Geophysical Research Abstracts
Vol. 14, EGU2012-7733, 2012
EGU General Assembly 2012

Combining vapor pressure and evaporimetric methods to generate swrc - and its application to interprete soil moisture data in hydrologic studies

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Transport of soil water affects heat and solute transport in soils, also it de[U+FB01]nes rates of biological processes in soil and water supply to plants, over transpiration and ground water replenishment, controls runoff, and has many other important functions in the environment. Therefore, the knowledge of soil water storage and its movement inside the matrix have many applications in hydrology, meteorology, agronomy, environmental protection, and other soil-related disciplines.
The aim of this research is to evaluate the combination of two different methods to obtain the complete water retention characteristic curve for a silt loam soil under laboratory conditions. The first method used for wetting part of the curve is the HYPROP System. This method is based on evaporation rates (Wind, 1968), i.e. loss water by evaporation and in some cases by plant transpiration as well. The evaporation method of Schindler (1980) is a simplification of the Wind (1968) approach. Tension is measured at two depths within a short soil column device (250 cm3), evaporating water from its surface, and taking the measured with two micro-tensiometers. Water content is determined by weighing in a accurate scale (0.01 g). The change in sample mass or water loss from the sample during evaporation is the ground for deriving soil water retention curve up to tensions <100 kPa.
A second method to obtain the driest part of the soil water characteristic curve was used. The method is called the vapour pressure method, using for it a dew point hygrometer WP4C. This device measures dew point temperature of air in vapour equilibrium with a soil sample and sample temperature to determine relative humidity. The relative humidity of air in vapour equilibrium with the sample should be related to water potential by the Kelvin equation. Using specific Hyprop Data Evaluation software both types of data (HYPROP and WP4C) can be related and fitted to several hydraulic models. In our case, we used an unconstrained closed form from Van Genuchten (1980). The quality of the fits was quantified in the group in terms of the root mean square error calculated for the water content data.
To sum up, the application of both methods allowed obtaining the soil moisture characteristic curve for this kind of soil. The outstanding features were a faster reach the complete curve, a small performance was carried out to assemble the devices, and especially the time consuming, such that only needs less than one week to achieve one curve accurately. On the other hand, some weakness of the methodology used could be to obtain good unaltered samples and reliable weights of them. Some variations on the data could prompt a low accurate results and high uncertainty.