

Mass and heat Transport in the subpolar North Atlantic

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Decrease of LSW formation - weakening of the subpolar gyre --- weakening of the MOC?





Böning and Biastoch, 2008

- Positive MOC anomalies follow periods of intensified LSW formation
- -- Amplitude of decadal MOC variability: ~ 2 Sv at 40°N
- -- from overflow another +-1-2 Sv (Latif et al., 2006)



Decrease of LSW formation - weakening of the subpolar gyre --- weakening of the MOC?

Schott et al. (2004): DWBC transport did not change between 1993-1995 (-11.3 Sv) and 1999 – 2001(-11.2 Sv)









- Role of Overflows, LSW formation, gyre strength: relation to meridional volume and heat transport ?
- Role of interior pathways for MOC strength and fluctuations ?
- Exchange between subpolar and subtropical gyre
- Meridional temporal and spatial coherency ?

Idea: extend 47°N array into the Eastern Atlantic, moor a sufficient number of C-PIES



Time series of the meridional mass and heat transport:

Separate velocity field V in

- V_{rel} : geostrophic velocity relative to reference level
- V_{fluc} : geostrophic velocity fluctuations at the reference level
- V_{mean} : mean velocity in the reference level



Relative velocity V_{rel}

Travel time measured by IES: transferred to top-bottom T/S profile with GEM (Gravest Empirical Mode)

Use T/S profiles from Argo program, use CTD data from cruises,

No Argo data below 2000m, T/S profiles from moored profilers (one in western one in eastern basin)

V_{fluc} : geostrophic velocity fluctuations at the reference level

calculate from pressure fluctuations p' measured by PIES, mean pressure cannot be used: unknown drift,...



V_{mean} : mean velocity in the reference level

directly measured by current meter attached to the C-PIES

Horizontal resolution must be sufficient to resolve mean velocity field **AND**

To calculate heat transport:resolve temperature field

Meridional velocity at 47°N from combined vm-ADCP and LADCP data,





Meridional velocity at 47°N annual mean year 2000 1/12° FLAME model Rossby Radius of deformation : 20 km Observed horizontal scales of NAC eddies and meanders : 80-100 km From Argo data: correlation scale T/S: 80km

Requested mean horizontal distance between the C-PIES: 70-90 km

about 30 C-PIES are needed

Planned array at 47°N

