Abstract

"The recent thermohaline changes in frontal areas of the Laptev Sea: result of two sequential summer oceanographic surveys in 2007-2008"

Igor Sergienko
Master program for Applied Polar and Marine Sciences

Supervisors: Dr. S. Kirillov,
Dr. I. Dmitrenko

Regions of Siberia, border upon the Laptev Sea, are the main resource of fresh water for the Arctic Ocean. Hereby they affect its thermohaline structure and predetermine formation of sea ice which influence on changeability of the global climatic system. The large interannual and spatial variability in the freshwater content on the shelves, as well as the insufficient spatial and temporal coverage of hydrographic data, results in unfair detection of long-term tendency in fresh water storage and changes in thermohaline structures associated with climate change.

The main objectives of this work are: 1) to analyse the changes in thermohaline structure at the oceanographic polygon located in the central Laptev Sea frontal zone area in summer 2007-2008; 2) to assess the influence of various hydrometeorological factors on this area and to analyse the key processes that might affect the interannual changeability of Laptev Sea thermohaline structure.

The following results have been outlined:

Thermohaline structure during summer 2007 and 2008 is a dramatic example of high variability of the Laptev Sea hydrography. Temperature and salinity field, sea level pressure and wind patterns are completely different for these two sequential years. Peculiarities of hydrometeorological processes during summer are mirrored in the polygon area hydrography, thereby it can be an indicator of changes that occur in the area of the Laptev Sea shelf as a part of the global Arctic system.

Thermohaline characteristics strongly depend on prevailing wind and demonstrate short response time. The atmospheric circulation pattern was predominantly cyclonic in 2007 and anticyclonic in 2008. However, there was no typical river water distribution for those atmospheric conditions because of instability sea level pressure patterns. It is possible to consider, that the analyzed years were a switch period of transition from one type of circulation to another, that correlate with Arctic oscillation quasi-decadal periodicity.

The anomalies in ice cover, air temperatures, and wind-driven vertical mixing in 2007, lead to the increase of heat content and thickness of mixed layer. Pycnocline was depressed due to the small influence of river discharge on investigated area. It results in general increasing of heat

flux to the bottom layers. As a result, in 2007 heat content of entire water column was extremely high. that result in ice formation delay in autumn-to-winter period.

Lena River discharge is relatively stable, but it affects the thermohaline structure of polygon in different ways depending on atmospheric circulation. In 2007 its influence was insignificant in polygon area and the frontal zone was located roughly along the 74.5N. In 2008 the influence of river water was more pronounced, especially in the eastern part of polygon. The frontal zone area was well-detected and located along 129E.

The location of polygon in area of Anabar-Lena and Western New Siberian polynyas, as well as closeness to Lena delta, predetermines the importance of this study. This region is a key to further investigation of processes that proceeding in Laptev Sea and in entire Arctic. Of course, this work is only a first step to the understanding of the interannual variability in Laptev Sea shelf. As a next step we should model the processes in the natural layers, taking into account all main factors that determine their variability.

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