Measurement of Aerodynamic Roughness Using Radar Backscatter over Vegetated Surfaces
(Topic 3- Active Microwaves)

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Gathering of local information from remote platforms is often a more cost-effective way of obtaining the required data type than are local measurements. A good example is the collection of wind regime data in order to infer the amount and type of aeolian transport at a given site. This paper describes a potential mechanism for remotely inferring the wind regime from synthetic-aperture radar data, and describes a project to estimate the practicality of using such a mechanism.

Both radar backscatter and wind flow are functions of the roughness of the site under study. It is therefore reasonable to suspect that a fairly well-behaved relationship might exist between normalized radar backscatter coefficient (cs$_o$) and aerodynamic roughness length, z_0, the two parameters used to quantitatively describe the respective phenomena [*Ulaby et al, 1 992; Arya, 1982*]. Aeolian transport of small particles depends in turn on wind flow and is an important quantity to measure for several economic-related reasons, but the direct measurement of wind flow regime generally involves construction of wind towers and many days of data collection, making such data extremely expensive and prohibitive in areas that cannot be easily accessed.

For both desert and vegetated sites where extensive wind profile data already exist, a NASA airborne multifrequency, multipolarization radar was used to acquire molar data at several incidence angles [*Greeley et al., 1991; **Rasmussen et d., 1993***]. At the vegetated sites, vegetation height varied from tens of centimeters to several meters, and surface roughness was a few centimeters.

Values of z_0 and σ_0 have been calculated from the wind and radar data, respectively. For a single choice of radar incidence angle, and using L-band cross-polarized radar backscatter, an empirical relationship has been found which seems to be reasonably independent of site type. The relationship holds over three orders of magnitude in z_0 (including both desert and vegetated sites), producing a variation in σ_0 of over 30 dB. Work has begun to derive a theoretical basis for this relationship so that these results can be generalized to other locations.

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References

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