The spatial variations in biomass size spectra between 0.1 µm and 10 mm based on optical measurements in the Fram Strait

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The expected restructuring of plankton communities, towards an increasing importance of small individuals, as well as the observed declining sizes on both the individual and population levels, are among the most pronounced effects of the observed climate warming in the Arctic. One of the tools to observe this transition are plankton size spectra analyses as a means of understanding energy fluxes in marine systems.

We analyzed size spectra of the pelagic community from 1 µm to 10 mm constructed by combining measurements from LISST (Laser In Situ Scattering and Transmissometry instrument) and LOPC (Laser Optical Plankton Counter), which were collected along 7 sections crossing the Fram Strait during summer 2013. This first application of a combined use of two complementary optical particle counters in Arctic waters showed that the measurements are consistent in the size range of which both instruments overlap. The spatial variability of particle and plankton size spectra was analysed along the vertical and horizontal gradients. Largest changes in slope and intercept of the normalized biomass size spectra were observed in the medium and large size fractions, indicating modifications in the trophic structures of pelagic communities within region. The smooth continuous transition in size spectra from small to large size classes indicates a continuous energy flow across different trophic levels. The analysis of zooplankton size variability in the main passage of Atlantic Water into the Arctic ocean, the Fram Strait, is a prerequisite for modelling and predicting changes in marine pelagic ecosystem dynamics in a warming Arctic.