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Eddy induced Temperature Exchange between Subpolar and Subtropical Gyre – a comparison of observations and model

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Eddies in the subpolar North Atlantic play an important role for temperature, freshwater and volume fluxes across the front between the subpolar and subtropical gyre and thus influence the hydrography and dynamics in the Subarctic and Arctic realm. Here, we ask where and how eddy induced mixing takes place, if there are localized hotspots of mixing and what are the main pathways of eddies between the gyres.
We analyze the eddy field in more than 20 years of satellite altimetry observations with 1/4° horizontal resolution, using a geometry based eddy detection and tracking algorithm. To estimate the respective temperature flux of individual eddies, the eddy surface area and translation speed from the eddy detection and tracking algorithm are combined with anomalies of a real-time global sea surface temperature (SST) analysis.
In order to analyze the effect of resolution on the results, we compare the findings in the observations to model experiments with the NEMO ocean model using two different set-ups: (1) ANHA4 with 1/4° horizontal resolution and (2) ANHA4 with an nested 1/12° horizontal resolution encompassing the subpolar North Atlantic.
For the analysis of the temperature flux, we focus on the zonal section at 47°N as it represents a good approximation for the gyre boundary. Additionally, we have ship based velocity observations from 10 cruises between 2003 and 2014 available for this section, that allow us to compare the observed eddy temperature flux to the mean circulation across the section.
In both observations and model, the shear region between Western Boundary Current, North Atlantic Current and the recirculation cell in the Newfoundland Basin is the most active region regarding eddy activity and eddy induced temperature flux across 47°N.