DECADAL VARIABILITY IN THE DEEP BRANCH OF THE ATLANTIC MERIDIONAL OVERTURNING CIRCULATION OBSERVED AT 16N

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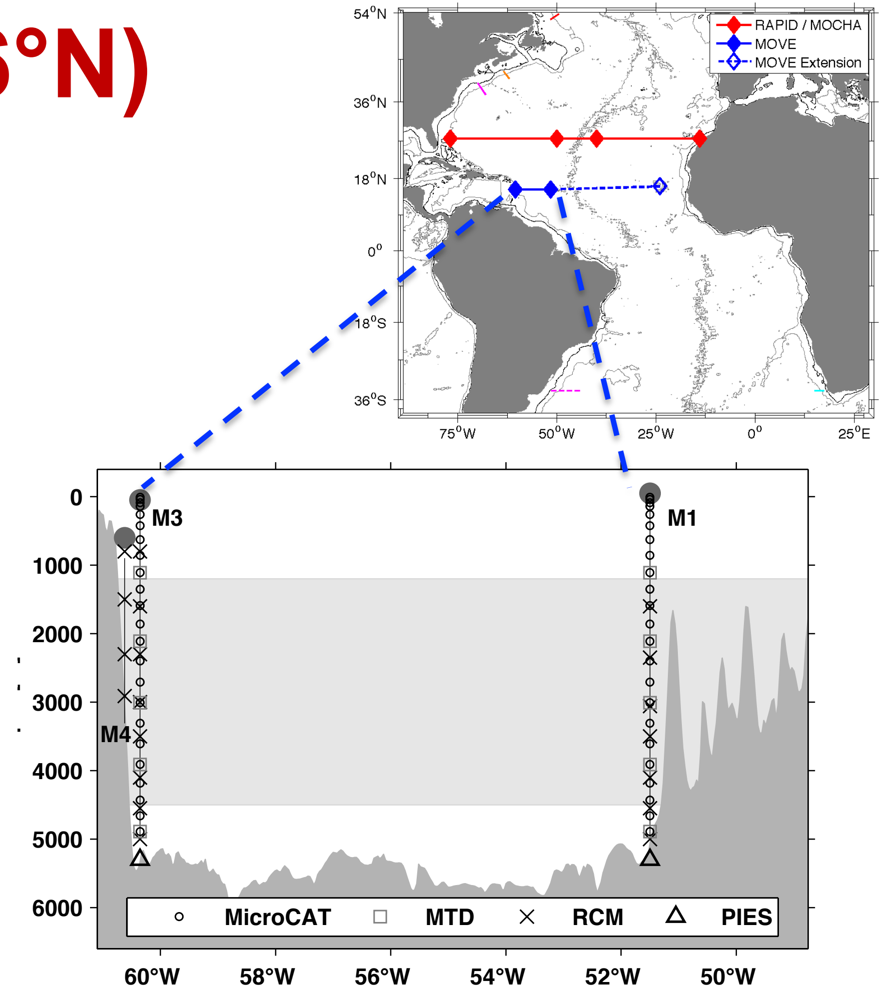
Line W data collected and provided by John Toole, Ruth Curry, Mike McCartney

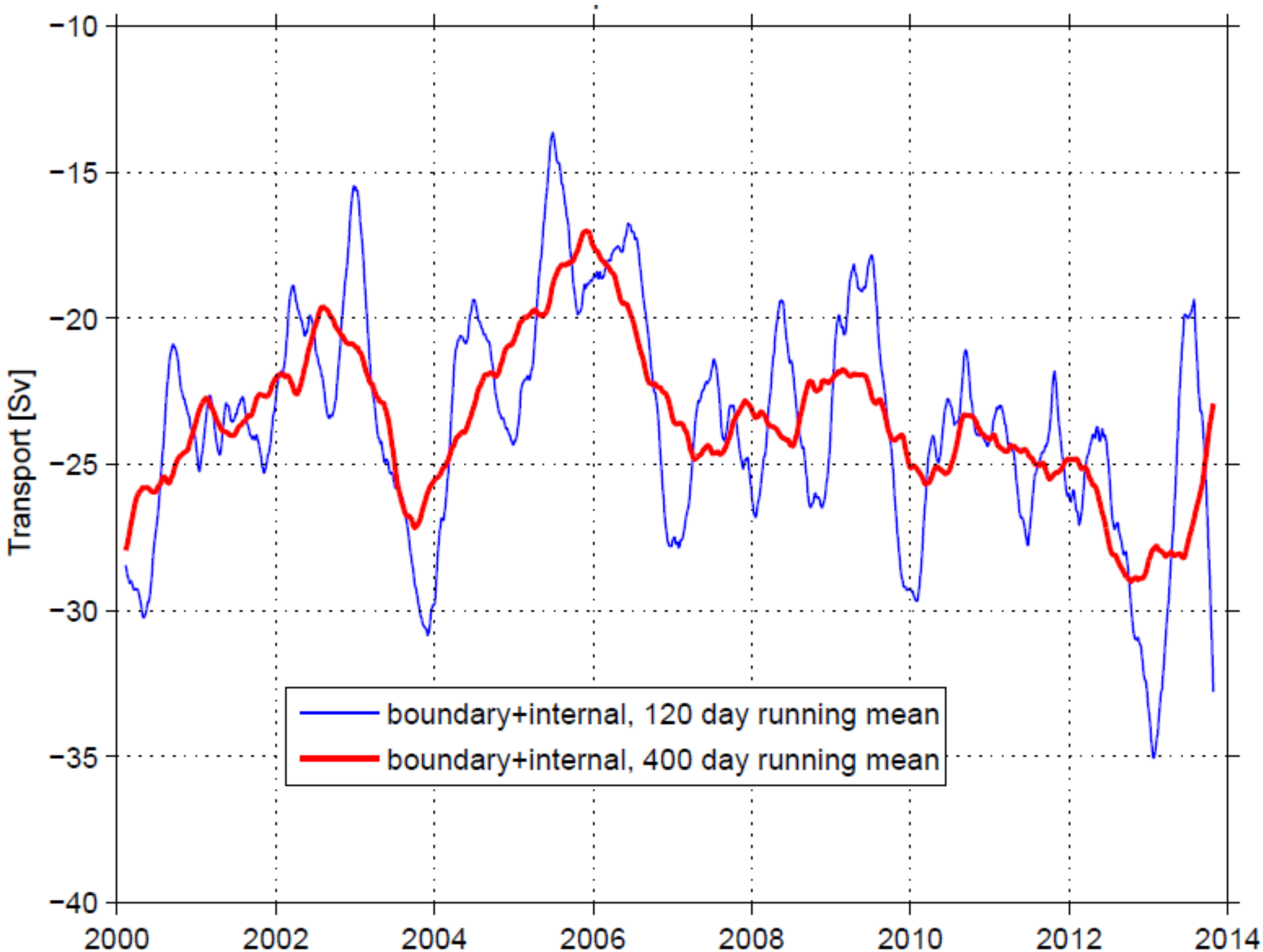
MOVE (16°N)

- CTD moorings (M3, M1) to infer meriodional geostrophic NADW transport relative to 4950 dbar (AABW / NADW boundary)
- Direct current meter velocity measurement (M3, M4) to derive NADW over western continental slope
- Bottom pressure records designed to address reference layer dependence

