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DENSE WATER FORMATION ON THE NORTHWESTERN SHELF OF THE OKHOTSK SEA: DIRECT OBSERVATIONS AND MODELING

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The Okhotsk Sea is the principal site of ventilation of intermediate depth waters of the North Pacific. The ventilation is driven by brine rejection that accompanies ice formation in the polynyas along the northern coast of the basin. A set of two bottom moorings was used to study the dense water formation on the northwestern shelf of the Okhotsk Sea in winter of 1999-2000. Each mooring was equipped with a CTD and upward-looking broadband ADCP.

The CTD record showed unexpected off-shore transition of the shelf front in early winter. As a result, the densification of the shelf water during the ice season started at a density of approximately 26.25σ_θ. This is significantly lower than the commonly accepted value of 26.6σ_θ, determined previously on the basis of summer and autumn surveys.

Dense water formation was observed from mid-January to the end of February as a steady nearly linear salinity and density increase on the inshore instrument, with the density increasing from 26.25 to 26.92σ_θ in 35 days. The maximum density of 26.95σ_θ was reached in a short burst in mid-March. A slow density decrease was observed throughout the rest of the record. The dense water formation region boundary was situated between the moorings, so only much weaker diffusive density increase was observed by the offshore instrument. Bottom temperatures were close to freezing throughout the winter. Dense shelf water transport was estimated to be 0.2 - 0.5Sv in winter and spring.

Termination of the linear density increase and all other significant changes in the den-

sity record coincided with the intensification of semidiurnal internal tides near the bottom. This suggests an important role for tidal mixing in the offshore transport of newly formed dense water from the polynya region.

A Lagrangian model is used to relate the dense water formation to the observed changes in ice cover, large-scale advection and meteorology. The model is forced by 1.125-degree ECMWF reanalysis daily heat fluxes combined with higher-resolution ice concentration and thin ice fraction, derived from Special Sensor Microwave/Imager (SSM/I) data.