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The Western Eurasian Basin Halocline in 2017: Insights From Autonomous NO Measurements and the Mercator Physical System

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We present the first sensor□based profiles of the quasi□conservative NO parameter obtained with an autonomous ice□tethered buoy in the Arctic Ocean. Data documented the halocline in the Transpolar Drift and Nansen Basin in 2017. A NO minimum was found in the Nansen Basin on a σ□horizon of 27.8 kg·m^{-3} corresponding to the lower halocline, while a lower NO minimum of 380 µM straddled the 27.4 σ□horizon and marked the cold halocline in the Transpolar Drift. Back trajectories of water parcels encountered along the buoy drift were computed using the Mercator physical system. They suggested that waters within the NO minimum at 27.4 kg·m^{-3} could be traced back to the East Siberian Sea continental. These trajectories conformed with the prevailing positive phase of the Arctic Oscillation. The base of the lower halocline, at the 27.85 σ□horizon, corresponded to the density attained in the deepest winter mixed layer north of Svalbard and cyclonically slowly advected from the slope into the central Nansen Basin. The 27.85 σ□horizon is associated with an absolute salinity of 34.9 g·kg^{-1}, a significantly more saline level than the 34.3 psu isohaline commonly used to identify the base of the lower halocline. This denser and more saline level is in accordance with the deeper winter mixed layers observed on the slopes of Nansen Basin in the last 10 years. A combination of simulations and NO parameter estimates provided valuable insights into the structure, source, and strength of the Arctic halocline.