Interannual Variability of the AMOC and Ocean Heat Transport at 26.5°N observed by the RAPID-MOCHA Array

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Continuous estimates of the meridional overturning circulation and ocean heat transport in the Atlantic from 2004-2011 are described, based on results from the RAPID-MOCHA (Rapid Climate Change – Meridional Overturning Circulation and Heatflux Array) observing system deployed along 26.5°N. The heat transport shows variations of nearly ± 1 PW about its 2004-2010 mean value of 1.28 PW. Year-to-year variability was relatively small during the first 5 years of the time series (2004-2008), but a large anomaly in both the AMOC and heat transport occurred in 2009-2010, resulting in lower mean heat transports of about 1.1 PW during those years. This anomaly was driven in part by reduced Ekman transports associated with a strong negative NAO anomaly in winter 2009-2010 - which recurred again in winter 2010-2011 - and in part by changes in the western boundary current and mid-ocean transports. A significant cooling event also occurred in the mid-latitude North Atlantic starting in winter 2009-2010 which does not appear to be fully explained by changes in surface heat flux forcing, suggesting that the reduced heat transport across 26.5N may have played a role in this event.