Geophysical Research Abstracts
Vol. 12, EGU2010-11291-2, 2010
EGU General Assembly 2010

Soil moisture - resistivity relation at the plot and catchment scale

Giuseppe Calamita (1), Angela Perrone (1), Antonio Satriani (1), Luca Brocca (2), and Tommaso Moramarco (2)
(1) CNR-IMAA, Italy (calamita@imaa.cnr.it), (2) CNR-IRPI, Italy

The key role played by soil moisture in both Global Hydrological Cycle and Earth Radiation Budget has been claimed by numerous authors during past decades. The importance of this environmental variable is evident in several natural processes operating in a wide range of spatial and temporal scales. At continental and regional scales soil moisture influences the evapotranspiration process and so acts indirectly on the climate processes; at middle scale is one of the major controls of the infiltration-runoff soil response during rainfall events; at small scales the knowledge of soil moisture evolution is crucial for precision agriculture and the associated site-specific management practices.
However, soil moisture exhibits an high temporal and spatial variability and this is even more evident in the vadose zone.
Thus, in order to better understand the soil moisture dynamics it is desirable to capture its behavior at different temporal and/or spatial scales.
Traditional in situ methods to measure soil moisture like TDR can be very precise and allows an high temporal resolution. Recently, the application in field of geophysical methods for capturing soil moisture spatial and temporal variations has demonstrated to be a promising tool for hydro-geological studies. One of the major advantages relies on the capability to capture the soil moisture variability at larger scales, that is decametric or hectometric scale.
In particular, this study is based on the simultaneous application of the electrical resistivity and the TDR methods. We present two study cases that differ from each other by both spatial and temporal resolution. For the first one, simultaneous measurements obtained during four different period of the year and carried out within a test catchment ($\sim$60 km2) in Umbria region (central Italy) were analyzed. The second case concerns almost three months of simultaneous measurements carried out in a small test site (<200 m2), located in the garden of IMAA-CNR institute in Tito Scalo (south Italy). One measurement every two days were performed on average, in particular 44 sampling events during 80 days.
In both case we present a correlation and a regression analysis conducted both on punctual measurements and on their spatial averages. The results show that the resistivity method can be conveniently applied for soil moisture retrieval with a fairly good accuracy. The capability of this technique to obtain information for the whole soil profile suggests its use to better investigate the role of soil moisture dynamics at catchment scale and its influence on the rainfall-runoff processes.