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A comprehensive view on ocean processes by the Multidisciplinary Arctic Ocean Observatory FRAM

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The Arctic is warming twice as fast as other parts of the globe. The loss of Arctic ice and changes in the Arctic environment are dramatic – but year-round in situ observations of this harsh, remote, and hardly accessible environment, are still scarce.
To overcome this lack of data and improve scientific insight, the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI) started to build up the Arctic Observatory FRAM (FRontiers in Arctic Marine Monitoring). Scientifically, FRAM grounds on more than fifteen years of AWI time-series observations in the Fram Strait and the central Arctic, including the LTER Observatory HAUSGARTEN. FRAM provides various sensor platforms to improve multidisciplinary year-round observations of the Arctic Ocean system in Fram Strait and the central Arctic, covering the entire water column, the sea ice, and the sea floor: Moorings, ice-tethered and mobile sensor platforms, fixed-point benthic installations as well as ship-based instrumentation and regular sampling campaigns allow a wide range of physical, biogeochemical, and biological measurements of Essential Ocean Variables (EOV). Field data are being cross validated by satellite observations and used to improve model simulations. FRAM is planned as a sustained observatory infrastructure for long-term operation to sustain multidisciplinary time-series. Large parts of FRAM are now operational, with ongoing and future extensions and further technical developments. The full set of physical, biogeochemical, and biological observations will be made freely available via the AWI data portal (https://data.awi.de).
This talk provides a) background information on FRAM infrastructure and b) present new mooring strategies in combination with FRAM's latest technical developments on sensors, samplers, observation platforms for autonomous year-round deployments and ship-based observations carried out during annual expeditions. Novel technologies include profiling winches, ice-tethered platforms, automated filtration systems, imaging systems for marine snow aggregates and zooplankton, as well as benthic crawlers for biogeochemical observations. These new technologies allow improved spatiotemporal coverage of observations in these remote areas and provide a comprehensive insight into dynamics in nutrient availability and primary productivity, particulate organic matter export, and its fate below the mixed surface layer and at the deep seafloor.