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Analysis of atmospheric sea level pressure (SLP) fields in the Northern Hemisphere (NH) for this century indicates an increased variability since the mid-1960s. In an attempt to explain the Arctic Ocean response to such changes, results are presented from a high-resolution, regional, coupled ice-ocean model, forced with realistic atmospheric data derived from the European Centre for Medium-range Weather Forecasts (ECMWF) for 1979–1998. The model resolution is 18 km and 30 levels and its rotated numerical grid includes the Arctic Ocean, Nordic seas, Canadian Archipelago, and sub-polar North Atlantic. The model consists of an ocean general circulation model (OGCM) adapted to the Pan-Arctic region, coupled to a viscous-plastic, dynamic-thermodynamic sea-ice model. The primary integration uses daily-averaged 1979 atmospheric data repeated for 20 years and then continues with interannual forcing for 1979–1998. Analysis of model output allows for improved understanding of the ice-ocean system response to the atmospheric circulation and its variability over the Arctic Ocean.

The cyclonic (or eastward) shift in ice and ocean circulation, distribution of fresh water and extent of Atlantic Water has been determined when comparing conditions between the early 1980s and 1990s. A new opposite trend is modeled during the late 1990s. It appears to have a tendency to reverse large-scale conditions of the ice-ocean system to its state known from the 1970s and 1980s, implying an oscillatory behavior of the system. Both sea ice and the upper ocean circulation as well as fresh water export from the Russian shelves and the intensified re-circulation of Atlantic Water within the Eurasian Basin indicate that the Arctic Ocean climate is undergoing another shift. Interannual variability of the atmospheric conditions appears to be the main and sufficient driver of modeled changes in the sea ice and ocean below during the last two decades. Additional data for the late 1990s, especially from the Eurasian Basin, is needed in order to verify the model prediction of the latest climate change in the Arctic.

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