

## Evaluation of Soil Thermal-Entropy Properties with a Single-Probe Heat-Pulse Technique

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**Abstract :** Although soil thermal properties are required in many areas to improve oil recovery, they are seldom measured on a routine basis. Reasons for this are unclear, but may be related to a lack of suitable instrumentation and entropy theory. We integrate single probe thermal gradient for the radial conduction of a short-duration heat pulse away from a single electrode source, and compared it with the theory for an instantaneously heated line source. By measuring the temperature response at a short distance from the line source, and applying short-duration heat-pulse theory, we can extract all the entropy properties, the thermal diffusivity, heat capacity, and conductivity, from a single heat-pulse measurement. Results of initial experiments carried out on air-dry sand and clay materials indicate that this heat-pulse method yields soil thermal properties that compare well with thermal properties measured by single electrode.

**Keywords :** entropy, single probe thermal gradient, soil thermal, probe heat

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