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Turbulent structure in the upper ocean during the MOSAiC drift

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Ocean turbulence measurements under the Arctic sea ice cover are sparse, especially in winter conditions. During the drift of the MOSAiC main camp, we collected vertical profiles of ocean microstructure in the upper 50-80 m using an ascending vertical microstructure profiler. Each profile terminated when the profiler hit the sea ice or broke through the surface in leads, which resolved the turbulent structure up to the ice or surface. These sporadic profile measurements were supplemented by an ice-moored system equipped with fast-response thermistors, collecting continuous time series at approximately 50 m below the ice. Both instruments are manufactured by Rockland Scientific, Canada. While the profiling was conducted from mid-February to mid-September 2020, the moored measurements were in the period between mid-December 2019 and late April 2020, spatially covering from 88°N30' to 84°N in the Amundsen Basin. From the vertical profiler, dissipation rate of turbulent kinetic energy, ϵ was estimated using the shear probes and the relatively standard methods applied to shear spectra. From the moored records, ϵ and dissipation rate of temperature variance, χ , were estimated using the high-resolution temperature records and maximum likelihood spectra fitting to the Batchelor spectrum using 75 s segments. This gives an exceptionally high time resolution of turbulence estimates, albeit from a fixed depth. Estimates ranged between 10^{-11} to 10^{-6} W/kg for ϵ , and 10^{-12} to 10^{-6} C²/s for χ . The vertical distribution of ϵ in the upper 50 m and the time variability and statistics of moored estimates will be discussed in relation to various environmental forcing conditions including storm events and convection.