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A new strategy to estimate soil moisture from passive distributed temperature sensing using a dual state-parameter assimilation technique

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Soil moisture information at regional/global scales with high resolution is required for accurately modeling and understanding climate-soil-vegetation dynamics. However, there are no techniques available for meeting these two requirements simultaneously. Distributed Temperature Sensing (DTS) is a newly developed technique for high resolution (down to 0.25 m) environmental temperature measurement, which can be applied on large scales (up to 10 km). This presentation will focus on soil moisture estimation using Passive DTS, i.e. when fiber-optic cables at several depths are used to monitor the soil temperature profile in response to net radiation. We will present a method to estimate soil moisture by assimilating temperature profile data into Hydrus 1D using a dual state parameter estimation technique. This new approach was tested using co-located soil moisture and temperature profile data from traditional in-situ sensors. Results will be presented from these preliminary experiments based on data collected at the SMAP MOISST site in Oklahoma from June 2010 to May 2011.