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

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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
