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TITLE: Natural variability or anthropogenically-induced variation? Insights from 15 years of multidisciplinary observations at the arctic marine LTER site HAUSGARTEN

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ABSTRACT:

Time-series studies of arctic marine ecosystems are rare. This is not surprising since polar regions are largely only accessible by means of expensive modern infrastructure and instrumentation. In 1999, the Alfred Wegener Institute, Helmholtz-Centre for Polar and Marine Research (AWI) established the LTER (Long-Term Ecological Research) observatory HAUSGARTEN crossing the Fram Strait at about 79° N. Multidisciplinary investigations covering all parts of the open-ocean ecosystem are carried out at a total of 21 permanent sampling sites in water depths ranging between 250 and 5500 m. From the outset, repeated sampling in the water column and at the deep seafloor during regular expeditions in summer months was complemented by continuous year-round sampling and sensing using autonomous instruments in anchored devices (i.e., moorings and free-falling systems). The central HAUSGARTEN station at 2500 m water depth in the eastern Fram Strait serves as an experimental area for unique biological in situ experiments at the seafloor, simulating various scenarios in changing environmental settings. Long-term ecological research at the HAUSGARTEN observatory revealed a number of interesting temporal trends in numerous biological variables from the pelagic system to the deep seafloor. Contrary to common intuition, the entire ecosystem responded exceptionally fast to environmental changes in the upper water column. Major variations were associated with a Warm-Water-Anomaly evident in surface waters in eastern parts of the Fram Strait between 2005 and 2008. However, even after 15 years of intense time-series work at HAUSGARTEN, we cannot yet predict with complete certainty whether these trends indicate lasting alterations due to anthropologically-induced global environmental changes of the system, or whether they reflect natural variability on multiyear time-scales, for example, in relation to decadal oscillatory atmospheric processes.

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