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Title:

The effect of rock on soil moisture retrieval from L-band passive microwave observation

Author:

YE Nan[1], Jeffrey Walker[1], Dongryeol Ryu[2], Robert Gurney[3], and Chris Rüdiger[1]

[1] *Department of Civil Engineering, Monash University, Australia*

[2] *Department of Civil and Environmental Engineering, University of Melbourne, Australia*

[3] *NERC Environmental Systems Science Centre, University of Reading, United Kingdom*

Email: ye.nan@monash.edu

Address: Room 156, Building 60, Monash University Clayton campus, Wellington Road, Clayton, Victoria 3800, AUSTRALIA

Abstract:

Being the first dedicated soil moisture satellite, Soil Moisture and Ocean Salinity (SMOS) mission employs L-band (~ 1.4 GHz) passive microwave techniques to provide surface (top ~5cm) soil moisture at global scale with a spatial resolution of ~45km, and with a target accuracy of $0.04m^3/m^3$. However, using homogeneous pixel approaches, soil moisture retrieval accuracy always suffers from heterogeneity of land surface at SMOS coarse scale. Without accounting for the microwave contribution of non-soil targets (such as surface rock, standing water, and urban areas) which may be present in the SMOS field-of-view, soil moisture retrieval accuracy will be potentially reduced and exceed the SMOS error budget. This work focuses on investigating the effect of surface rock on soil moisture retrieval accuracy by simulating the effect based on assumed rock dielectric constant and surface roughness and validating synthetic results on *in-situ* data collected from two airborne field experiments. The synthetic study illustrates that the magnitude of rock induced error in soil moisture retrieval relays on soil moisture and vegetation water content condition since microwave emission difference between soil and rock results the soil moisture retrieval error. The maximum and minimum soil moisture retrieval error introduced by rock could be made in high vegetation covered wet soil and in bare dry soil rock respectively. With 30% rock coverage, as much as 0.04 m^3/m^3 bulk soil moisture error could be induced in bare dry soil, while up to 0.04 m^3/m^3 in vegetated wet soil. In order to verify the synthetic result, two datasets respectively over vegetated wet soil and bare dry soil were used.

Keywords: *passive microwave, soil moisture, remote sensing, rock effect*