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Changes of warm Atlantic Water and fresh water distribution in the Arctic Ocean from observations for 1930s - 2005

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The observations in the Arctic Ocean have displayed a strong increase of water temperature in the Atlantic Water (AW) layer starting from 1990. Inspection of recent and historical observations throughout the Arctic Ocean allows tracing a growth and propagation of this warm anomaly and to compare with earlier anomalies. The warming started at the entry to the Arctic Basin through the Fram Strait and St. Anna trough at late 1980s. During the next 2-5 years warming extended over the Nansen and Amundsen Basins up to the North Pole and 150° E meridian. In summer 2005 observations showed retention of vast warm anomaly in AW layer and a growth of new pulse of AW through the Fram Strait. This evidence does not agree at this point with suggestions of THC decay in the North Atlantic. Previous warmings of AW layer in 1930s and 1960s were weaker than 1990s warming and did not penetrate much to the east. As consequence of amplification of AW inflow aroused the rearrangement of the density field and structure of water mass in the Arctic Basin. Depth of freshened upper layer was decreased over the area of AW stream and increased in the Beaufort Gyre and the area adjacent to the Greenland and Canadian Archipelago. As a result outflow of freshened water through Canadian Archipelago straits increased. Other source of the growth of freshwater flux from the Arctic Ocean is anomalous summer melting in the Arctic. Based of observations it is shown that the warmest summer seasons in 1960s, 1980s and 1990s are coincided with of negative salinity anomalies in the North Atlantic. Changes of freshwater content in the upper layer of the Arctic Basin are estimated and its reasons are discussed. The studies were supported by RFBR (project 06-05-64054) and INTAS (grant 03-51-4620).