Session: C37 Poster: TH69B

Atlantic Meridional Overturning Circulation: New estimates of Atlantic Ocean Heat Transport at 26.5oN from the RAPID-MOCHA Array

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Continuous estimates of the oceanic meridional heat transport in the Atlantic are derived from the RAPID-MOCHA (Rapid Climate Change - Meridional Overturning Circulation and Heatflux Array) observing system deployed along 26.5oN. The basin-wide meridional heat transport (MHT) is derived by combining temperature transports (relative to a common reference) from: (1) the Florida Current in the Straits of Florida, (2) the western boundary region offshore of Abaco, Bahamas, (3) the Ekman layer (derived from QuikSCAT wind stresses), and (4) the interior ocean monitored by "endpoint" dynamic height moorings. The interior eddy heat transport arising from spatial covariance of the velocity and temperature fields is estimated independently from repeat XBT and CTD sections, and can also be approximated by the array. The results show a mean MHT of 1.3 PW at 26.5oN, associated with a mean MOC strength of 18.5 Sv. The instantaneous (10-day average) heat transport varies over a range of more than 2 PW, with approximately half of the variance caused by Ekman transport changes and half caused by changes in the geostrophic circulation. The data indicate a seasonal cycle of the MHT with a maximum in summer (July-September) and minimum in late winter (March-April), with an annual range of 0.6 PW. A breakdown of the MHT into overturning (zonally-symmetric) and gyre (zonally-asymmetric) components shows that the overturning component carries 90% of the total heat transport. The overall uncertainty of the annual mean MHT derived from this data is about 10% of the mean value, a factor of two better than the typical uncertainty available from previous estimates.