Geophysical Research Abstracts
Vol. 19, EGU2017-5471-1, 2017
EGU General Assembly 2017

Spatial and temporal variability of temperature and salinity of the surface water in Newfoundland zone

Andrey Popov (1), Nikolay Lebedev (1), Andrey Rubchenya (2), and Taisiia Telpis (2)

(1) St-Petersburg State University, Institute of Earth Sciences, Oceanography Dpt., St-Petersburg, Russian Federation (pp6077@mail.ru), (2) Arctic and Antarctic Research Institute, St-Petersburg, Russian Federation (avpopov1955@gmail.com)

The region of the Atlantic Ocean near the Newfoundland Island represents one of the most important areas of the World Ocean. In this area cold arctic water with low salinity collides with warm waters transported by Gulf Stream. Large scale exchange energy and matter in this area influences very much on the weather and climate in Northern hemisphere. Subpolar hydrological front is formed here too.

To investigate the consequences of this interaction we prepared database using WOD13 data and results of Argo project, for region limited 55W in the West, 40W in the East? 40N in the South and 52N. Thermohaline variability in selected area for the period 1950 to 2016 were analyzed.

In this study the surface border of cold water with low salinity was chosen according to position of 33 psu and 34 psu isolines. Time series of temperature and salinity for winter and summer seasons were considered separately. For every year and season, mean, maximal and minimum values of salinity and temperature were calculated.

The analysis of time series revealed several interesting features. It was found sharp increase of fresh waters distribution to the East happens every time interval of 10-11 years, which is close to changes of solar activity period. The area of fresh waters limited 33 psu isoline extends to the east in the years of decrease in solar activity. The most east propagation of the area of cold waters limited by isotherm 5C is noted each 7-10 years.

Average salinity of surface water during the winter season in the Newfoundland zone fluctuated with long period of 23-29 years. Minor fluctuations with period 2-4 years was observed. During all studied period the slight negative trend was determined. The absolute maximum of average salinity (33.96 psu) during a winter season 1981/82, and a minimum (32.34 psu) during a season 1995/96 were observed. In 2010/11 the next long-term growth cycle of average salinity ended and its decrease began. For the maximum and minimum salinity values, opposite directional trends were noted. Minimum salinity of the Labrador Current decreased from the 31,72 psu in a season 1954/55 to 21,91 psu in 2006/07. In the last decade, positive tend to raise is noted, during a winter season 2015/16 this value reached 31,33 psu. The maximum salinity of waters, associated with Gulf Stream, increases from the 34,37 psu (1950/51) up to 38,296 psu (2014/15). Abrupt decrease to 36,57 psu was noted in a season 2015/16. The counter sign of trend changes testifies to a tendency of sharpening of the salinity gradients in hydrofront, at least up to 2006.

Based on our research we received results of interrelation of temporary changes of position of the hydrofront, thermohaline characteristics of the surface water in Newfoundland zone and various elements of climatic system: AO and NAO indexes, ice cover variability, temperature and salinity variability in different parts of Euro-Arctic Seas and North Atlantic.