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Properties of diapycnal mixing and determination of vertical diffusivity in the seasonally ice-free Arctic Ocean: effects of double diffusive interleaving layers

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This study aims to understand and quantify the diapycnal mixing in the upper ocean of the Arctic Ocean. We implemented microstructure measurements in the western Arctic Ocean, where sea-ice coverage has seasonally disappeared for a lasg decade. For specifying dissipation rates of kinetic energy and temperature gradient, ϵ and χ respectively, are estimated based on the micro velocity shear and temperature data. In the region, ε is estimated to be an order of $10^{-10} \sim 10^{-9}$ W kg^{-1}, decreasing monotonously with depth, whose magnitude is similar to that in lower latitude seas. This implies the non ice-covered situation enables for kinetic energy inputted from surface wind and being transported into deeper water. The microstructure data also indicate that double diffusion associated with horizontal interleaving can produce further enhanced mixing than that due to turbulence, particularly at a frontal region where the Pacific and the Arctic basin waters encounter.