

Arctic ocean circulation and eddies characterizing nutrient and phytoplankton distributions in the Canada Basin

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In recent years, the Arctic has rapidly lost its summer sea ice cover. The melting of thick, solid multi-year ice has produced fragmented and mobile sea ice with which the wind can drive the ocean circulation more efficiently. The enhanced ocean circulation changes nutrient distributions, and therefore, could impact ecosystem characteristics and biogeochemical processes in the Arctic Ocean. In the previous studies focused on the Canada Basin, it is indicated that the accumulation and thickening of fresh and nutrient-poor surface waters can inhibit nutrient supply from deep layers and thus decrease phytoplankton production. Ocean circulation should also be considered to extend this vertical one-dimensional interpretation. For example, the accumulation of freshwater in the Canada Basin produces a density gradient between the Chukchi Sea shelf and the basin, resulting in the formation of strong westward flow over the shelf slope. This strong westward flow prevents the spread of nutrient-rich shelf water towards the central Canada Basin. This blocking of nutrient-rich water may inhibit phytoplankton growth in the Canada Basin. On the other hand, warm-core eddies which contain high-ammonium shelf water can supply ammonium to the euphotic zone in the southwestern Canada Basin and may increase biomass of phytoplankton than that in the surrounding water in the basin. The role of warm-core eddies in supplying nutrients to the euphotic zone and controlling phytoplankton distributions seems to be more important than previously because the recent deepening of the nutricline in the Canada Basin has decreased the nutrient supply to the euphotic zone. We will further discuss the spreading of shelf water in the Siberian side of the Arctic Ocean and its implications for an increase in export production due to sea-ice melt.