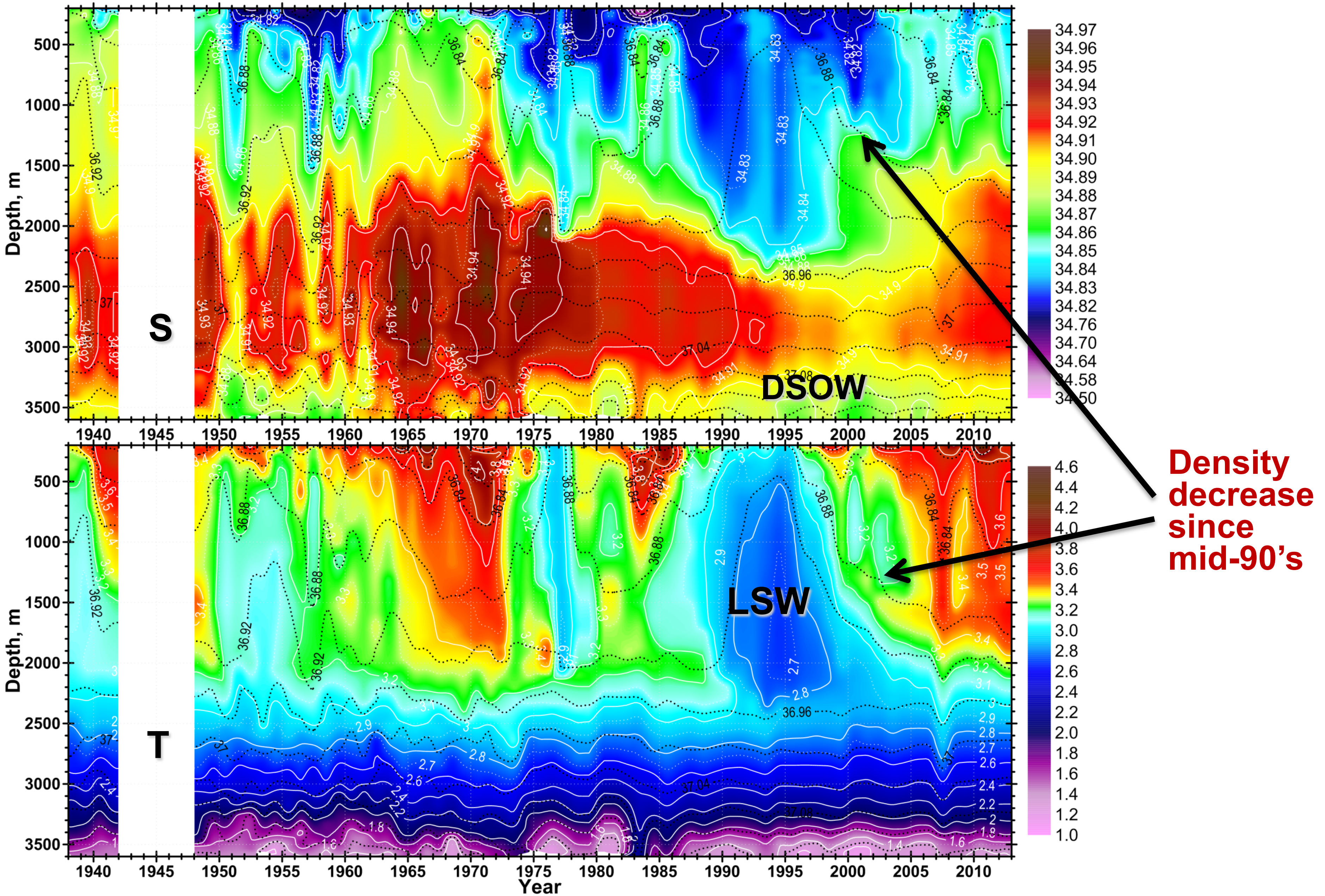


Recent RAPID study (Elipot et al, 2014) validates MOVE assumptions:
on interannual timescales, much of the MOC variability is captured by the geostrophic NADW transport in a fixed depth range, relative to a fixed reference level (between water masses, here AAIW/LSW).

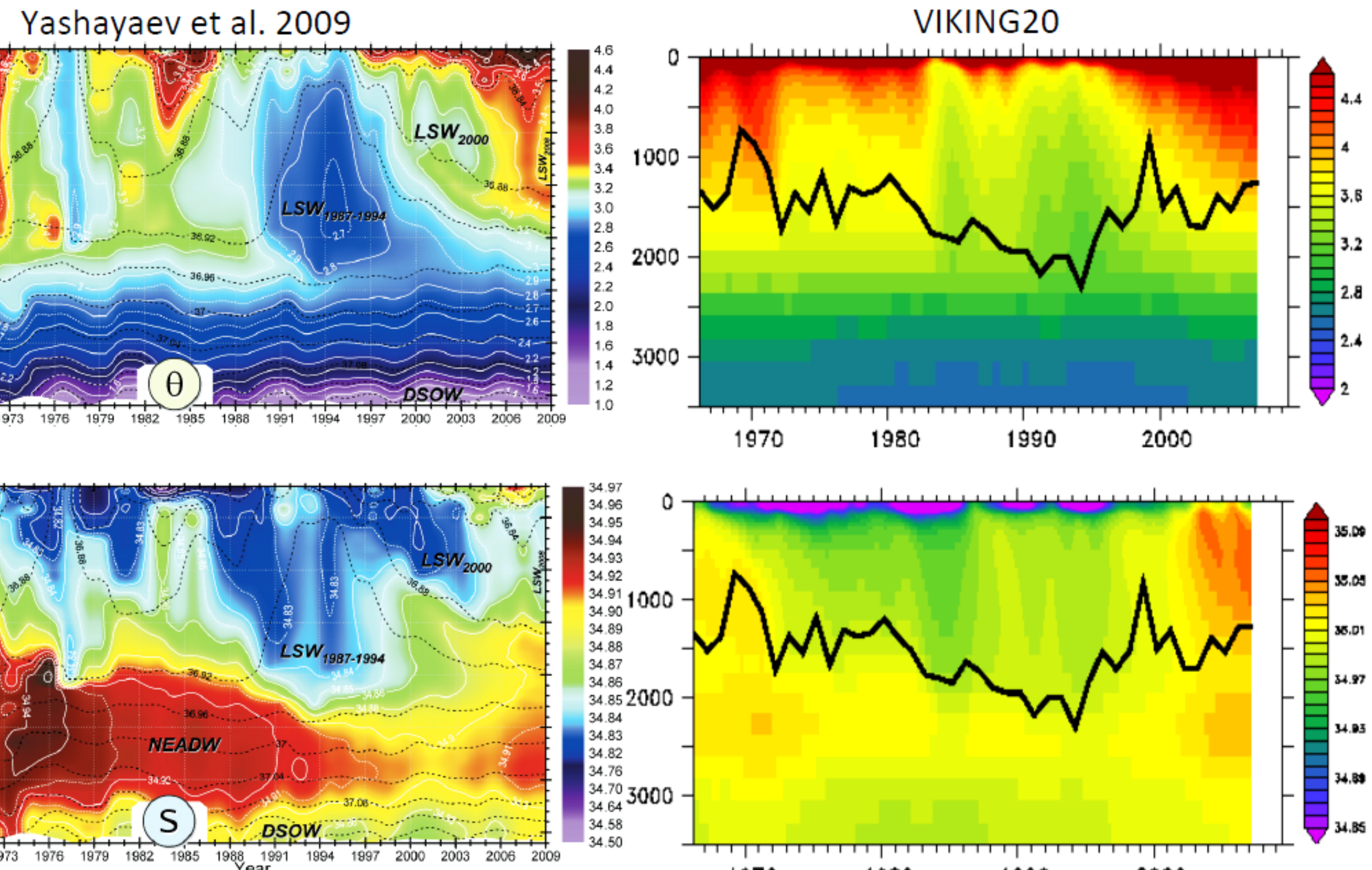
MOVE NADW transport relative 4950db, lower-frequency view



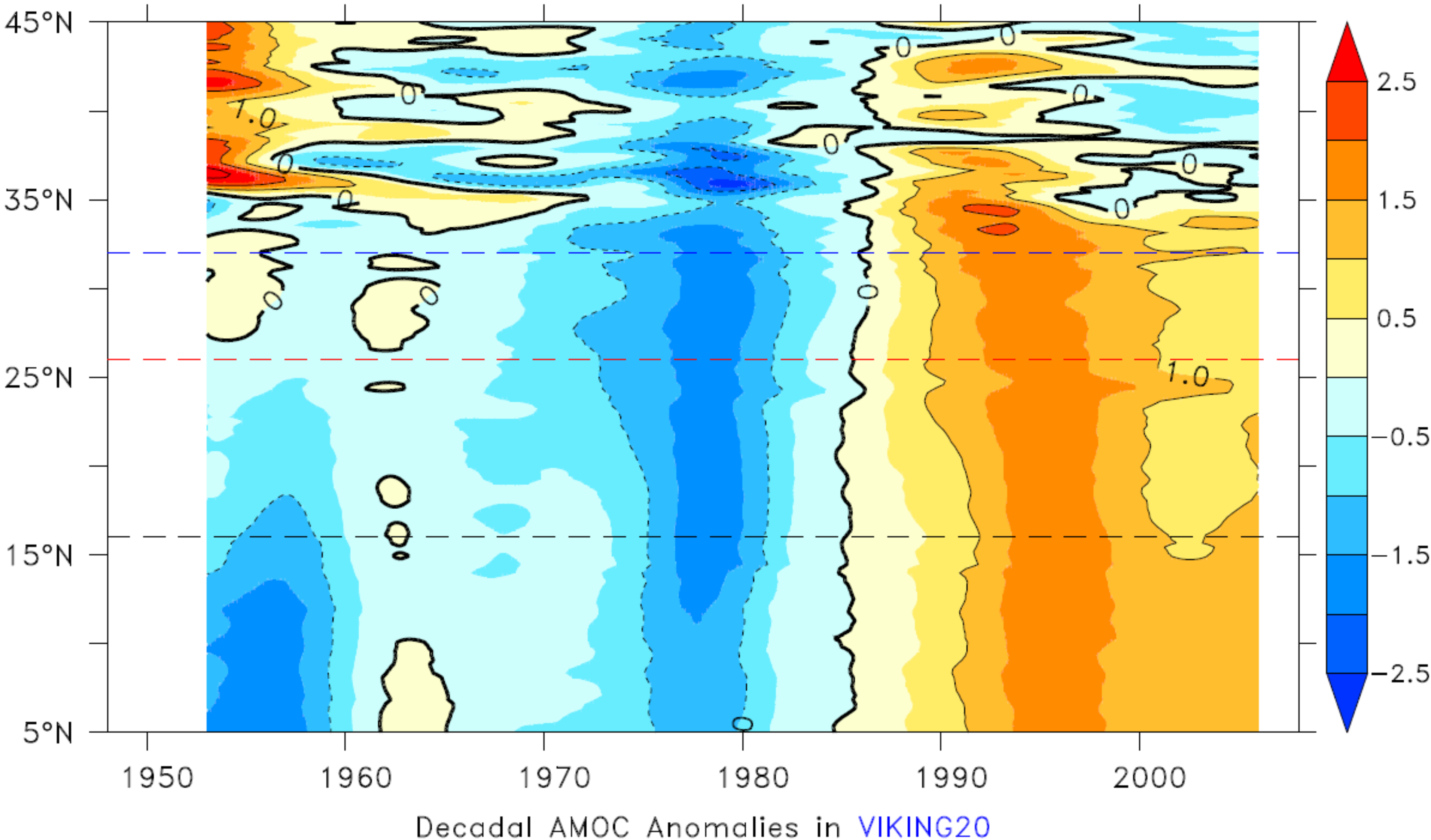
Central Labrador Sea water mass variability 1940-2010



