



Measurement of thermal properties on porous media subjected to wetting and drying processes

C. Rubio (1), D. Cobos (2), C. Campbell (2), and F. Ferrer (1)

(1) Lab-Ferrer, Cervera, Spain , (2) Decagon Devices, Pullman, United States

In order to partly fill the thermal soil properties studies, we focused this work in the relation between thermal and hydrodynamic soil properties for several soil textural classes. This study was divided in two different objectives; (i) to determine and to analyze soil thermal and hydrodynamic properties, and (ii) to explore the impacts of hysteresis on soil thermal properties under experimental controlled conditions. Samples were obtained from different locations in Spain. To measure soil thermal properties, simple needle sensors were used. The samples were repacked in a soil column device. Volumetric water content and thermal conductivity were monitored continuously. The results allowed a rather complete understanding of the relation between thermal and hydrodynamic properties at laboratory scale for silt loam soils. The column device showed a well-distributed water contents for both wetting and drying cycles. Differences in thermal properties at a given water content were interpreted as a results of different hysteretic paths observed, arising in turn from different wetting and drying processes. Reasonably, we support that, in observed water contents, a change has taken place in the internal structure of the soil water, and how the water was adsorbed. This fact produced differences in the thin water films around the particles, and affected heat transport. This topic needs further theoretical and experimental investigation, and moreover to establish comparison with other variables that could cause effect on the thermal properties.