomass and growth will be discussed in respect to the retrieved cosmic-ray neutron signals, which have an influence on the interpretation as soil moisture.