Central Labrador Sea water mass variability in Kiel Viking 20 model

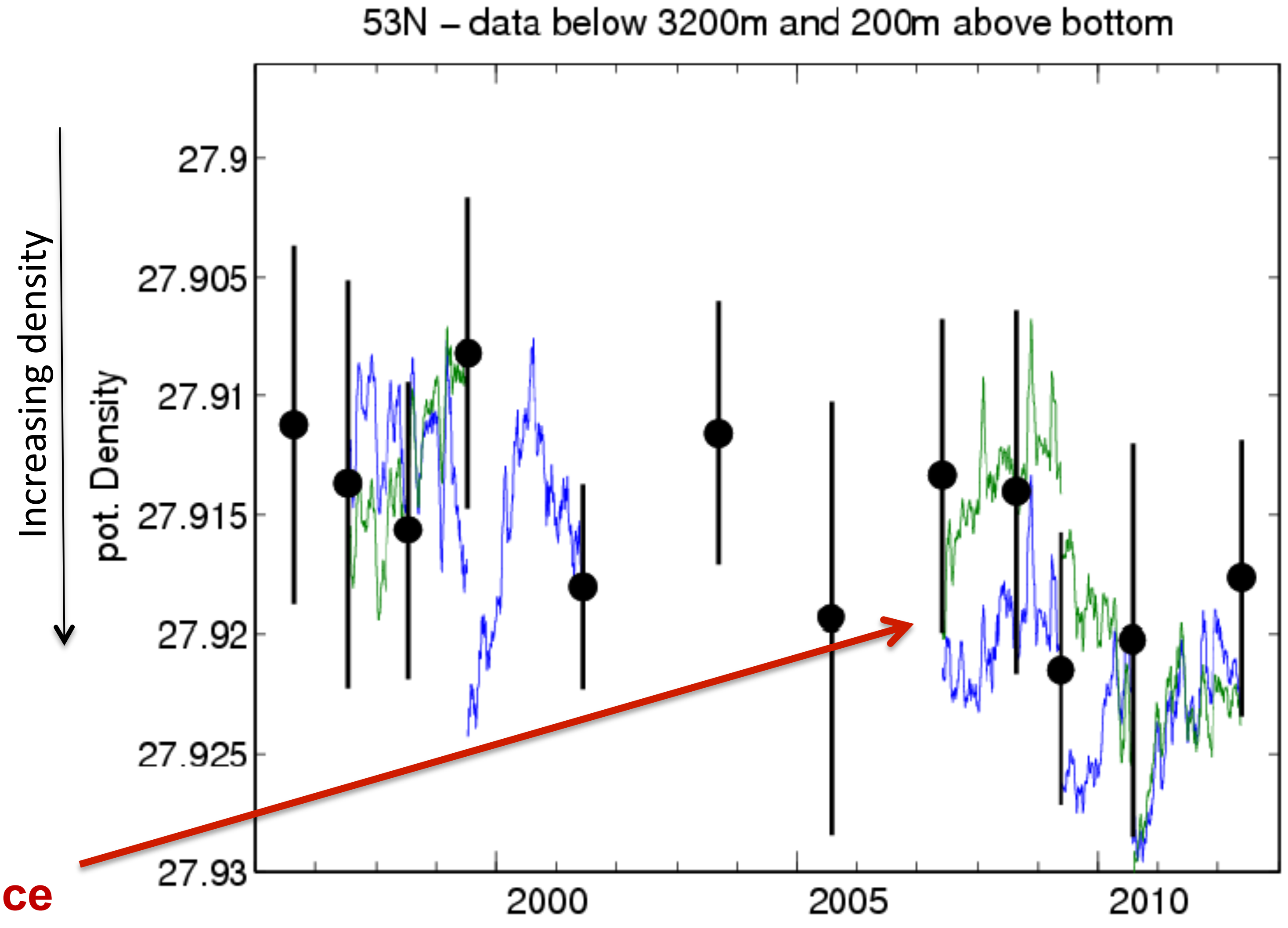


Decadal AMOC variations/coherence in Kiel Viking 20 model

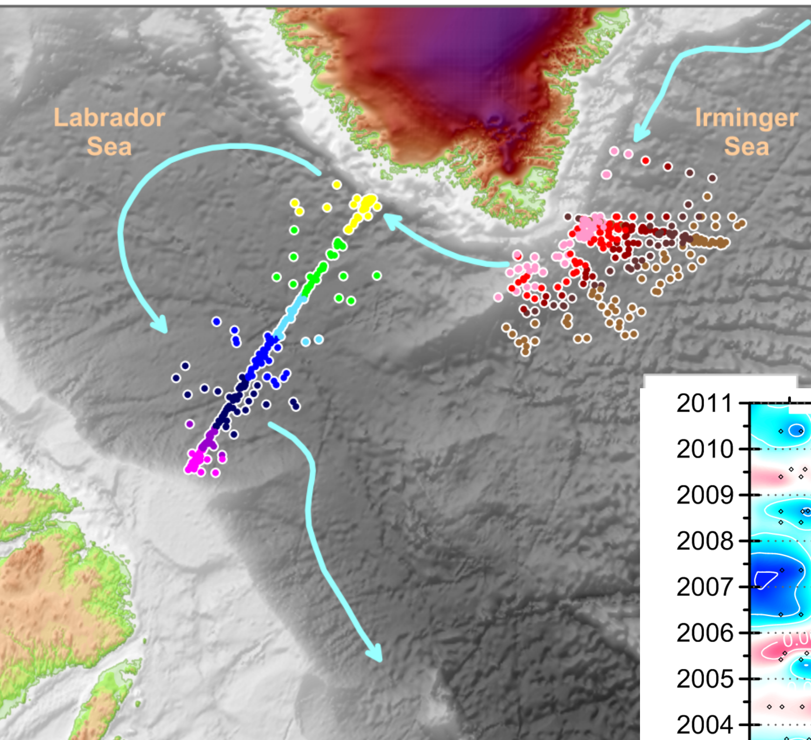


decreasing AMOC transports since mid 90's

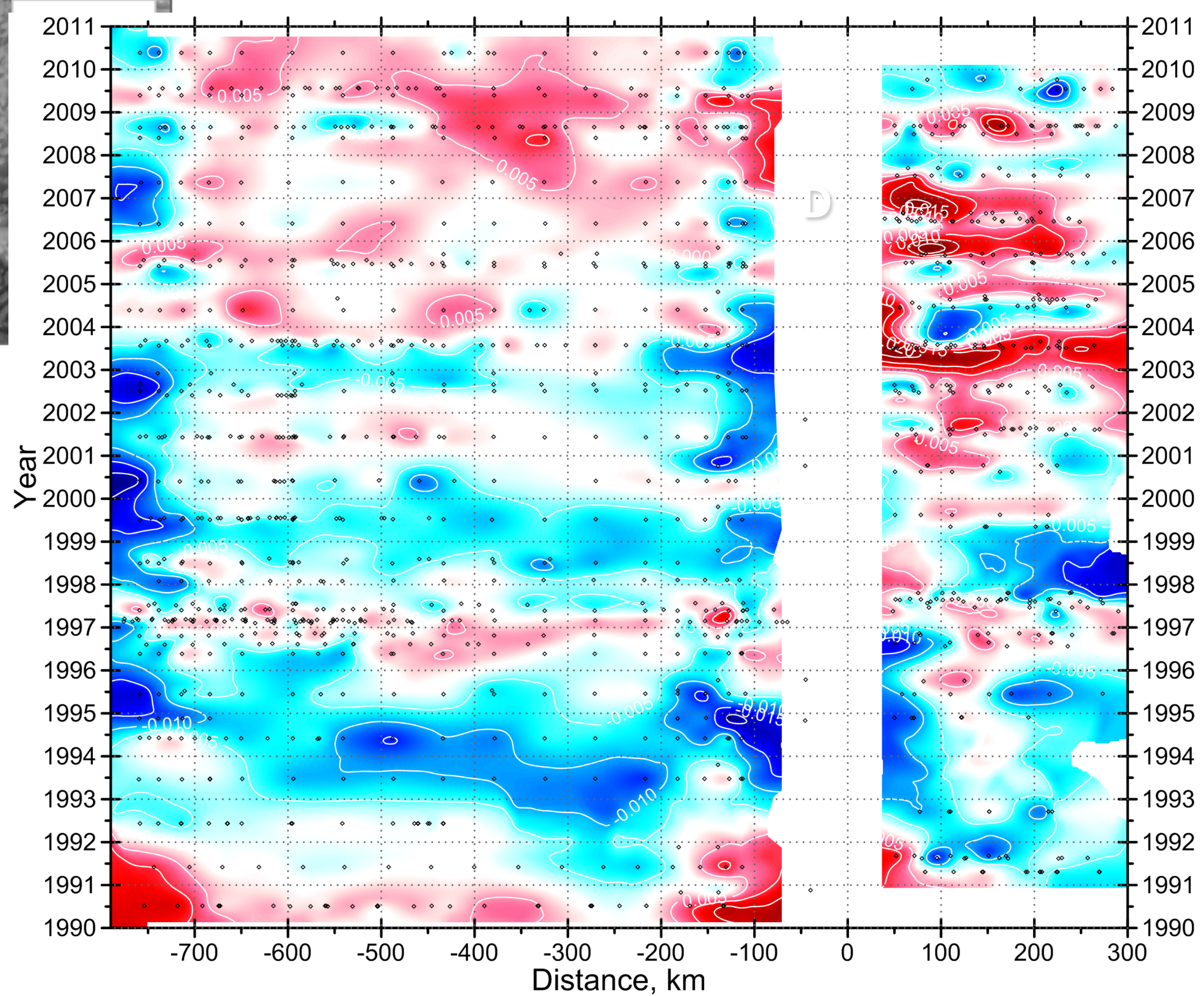
Near-bottom density from moorings/ship CTD at exit of Labrador Sea (53N)



