



Circulation in the northwest Laptev Sea in the eastern Arctic Ocean: Crossroads between Siberian river water, Atlantic water and polynya-formed dense water

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This paper investigates new unique observations from the poorly understood region between the Kara and Laptev Seas in the Eastern Arctic Ocean. We discuss relevant circulation features including riverine freshwater, Atlantic-derived water, and polynya-formed dense water, and emphasize Vilkitsky Strait (VS) as an important Kara Sea gateway (mean volume transport: 0.55 Sv), and the role of the adjacent 350 km-long submarine Vilkitsky Trough (VT) for the Arctic boundary current. Expeditions in 2013 and 2014 operated closely-spaced hydrographic transects and one year-long oceanographic mooring near VT's southern slope, and found persistent flow towards the Nansen Basin. The upper-ocean circulation is dominated by surface-intensified flow carrying Kara Sea freshwater along VT's southern edge with baroclinic volume and freshwater transports of 0.28 Sv and 16 mSv, respectively, though total transports may be substantially larger. The sub-surface features a steep front separating warm (-0.5°C) Atlantic-derived waters in central VT from cold ($<-1.5^{\circ}\text{C}$) shelf waters, which episodically migrates as indicated by current reversals and temperature fluctuations. Shelf-transformed waters dominate above VT's slope measuring near-freezing temperatures throughout the water column at a wide salinity range (34-35). These dense waters are vigorously advected toward the Basin and characterize VT as a conduit for near-freezing waters that could potentially supply the Arctic Ocean's lower halocline, cool Atlantic water, and ventilate the deeper Arctic Ocean. Our observations highlight a topographically-complex region with multiple water masses, narrow fronts, polynyas and topographically-channeled storms as shown by a high-resolution (5-15 km) atmospheric model, which underlines the benefits of high-resolution circulation models.