Satellite Measurements of Backscatter from Rain-Induced Roughness on the Sea Surface Using QUIKSCAT AND TRMM

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Abstract: The presence of rain affects the ability of the SeaWinds scatterometer to estimate surface wind speed and direction. There are several aspects of this problem. Studies are in progress to evaluate the effect of rain-induced sea surface roughness on the normalized radar cross section (NRCS) measured by the SeaWinds satellite radar on the QuikSCAT (QSCAT) satellite. In order to accomplish the wind measurement, the effect of attenuation and scattering by the atmospheric rain must be removed. The QSCAT NRCS data is collocated in space and time with the TRMM satellite, in the neighborhood of an NDBC buoy, to permit the calculation and removal of the contribution from the atmospheric precipitation. The buoy wind speed and direction provides critical information on the impact of this effect on the operational performance of this instrument, and to assist with other comparisons. Vertical profiles of the atmospheric water content and reflectivity are available from the TRMM sensors. The buoy winds are essential to estimate the nominal surface NRCS that is augmented by the rain-splash contribution.

The splash effect is more significant at the lower wind speeds. Initial results suggest that at a rainrate <1 mm/hr and at wind speeds of <4 m/s the enhanced small scale roughness caused by rain striking the surface leads to a 2-5 dB increase of the NRCS over the nominal sea NRCS. There are also indications of a polarization differential whereby the rain induced roughness affects the vertically polarized backscatter more than the horizontal polarization. More cases of these satellite collocations are being analyzed to observe the effects across a wider range of conditions.

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