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# Soil-Water Content and -Water Flux Profiles Determined by SWIR Imaging and TDR Array

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Advances in remote sensing algorithm developments and innovative in situ measurement approaches have created novel means for estimating soil properties and processes. Here we demonstrate high resolution soil water content and water flux profile determination under laboratory conditions using two new methods. Constant-head upward flow experiments were performed in samples of varying soil texture, packed into quartz Hele-Shaw cells. Soil profiles were imaged at high temporal frequency with a shortwave infrared (SWIR) camera in the 900-1700 nm optical domain. The SWIR reflectance recorded at each spatial pixel was converted to a soil water content value using a linear physically-based algorithm. The imaged moisture profiles were in reasonable agreement with soil moisture data independently measured using a recently developed time domain reflectometry (TDR) array with a 1-cm depth resolution. The high spatial (i.e. 0.3 mm) and temporal (i.e. 1 min) resolution of the SWIR reflectance-derived moisture profiles allowed calculation of soil water flux, which provides a potential new avenue for rapid estimation of soil hydraulic properties via inverse numerical modeling or analytical solution.