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Application of Dual Needle Heat Pulse to obtain the Thermal Properties in a Silty Porous Media under Laboratory Conditions

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Soil thermal property data, especially as a function of water content, are currently not readily available. Demand for these data is, however, on the increase because of improvements in wider applications of soil heat and water transport models, as well as for vegetal growth studies. Most of the existing investigations were focused in sandy soils, clayed soils or peat horticultural substrates, due to the different properties and applications of each. In order to partly fill the thermal soil properties studies into other types of soils, we focused this work in the relation between thermal and hydraulic soil properties of a silty soil under laboratory conditions. Samples were obtained from Can Solé Road located in the Llobregat delta plain (Northern of Spain), where frequently Cynara scolymus is cultivated. Small dual-needle sensors, employing the heat pulse methodology were used to measure the soil thermal diffusivity, heat capacity and thermal conductivity. A soil column specially designed for this study was employed. The soil in the column was monitored to determine the volumetric water content and matric potential, as well as, the thermal properties. To obtain these kinds of data a frequency domain probe and micro-tensiometer were used. Preliminary results allow a rather complete understanding of the relation between thermal and hydraulic properties at laboratory scale of the silty soil. Preliminary distributed water content and thermal data allowed investigations into the variability of these properties and its relations between them for this type of soil.