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Locally *vs* remotely forced AMOC variability: A matter of time scales

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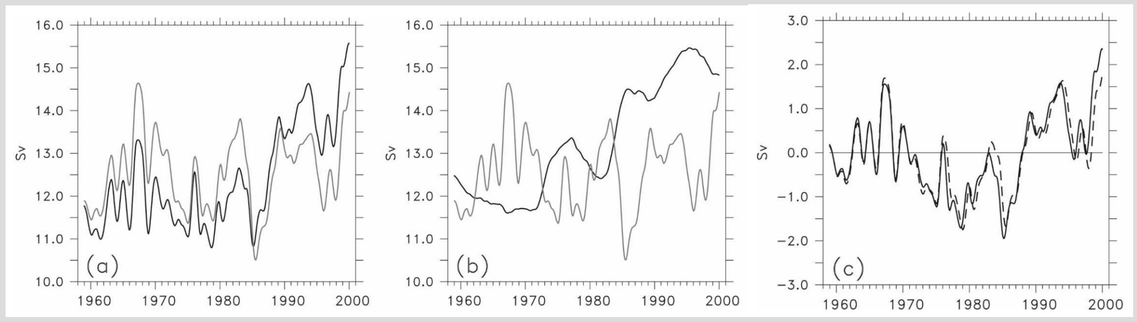
OBJECTIVE



Biastoch et al. (2008):

$$AMOC_{total} \simeq AMOC^{1-10\,yr}_{wind} + AMOC^{>10\,yr}_{buoyancy}$$

This study: Further test this hypothesis with:

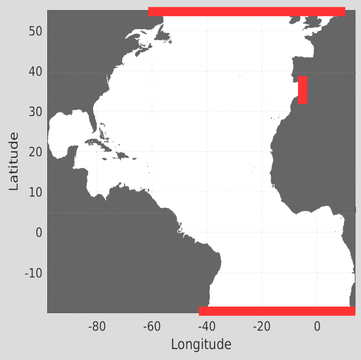
1/ A regional modeling approach

2/ An oceanic eddying regime

METHOD

1/ North Atlantic regional modeling

- 1/12° oceanic configuration of the MITgcm
- CheapAML (Atmospheric boundary layer)
- Atmospheric forcing: Drakkar Forcing Set v4.4
- Boundary conditions: ORCA12 global run
- 50-yr long simulations

