Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 2003		**00-00-2003 to 00-00-2003**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Acoustic Tomography With Navy Sonars	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Scientific Innovations, Inc,,6 Derring Dale Rd.,,Radnor,,PA,19087**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**3**	

Acoustic Tomography With Navy Sonars

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Contract Number: N00014-03-C-0155

LONG-TERM GOALS

The long-term goal of this research is to understand and predict the spatial coherence of broadband sound in the ocean.

OBJECTIVES

We will compare broadband acoustic signals at basin-scales with predictions for spatial coherence. Degradation of coherence will be modeled using spectra of internal waves in the ocean.

APPROACH

Data will be collected from a variety of Navy sonars. Traditional means to process the signals will be done including beamforming, coherent averaging (when dealing with periodic signals), correcting for Doppler shifts (when dealing with mobile sonars), and matched filtering (when a replica with the emitted waveform is available). The data will be interpreted using rays and the sound speed insensitive parabolic approximation (Tappert *et al.* 1995) . The acoustic models will be used in conjunction with oceanographic models that contain the best available digital data sets for bathymetry, sound speed fields that vary with range and depth, and internal waves. Spatial coherence will be modeled using the sound speed insensitive parabolic approximation and spectra of internal waves.

WORK COMPLETED

Data have been collected and processed from a wide variety of sonars over basin-scales in the Pacific Ocean. Acoustic models have been developed that incorporate realistic bathymetry, sound speed fields that change with geographic location, and time dependent fluctuations of internal waves obeying a linear dispersion relation.

RESULTS

This program is in its early stages so results are not available.

IMPACT/APPLICATIONS

Reliable models for the coherence of broadband sound are useful for designing and operating sonar and surveillance systems. Many Navy sonars provide an inexpensive and reliable means for collecting data over long distances. These data will accelerate the understanding of how sound propagates, and

may offer a practical means for imaging the sound speed and temperature fields using acoustical tomography.

RELATED PROJECTS

REFERENCES

Tappert, F. D., Spiesberger, J., and Boden, L., New full-wave approximation for ocean acoustic travel time predictions, J. Acoust. Soc. Am., 97, 2771-2782 (1995).

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