Springer

Acoustic Sensing Techniques for the Shallow Water Environment - Inversion Methods and Experiments

A. Caiti, N. Ross Chapman, J.-P. Hermand and S.M. Jesus (Eds.)

Comments: address your purchase orders to Springer.
Ref.: Springer, Dordrecht, (ISBN-10 1-4020-4372-4), The Netherlands, **2006.**

Abstract: This volume contains the collection of papers from the second workshop on Experimental Acoustic Inversion Techniques for Exploration of the Shallow Water Environment. The workshop theme followed the original concept of the first workshop, held in Carvoeiro, Portugal, in 1999, i.e., to focus on experiments and experimental techniques for acoustic sensing in the shallow ocean. More than forty leading international scientists were invited to meet in the picturesque town of St. Angelo on the island of Ischia, in June 2004, to discuss progress in the application of new experimental techniques for exploration and assessment of shallow water environments. Acoustic techniques provide the most effective means for remote sensing of ocean and sea floor processes, and for probing the structure beneath the sea floor. No other energy propagates as efficiently in the ocean: radio waves and visible light are severely limited in range because the ocean is a highly conductive medium. However, sound from breaking waves and coastal shipping can be heard throughout the ocean, and marine mammals communicate acoustically over basin scale distances.

The motivation for developing and improving acoustic techniques for shallow water applications remains as strong as ever. Near coast and inshore environments worldwide are critically important habitats for many ecologically, commercially, and socially important species. They are also rich with hydrocarbon and other mineral resources. At the same time, these areas house nearly 60% of the world's population and generate approximately 25% of global primary productivity. Pressure from industrial activity in the coastal cities, development of off shore resources, international and local shipping traffic and even recreation continues to threaten the coastal shallow water environment.

The papers in this book indicate a high level of research interest that has generated significant progress in development and application of experimental acoustic inversion techniques since the last workshop. The applications span a broad scope in geoscience, from geophysical, biological and even geochemical research. The list includes: estimation of geotechnical properties of sea bed materials; navigation and mapping of the sea floor; fisheries, aquaculture and sea bed habitat assessment; monitoring of marine mammals; sediment transport; and investigation of natural geohazards in marine sediments. Several papers reveal progress in using high frequency acoustic backscatter

to image objects on and beneath the sea floor, and generate data bases that combine bathymetry with non-acoustic information to provide comprehensive habitat maps of features such as eel grass. A new nonlinear acoustic technique is reported for detecting and quantifying the amount of gas in shallow marine sediments. Significant progress is reported in a series of papers related to the development of new techniques for estimating geoacoustic properties of the sea bed by inversion of acoustic field data. Inversion techniques are described here that make use of natural sound sources in the ocean, and also novel experiments that use aircraft and ships as the sound source. The same inversion techniques are also being used for passive detection and tracking of marine mammals, using a new autonomous experimental recording system. A common feature in all the inversion techniques is the inter-relationship of diverse features and processes that affect sound propagation in the ocean. An inversion for seabed properties cannot ignore the effect of processes in the water column; uncertainty in one parameter of the environment leads to errors in the estimates of another. Perhaps the best example of this relationship is seen in matched field inversion methods which require explicit understanding of the sound propagation. As was the case in the previous workshop, the second workshop brought together researchers from diverse but fundamentally overlapping interests. The collected papers in this volume provide a comprehensive representation of current research efforts and developments, together with survey papers critically reviewing the progress made in the past years and the most promising trends for future research.