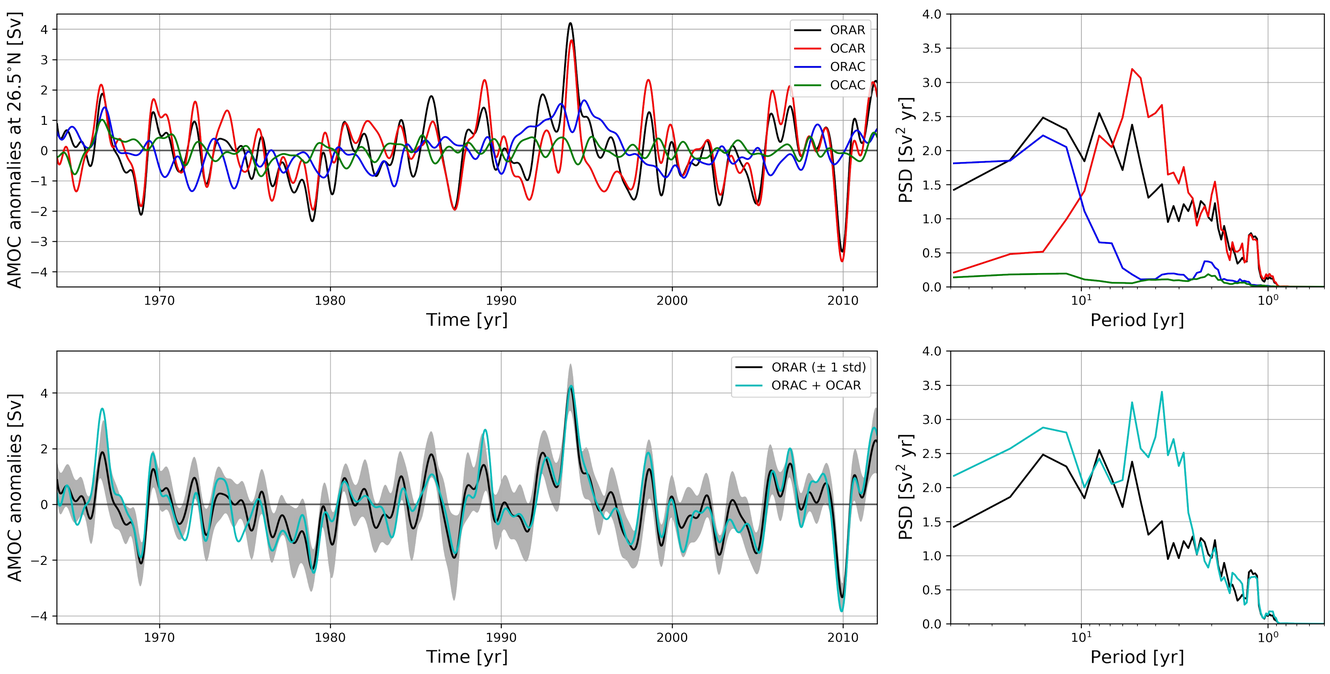


2/ Four sets of experiments

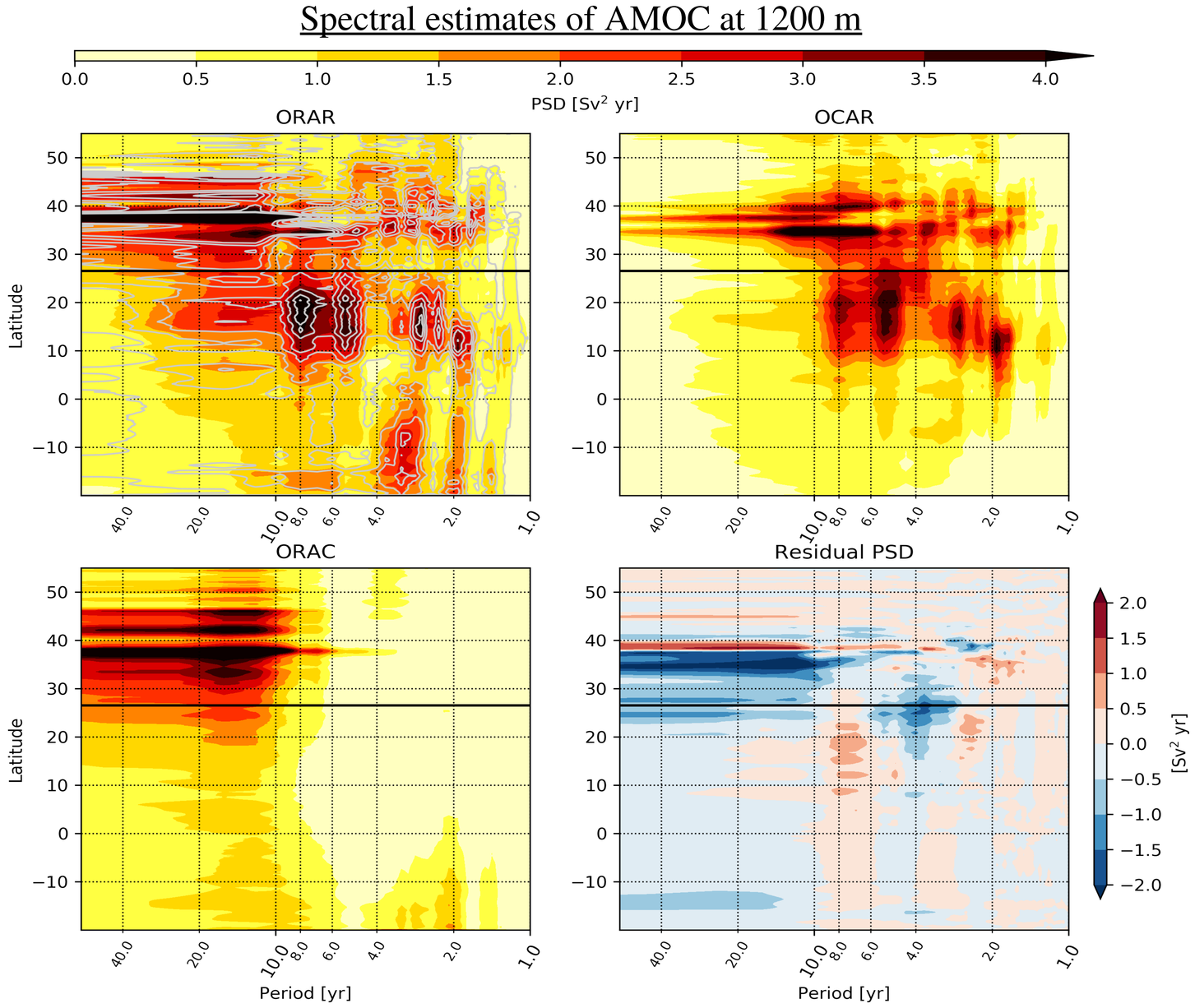
Open boundaries \ Atmosphere	*Normal year* *Aug 2003 – July 2004*	*Fully Varying* *1963-2012*
Climatological	**<OCAC>**	**<OCAR>**
Fully Varying	**<ORAC>**	**<ORAR>**

