Geophysical Research Abstracts, Vol. 8, 03291, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03291
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A semi empirical surface backscattering model for bare soil surfaces based on a generalized power law spectrum approach and its application for the derivation of surface parameters

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Surface backscattering models are commonly used for the inversion of land surface parameters as e.g. soil moisture, from microwave remote sensing data. As the microwave backscattering coefficient of bare soil surfaces is dominated by the effects of surface roughness and soil water content, the inversion of surface parameters is often an ill posed problem, as surface roughness is often unknown and the observing system is limited due to fixed sensor configurations (frequency, imaging geometry, polarization).

An adequate characterization of surface roughness is crucial to obtain reliable backscatter simulation results from existing analytical backscattering models. The surface roughness is typically characterized using rms height, autocorrelation length and shape of autocorrelation function. For the solution of inverse problems it is of interest to reduce the number of unknown surface parameters. Simplified backscattering models are required in this context.

The paper introduces a new semi-empirical backscattering model in C-band for rough dielectric surfaces which is based on the IEM. It is shown that surface roughness description can be reduced using a single surface roughness parameter. To account for the high variability of autocorrelation function types, the proposed model is based on a generalized power law spectrum approach which mediates between gaussian and exponential correlated surfaces. The approach is validated against analytical backscatter simulations and laboratory measured microwave signatures and the surface parameter

retrieval capabilities of the suggested model are investigated