

Interactive comment on “Frontal structures in the West Spitsbergen Current margins” by W. Walczowski

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I would like to thank Anonymous Referee #1 for the constructive and helpful comments. My responses to the comments are given below.

REFeree Page 989, line 21: “Baroclinic currents across sections were calculated with reference to the bottom (i.e. taking zero current at the bottom irrespective of depth). For horizontal distributions, currents were calculated with reference to 1000 dbar. The current vectors indicate only the baroclinic component of the flow, but offer a good representation of the general pattern of the flow (Walczowski et al., 2005). The heat content was calculated with respect to a temperature of 0.1 °C.” I wonder why the reference level at sections was taken at the bottom, while for spatial distributions it was taken at 1000 dbar? It is also not explained why heat content was calculated with respect to -0.1 °C? I

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would suggest the author to clarify his choice.

ANSWER I have used the bottom reference (zero velocity at the bottom) for total baroclinic transports calculations at the sections. For horizontal distributions I have used ‘traditional’ 1000 dbar as the zero velocity level to better represent the Atlantic Water pathways. In this case using the bottom reference gives the same pattern of currents but with a few per cent higher velocities. I do not compare both results, horizontal currents distributions are shown only at Fig. 19 as arrows. I do not want to discuss in this paper which reference level is more suitable. The temperature -0.1 °C is also a commonly used reference temperature for the heat transport and heat content calculations in the Arctic, adopted by numerous authors after Aagaard and Greisman (Toward new mass and heat budgets for the Arctic Ocean, J. Geophys. Res., 80, 3821–3827, 1975).

REFeree Page 996, line 7: “Water particles moving down along the inclined isopycnic surfaces: :” I suggest to remove the word “down” in this sentence, because as a result of baroclinic instability water particles are moving in both directions (up and down), depending on their density

ANSWER I agree, it has been changed

REFeree Page 1005, line 12: “Due to significant transformation and densification, the AW in this region usually subducts under the layer of Polar Waters”. The idea of AW subduction under the Polar Waters is somehow misleading. Rudels et al. (Rudels B., L.G.Anderson, E.P.Jones. Formation and evolution of the surface mixed layer and halocline of the Arctic Ocean// Journ. of Geophys. Res. – V.101, NC4.- 1996.-P.8807-8821) was probably the first who introduced the concept of gradual cooling and freshening of AW on its motion along the Eurasian continental margin to the east without actual subducting. Mooring observations at the North Barents Sea slope (about 31E, 81N) generally confirmed this hypothesis (see: Ivanov V.V., I.V. Polyakov, I.A. Dmitrenko, E. Hansen, I.A. Repina, S.S. Kirillov, C. Mauritzen, H. Simmons, L.A. Timokhov, Sea-

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sonal Variability in Atlantic Water off Spitsbergen // Deep Sea Res. I, 56, 1-14, 2009, doi:10.1016/j.dsr.2008.07.013). Therefore I would suggest rewording this sentence like say: "Due to intensive heat loss to the atmosphere and freshening through mixing with the ice melted water the AW upper portion cools and freshens, which leads to the isolation of the AW warm core from the ocean surface."

ANSWER I agree, it has been changed and the suggested reference has been added.

Interactive comment on Ocean Sci. Discuss., 10, 985, 2013.