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Intra - annual variability of carbon fluxes in the subtropical North Atlantic at 24.5°N

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The Atlantic meriodinal overturning circulation (AMOC) carries warm upper waters north where they cool and sink before returning as cold deep water. The associated ocean-atmosphere heat flux is responsible for northwest Europe's mild climate. The AMOC across 24.5°N is balance of three components: northern flow of the warm Gulf Stream, a shallow northern wind-driven Ekman layer and southward return flow in the interior of the basin. The oceans play significant role in storage of excess carbon from the atmosphere and North Atlantic has a particularly important one storing 23% of the excess CO2. To be able to better understand carbon storage in North Atlantic we concentrate on intra-annual changes of carbon fluxes. To determine them we use RAPID mooring array daily transports in the period 2004 to 2007, daily Ekman transports derived from QuickSCAT wind stress time-series and available carbon data in North Atlantic for all three circulation components. Time series of Dissolved Inorganic Carbon (DIC) in western Atlantic (Bermuda Atlantic Time-series Study - BATS) site and in eastern (European Time Series Station - ESTOC) in the Canary Island were related by trend, seasonal components, a SST linear relation and serial correlation modeled by second order autoregressive model. This allowed us to construct, using Reynolds SST data, time series of surface DIC across the 24.5°N section which we combined with Ekman volume transport to calculate surface DIC flux. For the interior part of section and Florida Strait we use DIC data profiles from hydrographic sections in 2004 to construct daily time series of DIC fluxes for the other two circulation components. Finally we determine AMOC DIC fluxes across the 24.5°N. The results suggest that most of the carbon flux variability is determined by circulation variability.