This matfile contains the heat transport results for the first 16.8 years of the RAPID/MOCHA program, from April 2004 through December 2020.

Variables contained in "mocha_mht_data_ERA5_v2020.mat":

Name	Size
Q_eddy	1x12202
Q_ek	1x12202
Q_fc	1x12202
Q_gyre	1x12202
Q_int	1x12202
Q_mo	1x12202
Q_ot	1x12202
Q_sum	1x12202
Q_wedge	1x12202
T_basin	307x12202
T_basin_mean	307x1
T_fc_fwt	1x12202
V_basin	307x12202
V_basin_mean	307x1
V_fc	307x12202
V_fc_mean	307x1
day	1x12202
hour	1x12202
julian_day	1x12202
maxmoc	1x12202
moc	307x12202
month	1x12202
trans_ek	1x12202
trans_fc	1x12202
year	1x12202
z	307x1

Description of the variables:

Q_sum is the net meridional heat transport, and the others are the components of temperature transport (relative to 0°C) that go into it: Q_fc is Florida Straits, Q_ek is Ekman, Q_wedge is the "western boundary wedge" off Abaco, Q_int is the rest of the interior to Africa (but only represents the contribution by the zonal mean v and T), and Q_eddy is our estimate of the interior gyre component due to spatially correlated v'T' variability across the interior, derived from an objective analysis of interior ARGO T/S data merged with the mooring T/S data from moorings, and smoothly merged into the EN4 climatology along 26.5°N below 2000m. Q_eddy is not dependent on the temperature reference (and neither is Q_sum). Q_mo is the sum of all the three interior components between the Bahamas and Africa (Q_int + Q_wedge + Q_eddy).

Q_ot and Q_gyre are the basinwide "overturning" and "gyre" heat transports, as classically defined (e.g. see Johns et al., 2011). All heat transports are in Watts.

Other potentially useful fields for comparison are:

T_basin	time-varying basinwide mean potential temperature profile
T_basin_mean	time-mean basinwide mean potential temperature profile
T_fc_fwt	time-varying Florida Current flow-weighted potential temperature
V_basin	time-varying basinwide mean transport profile (Sv/m)
V_basin_mean	time-mean basinwide mean transport profile (Sv/m)
V_fc	time-varying Florida Current transport profile (Sv/m)
V_fc_mean	time-mean Florida Current transport profile (Sv/m)
trans_ek	time-varying Ekman transport (Sv, calculated from ERA5 winds)
trans_fc	time-varying Florida Current transport (Sv, from the cable)
maxmoc	time-varying maximum value of MOC streamfunction (Sv)
moc	time-varying MOC streamfunction vs. depth (Sv)

The other variables are the year, month, day, and hour of each data point, the corresponding julian date, and the depth array (z) that corresponds to the profile variables.

Changes from the methodology used in Johns et al. (2011) are described in McCarthy et al. (2015), and updated as follows:

1. For this calculation we use ERA5 wind stress to calculate Ekman transports, instead of the previous ERA interim (ERA-I) winds which were converted to stress estimates via a bulk formula.

2. The Ekman heat transport is now calculated using these winds and the interior ocean temperature profiles derived from ARGO, where the Ekman transport is assumed to be confined to the upper 50 m of the water column. Thus the Ekman layer temperature is a weighted average of the upper 50 m temperatures. Previously we had used Reynolds SST's in the interior and assumed the Ekman layer temperature to be equal to the Reynolds SST. Differences between the two methodologies are negligible.

3. The mid-ocean eddy heat flux Q_eddy is derived from an objective analysis of available Argo data profiles in the interior and T/S profiles from the RAPID moorings. Meridional velocity anomalies across the section are derived from this OA using a geostrophic approximation relative to 1000 m. Previously, Q_eddy had been calculated from a "piecewise" mooring approach using only the mooring data across the section, as described in Johns et al. (2011). The two approaches agree within error bars and are consistent with the range of estimates available from trans-basin hydrographic sections along 26°N.

4. The interior zonal average temperature transport (Q_int) now uses a time varying interior temperature field derived from the Argo and mooring data as above, merged into a seasonal temperature climatology below 2000m based on the EN4 database. In Johns et al. (2011), the interior zonal mean temperature field was taken from only the seasonally varying RAPID HydroBase climatology.

5. The estimates of the temperature transport of the Florida Current now include an interannually-varying flow-weighted temperature (FWT) anomaly, in addition to the seasonal climatology of FWT used previously. Both the seasonal FWT of the Florida Current and its interannual anomaly are calculated from the 101 available synoptic sections across the Florida Current at 27°N collected by the NOAA WBTS program during the period of the RAPID observations (2004-2020).
The climatological seasonal cycle of the Florida Current FWT is estimated as a two harmonic (annual and semiannual) fit of the section-derived FWT estimates, and the interannual anomaly of FWT is calculated as a running 3-year average of the FWT anomalies with respect to the climatological seasonal cycle.

References:

Johns, W.E., Baringer, M.O., Beal, L.M., Cunningham, S.A., Kanzow, T., Bryden, H.L., Hirschi, J.J.M., Marotzke, J., Meinen, C.S., Shaw, B. and Curry, R., 2011. Continuous, array-based estimates of Atlantic Ocean heat transport at 26.5 N. *Journal of Climate*, *24*(10), pp.2429-2449.

McCarthy, G. D., and Coauthors, 2015: Measuring the Atlantic Meridional Overturning Circulation at 26 degrees N. *Progress in Oceanography*, **130,** 91-111.