

Arctic Ocean component of PEEEX

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Sea ice decline in the Arctic Ocean is one of the most evident indicators of climate warming. Since early 1980s, the Arctic sea ice thickness has decreased by approximately 50% and the summer-autumn ice extent by roughly 40%. These changes are associated with strong warming and moistening of the atmosphere and warming and freshening of the Arctic Ocean. Understanding these changes and their impacts is limited by the scarcity of observations from the Arctic Ocean and the marine atmosphere. Here we evaluate the primary needs for better observations on key variables and physical processes. We review the present status of observations, followed by evaluation of main challenges and emerging opportunities, the latter being mostly related to improving measurement techniques. In addition, the year-round drifting ice station MOSAiC, scheduled for 2019-2020, will provide major new opportunities and serve as a model for the marine infrastructure of Pan-Eurasian Experiment (PEEX) program. The main focus of PEEEX is on science based understanding the Grand Challenges of Arctic-boreal environments and societies such the role of the Arctic Ocean under changing climate.

Of particular interest for PEEEX are processes that link the Arctic Ocean and Eurasian continent. These include atmospheric transports, river discharge, and coastal processes. The atmosphere transports momentum, heat, moisture, and aerosols from over the continent to over the Arctic Ocean and vice versa, and rivers transport freshwater, heat, as well as dissolved and particulate matter from the continent to the ocean. The atmospheric transports are partly driven by the large differences in the surface fluxes of heat and freshwater over the Arctic Ocean and Eurasian continent. Observations and modelling of the atmospheric transports form a challenge. One of its many aspects is the proposed linkage between sea ice decline in the Barents and Kara seas and the more frequent and stronger wintertime cold-air outbreaks in East Asia.