

# **Glider Surveys of Japan/East Sea Circulation**

Charles C. Eriksen

School of Oceanography, University of Washington, Box 357940, Seattle WA 98195-7940

(206)-543-6528 voice, (206)-685-3354 fax

Internet address: [charlie@ocean.washington.edu](mailto:charlie@ocean.washington.edu)

Program #: ONR-322 PO N00014-98-1-0399

## **LONG-TERM GOAL**

The long term goal of this project is to observe and understand the circulation of the Japan/East Sea in the vicinity of the subpolar front.

## **OBJECTIVES**

The objective of this project is to collect temperature and salinity profiles using a small fleet of autonomous underwater vehicles now under development. The Japan/East Sea surveys will be the first dedicated scientific use of this technology. These profiles, collected both at fixed geographic locations and along transects, will be used to estimate geostrophic transport of the subpolar frontal region and to describe water mass transformation processes. Observations are intended to be continuous over a complete annual cycle.

## **APPROACH**

Our approach is to field a small network of comparatively inexpensive autonomous vehicles that can collect temperature and salinity profiles continuously from the upper km of the ocean while either maintaining their geographic positions or surveying along a desired track. This network is to report measurements in near real-time and be controllable from shore. These vehicles are to be launched from a small boat near shore in South Korea, carry out a multimonth survey, and be recovered similarly in Japanese waters.

We are collaborating with Prof. Kuh Kim (Seoul National University, South Korea) and Prof. Yoon (Kyushu University, Japan) to carry out field work and analyze the measurements.

Glider development and construction of the units to be used in this study are being supported through other ONR grants (the Multidisciplinary University Research Initiative project on Autonomous Oceanographic Sampling Networks and the Defense University Research Instrumentation Program). A prototype glider vehicle is now being tested in Puget Sound. The plan is to be ready to launch 3 vehicles in the Japan/East Sea in the late summer or fall of 1999.

## **WORK COMPLETED**

This project is in its first year of support. The principal tasks have been planning activities. We attended a meeting in Seoul, South Korea in April, 1998 to meet colleagues in the Circulation Research of East Asian Marginal Seas (CREAMS) program from South Korea, Japan, and Russia. After the meeting, we visited the East Sea Ocean Research Center (ESOREC) near Tonghae, S. Korea, to evaluate

# Report Documentation Page

Form Approved  
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>1998</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-1998 to 00-00-1998</b>	
4. TITLE AND SUBTITLE <b>Glider Surveys of Japan/East Sea Circulation</b>				5a. CONTRACT NUMBER	
				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) <b>University of Washington, School of Oceanography, Box 357940, Seattle, WA, 98195</b>				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 <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM002252.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>3</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

it as a possible staging site for glider final preparation and launch. We also travelled to Fukuoka and Mutsu, Japan, in January, 1998 (a trip supported by Japan) to plan the recovery of glider vehicles.

## **RESULTS**

The planned sampling scheme for glider surveys is shown in Figure 1. The plan is for three gliders to be launched near Tonghae, after which they will carry out a survey over a roughly 100 km wide region as they transit to the subpolar front near 40°N. Two of the gliders will take up fixed positions 100 km apart across the front while the third will execute a survey along a 100X100 km square track. Gliders will take turns carrying out the box survey, offering the opportunity to intercalibrate CTD sensors. Four to six months after the launch, a second group of three gliders will be deployed near shore to replace those at the subpolar front. When these reach the front, the original group will transit east along the front, crossing it several times, enroute to recovery near Akita, Japan, again by small boat. The goal of the survey is to collect temperature and salinity profiles from the sea surface to 1 km depth every 4 hours for a year at two sites, and carry out a multiple-vehicle survey across the Japan/East Sea in different seasons.

## **IMPACT/IMPLICATIONS**

The expected impact of successful use of gliders in the Japan/East Sea is that it will demonstrate how hydrographic profile surveys can be made at much lower cost than is now possible using moorings or ships. The ocean can then be sampled much more densely and over longer duration than is conventionally practical. The expected cost of 1 m resolution joint temperature/salinity profiles from the surface to 1 km depth at an arbitrary location, reported in near real-time, is under \$20.

