Geophysical Research Abstracts, Vol. 7, 03016, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03016

Subrtopical cells and meridional overturning circulation pathways in the tropical Atlantic

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The circulation in the tropical Atlantic is studied focussing on pathways of the Subtropical Cells (STCs) and the basin-wide meridional overturning circulation (MOC). A particle tracking algorithm is used to trace these pathways in a high-resolution ocean model. With this approach STCs and the MOC can be disentangled unambiguously and the degree of interaction and recirculation is determined explicitly. About 16 Sv of MOC water flows to the equator from the south, primarily in the North Brazil Current. The MOC water recirculates in the tropical gyres and after crossing the equator about half of it stays along the western boundary and the other half loops in a cyclonic circulation northward to join the North Equatorial Current. A small amount of MOC water recirculates in the STCs. The STC on the Southern Hemisphere has a strength of 4 Sv and about half of its transport originates from the MOC. Upon first approach from the South Atlantic the MOC and the STC are well separated with the MOC transferring water along the western boundary and the STC being shallower and containing more interior transport. After upwelling near the equator MOC water recirculates in the southern STC. A small STC is found in the north is found as well. It has a strength of 1.5 Sv and is confined to the retroflection area close to the equator. The entire northern STC contains MOC water.