Variability in Florida Straits properties: sources and consequences.

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Approximately 30 Sv flows through the 50km wide, 700m deep Florida Straits offshore of Miami. This constitutes the primary route for the northward flowing upper limb of the meridional overturning circulation at this latitude in the Atlantic. Not only the strength of the flow but also its properties (temperature and salinity) are key elements of the heat and freshwater transport through the straits and therefore across the whole ocean in the subtropical North Atlantic gyre. Thus understanding variability in not only the transport but also the properties of the transport are key to estimating and understanding the budgets of the North Atlantic.

In this study we examine 82 sections of repeat hydrography collected across Florida Straits by NOAA, AOML between 2001 and 2016. We use gridded velocity data from ADCPs and gridded temperature and salinity data from CTDs to examine the variability in property transports. The section is split into three water masses comprising surface water, recirculated, high salinity North Atlantic water concentrated in the east of the Straits and relatively fresh water in the deep western part of the Straits that has its origin in the South Atlantic. We examine seasonal, interannual and long-term variability and find significant signals on each of these time scales. The transport and transport-weighted temperature (TWT) in the surface water are dominated by a correlated seasonal cycle. Additional to the seasonal cycle there is interannual variability, and this interannual variability is what dominates the transport weighted salinity (TWS) time series. The water of predominantly North Atlantic origin shows seasonal cycles in the transport and the TWT, however these cycles are high when the surface water cycles are low and vice versa. The interannual variability of transport, TWT and TWS shows a long-term trend, with a particularly strong freshening trend in the TWS. The South Atlantic origin water is dominated by interannual variability in transport, TWT and TWS with a trend over the time period increasing the transport and decreasing the TWS. We examine the sources of this variability and relate it to local and remote forcing.