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Full Field Processing (FFP) Program

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LONG-TERM GOAL

Our long term goal to quantify via measurement, the advantage of three dimensional arrays for detection and tracking of surface ships and submarines and extrapolate these results to other environment and conditions. This is to be accomplished using adaptive full field methods and broadband array processing, followed by tracking algorithms which are similar to the maximum likelihood method contrained by certain track considerations.

OBJECTIVES

The specific objectives of the FFP were to demonstrate this advantage of multi-dimensional arrays via a feasibility demonstration in the Santa Barbara Channel. This included: the localization of the array elements using both active acoustics and passive engineering sensors; the detection and tracking of several different target types including surface ships; the tracking of surface traffic via radar; and an environmental characterization.

APPROACH

The approach consistened of building a multi-dimensional array, and deploying that array in a CONUS area which had acoustic and environmental properties that were similar to operational areas of interest. This was followed by several experiments using US Navy targets.

WORK COMPLETED

In March of 1998 the FFP array was deployed in the Santa Barbara Channel in 200 meters of water. This array consisted of five vertical line arrays (VLA's) each with 30 hydrophones. The physical aperture of each VLA was about 170 meters. The array was cabled back to shore using standard fiber optic telephone cable designed for undersea use. A test were conducted in early April 1998 which include the AGSS Dolphin, the Acoustic Explorer, and the R/P FLIP. This was followed in early May 1998 with a second test involving an SSN.

The April test was a joint effort between SAIC, SSC, AGSS Dolphin, MPL, NAWC, NRL, Orincon, BBN and NAS Pt. Mugu. In addition to the acoustic test, an extensive CTD survey was completed as well a continuous monitoring of the surface traffic by the Pt. Mugu radar. Beartrap runs were also made. The April test consisted of five days of operations with Dolphin on site. Approximately 3 TBytes of acoustic data were collected during the April test.

The May test involved SAIC, JHU/APL, BBN, and NAS Pt. Mugu. Approximately 0.7 Tbytes were collected during the May test. Data analysis has been in progress since the early summer with a concentration on estimating the shapes of the five VLA's for various time periods. More recently, the work has concentrated on the detection of the natural signatures of the targets.

RESULTS

Preliminary results include estimates of array shapes obtained from both the acoustic and non-acoustic methods, estimates of signal mismatch obtained from the augmentation tones transmitted during both exercises, and noise gains. This has been done for certain selected data sets.

IMPACT/APPLICATION

If the feasibility demonstration is judged successful, this technology will have an impact on tactical sonar systems for shallow water surveillence.

TRANSITIONS

No current transitions.

RELATED PROJECTS

The following is a list of related projects:

Matched-Field processing Classification (ONR321US)
Environmentally Enhanced Signal Processing (ONR/NRL)
Shallow Water Ambient Noise (ONR/NRL)
Full Spectrum Processing (ONR321US)
Covert Calibration of deployable Arrays (ONR321US)
Ocean Measurements and Modeling (ONR322OM)
Situationally Adaptive Sonar technologies (DARPA/TTO)
USS Dolphin Project (PMS395)
SSC-SD Naval reserve Unit 119 (Code 03R)

REFERENCES

Santa Barbara Channel Experiment (SBCX) Data Report, Newell Booth SSC Code D881.

PUBLICATIONS

None