ANTENNA PATTERN CORRECTIONS FOR THE COMBINED RADAR / RADIOMETER (COMRAD) GROUND-BASED SMAP SIMULATOR

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An antenna pattern correction model has been developed to study passive remote sensing of soil moisture from a ground-based system at L-band. It has been used to improve accuracy of radiometric measurements of NASA's combined radar/radiometer (ComRAD) system, which acts as a SMAP simulator, during the field campaigns. It is well known that the measured antenna temperature is degraded by several phenomena due to the geometry of the observing system, antenna polarization mixing and beamwidth. Because of these non-ideal conditions, care must be exercised when comparing measurements of different observing systems that operate at different platforms (ground-based, airborne, spaceborne, etc.) as well as theoretical model calculations. This paper presents a correction scheme that involves quantification of antenna sidelobe contribution, cross-polarization coupling, and beam divergence effects during radiometric observations of scene and sky.

ComRAD consists of dual-polarized 1.4-GHz total power radiometers (LH, LV) and a quad-polarized 1.25-GHz L-band radar sharing a single parabolic dish antenna. The antenna of the ComRAD instrument system has been undergone several upgrades over the course of its deployment at field campaigns since 2006. The original ComRAD antenna has been realized as a dual polarized Newtonian feed with a patch design. Later, it has been replaced with a new antenna of a Cassegrain type with a very low loss to achieve passive measurements for longer periods without recalibrating. This study aims to evaluate performance of the new antenna system for remote sensing of soil moisture from ground based systems as well as to investigate the effect of future antenna design approaches on the performance.