

Impacts of the changing seasonality of wind-driven mixing on the Arctic System

Luc Rainville[†]; Rebecca Woodgate; Amala Mahadevan; Patricia Matrai; Muyin Wang; James Overland

[†] Applied Physics Laboratory, University of Washington, USA

Leading author: rainville@apl.washington.edu

The Arctic Ocean has been traditionally described as an ocean with low variability and weak turbulence levels. Many years of observations from ice camps and ice-based instruments have shown that the sea-ice cover effectively isolates the water column from direct wind forcing and damps the existing motions, resulting in an internal wave field much weaker than in lower latitudes and relative small upper ocean variability. Under the ice, direct and indirect estimates across the Arctic basins confirmed that turbulent vertical mixing does not play a significant role in the general distribution of oceanic properties and for the evolution of Arctic water masses. However, as the sea-ice cover continues to decrease in the summer, the Arctic Ocean is now subject to more direct wind forcing which generate large inertial motions in the surface mixed layer and in water column. During ice-free periods, wind-driven inertial motions and mixing are important both on the shelves and over the deep basins. Wind forcing is responsible for deepening the mixed layer - as in lower latitudes, and for enhanced mixing throughout the water column. We discuss some potential impacts of this enhanced mixing on Arctic ecosystem and heat/freshwater balances.