Geophysical Research Abstracts
Vol. 14, EGU2012-5810, 2012
EGU General Assembly 2012

Interpretation of time series (salinity and temperature) layers in North Atlantic from 1950 to 2011

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On the basis of long period data series (1950-2011) form various sources (National Oceanographic Data Center (NOAD) (www.nodc.noaa.gov), WOD09 database and data from ARGO project) 10 boxes in North Atlantic were selected. Location of boxes was determined by circulation pattern in North Atlantic and Euro-Arctic Seas. For further analysis two "seasons" was selected: "cold season" (October-May) and "warm season" (June-September). Data verification was made.

Analysis of data series clearly show the "Great Salinity Anomaly" (so-called GSA) in 1960-70th, 1980th and 1990th. Trends of salinity and temperature data series were calculated. Spectral analysis allow us to calculate periodicity from 2 to 22 years. Boxes situated in regions with Arctic waters have singularity showed through domination of high frequency oscillation during propagation to South. In Fram Strait salinity fluctuates with periods 9..11 and 20 years, the same period was calculated using temperature data series. In Denmark Strait there are oscillations of temperature with specific period from 4 to 7 years. Range of variability vary. For salinity it is 0.4..4.6 psu, for temperature it is 0.04..5.5C. In salinity data series from boxes with surface Arctic waters noticed clear minimums connected with GSAs. Trends in Denmark Strait and Fram strait in the end of 2000th are negative at different levels. Since 1975 to 2001 salinity near the southern part of Greenland was increased, since 2001 – decreased. But temperature was raised from 0.04 in 1989 to 5.59 in 2010.

Thermohaline characteristics of water masses which has Atlantic origin oscillated with period near 20 years. Salinity near Newfoundland was decreased since 2005. In Farrero-Shetland straits salinity trend is positive since at 100m level, Salinity rising from 1970th to 2006 is about 0.3 psu were noticed. Oscillations with period 2..4 years is weak. But at 800m layer salinity oscillations are different, since 1990 there is not significant oscillations at all. Temperature trend at this level is negative since 1950th.

Salinity at 100-300 level at Station M area described with negative trend since 1960 to 1993, in both "seasons". Next, up to 2010 salinity is increasing, but in 2011 salinity dramatically decreased. Main oscillations have periods 2..3 years, 4..5 years and 20 years. At 800m level oscillations are very weak. Temperature is increased since 1995 in surface layer and since 2002 in deeper levels. At all levels temperature dramatically decreased after 2010.

In central part of Greenland Sea ("Cupola area") dominated oscillations with period 4 years (1950-60th), 5..7 years (1970th) and 9 years (after 1979). In "cold season" oscillation with 11 years traced. Salinity trend is positive at all levels during last 10-15 years. Salinity and temperature were increased at 800m level up to 2006. It could lead to termination of deep water formation. Since 2006 temperature decreased, especially in "cold season".

Salinity trend in West Spitsbergen Current is positive since 1996 at surface and sine 1978 at deeper levels. Temperature was increased since 1965 to 2006 in surface layer, but since 2006 in "warm season" temperature is decreasing at all layers. Main oscillations is 4..5 years, 6..7 years and 9..11 years.