Increasing density in deep water since 2006-2008 ?

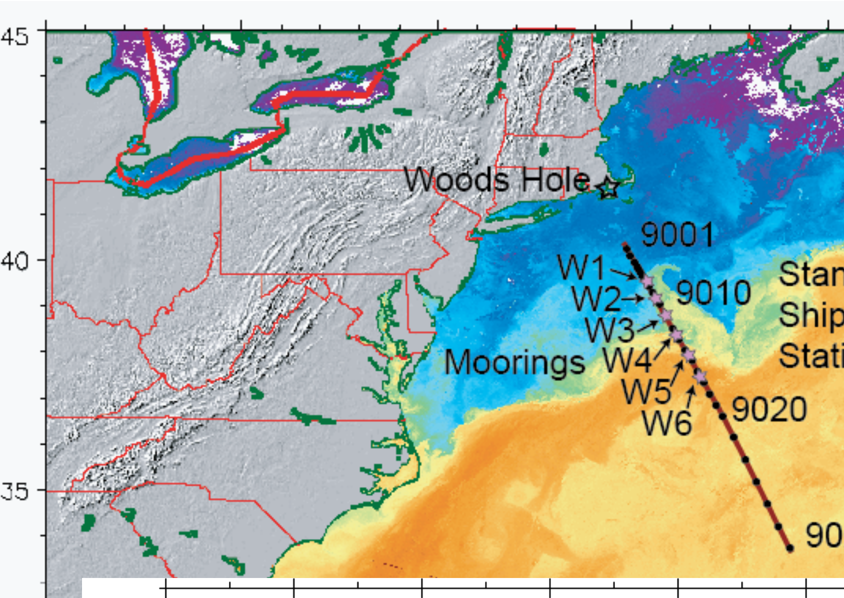


DSOW density variability 1990-2011

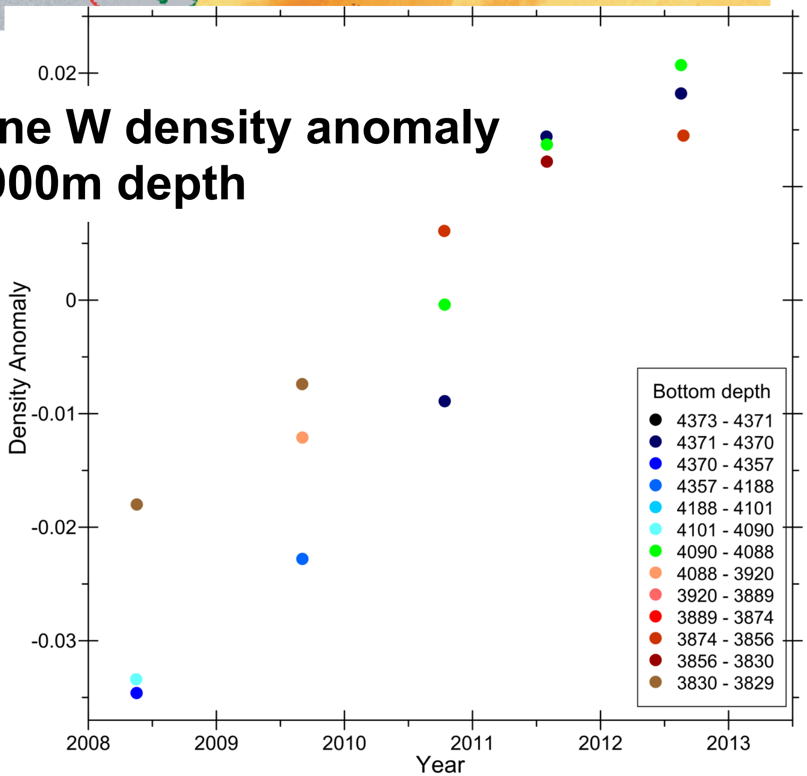


Large density increase in overflow water since 2004

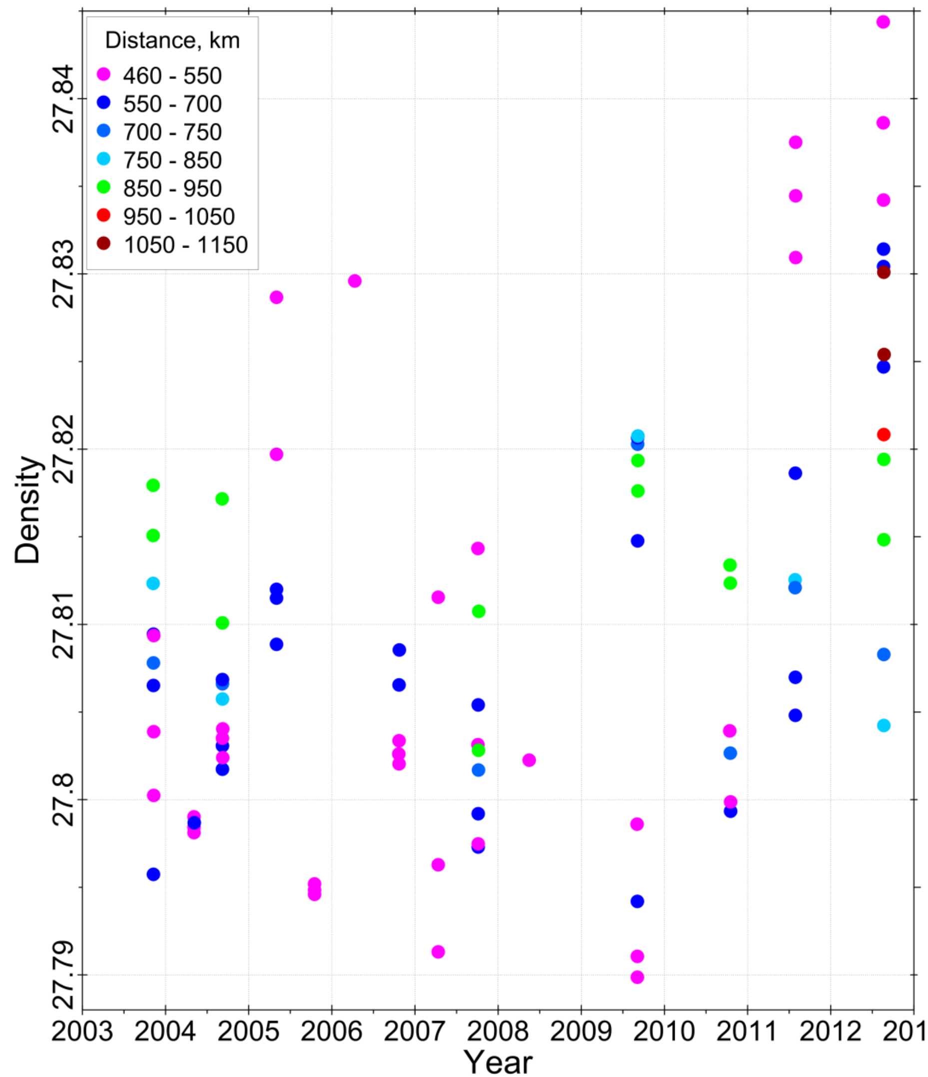
Line-W data suggest increasing density in NADW since 2008-2009



