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Polarimetric Microwave Remote Sensing of Wind-Driven Ocean Environment

Editors: Y. Zhang and T. M. Grzegorczyk

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POLARIMETRIC MICROWAVE REMOTE SENSING OF WIND-DRIVEN OCEAN ENVIRONMENT

PREFACE

This issue of Progress in Electromagnetics Research (PIER) is a special issue on Polarimetric Microwave Remote Sensing of the Wind-Driven Ocean Environment. This field of research has grown rapidly over the past decade. It has long been known that the sea surface microwave emission and scattering properties are affected by the local winds. Scatterometers have exploited this sensitivity to retrieve the ocean surface wind speed and direction. The SSM/I (Special Sensor Microwave/Imager), a series of space borne radiometers on the Defense Meteorological Satellite Program (DMSP), has provided ocean surface wind speed for the military and civilian users since the late 1980s. Now, we as a community are on the verge of measuring the wind direction with radiometers.

This new capability is the product of polarimetric radiometry, which measures not only the principal polarizations, but also their cross correlation. Studies and field campaigns in the 1980s and 1990s demonstrated that the microwave emission changed not only with wind speed, but also wind direction. Augmenting traditional dual-polarized radiometers with polarimetric channels provided additional information enabling resolution of the wind direction from the microwave measurements. The success of these early efforts and the continuing demand for global ocean surface wind vector gave the U.S. Navy and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) the confidence to sponsor the Naval Research Laboratory to develop the WindSat system. WindSat is a space borne demonstration of polarimetric microwave radiometry to measure the ocean surface wind vector. It was launched on 6 January 2003 as part of the Space Test Program Coriolis mission. WindSat is also a risk reduction mission for the NPOESS Conical Microwave Imager Sounder, which is required to operationally provide ocean surface wind vector through at least 2020.

With these two satellite missions, it is clear that the work contained in this volume has a clear purpose and a direct application to not only scientists and engineers, but also to everyone who uses satellite weather data. However, it is also clear that this is a field with many open questions. Much work remains for us to fully understand the microwave polarimetric signature of the wind-driven ocean across

a broad range of environmental conditions.

Despite this being a special issue on a single topic, this volume contains a wide array subject matter. There are papers addressing fundamental principles of electromagnetic scattering from anisotropic surfaces. Other papers present polarimetric emission models of the ocean surface. Still other papers analyze the effects of foam and oil slicks on the scattering and emission. Collectively, this volume represents an impressive body of work that will serve as an excellent reference for many years.

All the papers in this collection were peer reviewed. I would like to acknowledge the reviewers for their hard work and recommendations.

I would like to thank the editor of PIER, Jin Kong, and the editors of this special issue, Yan Zhang and Tomasz Grzegorczyk, for their efforts in producing this issue.

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