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On estimating the circulation in the North Atlantic from altimetry and ARGO data

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We estimate 3-dimensional ocean currents from hydrographic (ARGO) data by determining the associated circulation in an inverse model. While velocities are treated diagnostic as an instantaneous steady state response temperature and salinity are allowed to change slowly with their inter-annual variability. Annual mean solutions are presented for 1999 to 2008.
Altimetry referenced to a geoid provides a mean dynamic topography that determines the large scale surface circulation. AGRO data extend this information further into the ocean. It appeared useful to regularize the solution by constraining deep velocities to be small or as in our case to be close to a prognostic model simulation. Altimetry alone already improves temperature and salinity fields while ARGO data are less useful in constraining the dynamic topography.
Heat, volume and overturning transports are in general agreement with previous work. Their inter-annual variability appears to be large in comparison to possible trends. Transport variances are estimated by perturbing the input data in a Monte Carlo simulation. They are smaller than the changes between consecutive years. ARGO data coverage seems to be reliable for this work after the year 2002.