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Autonomous arctic Free Ocean Carbon Enrichment (arcFOCE) observing system

AWI developed and implemented an experimental system (arcFOCE) enabling scientists to study impacts of ocean acidification on (benthic) marine organisms. (Fig. 1). The mobile, autonomous system allows to conduct acidification experiments with different settings (e.g. different pH levels and exposure times in the mesocosms). The arcFOCE system was designed for one-year installations and re-deployments at different locations and water depths down to 4000 m – also after completion of the INTAROS project

During the RV *Maria S. Merian* expedition MSM77 in 2018, the first deployment of arcFOCE was done in the Fram Strait at 1.500 m water depth (Fig. 3). During RV *Polarstern* cruise PS121 in 2019, an ROV was used to take sediment samples inside the mesocosms as well as next to the system as controls (Fig. 2). Samples are analysed for bacterial and meiofaunal densities, biomass, and community composition as well as different background parameters (e.g., organic carbon content of the sediments, total benthic biomass).

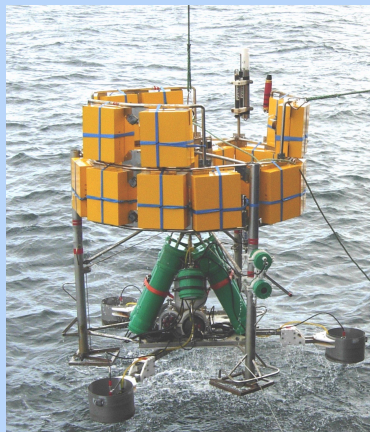
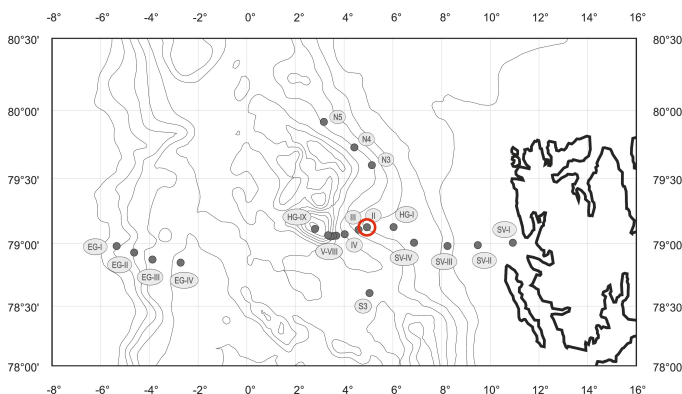


Figure 1. Recovery of the arcFOCE experimental set-up one year after the deployment at the LTER observatory HAUSGARTEN



Figure 2. Sampling of the arcFOCE mesocosms using an ROV .



The arcFOCE system enables us to generate data on the resistance of arctic marine benthic organisms and communities to a reduction in ocean pH, thereby filling existing knowledge gaps and allowing predictions for future ecosystem functionality. The finally processed arcFOCE data will be available at www.pangaea.de.

Figure 3 . The network of permanent sampling sites at the Hausgarten observatory. The red circle shows the arcFOCE deployment in 2021