Change of the dense bottom water production on the northern Okhotsk Sea shelf and its transport to the intermediate layer of the North Pacific

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Goal: on the base of regular observations to trace signal of climate variation from the sea ice formation in the northern Okhotsk Sea to the North Pacific Water (NPIW) ventilation

The Okhotsk Sea is the largest marginal sea of the North Pacific. Its position and size make this region vulnerable to climate change due to its great sensitivity to the atmospheric and oceanic processes. The Okhotsk Sea serves as a gateway for the high-salinity water of the North Pacific Water (NPIW) through the Vries Strait, which is considered as the most important area where the NPIW enters the North Pacific Ocean. The NPIW is a high-salinity, cold, dense water that plays a crucial role in the oceanography of the North Pacific and surrounding regions.

The NPIW is formed in the eastern North Pacific by the convection of the Upper layer (seasonally warmed) of the North Pacific. The NPIW flows into the Bering Strait and then into the Okhotsk Sea. In the Okhotsk Sea, the NPIW interacts with the Okhotsk Shelf Water, which is formed by the freezing of the intermediate layer (2 cores here) of the North Pacific. The Okhotsk Shelf Water is characterized by high salinity and low temperature, making it a dense water that can sink and contribute to the formation of the NPIW.

The Okhotsk Sea ice cover and the volume of the high-density Bottom Shelf Water are strongly correlated (R² = 0.5244). This correlation indicates that the Okhotsk Sea ice cover affects the formation and transport of the NPIW. The Okhotsk Sea ice cover is a significant factor in the formation of the NPIW, as it influences the density of the Bottom Shelf Water and its transport into the Okhotsk Sea.

Conclusions:
1) High-density water is formed in the northern Okhotsk Sea by freezing and flows into the Pacific in the intermediate layer, mostly through the Vries Strait.
2) Volume of the high-density water depends on freezing activity (ice cover) but its properties depend also on tidal mixing (Moon orbit inclination).
3) Tendencies to decreasing of the volume of high-density water and softening of its extreme properties are observed recently; it becomes less saline and less oxygenized, that causes worse ventilation of the NPIW.