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# Making Underwater Gliders Useful to Navy Operations

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## LONG-TERM GOALS

The investigators' goal is to develop the capabilities of autonomous underwater gliders to be maintained and piloted at sea for periods of several months and to exploit this capability to address fundamental questions in ocean science.

## OBJECTIVES

Underwater gliders are progressing from a developing technology to an operational tool. A major challenge now is to determine what tasks gliders are most suited to perform, a determination that is important to naval operation and to research applications. Our objective is to quantify the capabilities of the Spray underwater glider in the field in both Navy and research applications.

## APPROACH

In order to demonstrate the capabilities of Spray gliders for operational Navy applications, we are participating in surveillance exercises organized and carried out by the Naval Oceanographic Office. In these studies, we are typically given the general objectives that gliders are meant to accomplish (e.g. characterize sound speed structure in a particular region and time period), and we deploy and operate gliders to accomplish them.

To better test research capabilities, we are constructing a fleet of nine Sprays to be made available for ONR-sponsored oceanographic research studies. Three Spray gliders will be provided for use in the Non-Linear Internal Waves Initiative. These gliders will be deployed offshore of the Phillippines just south of the Luzon Strait, and will be recovered off the northeast coast of Taiwan. The current plan is for one glider to be deployed in April 2007 and recovered in July 2007. At that time, two gliders will be deployed to be recovered in October 2007. Three Seagliders, provided by University of Washington in a collaborative effort, will be deployed on the same schedule to double the size of the fleet sampling the Kuroshio.

Additional gliders will be built to comprise a fleet available for ONR projects after 2008. The management of this fleet will be determined as operational experience is gained.

## WORK COMPLETED

One Spray was deployed near the Kuroshio from a Naval Oceanographic Office ship in September of 2005. The glider was deployed smoothly, operated without fault for 27 days producing 252 temperature and salinity profiles to 500 m, and was recovered without damage and with 3 months of energy remaining in the batteries. The data is under analysis at the Naval Oceanographic Office.

Gliders for the NLIWI effort have been identified and all appropriate recent improvements have been retrofitted. New procedures for recovery from large vessels are in development and should be ready for testing by the start of the NLIWI exercises.

## RESULTS

In comparison with Slocum gliders, the Kuroshio showed the importance of reliability; a vehicle failure is very expensive in ship costs. A temporary functional limitation kept the Spray from diving below 500 m depth, and a comparison with a simultaneous Seaglider profiling to 1000 m showed the advantage of deep operations when trying to navigate in a region of strong surface-intensified currents.

## IMPACT/APPLICATION

We have not yet learned the impact that glider data had on the acoustic products that the Naval Oceanographic Office was preparing in the Kuroshio operation.

## HONORS/AWARDS/PRIZES

Russ Davis was selected the Monterey Bay Aquarium Research Institute 2006 Distinguished Lecturer.