TAOS Review: The AMOC in the Tropical Atlantic

Outline

1. Impacts of AMOC Variability on the Tropical Atlantic:
   • Climate Impacts of an AMOC slowdown/shutdown
   • Influence of Agulhas Leakage Variability
   • Interaction of the AMOC with the Atlantic STC’s

2. Current AMOC Observations in the Tropical Atlantic (MOVE, 11°S)

3. Recommendations
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SST/Atmospheric response to an AMOC shutdown (Jackson et al. 2015)
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The “Equatorial Buffer” Mechanism (Kawase, 1987; Johnson and Marshall, 2002)
Influence of Agulhas Leakage on AMOC variability (Biastoch et al. 2008)
Effects of long-term trend in Agulhas Leakage (Biastoch et al. 2009)
The Atlantic “Subtropical Cells” (STC’s) Schott and McCreary, 2004)
AMOC-induced asymmetry of the Atlantic STC’s (Fratantoni et al. 2000; Zhang et al. 2003)
AMOC interaction with the Atlantic STC’s (Chang et al. 2008)
Present/future AMOC observing arrays in the Tropical Atlantic

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Courtesy: Peter Brandt
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MOVE (17° N)

Southward NADW transport (1200 – 4920 dbar)
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MOVE vs. RAPID (Frajka-Williams et al. 2018)

RAPID and MOVE show opposing AMOC trends over their common time period.
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MOVE vs. RAPID (Frajka-Williams et al. 2018)

Dynamic height changes on the western boundary
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WBCS/RACE/SACUS (11° S)

- Eastern boundary moorings: since 2013
Proposed Recommendations:

1. Continuation of the MOVE measurements is strongly recommended
   - one of the few locations where AMOC measurements of greater than a decade in length are available (now 19 years long, 14 year overlap with RAPID)
   - observation of coherent deep (NADW) density anomalies along the western boundary; propagation of AMOC anomalies from subtropics to tropics

2. The 11° S array is seen as a very important new addition to the basin-wide AMOC observing system; continued support for it is strongly recommended
   - in conjunction with the subtropical RAPID and SAMBA arrays, allows investigation of the coherence of AMOC signals in the Atlantic as well as possible convergence of the associated heat transport in between the arrays (e.g. “equatorial buffer” mechanism)
   - further development could benefit from OSSE study using high-resolution model(s)