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Using Argo and dynamic topography to assess the quasi stationary circulation in the North Atlantic

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We analyze the North Atlantic circulation by combining data from Argo profiling buoys and observed dynamic topography into an inverse finite-element ocean circulation model. The inverse model finds temperature and salinity fields which are close to Argo data and correspond to a large-scale ocean circulation with a surface elevation close to the observations. The ocean circulation is analyzed separately for each of the years 1999 to 2008. Numerical experiments carried out with and without using dynamic topography are discussed. The use of the latter changes the model pressure on large scales, this difference is reflected in the corresponding change in circulation. As a consequence the model estimates more realistic heat transports when the topography data is used. The resulting temperature and salinity fields that minimize the model/data misfit are discussed. It is found that both types of observations are to a large extent complementary to each other. The changes due to Argo-data are similar to those due to dynamic topography mainly in regions of dense Argo-data coverage.