

The first sensor-based profiles of the NO parameter in the central Arctic and southern Canada Basin: new insights regarding the cold halocline

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ABSTRACT

Here we report the first vertical in-situ, optical sensor-based profiles of nitrate from the central Arctic and Canada Basin that were obtained as part of an International Polar Year program during spring 2007 and 2008 field seasons of the North Pole Environmental Observatory (NPEO) and Beaufort Gyre Exploration Program (BGEP). These nitrate data were combined with in-situ sensor-based profiles of dissolved oxygen to derive the first high-resolution vertical NO profiles to be reported for the Arctic Ocean. Greater resolution afforded by these data reveal NO minima within the cold halocline layer of stations located within the Makarov Basin that rival minima associated with underlying lower halocline water. Differences between absolute minimum NO values and those associated with lower halocline water suggest different sources of low-salinity waters ventilated the cold halocline layer and mixed into the lower halocline of the Amundsen and Makarov Basins. These differences appear to be coincident with a larger influence of Eurasian river runoff in the Makarov versus Amundsen Basins. Observations in the southern Canada Basin corroborate previous studies showing multiple influences on the lower halocline, including diapycnal mixing between Pacific winter waters and Atlantic-derived lower halocline waters, brine formation associated with polynyas, and cold, O₂-rich lower halocline waters originating in the Eurasian Basin.