EVALUATION OF THE SMAP L1 RADAR BACKSCATTER DATA AND EFFECTS OF TERRAIN TOPOGRAPHY ON SOIL MOISTURE ESTIMATION

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The NASA Soil Moisture Active-Passive (SMAP) mission lunched in January 2015 aims to provide the science community with unprecedented global surface soil moisture estimates to address many of the pressing and current climate dynamics questions. To address the need for high spatial and temporal resolution soil moisture estimates, SMAP incorporates an L-band Synthetic Aperture Radar (SAR) alongside an L-band passive Radiometer. Approximately 2.5 months of high resolution (1-3km) SMAP global SAR data, formally the L1C_S0_HiRes data product, is available for analysis.

Over a given area, SMAPs fixed incident angle conically scanning antenna yields unique spacecraft measurement observation geometries, which when tied to regional topographies pose as a challenge when estimating surface soil moisture. This is primarily due to the fact that within physics-based retrieval methods conventional radar scattering models do not adequately account for terrain topography and their backscatter predictions represent a vegetated, yet horizontal and rough earth.

The focus of this presentation will be on a comprehensive assessment of SMAP radar data obtained over a ~3 km Woody Savanna region in North-central California, knowns as the Tonzi Ranch study site. This location, a candidate core Calibration and Validation (Cal/Val) site for SMAP, includes an extensive network of *in situ* soil moisture sensors (~20 locations).

A twofold discussion will be presented (a) Forward radar scattering model comparisons with SMAP radar, especially an examination of different orbits and spacecraft geometry; for almost all pixels, SMAP has both descending and ascending orbits as well as fore- and aft-looks (b) soil moisture estimation and comparisons with *in situ* sensors. Within a radar-only Objective function, the combination of different SMAP radar co-pol backscatter values and their effects on soil moisture retrieval will be examined.