



Variability of the mid-depth North Atlantic circulation reconstructed from Argo data

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We use some spectral decompositions for the mid-depth currents (at 1000 m) and temperature (from ocean surface to 1000m) to reconstruct spatial snapshots for circulation with three-month averaging, and monthly temperature fields on a two-degree, latitude-longitude grid. The obtained snapshots are analyzed to understand variability in the whole North Atlantic and in some regions, such as a zonal band between 4 N and 24 N and sub-domain with boundary along the North American Coast, the Mid-Atlantic Ridge, 40 N and 20N latitudes (the western corner of the North Atlantic).

Our computations demonstrate: (1) strong variability of the Subtropic Gyre affected by wind and long Rossby waves. This variability appears through the periodical closing and opening of the main pathways in the North Atlantic; (2) long Rossby waves in the Tropical Atlantic. We detected both standing and propagating Rossby waves in both the sub-basins (to the left and to the right of the Mid-Atlantic Ridge), and identified possible physical mechanisms for their generation; (3) existence of the rapid global reversal events for the mid-depth currents. We identified two reversals with duration less than 3 months in 2004 and 2005. This dynamical regime is characterized by dissipation of the Southern Re-circulation Gyre, formation of a cyclonic gyre with centre located approximately at 30 N, 50 W; preferably cyclonic circulation in the Subpolar Gyre.