A decade of Atlantic Ocean heat transport estimates from the RAPID-MOCHA array at 26.5°N

William Johns[1], Jian Zhao[1], Gerard McCarthy[2], David Smeed[2], Chris Meinen[3], Molly Baringer[3], Eleanor Frajka-Williams[2], Darren Rayner[2], Elaine McDonagh[2], and Brian King[2]
[1] Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL USA
[2] National Oceanography Centre, Southampton, England
[3] NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami, FL USA

Since April 2004, continuous estimates of the oceanic meridional heat transport in the Atlantic have been derived from the RAPID-MOCHA (Rapid Climate Change – Meridional Overturning Circulation and Heatflux Array) observing system along 26.5°N. The methodology has been recently updated to incorporate available Argo data across the mid-ocean region and improvements in the near-surface extrapolation of mid-ocean geostrophic current profiles. The mean northward heat transport from for the first 8.5 years of observations (2004-2012) is 1.25 ± 0.11 PW, with annually averaged values varying from 1.08 PW to 1.39 PW. The first five years of the time series (2004-2008) showed a fairly stable mean value of 1.34 ± 0.05 PW, followed by a sharp decrease to values of less than 1.1 PW in 2009 and 2010, associated in part with large negative NAO anomalies in the winters of those years. A rebound to 1.28 PW occurred in 2011 but a drop to near 1.1 PW occurred again in 2012. The time series will soon be updated through March 2014. While Ekman transport variability accounts for much of the short-term heat transport variability and some of the interannual variability, year-to-year changes in the heat transport are mostly explained by changes in the geostrophic circulation and specifically the mid-ocean heat transport. A breakdown of the total heat transport into overturning and gyre heat transport components shows that most of the heat transport (~90%) - and essentially all of the interannual variability observed thus far - is contained in the overturning component. The gyre component on the other hand shows a fairly regular seasonal cycle which is mainly dominated by the annual cycle of the Florida Current.