

Japan East Sea 2001 Convection Study and 1999-2000 Hydrographic/ADCP/LADCP Data Analysis

Lynne D. Talley
PORD/SIO/UCSD
9500 Gilman Dr.
La Jolla, CA 92093-0230
phone: (858) 534-6610 fax: (858) 534-9696 email: ltalley@ucsd.edu

Award Number: N00014-98-1-0220

http://sam.ucsd.edu/onr_jes

LONG-TERM GOALS

Long-term goals were (1) to provide sufficient hydrographic data in the Japan/East Sea to fully describe the mean water mass and circulation distributions, from top to bottom, and particularly the importance of topography and sills to these distributions, (2) to determine the principal ventilation processes for the Japan/East Sea, particularly for the intermediate and deep waters, and (3) to provide these data sets, including hydrographic/ADCP/LADCP observations to the other Japan/East Sea investigators, particularly those engaged in modeling.

OBJECTIVES

Scientific or Technological Objectives of this effort. The objectives were to produce cross-sections and maps of hydrographic properties and circulation in the summer and in the winter, and compute budgets for the water properties. These were in support of the goals of describing the circulation, water masses and ventilation processes.

APPROACH

The work was carried out through three hydrographic cruises, two in summer 1999 and one in winter 2000. A fourth cruise in winter 2001 was funded by NSF through an SGER, based on the extremely cold climate conditions of that winter. The first summer 1999 cruise was in the southern/eastern Japan Sea, on the R/V Revelle, with a full complement of hydrographic, tracer chemistry, biological, and optical measurements (separate PI's - Jenkins, Warner, Ashjian, Mitchell - for the latter 3). The principal technical support group for my work was the Oceanographic Data Facility at SIO.

A group of 17 Russian scientists and technicians joined the Revelle cruise, learning the technical procedures. This group of Russian scientists then conducted a second cruise on the R/V Professor Khromov in the northern Japan Sea, immediately following the Revelle cruise, to give almost complete coverage of the Japan Sea. The only missing sector is the North Korean sector. The winter cruise was to the northern Japan Sea only, with the exception of a set of test stations in the Ulleung Basin east of Korea, and was conducted on the R/V Khromov with the Russian group. The chief scientists for the Khromov cruises were Dr. Vladimir Luchin (FEHRHI) - summer 1999, and Dr. Vyacheslav Lobanov (POI) - winter 2000.

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 30 SEP 2002	2. REPORT TYPE	3. DATES COVERED 00-00-2002 to 00-00-2002			
4. TITLE AND SUBTITLE Japan East Sea 2001 Convection Study and 1999-2000 Hydrographic/ADCP/LADCP Data Analysis		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) PORD/SIO/UCSD,,9500 Gilman Dr.,,La Jolla,,CA, 92093		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 Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Long-term goals were (1) to provide sufficient hydrographic data in the Japan/East Sea to fully describe the mean water mass and circulation distributions, from top to bottom, and particularly the importance of topography and sills to these distributions, (2) to determine the principal ventilation processes for the Japan/East Sea, particularly for the intermediate and deep waters, and (3) to provide these data sets, including hydrographic/ADCP/LADCP observations to the other Japan/East Sea investigators, particularly those engaged in modeling					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a REPORT unclassified	b ABSTRACT unclassified	c THIS PAGE unclassified	Same as Report (SAR)	4	

WORK COMPLETED

All three cruises were completed successfully. The data have been through a preliminary calibration step. Final calibration of the CTD data sets remains to be done - the ODF backlog is very large. The preliminary calibrated data are sufficient for publications, but not for archiving.

RESULTS

One publication is in press, on the near-inertial wave signature in the LADCP data sets (Shcherbina, Talley, Firing and Hacker, JPO, 2002). There were two principal results: (1) trapping of near-inertial wave energy in the subpolar front and an eddy, as found in previous experiments (Kunze and others), and (2) upward propagation of near-inertial energy throughout the sea below about 500 m, indicating a deep source for these waves. This latter is a new result, and we have looked further at other LADCP data sets (from WOCE) and found similar phenomena in relatively high latitudes over topography.

A second major result, which is submitted for publication in GRL (Talley et al., 2002) is the determination of the principal ventilation sites and mechanisms for the deep Japan Sea. There are two processes - brine rejection in Peter the Great Bay, and deep convection (reaching to as much as 1500 meters) in the open ocean south of Peter the Great Bay.

IMPACT/APPLICATIONS

The determination of the ventilation mechanisms is of broad impact, as there are very few sites where either and especially both of these ventilation processes (deep convection and brine rejection) operate. Since there are so few, any additional site, such as this one, assists in validating and challenging models and theories of the processes.

The finding of upward propagating near-inertial energy can have implications for deep internal wave fields elsewhere, and hence possibly deep mixing estimates.

The summer data set is the first synoptic, coast-to-coast, top-to-bottom view of the Japan Sea properties, and will be a benchmark data set for modeling and context of past and future observations.

TRANSITIONS

The knowledge from the winter data sets has been used directly in two modeling efforts - those led by C. Mooers and by C. Clayson. The data, in smoothed form, should be useful for initialization of models.

RELATED PROJECTS

All of the Japan/East Sea projects funded for the 1999-2000 period were closely related. The projects are all included in the project website: http://sam.ucsd.edu/onr_jes, which I developed through funding and mandate from this overall set of projects.

PUBLICATIONS

Shcherbina, A., L. D. Talley, E. Firing and P. Hacker, 2002. Near surface frontal zone trapping and deep upward propagation of internal wave energy in the Japan/East Sea. *J. Phys. Oceanography*, accepted.

Talley, L. D., V. Lobanov, V. Ponomarev, A. Salyuk, P. Tishchenko, I. Zhabin and S. Riser, 2002. Deep convection and brine rejection in the Japan/East Sea. Submitted to *Geophys. Res. Lett.*