



## Is the North Atlantic ocean warming or cooling?

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Whether the North Atlantic Ocean is warming or cooling is an important question both in physical oceanography and climate change. The ARGO buoys provide an accurate and stable instrument for determining the tendencies in heat content from the surface to 2000m from 1999 to 2005. However there are both spatial and temporal gaps in this data set. For this reason we combine these observations with a climatology. The climatologies used are the well known Levitus climatology, and a new WOCE Global Hydrographic climatology (Gouretski and Koltermann, 2004). By this method we estimate the anomaly of heat content (AHC) by using the ARGO temperature profiles in the North Atlantic between 10 N and 70 N and all of its smaller sub-domains for the period 1999-2005. We also have made an analysis for the 10-degree zonal belts, and for the western and eastern regions. The analysis shows the negative anomaly of the heat content for the North Atlantic occurs in the upper 1500 m, and the two minimums are concentrated at a depth of about 50 m and between 350-900 m. The contribution of the upper layer negative minimum is minor, because the layer is thin, at about 50-75 m. The main contribution to the total negative value of the AHC is from the lower main thermocline and upper intermediate waters between 350-900m.

The southern and mid latitude North Atlantic sub domains between 10 N and 50 N made the greatest contribution to the total negative value of the AHC with the strongest contribution in the western part of the North Atlantic. The amplitude of the AHC of the upper 1000 m layer is much higher than in the layer 1000 - 1500 m. In the sub polar North Atlantic both the western and eastern regions have positive values of the AHC. In contrast to the mid North Atlantic the strongest positive anomaly takes place in the upper ocean, above 400 m. We have found a positive trend of the AHC in the most parts of the domain between the surface and 1500 m. However there is cooling in the last 3 years compared to 2000-2002 in the zonal belts between 20 - 30

N and 40 - 50 N.