

AUV based study on physical and ecological processes at fronts

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Small-scale processes and their effects get more and more attention when it comes to understanding processes and changes in the (Arctic) ocean. Here we present a study on physical processes and ecological responses at submesoscale frontal systems in the Fram Strait investigated using an autonomous underwater vehicle (AUV). The AUV is equipped with physical and biogeochemical sensors such as an acoustic Doppler current profiler, a turbulence probe, a conductivity-temperature-depth probe, and sensors for Oxygen, Nitrate, Chlorophyll a, and photosynthetically active radiation (PAR).

The study is designed such that the AUV covers tracks of several kilometers length in cross-frontal direction with the front roughly located in the middle of the track. On its way, the AUV records high-resolution vertical or zigzag profiles of the physical and biogeochemical properties in the upper 50 m which includes the euphotic zone. In both, physical and biogeochemical terms, the measurements revealed a complex structure of the water column. At the fronts the distribution of phytoplankton and nutrients was highly inhomogeneous, possibly due to wind-driven frontogenesis or the growth of mixed layer eddies. To set the observations into a larger context we also examine ship-based and satellite data. We investigate how the observed patterns of the potential vorticity and the biogeochemical properties may be formed and which processes could lead to a smoothing of the observed gradients.