Heat Pulse Probe Sensor Design for Measuring Soil Moisture, Solute and Heat Transport. (S01-mori192759-Poster)

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Abstract:

Soil water, solute, and heat flow are three major transport mechanisms in soils. As all three transport types are related to each other, obtaining these properties at the same time, location, and measurement volume is essential for the general understanding of transport phenomenon in soils. A small multi-functioned sensor with 6 needles that includes a heater, four thermistors, and four electrodes (Wenner array) was developed. Volumetric heat capacity and diffusivity were obtained by applying a heat pulse along the heater needle and measuring temperature responses at 4 needles, each 6 mm away from the heater. Volumetric water content was estimated from volumetric heat capacity knowing the specific heat of the soil. Bulk soil electrical conductivity (EC) was obtained by the four electrodes, from which the EC of the soil water was estimated using volumetric water content obtained by heat pulse probe. All soil properties were obtained simultaneously and estimated by parameter optimization. Since the data sets are interrelated, parameter optimization for simultaneous soil water, solute, and heat transport gives more accurate results than from single property measurements.

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