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Soil Moisture Estimation by PALSAR in Sendai

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ALOS was successfully launched on January 24, 2006 and a huge amount of data, which includes PALSAR/polarimetry data, has down-linked since now. One of the prospective applications for the PALSAR data is soil moisture retrieval. But frequency of observation with PALSAR for any places is limited, even if the PALSAR has a mature observation plan in advance. Our purpose is to use the GB-SAR system for increasing a chance of the polarimetry observations for any place & time, connect it with the PALSAR observation and efficiently develop any algorithms for applications of satellite SAR data, such as soil moisture & forest biomass retrieval, and so on.

In this time, we selected bare soil areas and performed the simultaneous GB-SAR field experiment with the PALSAR observation near our university, where small pebbles were covered with on April 14, 2007. The picture of the experiment is shown in Fig. 1. We carried out not only the GB-SAR measurement, but also measured surface roughness, soil moisture(or dielectric constant) in the soil by using a ground penetrating radar (GPR) and TDR. We also selected two other places as validation sites for PALSAR data and measured surface roughness and soil moisture values there. The PALSAR observation was done in the same day with an off-nadir angle of 21.5° and with the polarimetry mode. Two small corner reflectors were deployed in the field experiment sites for the purposes of the site identification and geometric calibration.

GB-SAR data with off-nadir angles of 20° and 40° were taken in each measurement. A size of the data is 4m in azimuth and 6m in range direction, but the effective size of the range is about 4m. The frequency is selected from 0.05GHz to 3.05GHz. Four metal spheres were put on a ground for a calibration purpose.

σ^0 values for each polarization, and Entropy/ α / Anisotropy are calculated from the both data. These values show well agreements in each parameter under some assumptions. We compare the parameters derived from our experiment with some models. While two classical models tends to mach the parameters, recent model show some discrepancy.

While the soil moisture value could not estimate from one of the recent model due to an out of range of a parameter space, the roughness is estimated to be 2.4cm. But the roughness derived from field experiment is 0.7cm and show large discrepancy.



Fig. 1. GB-SAR observation site