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SLAP's Radar Calibration and Freeze Thaw Data Analysis

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The Scanning L-band Active Passive (SLAP) is an airborne simulator of NASA's Soil Moisture Active Passive (SMAP) satellite. This presentation will concentrate on the operation and calibration of SLAP's radar and the use of its radar data to detect freeze thaw soil conditions.

SLAP has been built by NASA's Goddard Space Flight Center and includes both a 1.4 GHz radiometer (passive microwave) and a 1.26 GHz radar operating with the same frequencies, polarizations, and conical scan geometry as the SMAP satellite. Acting as a radar, SLAP operates in real aperture mode as a quad-pol scatterometer with the antenna having a conical scan at a fixed 40 degree angle of incidence.

The calibration of the radar is achieved using the classical side-looking-radar formula together with a known antenna pattern and internal calibration of the receiver from the antenna port to the detector stage. At a typical flying altitude of 2500 ft, the 1 microsec transmit pulse usually fills 3 to 4 range gates. The antenna patterns are integrated over each range gate to obtain the total contribution from each. At this altitude the radar illuminates a patch of approximately 350 meters in length on the ground.

Radar data from the SLAPex Freeze/Thaw two week campaign in early November 2015 near Winnipeg, Canada over largely flat agricultural fields will be used in the analysis. Radar return over plowed fields is compared with the results obtained from Adrian Fung's IEM rough surface scattering model. Rough surface profiles measured by investigators on the ground along with continuous surface and subsurface temperature measurements are employed to estimate the ground dielectric constant and roughness correlation coefficient*. Results show that on days with sufficient temperature variation between early morning and afternoon that the SLAP radar data indicates evidence of freezing and then thawing. Data using the SLAP radiometers have shown similar results. These results will be presented at the meeting.

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