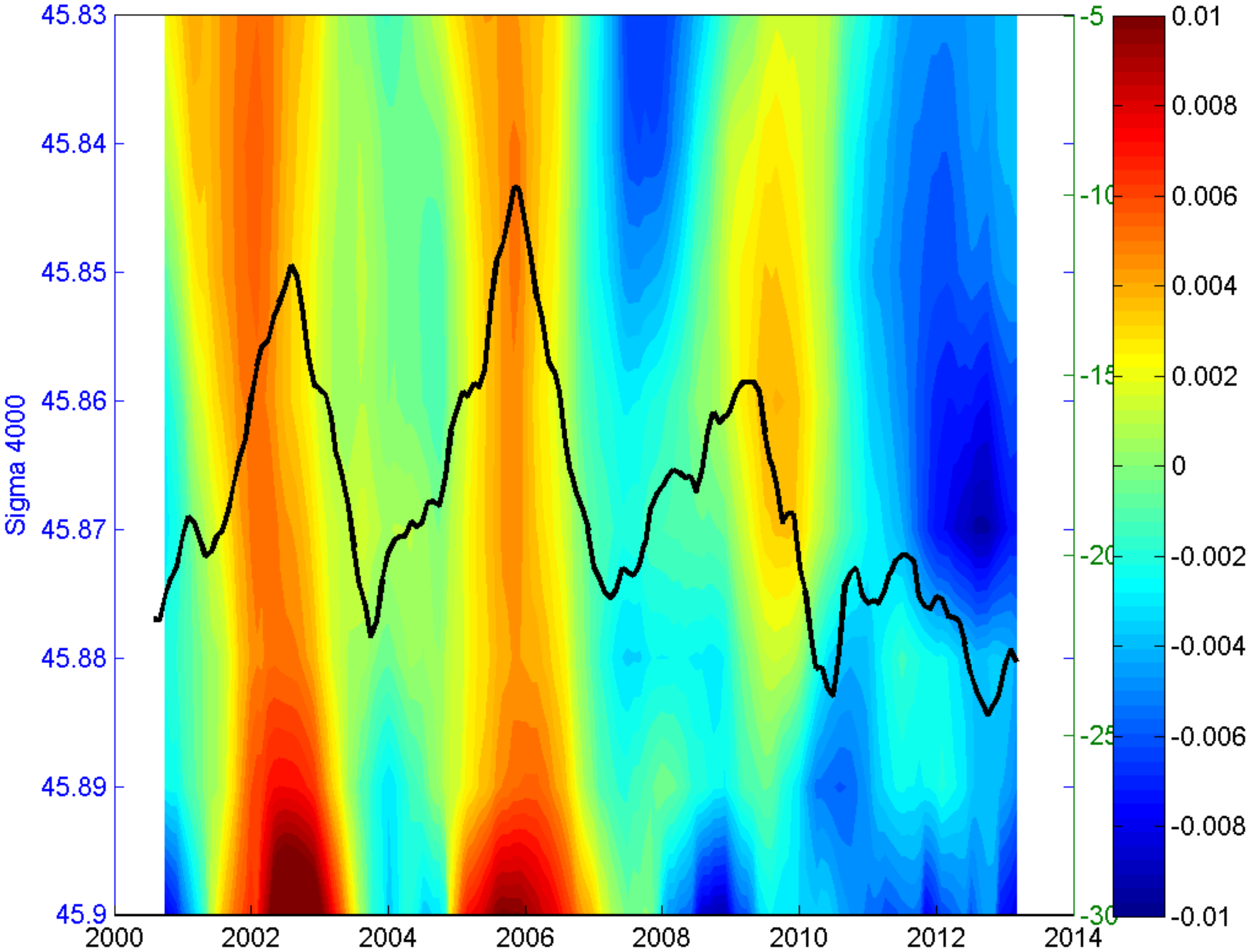
Line W density anomaly 1900m depth



Line W 2000-2500m layer density (450-1000km from coast)



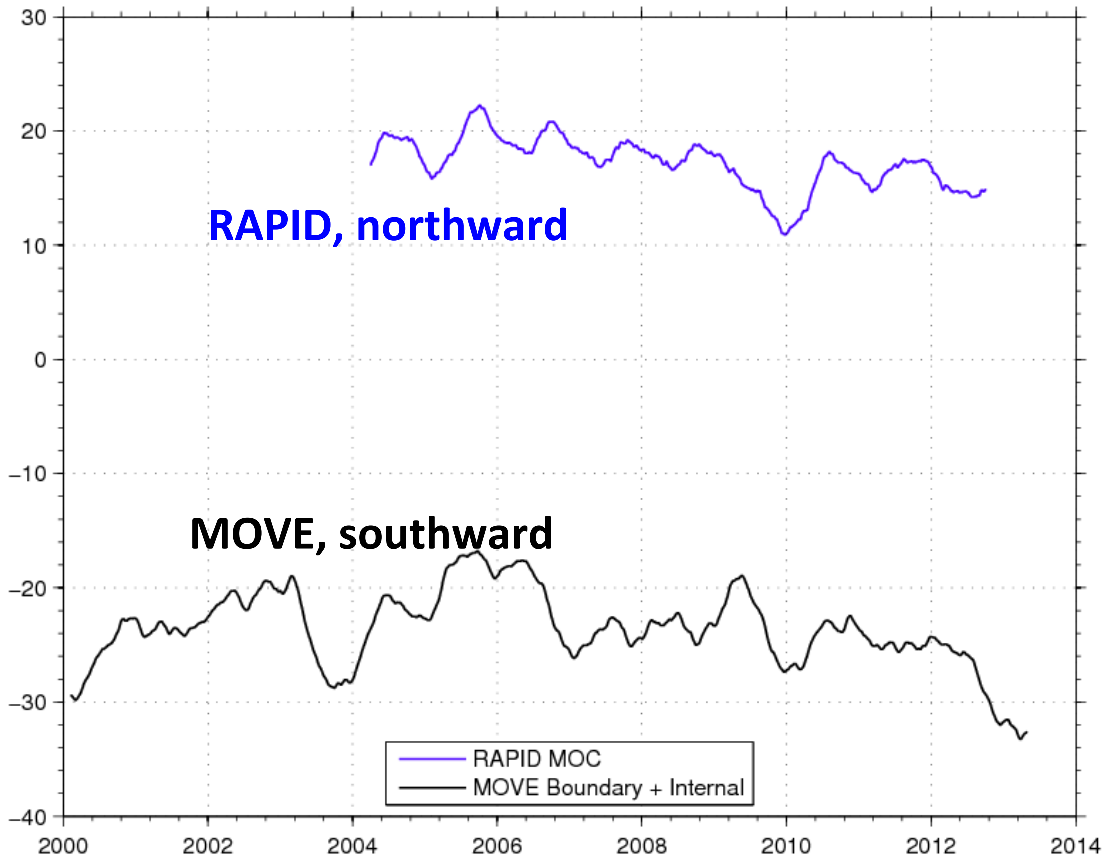
MOVE transport (black) is also closely related to Spiciness west-east difference on deep isopycnals (color)



