

ONR Special Award in Ocean Acoustics FY10-FY11

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LONG-TERM GOALS

To understand the effects of deterministic and random ocean processes on acoustic propagation with emphasis on torpedo and sonar frequencies. To work with the younger students and Faculty where my 50 years of experience in University research can provide assistance in their research and scholarly pursuits. To work with the Director of APL and others to provide a long term view of the science and staff policies at our University.

OBJECTIVES

1. To complete publication of my paper covering the 50 years I've spent studying ocean acoustic WPRM (Wave Propagation in Random Media), 2. To complete a paper with Frank Henyey on the "goodness of fit" testing of proposed probability distributions in WPRM, and 3. To complete a paper with Brad Bell and Frank Henyey on a technique we developed to implement a complex amplitude multi-dimensional matched filter, CAMDMF, on pulsed data returns

APPROACH

My approach to completing the publication of work funded by my ONR 10 year award in ocean acoustics is as follows: 1. Following a 3rd editing based on the review of some of my Colleagues, the "50 years" paper will be submitted to JASA as a Tutorial in Ocean Acoustics. 2. For both of the other research efforts it has been necessary to get the software for these projects that was written by myself or a programmer that worked for me up and running on my computer in order to complete some desired computations before the papers can be completed. In this work I will be collaborating with Brad Bell and Frank Henyey of APL.

WORK COMPLETED

My "50 Years Studying Ocean Acoustic WPRM" paper was completed near the beginning of this contract. It was reviewed by Kevin Williams of APL, and Barry Uscinski of Cambridge University, and those comments/suggestions were incorporated into a new draft. That draft was sent to Jim Lynch and another Colleague, and Jim recently returned the manuscript with considerable editing and suggestions to make the paper more readable to a wider audience. Since returning from travel in Europe, I have begun that editing effort. My work to bring up the software for the CAMDMF and the probability distribution "goodness of fit" tests, when completed, can lead to their dissemination to the ocean acoustics research and Navy signal processing communities.

RESULTS

The most significant result of this period was the completion of the “50 years” paper, which summarizes my research into ocean acoustic WPRM. This research points out new directions for research in the field of ocean acoustic WPRM, and lays to rest some of the misunderstandings in the area of the theoretical predictions of signal variance in ocean acoustic WPRM.

IMPACT/APPLICATIONS

This research provides to the ocean acoustic community clear results on when the variance of signals propagating in the random ocean can be predicted and when and why they cannot be predicted.

TRANSITIONS

This work, especially the work on the pdf of intensity and the work on the CAMDMF can be transitioned to the signal processing community.

RELATED PROJECTS

This research is significant to any studies where the statistics of Sonar or Torpedo frequencies are investigated.