Microwave Remote Sensing Active And Passive Volume Ii Radar Remote Sensing And Surface Scattering And Emission Theory

The power of microwave remote sensing for studying the oceans of the world was demonstrated conclusively by the SEASAT mission in 1978. Since then, no further satellite-flown instruments have been available to provide further data of this type. However, the proposed launch of ESA's ERS-1 satellite will lead to a new set of active microwave instruments being flown in space in 1990. Even though similar data has been obtained from aircraft-flown instruments SAR, scatterometers, altimeters etc. - a great deal of activity has been taking place to develop the necessary expertise in handling and analysing such data when it comes on-stream from ERS-1 and from subsequent satellites. It was against this background that the scientific Affairs Division of NATO again agreed to sponsor an ASI in Dundee in 1988. Its purpose was to review existing knowledge of the extraction of marine and atmospheric geophysical parameters from satellite-gathered microwave data and to enable scientists to prepare themselves and their computing systems to utilise the new data when it becomes available. The importance of the data is largely as input parameters to assist in the fitting of boundary conditions in large computer models. The course was concerned more with the non-imaging instruments, that is with passive radiometers, altimeters and scatterometers, than with the (imaging) synthetic aperture radar.

The use of air photographs as an aid to understanding and mapping natural resources has long been an established technique. The advent of satellite imagery was, and indeed by many still is, regarded as a very high altitude air photograph, but with the introduction of digital techniques the full analysis of imagery has become very sophisticated. Radar imagery presents the resource scientist with a new imaging technique that has to be understood and used, a technique which, although in many respects still in its infancy, has considerable applications potential for resources studies. Remote sensing now forms an element in study courses in the earth sciences in many major universities and a number of universities offer specialist post-graduate courses in remote sensing. Nevertheless there are a large number of earth scientists already working with imagery who have progressed from the air photograph base to satellite imagery. Such scientists may find themselves confronted with microwave or radar imagery or wish to use the imagery for surveys and find themselves hindered by a lack of understanding of the differences between radar imagery and optical imagery. Unfortunately reference to much of the literature will not be of very great help, many excellent text books on the theory and interaction of microwaves, on instrument design and construction and on the research carried out on specific target types exist, most of these are however written for specialists who are usually physicists not earth scientists.

Remote Sensing of Aerosols, Clouds, and Precipitation compiles recent advances in aerosol, cloud, and precipitation remote sensing from new satellite observations. The book examines a wide range of measurements from microwave (both active and passive), visible, and infrared portions of the spectrum. Contributors are experts conducting state-of-the-art research in atmospheric remote sensing using space, airborne, and ground-based datasets, focusing on supporting earth observation satellite missions for aerosol, cloud, and precipitation studies. A handy reference for scientists working in remote sensing, earth science, electromagnetics, climate physics, and space engineering. Valuable for operational forecasters, meteorologists, geospatial experts, modelers, and policymakers alike. Presents new approaches in the field, along with further research opportunities, based on the latest satellite data Focuses on how remote sensing systems can be designed/developed to solve outstanding problems in earth and atmospheric sciences Edited by a dynamic team of editors with a mixture of highly skilled and qualified authors offering world-leading expertise in the field

Past research has comprehensively assessed the capabilities of satellite sensors operating at microwave frequencies, both active (SAR, scatterometers) and passive (radiometers), for the remote sensing of Earth’s surface. Besides brightness temperature and backscattering coefficient, microwave indices, defined as a combination of data collected at different frequencies and polarizations, revealed a good sensitivity to hydrological cycle parameters such as surface soil moisture, vegetation water content, and snow depth and its water equivalent. The differences between microwave backscattering and emission at more frequencies and polarizations have been well established in relation to these parameters, enabling operational retrieval algorithms based on microwave indices to be developed. This Special Issue aims at providing an overview of microwave signal capabilities in estimating the main land parameters of the hydrological cycle, e.g., soil moisture, vegetation water content, and snow water equivalent, on both local and global scales, with a particular focus on the applications of microwave indices.

Active remote sensing is the principal tool used to study and to predict short- and long-term changes in the environment of Earth - the atmosphere, the oceans and the land surfaces - as well as the near space environment of Earth. All of these measurements are essential to understanding terrestrial weather, climate change, space weather hazards, and threats from asteroids. Active remote sensing measurements are of inestimable benefit to society, as we pursue the development of a technological civilization that is economically viable, and seek to maintain the quality of our life. A Strategy for Active Remote Sensing Amid Increased Demand for Spectrum describes the threats, both current and future, to the effective use of the electromagnetic spectrum required for active remote sensing. This report offers specific recommendations for protecting and making effective use of the spectrum required for active remote sensing.