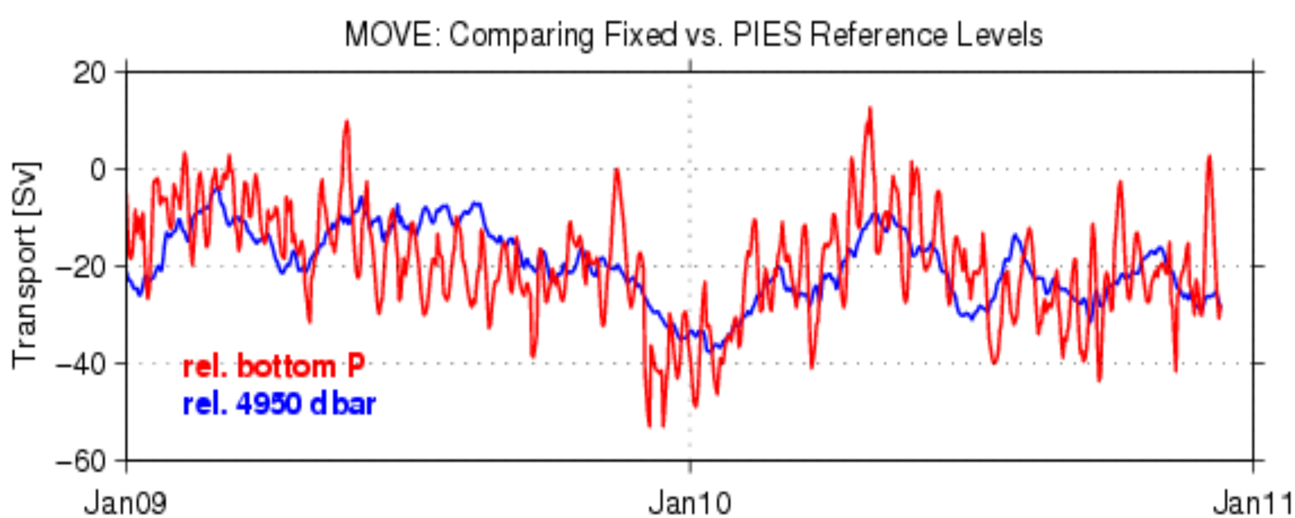
not related to dynamic effect of sloping isopycnals since done ON isopycnals…

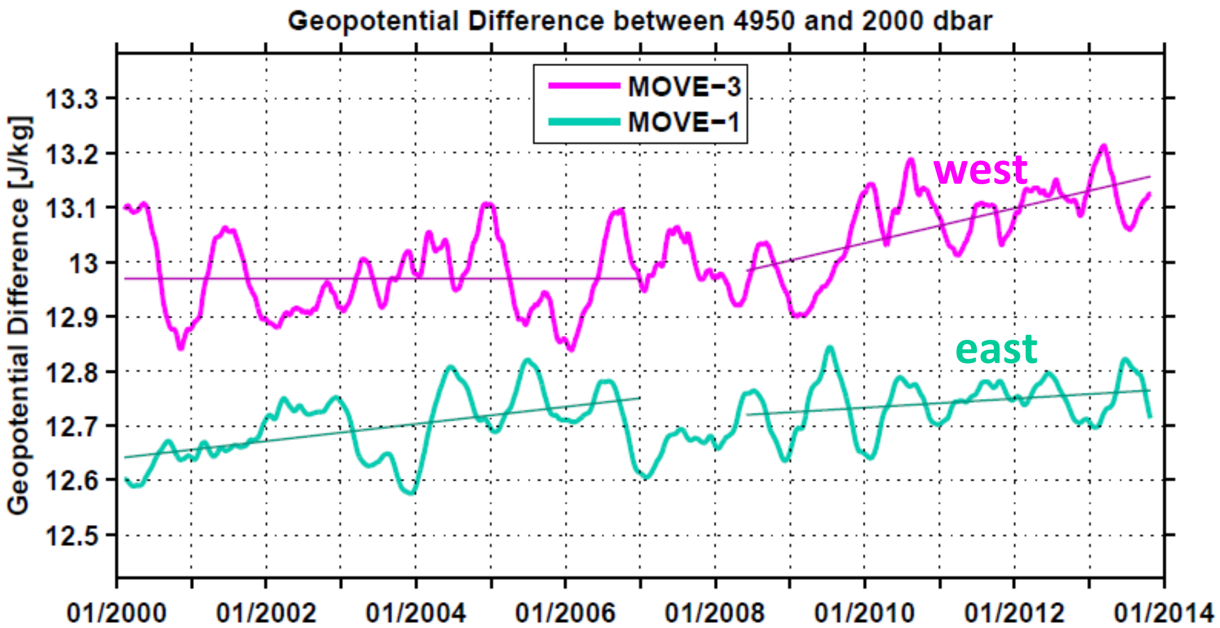
purely advective “flavor” signature of flow variability ?

Low-passed RAPID MOC and MOVE southward transport

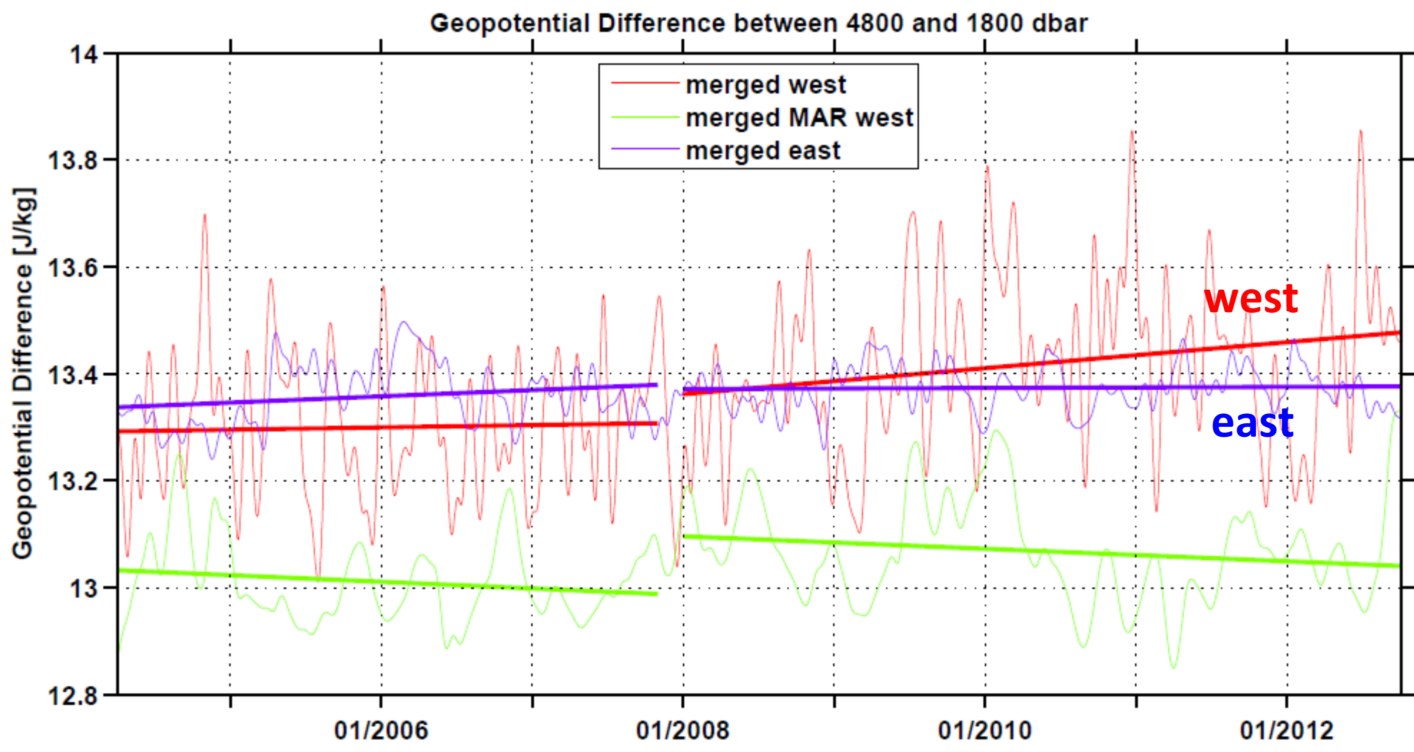


MOVE variability does not change when referenced to PIES bottom pressure (1-2 year time scale)

