The Cold Water Upwelling Near the Anadyr Strait: Observations and Simulations

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Anadyr Strait, located at the northernmost reaches of the Bering Sea, influences pan-Arctic climate through processes occurring in the strait as the Siberian Coastal Current carries water from the subpolar North Pacific Ocean into the Western Arctic Ocean. A sharp sea-surface temperature front near the Anadyr Strait segregates a tongue-shaped mass of warm water from areas of cold-water upwelling proximate to the Siberian coast. To clarify dynamical processes in this region, we conducted shipboard observations through and near the Anadyr and Bering straits during the summers of 2017 and 2018. Microstructure measurements show enhanced turbulence near the sea floor as strong throughflow occurs in the narrow straits. Direct observations of ocean currents indicate that the semidiurnal barotropic tide partly contributes to the near-bottom currents driving mixing. Frictional effects accompanying the barotropic current are examined using a three-dimensional regional model. Bottom friction produces a westward Ekman current in the bottom boundary layer, which then causes upwelling of underlying cold water on the western (Siberian) side of the Anadyr Strait. Secondary circulation across the strait is also maintained by the near-surface eastward velocity, which is established by the steep slope of the main thermocline.

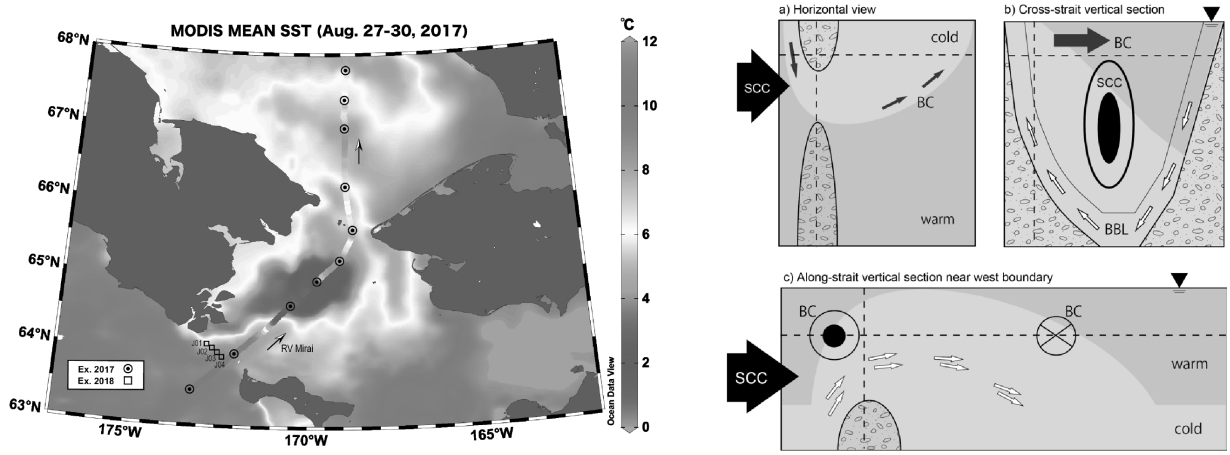

Figure: (Left) Sea surface temperature demonstrating the cold water plume in the middle between Anadyr and Bering straits. Locations of hydrographic and turbulent observations, during two science cruises (RV Mirai for 2017 and Prof. Multanovski for 2018), are respectively indicated by bull's eye circles and diamonds. (Right) Schematic explanation about the upwelling of stratified water that moves through the Anadyr Strait.

Reference

Kawaguchi, Y., Nishioka, J., Nishino, S., Fujio, S., Lee, K., Fujiwara, A., Yanagimoto, D., Mitsudera, H., Yasuda, I. (2020). Cold water upwelling near the Anadyr Strait: Observations and simulations. *Journal of Geophysical Research: Oceans*, *125*, e2020JC016238. https://doi.org/10.1029/2020JC016238