

A THERMO-DIELECTRIC ANALYZER TO MEASURE THE MOISTURE CHARACTERISTIC IN POROUS MEDIA

M. Bittelli (1), M.Flury (2) and G.S. Campbell (3)

(1) Institute of Environmental Physics, University of Heidelberg, D-69120 Heidelberg, (2) Department of Crop and Soil Sciences, Washington State University, Pullman, WA 99163, (3) Decagon Devices Inc, 950 NE Nelson Court, Pullman, WA 99163.

marco.bittelli@iup.uni-heidelberg.de/Fax: (+49 6221) 54 6405

Knowledge of the soil properties determining water flow and transport processes in the unsaturated zone is of primary importance. The Soil Moisture Characteristic (SMC), which relates the amount of soil moisture to the its matric potential, is a soil specific property crucial to the investigation of water flow and contaminant transport in soil. Its experimental determination is cumbersome, time consuming, several experimental methods are used and each of them can only measure a limited range of the water potential range. The objective of this research is the development of a new instrument to improve the current measurement techniques for the determination of the soil moisture characteristic. The instrument is based on the determination of the soil freezing characteristic (SFC), which relates the amount of liquid water at a given temperature below zero and its temperature. Thermodynamic relationships for soils at and below freezing point allow then to obtain the Soil Moisture Characteristic by knowledge of the Soil Freezing Characteristic. Modeling of the freezing experiments is performed to describe the physical processes involved during the experiments.