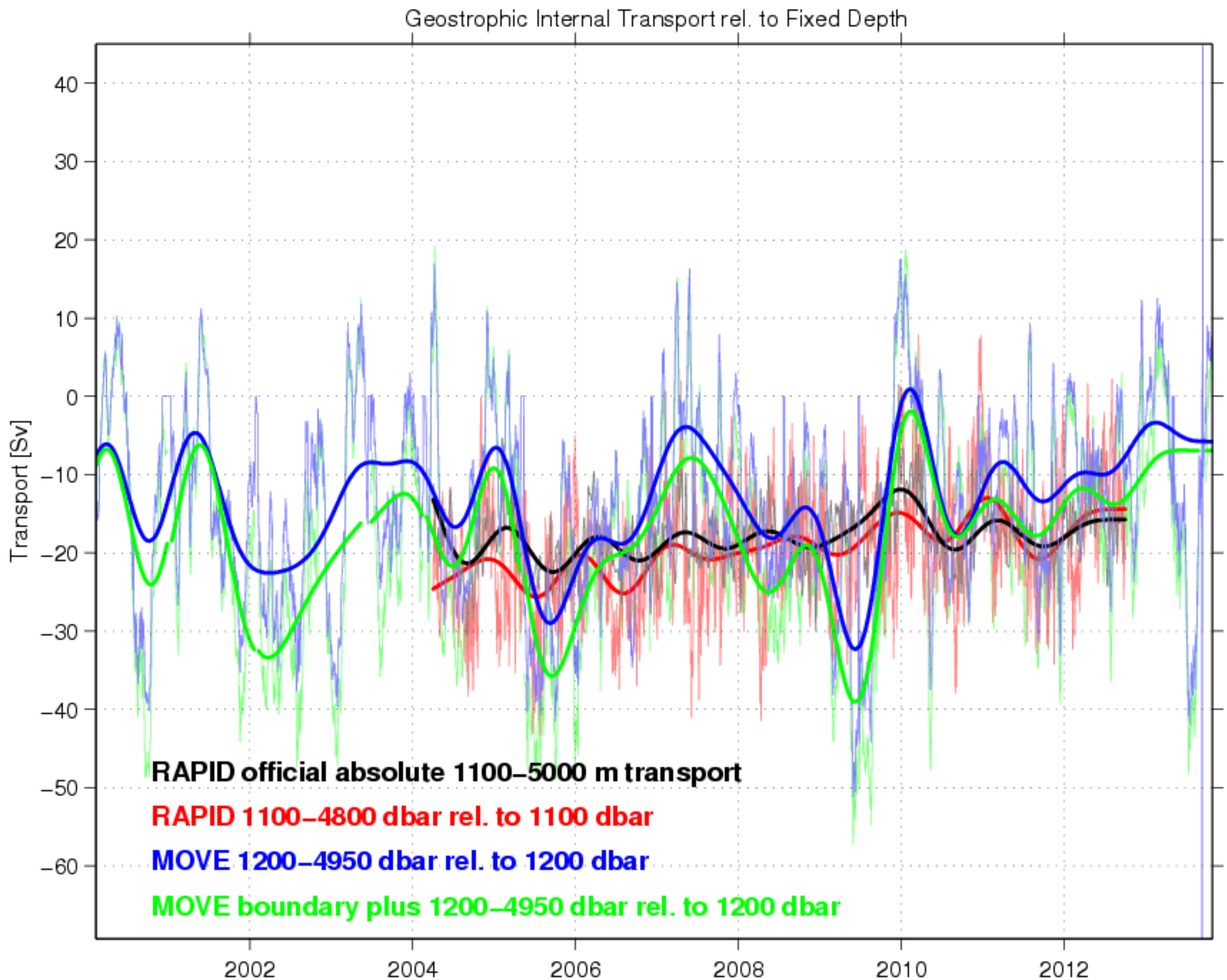


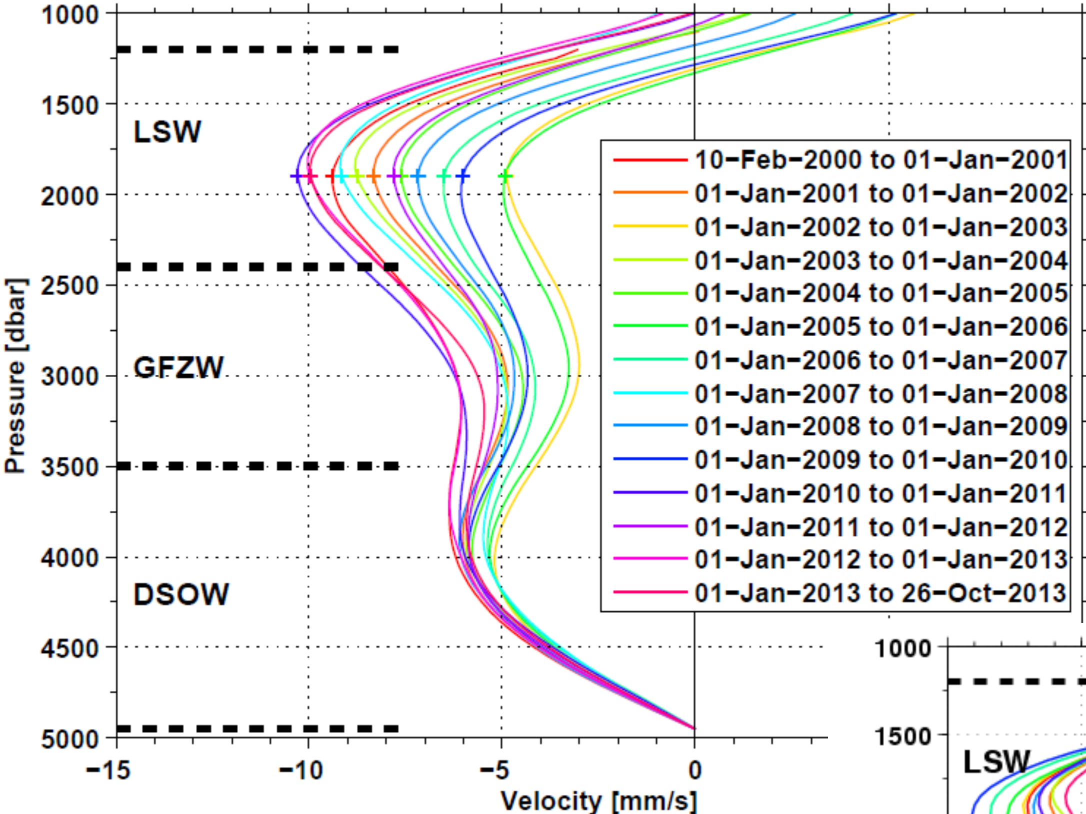


Trends in internal structure are similar at MOVE and RAPID



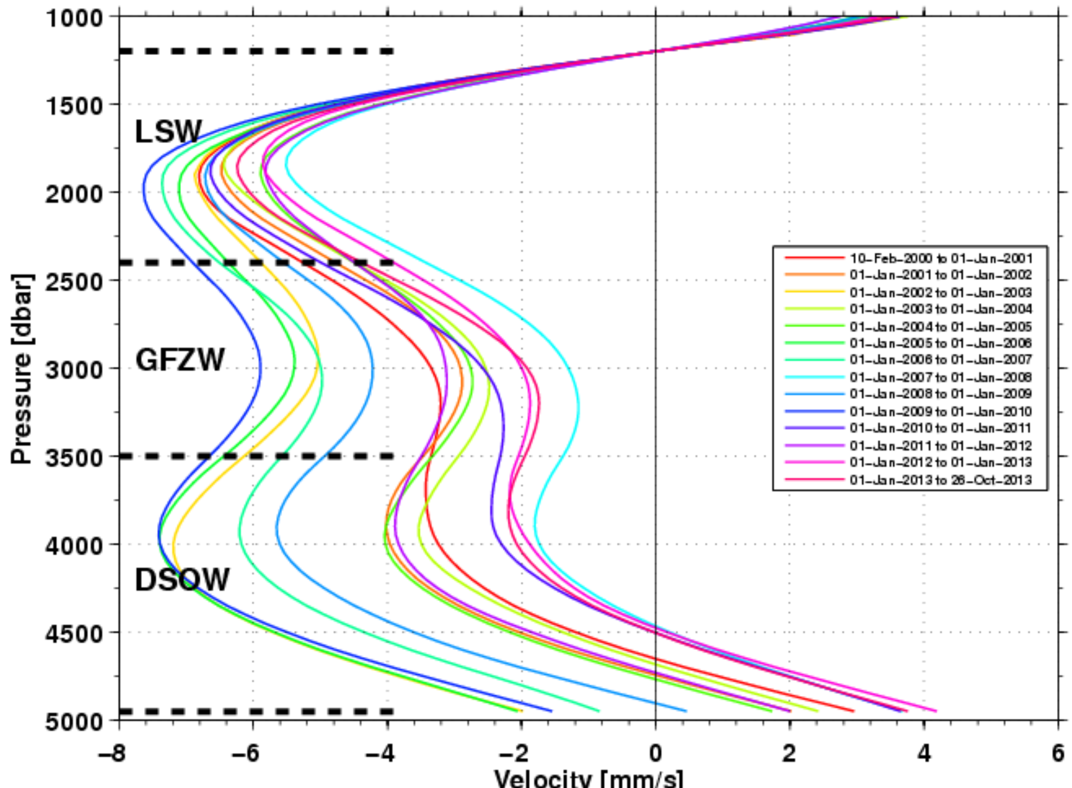
<u>IF</u> the same reference level is used, trends are similar at MOVE and RAPID



