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Circulation in the North Atlantic derived from Inverse Finite-Element Ocean Model

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The circulation in the North Atlantic is estimated by assimilating climatological datasets of Lozier et al. (1995) and Gouretski and Kolltermann (2004), and World Ocean Database (2001). A diagnostic inverse model (IFEOM) is used to derive ocean transports from hydrographic data. It is based on a steady-state version of the finite element ocean general circulation model FEOM (Danilov et al., 2004). A steady state velocity field is determined from the momentum equations, and the advective-diffusive tracer balance is accounted for as a soft constraint. Due to the flexibility of the unstructured mesh discretization, the model is able to resolve complex ocean boundaries (coast and bottom) in an accurate manner.

The analyzed circulation derived from the datasets mentioned above is superior to single section approaches as it derives a consistent 3D flow field simultaneously for the whole North Atlantic. Results are compared to each other and to publications. We discuss meridional overturning circulation, the barotropic transport and transports through several sections (including A5, AR1, A2, M50 and AR7E).

The intercomparison of datasets shows that climatology of Gouretski and Koltermann (2004) is more dynamically consistent in the North Atlantic than the two other climatologies.