RAINFALL ON MICROWAVE RETURN FROM THE SEA SURFACE

by

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Our long range goal remains unchanged--conduct experiments and develop/test theoretical models to permit useful algorithms to be constructed for microwave systems that observe oceanic processes. This topic is relevant to altimeters, scatterometers, and rain rate measurements. We currently are focusing attention on scatterometer wind velocity measurement. In the future, we plan to also investigate (a) the modification of altimeter cross-section due to rain--which is relevant to altimeter derived wind speed, and (b) bistatic scatter angle modification due to rain--which is significant to radar measurement of rain-rate by sensor proposed for the Tropical Rainfall Measurement Mission.

One component of our laboratory efforts is an experiment conducted, in the wind-wave tank at the GSFC/WFF, to quantify the effect of rain-generated surface-wave brightening of radar cross-section. Laboratory conditions can be characterized as light wind, functional rain rates, a single drop size, and a 36 GHz radar system at 30 degrees inclination. This study set a standard for future experiments because these are the first observations to reveal a possible functional form for modelling this process. During the remainder of FY88, we plan to: (1) investigate the effect of drop size on the cross-section brightening by rain-wave generation, and (2) conduct an

experiment at the Institut de Mechanique and Statistique de la Turbulence in Marseille, France, to check the feasibility of making measurements at azimuthal angles so that scatterometer directional response during rain can be quantified.

Our primary enterprise during FY89 will be to conduct experiments to quantify the effect of rain attenuation on existing wind-waves as observed by scatterometers. This requires construction of a 15- by 1.5-feet rain simulator. Design and testing of the simulator concepts have been conducted so that construction can proceed in a timely manner. The completed system will: (a) control rain rate by varying pressure on the water supply, (b) control drop size by air-jets blowing drops off each water nozzle, and (c) provide realistic raindrop distributions by microprocessor control of the air-jets.

The main research topic for FY89 is to conduct experiments to test Manton's 1973 model of rain-attenuation of wind-waves.

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