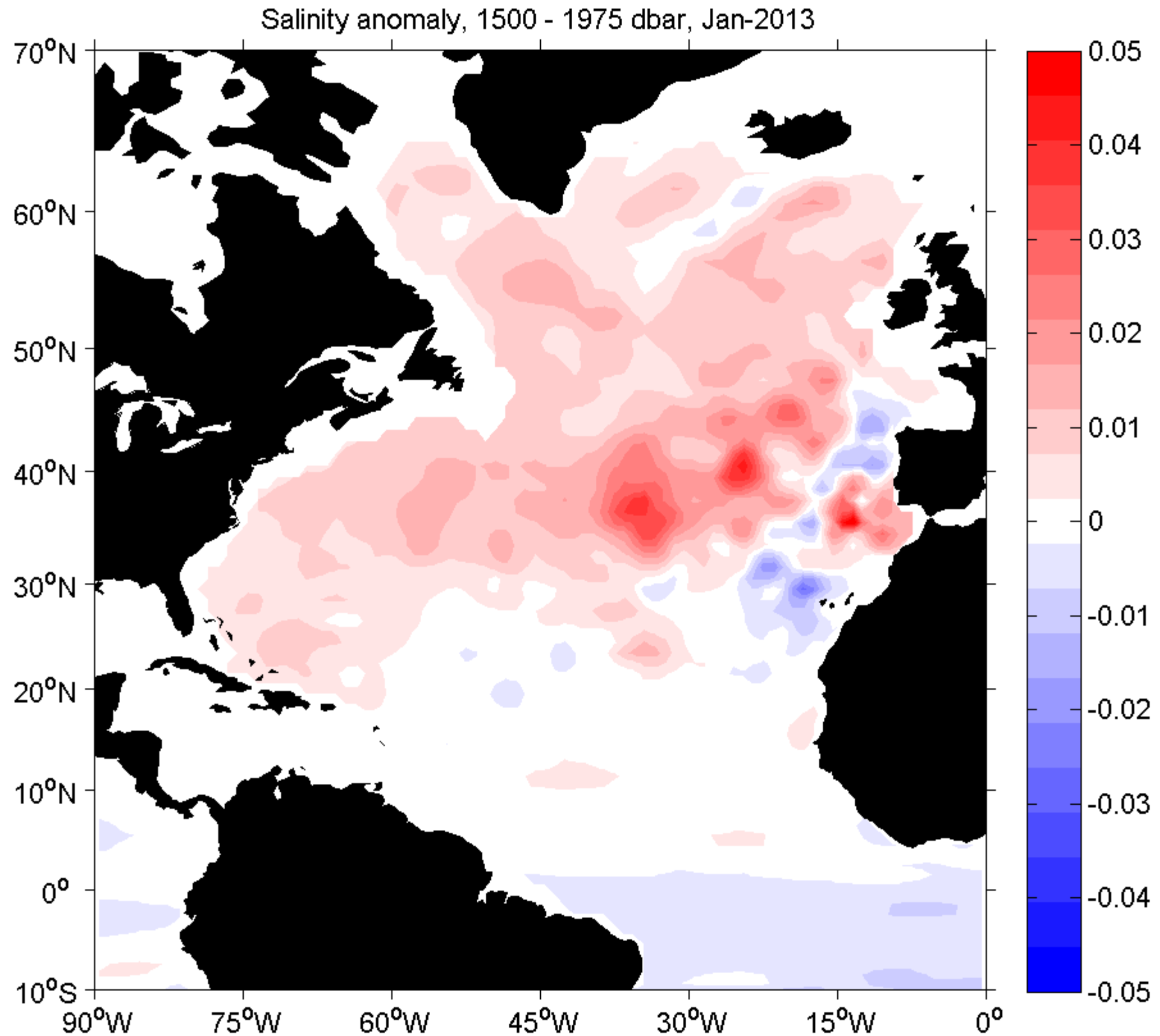


Annual average current profiles with deep reference level

with shallow reference level



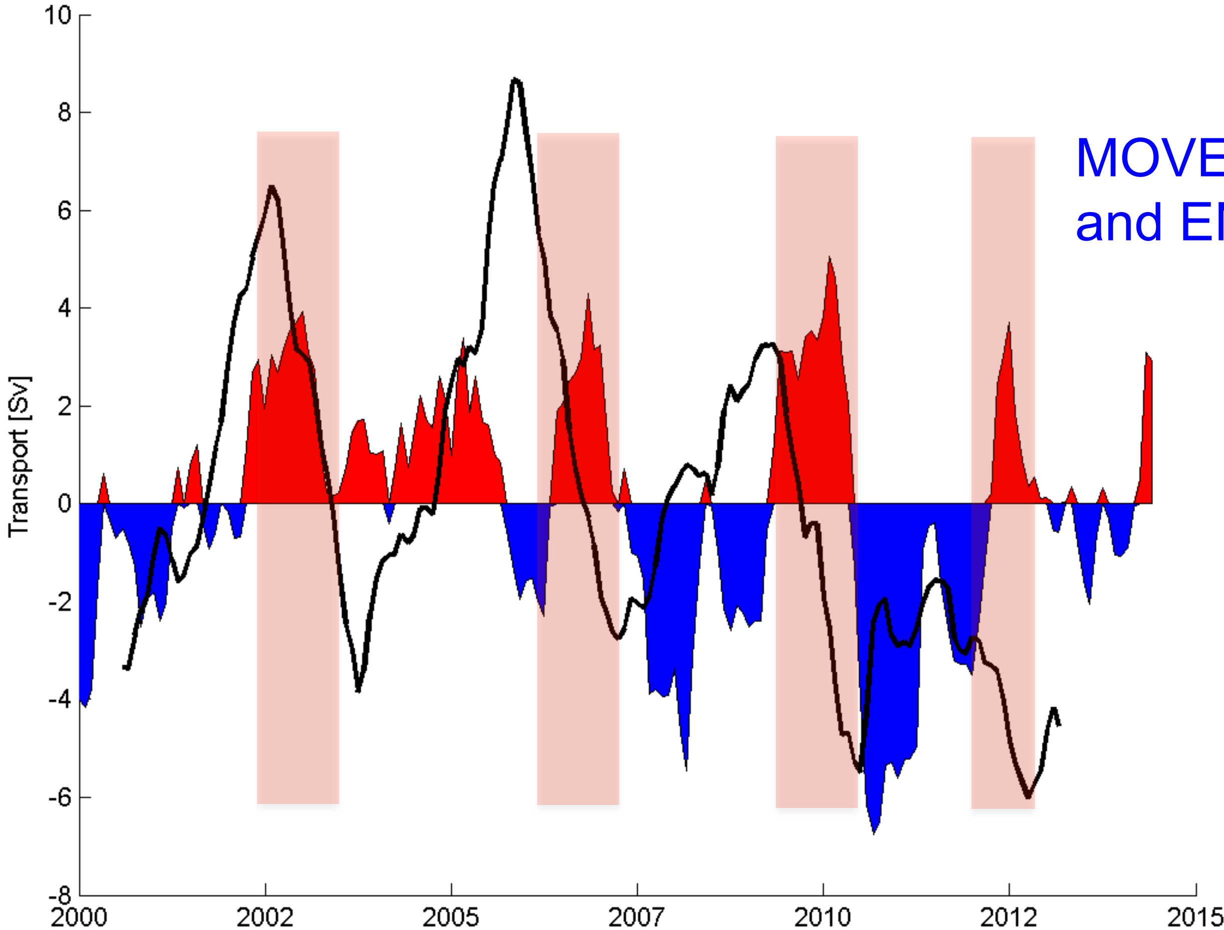
Mediterranean outflow influence: salinity anomaly example (2013) at LSW level



Ongoing efforts to investigate absolute flow & reference level differences between MOVE and RAPID:

- **tie internal dynamic height to altimetry (AVISO)**
- **estimate absolute flow at one level from ARGO trajectories**
- **study changes in water mass boundaries (sinking isopycnals, shoaling isohalines)**
- **estimate divergence between RAPID and MOVE compared to layer thickness changes**
- **compare with shallow/deep flow characteristics in models**

Fun coincidental observation….



MOVE transport anomaly and ENSO index

All MOVE microcat data now available on OceanSITES, PIES bottom pressure soon to follow