Geophysical Research Abstracts,
Vol. 11, EGU2009-5203, 2009
EGU General Assembly 2009

On determining field water capacity and available water in uniform and layered soil profiles: Critical accounts and Proposals

F. Ceres, G.B. Chirico, and N. Romano
Department of Agricultural Engineering and Agronomy, University of Naples Federico II

EGU09 – Session HS4.1

On determining field water capacity and available water
in uniform and layered soil profiles: Critical accounts and Proposals

Ceres F., Chirico G.B., Romano N.

Abstract
Field water capacity and available water concepts are major agronomic parameters widely used for irrigation management, especially in Mediterranean zones facing with shortage of water. However, their definitions are still under discussion among scientists and practitioners. Field water capacity is often determined using empirical relationships (e.g. pedotransfer functions) or from water retention points obtained in the laboratory, thus underplaying or even ignoring the important role exerted by the actual evolution of water redistribution processes in a soil profile, especially if it is a layered one. An objective and replicable method for determining the field water capacity requires monitoring a water redistribution process evolving in a soil profile thoroughly wetted by a preliminary infiltration phase. Accordingly, in this study free drainage processes in soil profiles have been simulated by applying the numerical model developed by Romano et al. (1998) and verified by Brunone et al. (2003). This model solves Richards' equation by applying the Crank-Nicolson finite difference technique and uses a numerical algorithm specifically designed in case of layered soils for calculating the hydraulic conductivity between soil layers. In addition, to ensure a good correspondence between the analyses performed and actual situations, an extensive database of uniform and layered soil profiles have been employed.
Outcome from the scenarios on uniform soils have shown that soil water content values under the condition of field capacity do not match water content values obtained from water retention point measured at preselected matric pressure head. Similar results have been obtained when using retention data points retrieved from the use of well-established pedotransfer functions (such as the HYPRES-PTF). In case of layered soil profiles, which actually represent the rule rather than an exception, the layer sequence and reciprocal differences in the soil hydraulic properties (soil water retention and hydraulic conductivity functions) strongly influence the value of water content value at field capacity. This aspect is shown by the values achieved during the drainage process simulations contrasting to the results obtained from the assessment of each individual layer.