Abstract View

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Radar Returns from the Sea Surface—Bragg Scattering and Breaking Waves

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ABSTRACT

Recent ideas on the structure of the equilibrium range of wind-generated ocean waves are applied to the question of radar backscattered returns from the sea surface. It is shown that the backscattering cross section can be represented as the sum of separate contributions from Bragg-scattering and from individual breaking events: where θ is the angle of incidence, ϕ is the direction of observation relative to the wind, u_* is the friction velocity and κ the radar wavelength; the Bragg-scattering contribution increases linearly with u_* and the sea spike contribution cubically. The number of sea spikes per unit time per unit surface area for a given threshold of spike intensity or duration is proportional to $g^{-1}u_*^3$. Calibrated radar measurements of median values of σ_0, which tend to suppress sea spike contributions, have been made by Guinard et al. over a range of radar wavelengths from 70 to 3.4 cm. These scale consistently with the parameter $(u_*^2\kappa/g)^{½}$ over angles of incidence greater than 30°, and are, overall, in accordance with a linear dependence. This suggests that the sea spike contribution to the median σ_0 is generally small over the range of observations, though their influence on the mean is not established. The cubic dependence predicted for the *frequency of occurrence* of sea spikes on u_* does, however, suggest a new and simpler method for the measurement of surface wind stress by remote sensing.

top

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