MEASURING SOIL MOISTURE WIT]] ACTIVE MICROWAVE: EFFECT OF VEGETATION.

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An empirical algorithm for the retrieval of soil moisture content and surface Root Mean Square (RMS) height from remotely sensed radar data was developed using scatterometer data acquired with the RASAM and POLARSCAT systems. The algorithm requires two co-polarized channels at a frequency between 1,5 GHz and 11 GHz. It gives best results for kh less than 2.5 where k is the wave number and h is the RMS height of the surface and for the local incidence angle greater than 30 degrees.

Omitting the usually weaker hv-polarized returns makes the algorithm less sensitive to system cross-talks and system noise and simplify the calibration process. It also makes the algorithm more robust to the presence of vegetation. However, inversion results indicate that significant amounts of vegetation cause the algorithm to underestimate soil moisture and overestimate RMS height. To address this problem, a simple criteria based on the ratio of the cross-polarized return over the vv-polarized return is developed to select the areas where the inversion results are more reliable, i.e. where the vegetation is sparse enough. This SAR derived vegetation parameter is shown to be positively correlated with the Normalized difference Vegetation Index (NDVI).

The inversion can then be applied blindly to full scenes and provide a soil moisture map and a surface roughness map masking out automatically the areas where the algorithm is not applicable due to vegetation cover. Among the areas over which the inversion cannot be applied, the areas with intermediate vegetation cover are of particular interest as both the vegetation and the under] ying bare surface affect the backseat ter. U sing the cross-polarized channel together with the co-polarized channels, the surface and the vegetation components of the backscatter are decoupled and the soil moisture of the underlying bare surface can be estimated.

In order to assess the inversion accuracy, the derived soil moisture values are compared with *in-situ* measurements collected over a variet y of scenes between 1989 and 1994. The experiments involved are Washita'92, Washita'94, EFEDA'91. Both spaceborne (SIR-C) and airborne (AIRSAR) data are used in the test, The studied areas include an agricultural area in the Mid-West (Washita) and an agricultural area in a semi-arid climate (EFEDA). Over this large sample of conditions, the RMS error in the soil moisture estimate is found to be 3.5 % and the RMS error in the RMS height estimate is less than 0,35 cm absolute for bare or slightly vegetated surfaces. The algorithm accuracy over areas with intermediate vegetation cover will also be discussed.