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Ground-Based Remote Sensing of Soil Moisture Using Lower Frequency Microwave Radiometers

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The soil is the interface between the biology and geology forming the living skin of the earth, and the water in it keeps the earth alive. Timely information on soil moisture is useful to monitor and forecast agricultural droughts, wildfires, flood risk areas, landslides, etc., Soil moisture measurement using L-band radiometry is now widely accepted as the state-of-art remote sensing approach, and has been adopted by both the soil moisture dedicated satellite missions – Soil Moisture and Ocean Salinity (SMOS) and Soil Moisture Active Passive (SMAP). P-band, which is a longer wavelength measurement, provides the potential to retrieve deeper soil moisture information and to do so more accurately due to reduced soil roughness and vegetation effects. There are very few works using P-band radiometer [1,2] conducted at the USDA / Beltsville Agricultural Research Centre employing truck-mounted L-, C- and P- band radiometers.

The Polarimetric P-band Multibeam Radiometer (PPMR) used in this research operates at 740 MHz / wavelength of 40 cm. It is used along with the Polarimetric L-band Multibeam Radiometer (PLMR), which operates at 1.4 GHz / wavelength of 21 cm. The PPMR and PLMR are mounted onto a 10m high tower in an agricultural farm located at Cora Lynn, Victoria. It is proposed that by considering longer wavelength observations such as P-band, it will be possible to measure soil moisture content over deeper depths, being more comparable with prediction models used in data assimilation. Moreover, it is expected the P-band observations will be less affected by surface roughness and that the vegetation will be more transparent, meaning that soil moisture retrievals should not only be for a deeper layer of soil but will also be more accurate and for parts of Earth where vegetation effectively masks the L-band signals.

This paper will present the preliminary data collected and supporting analysis performed in the arena of P-band Radiometer in soil moisture remote sensing. However, the focus of this paper will be the statistical relationship between P-band Brightness Temperature (T_B) data and soil moisture at various depth ranging from 0 to 60 cm.

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2. Wang, J., T. Jackson, E. T. Engman, W. Gould, J. Fuchs, W. Glazer, P. O Neill, T. J. Schmugge, and J. Mcmurtrey III. (1984) "Microwave radiometer experiment of soil moisture sensing at BARC test site during summer 1981." *NASA Technical Memorandum - 86056.*