

The effect of fire on the thermal properties of soils

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Abstract. The thermal properties of soil under forest fire conditions are important in many agricultural, soil science, and engineering applications. These thermal properties are strongly influenced by grain size, porosity, soil moisture content, and organic matter. The influence of these properties has been well studied and documented both for lab sands, and field soils. However, there exists no comprehensive data set that evaluates the influence of extreme heating during fires on the thermal properties of soils, and investigates the differences. This study focuses on quantitatively evaluating the impact of fires on the thermal conductivity of soils by directly comparing burned soils to unburned control soils. In this study, thermal conductivity (λ), and volumetric specific heat (C) were measured for twelve soil samples, from three sites within Colorado's Manitou Experimental Forest (MEF), under varied saturation (q). Several recent sensor based technologies were integrated into a small cell modified to have a network of sampling ports, continuously monitoring water saturation, temperature, and soil thermal properties. Experimental values were compared to empirical models from literature to evaluate the influence of fire burns with respect to other physical properties. Preliminary data shows good agreement was observed for most λ - S data. Experimental and modeling results demonstrate the effect that wildfires, and controlled burns have on the thermal properties of MEF burned soils.

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