This book contains papers by well renowned scientists from all over world --- including Eastern Europe --- which were presented during a specialist meeting on microwave radiometry and its applications to remote sensing of the atmosphere and the surface of the earth held in Florence, Italy, in March 1988. The book is divided into five sections, some of which contain review papers which summarize the most recent advances in the field. The sections are: -- Microwave radiometry of the earth's surface -- Dielectric properties of natural materials -- Microwave radiometry of the atmosphere -- Synergism of passive and active microwave remote sensors -- Technology of passive microwave systems

Microwave and millimeter-wave remote sensing techniques are fast becoming a necessity in many aspects of security as detection and classification of objects or intruders becomes more difficult. This groundbreaking resource offers you expert guidance in this burgeoning area. It provides you with a thorough treatment of the principles of microwave and millimeter-wave remote sensing for security applications, as well as practical coverage of the design of radiometer, radar, and imaging systems. You learn how to design active and passive sensors for intruder detection, concealed object detection, and human activity classification. This detailed book presents the fundamental concepts practitioners need to understand, including electromagnetic wave propagation in free space and in media, antenna theory, and the principles of receiver design. You find in-depth discussions on the interactions of electromagnetic waves with human tissues, the atmosphere and various building and clothing materials. This timely volume explores recently developed detection techniques, such as micro-Doppler radar signatures and correlation radiometry. The book is supported with over 200 illustrations and 1,135 equations.

Microwave and millimeter wave high-power vacuum electron devices (VEDs) are essential elements in specialized military, scientific, medical and space applications. They can produce mega watts of power which would be equal to the power of thousands of solid state power devices (SSPDs). Similarly, in most of today's T/R-Modules of active phased array antennas for radars and electronic warfare applications GaAs based hybrid and MMIC amplifiers are used. The early applications of millimeter-wave MMICs were in military, space and astronomy systems. In the last three decades, microwave remote sensing has shown a high potential in characterization of land surface parameters (soil moisture, vegetation biomass, water covers, etc.). In this context, a very rich activity has been developed to propose techniques (satellite, airborne, in situ) and methodologies to optimize contribution of microwave remote sensing, in terms of precision, spatial, and temporal resolutions. Microwave Radar and Radiometric Remote Sensing provides you with theoretical models, system design and operation, and geoscientific applications of active and passive microwave remote sensing systems. It is aimed to the study of both reviews and original researches related to recent innovative microwave remote sensing instrumentation for land surface applications. Microwave remote sensing provides a unique capability towards achieving this goal. Over the past decade, significant progress has been made in microwave remote sensing of land processes through development of advanced airborne and space-borne microwave sensors, and the tools - such as physics-based models and advanced inversion algorithms - needed for analyzing the data. These activities have sharply increased in recent years since the launch of the ERS-1/2, JERS-1, and RADARS AT satellites, and with the availability of radiometric data from SSM/I. A new era has begun with the recent space missions ESA-ENVISAT, NASA-AQUA, and NASDA-ADEOSII, and the upcoming PALSAR and RADARSAT2 missions, which open new horizons for a wide range of operational microwave remote-sensing applications. This book highlights major activities and important results achieved in this area over the past years.

Introduction to Microwave Remote Sensing offers an extensive overview of this versatile and extremely precise technology for technically oriented undergraduates and graduate students. This textbook emphasizes an important shift in conceptualization and directs it toward students with prior knowledge of optical remote sensing: the author dispels any linkage between microwave and optical remote sensing. Instead, he constructs the concept of microwave remote sensing by comparing it to the process of audio perception, explaining the workings of the ear as a metaphor for microwave instrumentation. This volume takes an “application-driven” approach. Instead of describing the technology and then its uses, this textbook justifies the need for measurement then explains how microwave technology addresses this need. Following a brief summary of the field and a history of the use of microwaves, the book explores the physical properties of microwaves and the polarimetric properties of electromagnetic waves. It examines the interaction of microwaves with matter, analyzes passive atmospheric and passive surface measurements, and describes the operation of altimeters and scatterometers. The textbook concludes by explaining how high resolution images are created using radars, and how techniques of interferometry can be applied to both passive and active sensors.