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Model simulation of the fresh water content climatic evolution in the Arctic Ocean

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Velocity, temperature and salinity fields for 1958-2006 years have been reproduced in numerical experiments with Institute of Numerical Mathematics Ocean Model (INMOM) realized for North Atlantic and Arctic Ocean (AO) basin with 0.25° spatial resolution and 27 sigma levels. Realistic CORE atmospheric forcing provided by GFDL (6hr for turbulent and 24hr for radiative fluxes) is used. Fresh water content from the surface to the depth of 34.8 psu in the AO is investigated. Spatial distribution of the fresh water layer thickness (FWLT) in model experiment is adequate to observed one. Absolute maximum of FWLT is located in the Beaufort Gyre (BG). The stable connection between FWLT evolution and BG circulation vorticity one is found. There are three periods of the relatively increased values of FWLT and current vorticity in the BG (1960s, 1980s and 2000s years). Long period trends of the growth the FWLT and current vorticity in the BG are seen from 1976 to our days. These trends coincide with the stable trend of the AO sea ice area decrease according to NSIDC (National Snow and Ice Data Center) data. Current vorticity outstrips the FWLT evolution for 1.75 year. There exists a stable interaction of climatic factors, when ocean circulation intensification is connected with growth of Atlantic warm waters inflow into the AO and the gain of the anti–cyclonic current vorticity in the BG. This is followed by the sea ice melting and total sea ice area decrease in the AO as well as the increase of fresh water amount and its dynamical accumulation in the BG. This work is supported by RFBR grants 09-05-00266a and 09-05-00232a .