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Using vegetation indices for soil-moisture retrievals from passive microwave radiometry

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Abstract. Surface soil moisture and the nature of the overlying vegetation both influence microwave emission from land surfaces significantly. One widely discussed but underused method for allowing for the effect of vegetation on soil-moisture retrievals from microwave observations is to use remotely sensed vegetation indices. This paper explores the potential for using the Normalised Difference Vegetation Index (NDVI) in soil-moisture retrievals from L-band (1.4 GHz) aircraft data gathered during the Southern Great Plains '97 (SGP97) experiment. A simplified version of MICRO-SWEAT, a soil vegetation atmosphere transfer (SVAT) scheme coupled with a microwave emission model, was used as the retrieval algorithm. Estimates of the optical depth of the vegetation, the parameter that describes the effect of the vegetation on microwave emission, were obtained by calibrating this retrieval algorithm against measurements of soil moisture at 15 field sites. A significant relationship was found between the optical depth so obtained and the observed NDVI at these sites, although this relationship changed with the resolution of the microwave brightness temperature observations used. Soil-moisture estimates made with the retrieval algorithm using the empirical relationship between optical depth and NDVI applied at two additional sites not used in the calibration show good agreement with field measurements.

Keywords: NDVI, soil moisture, passive microwave, SGP97

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