

Abstract

Down the slope with the dense water pump: dense shelf water subduction as lateral particle injection mechanism from productive Arctic shelves

A. Rogge¹, L. Oziel², C. Wekerle¹, A. M. Waite³, M. Holtappels¹ et al.

¹Alfred Wegener Institute, Helmholtz Centre for Polar und Marine Research, Bremerhaven, Germany

²CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France

³Ocean Frontier Institute, Dalhousie University, Halifax, Canada

Polar dense waters fill the deepest parts of the ocean basins and drive the thermohaline circulation. They are primarily formed in ice-free areas as a result of increased heat loss and brine rejection during sea ice formation. While sinking to the ocean interior, those waters can carry large amounts of dissolved inorganic carbon to depth, a process known as solubility pump and one of the major sinks in the global carbon (C) cycle. On Arctic shelves, wind stress from land keeps large areas ice-free which intensifies dense water formation. These so-called polynyas are also characterized by high primary productivity rates due to increased light availability and nutrient supply from vertical mixing. This co-location of biological C fixation and dense shelf water formation could, next to dissolved fractions, also cause an injection of C-rich particles from the productive shelves into the deep ocean basins but detailed investigations on this lateral injection mechanism within the biological carbon pump were missing so far. Here I present recent and ongoing investigations on dense water driven lateral carbon injection into the deep Arctic basins. I show latest insights about the discovery of a deep plume of particulate material in the Arctic Nansen and Amundsen Basin, representing a potential long-range transport into the central Arctic Ocean.