



ACOUSTIC SIMULATION, MEASUREMENTS AND TACTICS

The Naval Research Laboratory (NRL) conducts broad-based research in ocean acoustics to better understand the effects of the ocean environment on underwater acoustics, and to assess and predict how these environmental effects will impact the performance of Naval systems, operations, and missions. The "ocean environment" includes three-dimensional, time-evolving features such as rough air-sea interfaces, sub-surface bubbles and plumes, volume effects (e.g., internal waves, solitons, fluctuating media, biologics, pollutants, fronts, eddies), rough sea-floor interfaces, and ocean bottom and sub-bottom regions. "Underwater acoustics" includes all acoustic processes and interactions that can occur within the ocean environment (e.g., propagation, scatter, attenuation, dispersion, mode conversion, coherence, ambient noise and sediment penetration). "Naval systems, operations, and missions" include, but are not limited to, sonar systems, Anti-Submarine Warfare (ASW), Mine Counter Measures (MCM), warfare effectiveness, and strategy and tactics optimization. Numerical techniques and computer codes are developed as required to support the Navy's need for improved ocean acoustics models and data bases and to provide supporting analysis for operational and tactical application of computer models.

Current major areas of research interest include:

- (1) Acoustic Simulation and Modeling (e.g., theoretical formulations, computational acoustics, numerical modeling, inverse methods, stochastic methods, visualization, and scalable computer and supercomputer code development);
- (2) Warfare Effectiveness (i.e., research in advanced methods of assessing environmental impact on Naval missions and strategy optimization);
- (3) High-Frequency Acoustics (i.e., MCM and weapons frequencies as related to the effect of the environment on the performance of Navy sonar systems, including the effects of the medium coherence, bottom roughness, sediment composition, clutter and their effects on advanced imaging techniques); and,
- (4) Coastal Acoustics, as related to the application of sophisticated signal processing methodologies (e.g., matched field processing and high-order spectral techniques), to determine the limits and variability of harsh environments on the performance of Navy sonar systems.

Other research interests include:

a) The combination of acoustics with other sensing techniques, such as optics, magnetism, electromagnetics, hydrodynamics, geophysics and others for both ASW and MCM applications;

(b) Acoustic environmental characterizations, data base modeling, and analysis of those aspects of the marine environment relevant to acoustic propagation; and

(c) coupled target-waveguide modeling and target recognition, classification, and discrimination.

Proposals for evolutionary improvements are inappropriate under BAA authority and are not desired.

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