2013-10

Introduction to special issue on deep water ocean acoustics

Colosi, John A.; Worcester, Peter F.

J. Acoust. Soc. Am. 134 (4), Pt. 2, (October 2013), p. 3115
http://hdl.handle.net/10945/48420

Introduction to special issue on deep water ocean acoustics

John A. Colosi[a)]
Department of Oceanography, Naval Postgraduate School, Monterey, California 93943

Peter F. Worcester
Scripps Institution of Oceanography, University of California, La Jolla, California 92037

(Received 28 August 2013; accepted 29 August 2013)
[http://dx.doi.org/10.1121/1.4821096]

PACS number(s): 43.30.Bp, 43.30.Cq, 43.30.Pc [ADP]

The beginning of the subject of deep water ocean acoustics might rightly be placed in 1944 when Ewing and Worzel made the first measurements that clearly demonstrated that sound in the deep ocean is channeled and can propagate to very long ranges. Independently, but slightly later (1949), measurements by a Russian team led by Leonid Brekhovskikh also demonstrated the existence of a deep ocean sound channel and long range propagation. The deep ocean signals resulting from the explosive sources available at the time all had the same character: A series of arrivals with ever increasing intensity (a crescendo!) followed by an abrupt cutoff. Subsequent experimentation and theoretical development focused on the military applications of deep ocean sound, where discoveries were made regarding the distribution of ambient sound, the attenuation from sea water, the coherence of receiver arrays of ever increasing length, and convergence zone and ocean mixed layer propagation. Up through the 1960s observations were generally made using explosive or continuous wave sources and small receiving arrays.

We have come a long way since this early period of development. This special issue chronicles some of the rapid growth in the use of sound in the deep ocean and the technologies developed to advance those uses. In addition to military applications, this growth has been driven by the significant increases in the use of the ocean for commerce (e.g., shipping), as a source of natural resources (e.g., oil, gas, minerals, food, etc.), and a realization that the ocean is a critical factor in modulating our climate and the global response to increased CO_2 in our atmosphere. In one way or another uses of deep water sound can be classified under the headings of remote sensing (active and passive), navigation, or communication. This issue has several papers addressing the issue of ocean acoustic remote sensing. These papers fall into the topics of (1) ocean acoustic tomography and associated methodologies, (2) sensing and interpretation of seismo-acoustic signals, (3) ambient noise sensing of surface gravity waves and nonlinear wave-wave interactions, and (4) measurements of undersea volcanic activity. With regards to navigation and communication, there are papers on undersea glider positioning using an acoustic tomography array and multiuser undersea communication using time reversal techniques. Acoustic fluctuations due to small-scale oceanic variability touch all aspects of deep water acoustics. This issue includes a selection of papers covering observations and theory for wave propagation through the stochastic ocean sound-speed structure. Much of the recent progress in deep water ocean acoustics is associated with new technological developments. Some noteworthy examples described in the following pages are: (1) Cabled deep sea acoustical observatories, (2) 5 to 6 km long, water-column-spanning vertical receiver arrays, (3) undersea gliders with acoustic receivers, and (4) energy efficient broadband electronic acoustical sources.

As Guest Editors we would like to especially thank the editorial staff of the journal for their support and patience, both of which have been needed to deal with the complexities associated with special issues. We would also like to thank the JASA Editor-in-Chief Allan Pierce for his steadfast support of special issues, his encouragement, and his sage advice. Last, we thank our large number of contributing authors, whose patience over review and publication delays was greatly appreciated and whose collected work have made this issue a significant contribution to the literature on deep water ocean acoustics.

[a)]Author to whom correspondence should be addressed. Electronic mail: jacolosi@nps.edu