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Climate change in the marine Arctic in the early 21st century

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The enhanced warming in the Arctic began in the middle of 1990s and maximized in 2007. During this period an abrupt shrinking of the summer ice extent occurred and significant positive anomaly of temperature in Atlantic Water (AW) layer in the Arctic Basin expanded over larger area. This climate shift coincided with the resumption of intensive field studies in the Arctic Ocean. The observations collected during the last two decades and especially in the frame of IPY 2007/08 international projects provided an enormous database of oceanographic, sea ice and atmospheric data that makes it possible to determine the climate shift in the marine Arctic, to compare the recent anomalies to those in 1970s and to link the Arctic climate shift to the global climate change.
Observations show that since 1990 the surface air temperature (SAT) in the marine Arctic increased rapidly. The CMIP3 ensemble of climate models is seemed to underestimate the rise of SAT especially in summer. Time series of the AW layer parameters along with its pathway over the Arctic Basin during the period of 1930-2009 were compiled in order to trace the development of anomalies. Mean decadal oceanographic fields for 1990s and 2000s and for 2007 year were produced and its anomalies from 1970s were estimated.
Rapid climate changes in the marine Arctic in 1990-2000s can not be accounted solely for the anthropogenic effect since the actually observed changes exceed the predictions of the global climate models. Our analysis emphasizes an important role of the increasing summer heat fluxes, as well as the influence of low latitude ocean variability and the solar activity. Other conclusion is that abrupt warming in the marine Arctic stopped in 2008-2009 and it is necessary to continue the monitoring of further changes.
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