View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Purdue E-Pubs

The Summer Undergraduate Research Fellowship (SURF) Symposium
2 August 2018
Purdue University, West Lafayette, Indiana, USA

Remote Sensing using I-Band and S-Band Signals of Opportunity

Kadir Efecik, Benjamin R. Nold
School of Electrical and Computer Engineering, Purdue University
James L. Garrison
School of Aeronautics and Astronautics, Purdue University

ABSTRACT

Measurement of soil moisture, especially the root zone soil moisture, is important in agriculture, meteorology, and hydrology. Root zone soil moisture is concerned with the first meter down the soil. Active and passive remote sensing methods used today utilizing L-band(1-2GHz) are physically limited to a sensing depth of about 5 cm or less. To remotely sense the soil moisture in the deeper parts of the soil, the frequency should be lowered. Lower frequencies cannot be used in active spaceborne instruments because of their need for larger antennas, radio frequency interference (RFI), and frequency spectrum allocations. Ground-based passive remote sensing using I-band(0.1-1GHz) signals of opportunity provides the required sensing depth and solves the problems that come with the spaceborne remote sensing instruments using I-band reflectometry. A dual monopole antenna setup was used with one on the ground for direct signal and one 30m above ground for the reflected signal. The reflectivity and therefore the soil moisture was obtained from the differences between direct and reflected signals. Initially, an S-band (2-3GHz) signal was used as a proof of concept and its ease of implementation because of its higher transmitted power and stationary satellite. This experiment provides conclusions about the root zone soil moisture based on our observation and comparison of direct and reflected satellite signals of two different frequency bands and determination of reflectivity.

KEYWORDS

Remote sensing, soil moisture, reflectometry, I-Band, S-Band