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Soil moisture and vegetation sensing using GNSS-R polarimetric measurement

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Abstract

GNSS-Reflectometry is an efficient tool for remote sensing and plays a key role in several of applications. The estimation of soil moisture and vegetation in the land field is attracting widespread interest in hydrology, climatology and carbon cycles. In order to investigate the scattering polarization properties from different types of surface environments, an airborne measurement was performed using a new 4-channel prototype for collecting the direct, reflected left-hand circular polarized (LHCP) and right-hand circular polarized (RHCP) signals. Both LHCP and RHCP reflected signals were acquired by a dual polarization antenna at the same time. A data averaging procedure was used to reduce the incoherent power of received power and the reflected data from two channels were normalized by direct signals obtained from each front-end (FE). Then three polarimetric observables were used to analyze the vegetation biomass and soil moisture fluctuations. It was concluded that polarimetric ratio is sensitive to soil moisture content (SMC), and considerably independent to roughness and vegetation biomass. The trunk component was confirmed to be the most important factor affecting the amplitude of scattering polarizations. Furthermore, the measurement results show that the PR variation between different elevation angles was affected by roughness and biomass. The results show another possibility of further geophysical parameter evaluation by using polarimetric applications in GNSS-R.

Keywords: *GNSS-R; Polarimetric; Soil moisture; Vegetation.*