An Examination of TDS-1 GNSS-R Returns over Land Surfaces

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GNSS-R (Global Navigation Satellite System Reflectometry) uses reflected GNSS signals from the Earth's surface and operates in a bistatic radar configuration having a GPS or other GNSS satellite as the transmitter and a receiver located either on the ground, an aircraft, or a low Earth orbit (LEO) satellite. GNSS-R can be used for various Earth remote sensing applications, including measurements of sea surface winds, sea surface height, and others. The majority of past application studies have emphasized sea surface observations, given the reasonably well established relationships between sea winds and sea roughness properties. Land applications have also been explored, but the complexity of land surfaces, including their variations in soil moisture, soil texture, surface roughness, and vegetation cover, make land sensing applications more challenging.

The recent (July 2014) launch of the space-borne mission TechDemoSat-1 (TDS-1) by Surrey Satellite Technology Ltd (SSTL) offers opportunities for examining GNSS-R land surface returns and their relationship to land surface properties. TDS-1 provides onboard-processed Delay-Doppler maps (DDMs), and an initial set of TDS-1 dataset has been made available to the science community.

This presentation will describe an initial examination of TDS-1 land surface returns and their relationships to soil moisture, surface roughness, vegetation cover, and other land properties determined from external data sources. Particular emphasis will be given to a search for "coherent" land surface returns, which can occur for cases have small surface roughness and can allow for higher spatial resolution in TDS-1 measurements. Evidence of relationships that may allow use of TDS-1 data for land surface property remote sensing will also be discussed, along with the implications of these results for future GNSS-R land sensing missions.