

Interactive comment on “Variability of heat and salinity content in the North Atlantic in the last decade” by V. O. Ivchenko et al.

A. Sarafanov

sarafanov@mail.ru

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The study by Ivchenko et al. is a valuable contribution to the research of the decadal variability of the North Atlantic (NA) heat and freshwater content.

However, a weak point of the paper is rather poor interpretation of the results. One of the valuable but expected results is the derived strong warming / salinification signal in the subpolar NA. If the recent papers on this matter were taken into account by the authors, they could provide more interesting discussion.

Authors reasonably note in lines 18–19: "The local salinity content is linked to the dynamical processes, as well." Noteworthy, the local heat content is also linked to the dynamical processes.

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In a number of studies (Bersch, 2002; Bersch et al., 2007; Häkkinen and Rhines, 2004; Häkkinen and Rhines, 2009; Hátún et al., 2005; Holliday et al., 2008; Lozier and Stewart, 2008; Lozier et al., 2008; Sarafanov et al., 2007; Sarafanov et al., 2008; Sarafanov, 2009; Thierry et al., 2008; Yashayaev, 2007) the substantial warming and salinification in the northern NA is documented and causes of the decadal thermohaline and circulation variability in the region are discussed. In my opinion, these results should not be ignored by the authors.

In general, the results of the listed studies point to the following main causes of TS increase at the upper and intermediate levels in the northern NA since the mid-1990s:

- (i) Weakening and contraction of the subpolar gyre that resulted in the redistribution of cold fresh subpolar waters and warm saline subtropical waters;
- (ii) Drastic reduction of convection activity in the Labrador Sea – the source of cold fresh intermediate waters.

Consideration of these factors in the context of the reported changes would considerably improve the paper. Otherwise, the paper looks like a "technical" report on the (valuable) calculation results.

References:

Bersch, M., 2002. North Atlantic Oscillation – induced changes of the upper layer circulation in the northern North Atlantic Ocean. *J. Geophys. Res.* 107, 3156, doi:10.1029/2001JC000901.

Bersch, M., Yashayaev, I. and Koltermann, K. P. 2007. Recent changes of the thermohaline circulation in the subpolar North Atlantic. *Ocean Dynamics* 57, 223–235.

Häkkinen, S. and Rhines, P. B. 2004. Decline of subpolar North Atlantic circulation during the 1990s. *Science* 304, 555–559.

Häkkinen, S. and Rhines, P. B. 2009. Shifting surface currents in the northern North

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Atlantic Ocean. *J. Geophys. Res.* 114, C04005, doi:10.1029/2008JC004883.

Hátún, H., Sandø, A. B. and Drange, H. 2005. Influence of the Atlantic Subpolar Gyre on the thermohaline circulation. *Science* 309, 1841–1844.

Holliday, N. P., Hughes, S. L., Bacon, S., Beszczynska-Möller, A., Hansen, B. and co-authors. 2008. Reversal of the 1960s to 1990s freshening trend in the northeast North Atlantic and Nordic Seas. *Geophys. Res. Lett.* 35, L03614, doi:10.1029/2007GL032675.

Lozier, M. S. and Stewart, N. M. 2008. On the temporally-varying northward penetration of Mediterranean Overflow Water and eastward penetration of Labrador Sea Water. *J. Phys. Oceanogr.* 38, 2097–2103, doi:10.1175/2008JPO3908.1.

Lozier, M. S., Leadbetter, S., Williams, R. G., Roussenov, V., Reed, M. S. C. and Moore N. J. 2008. The spatial pattern and mechanisms of heat-content change in the North Atlantic. *Science* 319, 800–803.

Sarafanov, A. 2009. On the effect of the North Atlantic Oscillation on temperature and salinity of the subpolar North Atlantic intermediate and deep waters. *ICES J. Mar. Sci.* 66, in press.

Sarafanov, A., Sokov, A., Demidov, A. and Falina, A. 2007. Warming and salinification of intermediate and deep waters in the Irminger Sea and Iceland Basin in 1997–2006. *Geophys. Res. Lett.* 34, L23609, doi:10.1029/2007GL031074.

Sarafanov, A., Falina, A., Sokov, A. and Demidov, A. 2008. Intense warming and salinification of intermediate waters of southern origin in the eastern subpolar North Atlantic in the 1990s to mid-2000s. *J. Geophys. Res.* 113, C12022, doi:10.1029/2008JC004975.

Thierry, V., de Boisséson, E., and Mercier, H. 2008. Interannual variability of the Subpolar Mode Water properties over the Reykjanes Ridge during 1990–2006. *J. Geophys. Res.* 113, C04016, doi:10.1029/2007JC004443.

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Yashayaev, I. 2007. Hydrographic changes in the Labrador Sea, 1960–2005, Prog. Oceanogr., 73, 242–276.

Interactive comment on Ocean Sci. Discuss., 6, 1971, 2009.

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