RESULTS

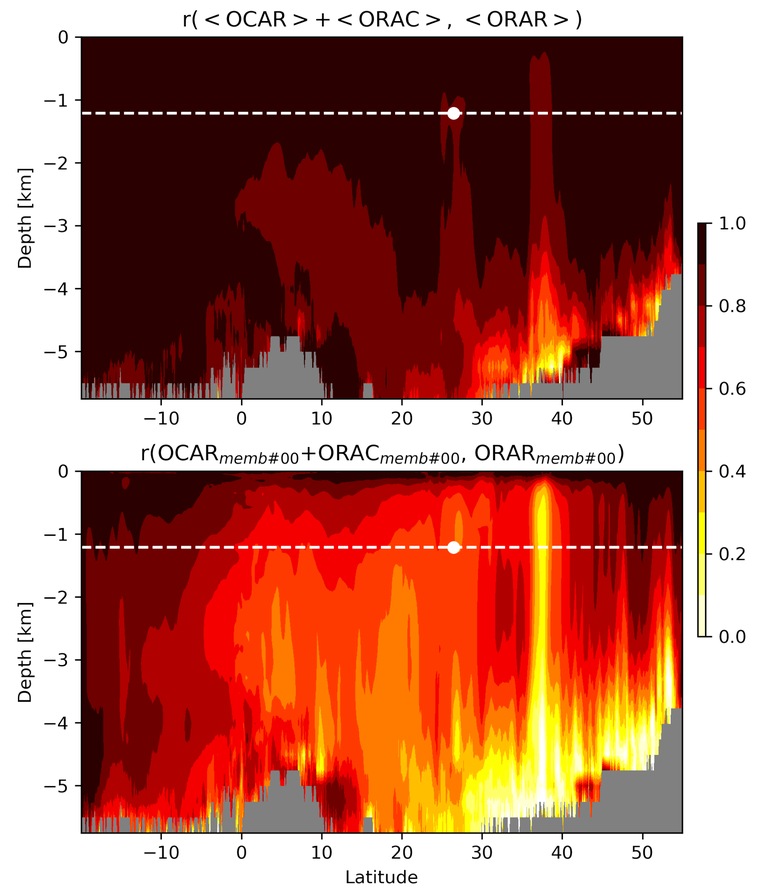
AMOC time series at 26.5°N



Spectral estimates of AMOC at 1200 m



Correlation coefficients between reconstructed and realistic AMOC



CONCLUSIONS

Marked time scale separation

- Interannual time scales (2-10 yrs):
  → Local atmospheric forcing (baroclinic adjustment?)
- Decadal time scales (10-30 yrs)
  → Remote processes (DWBC, Agulhas rings?)

Linear superposition in the STG

- Peculiarities emerge at the inter-gyre, **BUT** most of the subtropical AMOC variability can be understood as:

$$AMOC_{total} \simeq AMOC^{1-10\,yr}_{surface} + AMOC^{>10\,yr}_{boundaries}$$

Needs of ensembles

- In the eddying regime, intrinsic ocean dynamics introduce chaotic AMOC variability with a random phase, making the attribution more complicated