

The role of the Okhotsk and Japan Seas in modifying intermediate waters in the North Pacific

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A primary site of water mass modification in the North Pacific at densities higher than $26.8 \sigma_{\theta}$ is shown to be the Okhotsk Sea, where sea ice formation on the shallow shelf produces near-freezing shelf water of densities up to $27.05 \sigma_{\theta}$ (Kitani, 1973). Localized vertical mixing in Bussol' Strait, connecting the Okhotsk Sea and North Pacific, causes this fresh, near-freezing water to influence densities up to $27.6 \sigma_{\theta}$. It is shown that this low salinity source accounts for most of the low salinity signal in the North Pacific at these densities. Therefore, the Okhotsk Sea can be thought of as the "source" of the North Pacific Intermediate Water, which however does not evidence itself as a salinity minimum until it is overrun by subtropical waters off Japan. It is shown that the Okhotsk sea is capable of modifying waters at these densities only because of the saline input from the Japan Sea through Soya Strait. Lastly the influence of the Japan Sea's saline water on the North Pacific east of Japan, via the Tsugaru Current, is important in selecting the density of the overrun of the subpolar by subtropical waters, and hence the density of the main salinity minimum.