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DETERMING SYNTHETIC APERTURE RADAR SIGNATURE OF TERRAIN FOR EARTH OBSERVATION USING COMPUTER ELECTROMAGNETIC MODELS

Abstract

Characterisation of earth terrain using airborne or satellite synthetic aperture radar (SAR) requires an understanding of the radar signature of different terrain types. Based on our previous work using computer simulation models and experimental data to determine the SAR remote sensing signature of petroleum sands for petroleum exploration, this paper investigated the performance of SAR remote sensing to track desertification and land degradation from airborne or space-borne platforms. First physical terrain parameters that influence the radar signature of terrain were identified then sensor characteristics that influence electromagnetic (EM) reflectivity of terrain were modeled. Finally EM scattering models were developed along with an algorithm to distinguish subtle variations in backscatter from different terrain types using a range of frequencies, polarizations and incident sensor geometry. The results provide new information on the effect of the complex electrical permittivity $\varepsilon\ \{\omega\}$ and loss tangent, tan δ of terrain on one hand and the presence of soil moisture on the identification of desertification. This information can be used to develop early warning databases to monitor the progress of desertification and efforts to combat the trend.