

PALS Observations of Soil Moisture in SMEX02

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Abstract

Spaceborne missions for measuring soil moisture using L-band microwave sensing are currently in formulation. To contribute to the science algorithm development for these missions, experimental data were acquired by the Passive and Active L/S-band airborne sensor (PALS) during the SMEX02 experiment in June/July 2002. SMEX02 was conducted in the Walnut Creek watershed near Ames, Iowa, and included comprehensive ground data collection of soil moisture, vegetation water content, soil temperature, and other surface characteristics, along with remotely sensed data from a suite of microwave airborne instruments. The PALS instrument is a combined microwave radiometer and radar scatterometer. The radiometer operates at 1.41 and 2.69 GHz, V and H polarizations; the radar operates at 1.26 and 3.15 GHz, VV, HH and VH polarizations. The instrument is non-scanning and views the surface at approximately 40° from nadir at ~400m spatial resolution from an altitude of 3500 feet. By flying several parallel flight lines over the watershed region, mapping coverage was obtained for seven days during an approximately two-week period from June 24 through July 6. Data were acquired at two different altitudes (3500 and 7000 feet) to examine the effects of varying spatial resolution on models and retrievals. Some repeat passes over the same flight lines in both directions were also acquired to examine possible directional solar and RFI effects. The PALS data provide a basis for improved microwave modeling of soil moisture and vegetation at L- and S-bands, and for development of multichannel soil moisture and vegetation water content retrieval approaches. Results will be presented showing the characteristics of the radar and radiometer responses to changing soil moisture conditions in the presence of variable vegetation cover. The vegetation cover consisted of predominantly corn and soybean crops in mid-to-late growing season, with typical field dimensions of ~800m. Some wooded areas within the watershed were also observed. The results of tests of different approaches for soil moisture and vegetation estimation using the PALS data will be presented, indicating their respective merits.

Invited Paper: Special Session, T. Jackson

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