INT. J. REMOTE SENSING, 1982, VOL. 3, NO. 4, 359–361

Foreword

Remote sensing experiment in MARSEN

K. HASSELMANN

Max-Planck-Institut für Meteorologie,
Bundesstrasse 55, 2000 Hamburg 13, F.R. Germany

and O. H. SHEMDIN

Jet Propulsion Laboratory,
4800 Oak Grove Drive, Pasadena, California 91103, U.S.A.

This issue of the *International Journal of Remote Sensing* contains eight papers describing results from the *Ma*rine *R*emote *Sen*sing (MARSEN) project. The MARSEN experiment was carried out in the North Sea in the period 15 July–15 October 1979 and had two principal objectives:

to test ocean remote sensing techniques, and

to apply these techniques, together with conventional measurements, to study the dynamics of near-shore oceanic processes.

The importance of adequate sea truth data to test remote sensing techniques has often been stressed. It is also generally recognized that the proper interpretation of remote sensing signals requires detailed *in situ* experiments to study the local processes affecting the emission, scattering, absorption, etc., of the probing wave fields. These needs motivated the remote sensing experiments designed to meet the first MARSEN objective.

The second objective of MARSEN was primarily oceanographic: to understand and develop improved models of the complex dynamics and interactions of surface waves, currents, sea level variations, and the salinity and temperature structure in the near-shore regions of the ocean. Remote sensing methods were applied here mainly as a tool to complement the moored arrays of conventional instruments and ship measurements.

It is a characteristic of oceanic remote sensing methods that they offer sampling possibilities beyond the realm of conventional instrumentation in some respects (for example, synoptic, extended high resolution horizontal coverage) while suffering from inherent limitations in other regards (for example, restriction to surface properties of the ocean, ambiguities in signal interpretation). Their value in oceanic field programmes therefore depends on a well-balanced measurement strategy in which the sampling advantages of the remote sensing methods are fully exploited, while the information not available from these techniques is provided by conventional instrumentation. Ultimately, the scientific impact of oceanic remote sensing methods can be assessed only from the experience gained in such multi-system field projects. The second, scientific objective of the MARSEN experiment

0143-1161/82/0304 0359 $03.00

provided a valuable opportunity for testing remote sensing methods in such a realistic scientific environment—an important ingredient for the development of oceanic remote sensing techniques which has often been lacking in the past.

The present set of MARSEN papers, however, is largely directed towards the first objective: the investigation of remote sensing techniques *per se*, independent of their scientific application. A collection of MARSEN papers concerned with various physical processes in the near-shore region, in addition to further remote sensing studies, is in preparation for a special issue of the *Journal of Geophysical Research*. We refer to the introductory article of this collection for a more detailed summary of the complete MARSEN experiment (cf. also the reports *MARSEN Experiment Plan*, 1978, and *MARSEN Data Analysis and Research Plan*, 1980, by Hasselmann and Shemdin). Abstracts and summaries of MARSEN results pertaining to both objectives of the experiment are given also in the *Proceedings of the North Sea Symposium*, Hamburg, 31 August–4 September 1981, the Fall Meeting of the American Geophysical Union in San Francisco, 7–11 December 1981, the *First International Conference on Meteorology and Air/Sea Interaction of the Coastal Zone*, The Hague, 10–14 May 1982 and the *International Geoscience and Remote Sensing Symposium*, Munich, 1–4 June 1982.

The MARSEN remote sensing investigations covered a wide range of techniques, including optical (both passive and active), infrared (passive), microwave (passive and active), and HF (active) methods. The systems were operated from aircraft (Convair 990, Phantoms, P3, Do 28s and B17), research towers (Nordsee Forschungsplattform and Noordwijk), and land stations (5 HF radar stations). The optical and I.R. data were compared with satellite imaging data (NIMBUS G, TIRUS N, NOAA 6, LANDSAT 2 and 3). Unfortunately, the originally planned intercomparison of a number of MARSEN microwave experiments with similar microwave measurements made from SEASAT could not be carried out because of the premature failure of the satellite.

Only a part of the remote sensing experiments carried out during MARSEN are reported here. The most conspicuous omission concerns the microwave backscatter modulation and surface wave experiments made at the Nordsee and Noordwijk research towers, and the concurrent aircraft overflights over the towers with synthetic aperture radars. A collection of papers discussing the interrelationship between the modulation of microwave backscatter by surface waves, hydrodynamic interactions between long surface waves and short backscattering ripples, and the imaging of a moving sea surface by synthetic aperture radars is in preparation. The present set nevertheless includes several interesting studies addressing particular experimental and theoretical aspects of microwave remote sensing. It is hoped that these will contribute to the synthesis which will be attempted in the collected set of MARSEN microwave investigations to be published later.

Another significant omission is the intercomparison of optical and I.R. aircraft data with *in situ* radiation and sea surface temperature data obtained from ships. These results will be reported in the aforementioned special MARSEN issue of the *Journal of Geophysical Research*.

Although the following contributions cannot for these reasons claim to represent a balanced summary of the principal MARSEN remote sensing activities, they do provide an interesting sample of the widely diverse remote sensing techniques which were successfully deployed during the experiment. The intercomparison and final synthesis of a number of interrelated remote sensing experiments, particularly in the

microwave area, remain still to be carried out. Furthermore, a final assessment of the overall MARSEN remote sensing effort must await the completion of the comprehensive scientific oceanographic analysis and modelling programme, in which the remote sensing methods were tested as tools. The analysis of individual MARSEN remote sensing results presented in the following papers, although interesting in their own right, should therefore be viewed from this perspective as the necessary first steps towards the realization of these broader MARSEN objectives.

Cover photograph

Landsat scene of the MARSEN test area 'German Bight'.