Geophysical Research Abstracts
Vol. 13, EGU2011-14196, 2011
EGU General Assembly 2011

Summer-time modification of surface fronts in the North Atlantic Subpolar and Subtropical Gyres

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First, we consider a 14-year long thermosalinograph data set from ships of opportunity was used to make an extensive study of mesoscale hydrographic fronts in the western part of the North Atlantic subpolar gyre from 1997 to 2009. Fronts are identified on a sea-surface-salinity/sea surface temperature gradient criterion with a typical width of 20 to 60 km. We find that whereas gradients across individual fronts are usually close to larger scale thermohaline gradients, the temperature gradients are often smaller near fronts, in particular in summer-time. Although the distribution of fronts sampled changed seasonally, this property is independent of location. We also find on a set of June hydrographic cruises that the relative weight of temperature over salinity in the density jump across surface fronts are smaller at the surface than at subsurface. We suggest that air-sea fluxes, mostly heat fluxes, but possibly also differential vertical stirring, are responsible for a damping of the meso-scale horizontal temperature gradient. This is comforted by an eddy-permitting numerical simulation of this region (DRAKKAR simulation ORCA-025-G70). This is also investigated using the GLORYS reanalysis.

Other sets of repeated thermosalinograph sections in recent years are then used to carry a preliminary investigation of surface fronts in the subtropical gyre of the North Atlantic Ocean, in particular near the core of salinity maximum, which will be the site of the international SPURS experiment in 2012-2013.