

Circulation in Vilkitsky Canyon in the eastern Arctic Ocean

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The eastern Arctic Ocean is characterized by steep continental slopes and vast shallow shelf seas that receive a large amount of riverine freshwater from some of the largest rivers on earth. The northwestern Laptev Sea is of particular interest, as it is a freshwater transport pathway for a swift surface-intensified current from the Kara Sea toward the Arctic Basin, as was recently highlighted by high-resolution model studies. The region features complex bathymetry including a narrow strait and a large submarine canyon, strong tides, polynyas and severe sea ice conditions throughout much of the year. A year-long mooring record as well as detailed hydrographic shipboard measurements resulted from summer expeditions to the area in 2013 and 2014, and now provide a detailed picture of the region's water properties and circulation. The hydrography is characterized by riverine Kara Sea freshwater near the surface in the southern part of the canyon, while warmer ($\sim 0^{\circ}\text{C}$) saline Atlantic-derived waters dominate throughout the canyon at depths $>150\text{m}$. Cold shelf-modified waters near the freezing point are found along the canyon edges. The mean flow at the 300 m-deep mooring location near the southern edge of the canyon is swift (30 cm/s) and oriented eastward near the surface as suggested by numerical models, while the deeper flow follows the canyon topography towards the north-east. Wind-driven deviations from the mean flow coincide with sudden changes in temperature and salinity. This study characterizes the general circulation in Vilkitsky Canyon and investigates its potential as a conduit for upwelling of Atlantic-derived waters from the Arctic Basin to the Laptev Sea shelf.