

## **Ocean Acoustic Observatories**

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### **LONG-TERM GOALS**

The long-term goals of this work are to enhance the understanding of ocean processes that ultimately determine the limits of long-range acoustic transmissions, to understand the spatial and temporal behavior of low-frequency noise processes (earthquakes, volcanoes, storms, biology) that control the signal-to-noise ratios for long range transmission as well as to search for any correlations among these phenomena, and to improve our capabilities for acoustic detection in the ocean.

### **OBJECTIVE**

The objective of this project is to record individual channels from 1-2 existing SOSUS arrays in the Pacific to provide continuous acoustic time series with a bandwidth of 100 Hz.

### **APPROACH**

At very low frequencies, it has been established that the ocean provides a very coherent medium for widely separated receivers. It is our intent to extend our understanding of interprocessing acoustic measurements to full ocean basin scales. Through the acquisition of data from very widely separated arrays over an extended period of time, the long-term, large-scale environmental effects on acoustics can be investigated. In essence, this is the initial research effort for an ocean acoustic observatory - a telescope in the ocean.

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The emphasis of this project has been on the planning and acquisition of digitizing and recording hardware and its installation at 1-2 SOSUS array sites. The data will be archived for use by the investigators and other scientists with interests in the analysis of long-term observations.

Scientifically, the focus of this work will be to identify and track naturally-occurring phenomena such as large-scale storms as they move across the ocean basin, earthquakes, and volcanic eruptions, shipping, and marine mammals. Ultimately, the intent is to link the acoustic measurements with other sensing systems, particularly satellite imagery for storm activities and seismic measurements for earthquake and volcanic eruptions.

## **WORK COMPLETED**

In cooperation with the Naval Postgraduate School, digitizing and recording hardware has been installed at the Pt. Sur SOSUS array site. The hardware digitizes 32 channels of data at 200 Hz with a 24-bit resolution. The hardware outputs data in a standard format (SEG-Y) which can be readily read and processed by software at MPL/IGPP. The resulting archival tapes are being sent to San Diego for cataloging and storage. A processing facility has been established and is available for use in analyzing the data. The archive also includes data from the now-closed arrays previously recorded at Keflavik, Iceland. A recording system identical to the one installed at Pt. Sur will be installed at Barbers Point in January 2000.

## **RESULTS**

A 32 channel digitizing and recording system has been installed at the Pt. Sur SOSUS array site. The data tapes are being sent to San Diego for cataloging and archival. A processing facility has been established for access to the archive and analysis of the data. Discussions have been held with SSC-SD concerning access to the data from the San Nicholas Island SOSUS arrays and upgrades have been made to both of these arrays as well as the array at Barbers Point by the University of Washington Applied Physics Laboratory (APL) to allow the connection of the recording equipment sponsored by this program.

## **IMPACT / APPLICATIONS**

The ultimate limits to long-range acoustic transmissions are imposed by ocean processes, including internal waves, mesoscale variability, interior ocean boundaries (fronts), atmospheric and ocean weather, and bathymetric scattering. Extending our capabilities for acoustic detection and acoustic transmission depends on an understanding of these processes and their impact on acoustics through long-term observations and is critical for a broad range of ocean studies including the Acoustic Thermometry of Ocean Climate (ATOC) program.

## **TRANSITIONS**

The data will be archived for use by the investigators and other scientists with interests in the analysis of long-term observations.

## **RELATED PROJECTS**

The hardware installations will take advantage of ATOC interfaces already installed at the candidate array sites. The sites will necessarily receive the ATOC source signals and we intend to work closely with that program in analysis of the data.