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IN WATER DEMONSTRATION OF MONOCHROMATIC ACOUSTIC MODE GENERATION IN SHALLOW WATER

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LONG-TERM GOALS

To develop active acoustic methods which improved our ability to efficiently monitor and characterize the acoustic propagation characteristics of a shallow water environment.

OBJECTIVE

The technical objective of this effort is to demonstrate the feasibility of generating an acoustic field at a desired location which is composed of a single selected mode in a range and temporally varying shallow water environment.

APPROACH

A vertical array of acoustic sources is used to control the vertical structure of the acoustic field. The resulting field is received at a vertical array of hydrophones (the feedback array located at the point at which a single acoustic mode is desired) a short distance from the source array. This received field is used as the input to a feedback control algorithm which will adjust the signals transmitted by the source array. These signals are adjusted so that the acoustic field as received at the feedback array is composed of only the desired mode. This single mode field will then propagate down range from the feedback array and can be monitored at other points. The modal structure of the received field at these other points can be used to characterized the modal coupling behavior of the environment.

The critical people involved in the development of the control algorithm a-re Professor John Buck (University of Massachusetts at Dartmouth) and Dr. Preisig. The key people involved in the development of system hardware and software are Professor Buck and Dr. Johnson.

WORK COMPLETED

This year, after a period of little activity under the leadership of co-PI Dr. Josko Catipovic, a change in PI's was requested and granted so that Drs. Preisig and Johnson are the new co-PIs. The budget and remaining resources were examined and the experimental plan refined to maintain consistency with the available monetary and time resources. The new experimental plan consists of an engineering test of the system on Lake Wyola. in mid-winter 1998 to take advantage of the ease of deployment on an ice covered lake followed by a full-scale demonstration of the system in Buzzards Bay in late spring 1998.

The following are the technical accomplishments of the program for this year:

1. An improved mode filtering algorithm was developed to accomplish the task of the modal decomposition of the acoustic field as received at the feedback array.

2. The suite of power amplifiers to drive the array of sources have been built and are currently in testing.

3. The feedback array has been built.

4. The communications equipment to provide feedback to the source array is almost completed.

5. The equipment for time synchronization of the source and feedback arrays is almost completed.

6. The feedback control algorithm has been ported to the AMS operating system which win be used on the deployed equipment.

The majority of the work listed in items 1, 4, 5, and 6 had been performed by Professor Buck and his students on a sub-contract from this grant.