Geophysical Research Abstracts
Vol. 15, EGU2013-10663, 2013
EGU General Assembly 2013

Comparison of Predicted and Measured Soil Retention Curve in Lombardy Region Northern of Italy

Fatma Wassar, Michele Rienzner, Enrico Antonio Chiaradia, and Claudio Gandolfi
university of milan, hydraulic institute, agricultural engineering, Milan, Italy (fatmawassar@yahoo.fr)

Water retention characteristics are crucial input parameters in any modeling study on water flow and solute transport. These properties are difficult to measure and therefore the use of both direct and indirect methods is required in order to adequately describe them with sufficient accuracy. Several field methods, laboratory methods and theoretical models for such determinations exist, each having their own limitations and advantages (Stephens, 1994). Therefore, extensive comparisons between estimated, field and laboratory results to determine it still requires their validity for a range of different soils and specific cases. This study attempts to make a contribution specifically in this connection. The soil water retention characteristics were determined in two representative sites (PMI-1 and PMI-5) located in Landriano field, in Lombardy region, northern Italy. In the laboratory, values of both volumetric water content (θ) and soil water matric potential (h) are measured in the same sample using the tensiometric box and pressure plate apparatus. Field determination of soil water retention involved measurements of soil water content with SENTEK probes, and matric potential with tensiometers. The retention curve characteristics were also determined using some of the most commonly cited and some recently developed PTFs that use soil properties such as particle-size distribution (sand, silt, and clay content), organic matter or organic Carbon content, and dry bulk density. Field methods are considered to be more representative than laboratory and estimation methods for determining water retention characteristics (Marion et al., 1996). Therefore, field retention curves were compared against retention curves obtained from laboratory measurements and PTFs estimations. The performances of laboratory and PTFs in predicting field measured data were evaluated using root mean square error (RMSE) and bias. The comparison showed that laboratory measurements were the most accurate. They had the highest ranking for the validation indices (RMSE ranging between 2.4 and 7.7% and bias between 0.1 and 6.4%). The second best technique was the PTF Rosetta (Schaap et al. 2001). They perform only slightly poorer than the laboratory measurements (RMSE ranging between 2.7 and 10% and bias between 0.3 and 7.7%). The lowest prediction accuracy is observed for the Rawls and Brakensiek (1985) PTF (RMSE ranging between 6.3 and 17% and bias between 5 and 10%) which is in contradiction with previous finding (Calzolari et al., 2001), showing that this function is well representing the retention characteristics of the area. We conclude that the Rosetta PTF developed by Schaap et al (2001) appears to be well suited to predict the soil moisture retention curve from easily available soil properties in the Lombardy area and further field investigations would be useful to reinforce this finding.

Keywords: water retention curve; laboratory measurements; field measurements; pedotransfert functions; comparison.