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A radar backscattering mechanism of ocean surface in response to rainfall[1] XINAN LIU, QUANAN ZHENG, REN LIU, JAMES H. DUNCAN, University of Maryland, College Park — The characteristics of ocean surface in response to rainfall and its radar back-scatter are simultaneously measured in laboratory. The experiment is carried out in a water pool that is 1.22 m by 1.22 m with a water depth of 0.3 m. Artificial rainfall is generated from an array of hypodermic needles. The surface characteristics including crowns, stalks, secondary droplets and ring waves are measured with a cinematic Laser-Induced-Florescence (LIF) technique. Our experimental results show that impinging raindrops on the water surface generate various water surface structures with different relative sizes. Among them stalks and crowns comprise the dominant radar backscattering. On the basis of these laboratory experiments and theories of radar scattering from a rough surface, a near-resonance radar backscattering model for quantifying the dependence of the radar return intensity on rain rate on the ocean surface is developed. The model explains the radar response to rain rate simultaneously observed by C-band ASAR and ground-based weather radar. The physical model provides reasonable mechanisms to explain the frequency dependence and polarization behavior of radar signatures from rain cells on the ocean surface.

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