

DENSE WINTER WATER MASS FORMATION IN THE NORTHWESTERN PACIFIC MARGINAL SEAS:

L. Talley (1), V. Lobanov (2), P. Tishchenko (2), A. Shcherbina (1), D. Rudnick (1), A. Salyuk (2), S. Sagalaev (2), V. Ponomarev (2), I. Zhabin (2)

(1) Scripps Institution of Oceanography UCSD, (2) Pacific Oceanological Institute, Russian Academy of Sciences

Two separate winter water mass formation experiments were carried out in the northwestern Pacific. The Japan/East Sea (JES) is well-ventilated to the bottom (3500 m depth), and is much better ventilated than the adjacent North Pacific at the same depth and density. Winter data from 1999 and 2000 show that the JES is one of the few sites in the world with deep winter convection, and that convection in the JES has many similarities to convection in the Mediterranean. It was shown previously that deep oxygen in the JES has been declining over many decades, suggesting that ventilation was more vigorous early in the 20th century than in recent decades. Nevertheless, the presence of significant oxygen and chlorofluorocarbons to the JES bottom suggests ongoing ventilation. In winter, 1999, a first late-winter survey of the northern JES included one hydrographic station with evidence of open-ocean convection to about 1100 meters in the cold air outbreak region south of Vladivostok, and weak evidence of brine rejection under ice formation in Peter the Great Bay (shelf near Vladivostok). Topography and the presence of a semi-permanent anticyclonic eddy and the subpolar front delineate the convection region, which is in the path of strong northerly winter winds. Persistently colder conditions in winter 2000, including Vladivostok air temperatures colder than any other year since 1976 and SST -2°C below normal in the northern Japan Sea, showed widespread convection. Significant bottom water was created through brine rejection in Peter the Great Bay and was found the base of the continental slope south of Vladivostok.

Ventilation of North Pacific Intermediate Water occurs in the Okhotsk Sea, through brine rejection during sea ice formation, in polynyas on the northwest shelf. Moored observations on the shelf during winter 1999-2000 showed the creation of dense shelf water at $26.95 \sigma_{\theta}$ and clear evidence of brine rejection through the winter. The 1999 deployment hydrographic survey shows cold, dense water from the shelf at $26.95 \sigma_{\theta}$. The lower density shelf water in June 2000 compared with September 1999 is consistent with the reduced severity of winter 2000. Outflow of the densest cold water of shelf origin in both the 1999 and 2000 CTD surveys was located slightly inshore of the axis of the deepest channel between Sakhalin and Kashevarov Bank.