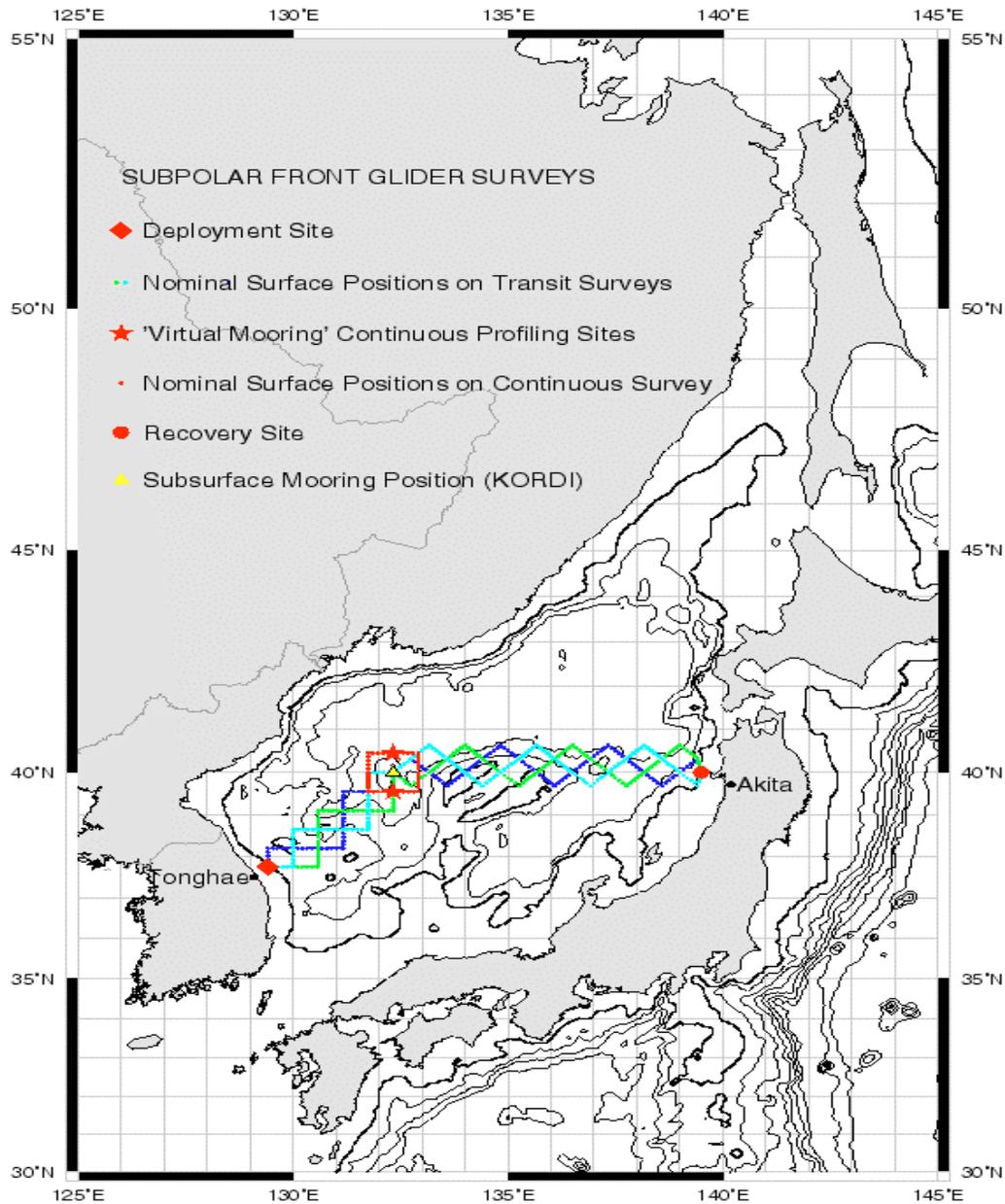
This study will provide a description of the subpolar front in the Japan/East Sea at unprecedented resolution in time and space. Modeling studies will be able to use the measurements to test their fidelity to reality and ability to predict the state of the Japan Sea. This work is intended as a demonstration project of the potential for gliders in studying the ocean.

## **RELATED PROJECTS**

This project is supported in part by the Multidisciplinary University Research Initiative (MURI): “Real-Time Oceanography with Autonomous Sampling Networks: A Center for Excellence”

## **REFERENCES**

See the MURI-AOSN web site: [http://web.mit.edu/seagrant/www/MURI\\_home.html](http://web.mit.edu/seagrant/www/MURI_home.html)



*Figure 1. The glider sampling plan superimposed on bathymetry of the Japan/East Sea. The subpolar front is found near 40°N across the basin. Individual symbols indicate the spatial sampling density (~10 km) of the surveys by indicating nominal sites where gliders will reach the surface.*