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Special Award in Ocean Acoustics

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LONG TERM GOAL

My long-term goals are to try to better understand the relationships between ocean processes (particularly those with relatively high wavenumbers and frequencies like internal waves, finestructure, and microstructure) on acoustic scattering in the ocean.

OBJECTIVES

One of my objectives is to document progress that I have been a part of over the last 35 years in oceanography and ocean acoustics. Barry Uscincki and I have agreed to write a book focusing on the theoretical and experimental results of the last 30 years in wave propagation in random media, WPRM. Another objective is to continue to define my proposed experiment, "MATE in the Vertical," with the hope that I find support to carry it out. Ultimately, I want to complete the analysis, with other APL scientists, of the SAS experiment, where shallow water oceanography complicates the theory/experiment comparisons.

APPROACH

I am working with young scientists and others in the Multiple Discipline Group at APL in the development of new research topics. I am trying to help young scientists develop a more multiple discipline approach to science after their emergence from the narrowly focused work of their PhDs and Post Doctoral positions. My work on WPRM with Barry Uscinski (University of Cambridge), Frank Henyey (APL), and Charlie Macaskill (University of Sydney) will continue.

WORK COMPLETED

Work with Frank Henyey on extending the so-called "detect" algorithm to work with the CLAMMS mine hunting system has been completed. We were able to demonstrate a significant improvement in detection of actual targets using a hybrid combination of their methods and ours. This was without proper optimization of the "detect" algorithm, and we are funded to continue that research.

A preliminary draft of the SAS experiment paper has been completed, and all authors meet once a week to discuss that analysis. The serious issue is the vastly different oceanographic regime of the shallow water coastal area from the open ocean. We have successfully modified the Bell/Ewart multi-path separation algorithm to include a Maslov index for each path.

Work was completed on tank measurements to show that the random rough surface can account for the energy that arrives in sediments below the critical angle (Mellema, 1999). This experiment makes the far more complicated hypotheses of a slow wave being responsible for the energy unlikely, and validates the rough surface scattering hypotheses. This work was carried out by my PhD student Garfield Mellema, who graduated Summer Quarter '99.

RESULTS

Covered in Work Completed.

IMPACT/APPLICATIONS

Both the "detect" work and Garfield Mellema's Ph.D thesis have application to mine hunting sonars.

TRANSITIONS

The "detect" work and Garfield Mellema's Ph.D thesis work have potential for transitioning to Navy projects where mine hunting sonars are being developed. The Synthetic Aperture Sonar, SAS experiment results could also be used by mine hunting sonar developers.

RELATED PROJECTS

The "detect" research has been coupled to the CLAMMS project, being conducted at the Applied Physics Laboratory, Peter Kaczkowski, P.I..

REFERENCES

Mellema, Garfield R (1999). Subcritical acoustic scattering across a rough fluid-solid interface, *University of Washington Dissertation*, 58 pp.

PUBLICATIONS

Ewart, T.E., S.A. Reynolds, and D. Rouseff (1998). Determining an open internal wave model using acoustic log-amplitude and phase: A Rhytov inverse, *J. Acoust Soc. Am.*, 104(1), 146-156.

Rouseff, D., T. E. Ewart, and S. A. Reynolds (1999), Acoustical remote sensing of ocean internal waves: progress and remaining challenges. Published in the Conference Proceedings of Oceans '99 MTS/IEEE, Seattle, WA, June, 1999, 6 pages.

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