Spatio-Temporal Patterns of Chaos in the Atlantic Overturning Circulation

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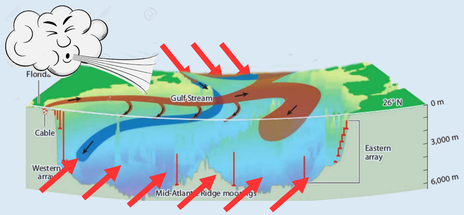
OBJECTIVE

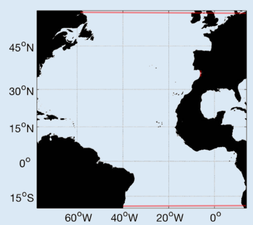
Categorize the **North Atlantic** low frequency variability as **local** or **remote, forced** or **intrinsic**



METHOD

1/ North Atlantic regional modeling

- MITgcm (1/12°)
- Modified geometry
- CheapAML atmospheric 1D boundary layer +
- 50 year long simulations



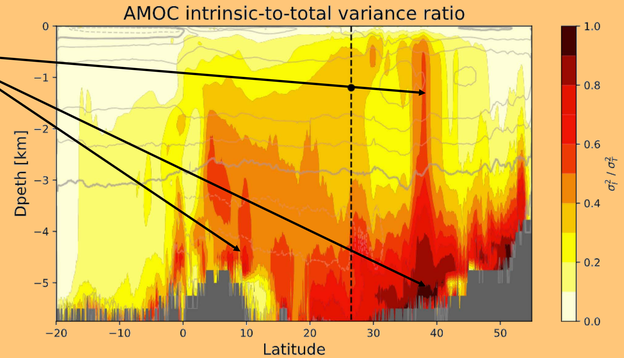
2/ Four sets of experiments (ensembles)

- Permutation of surface and boundary forcing as fully varying or yearly repeated
- Normal year: August 2003 – July2004
- 12 or 24 members ensembles (still ongoing and growing)

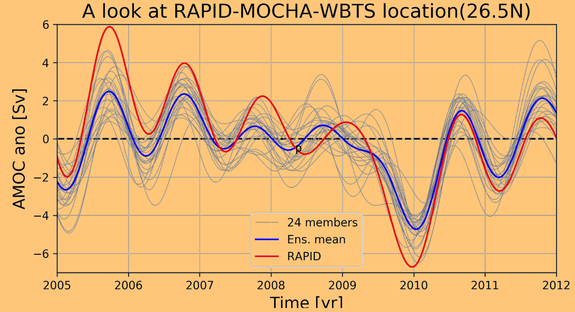
	Atmosphere	*Normal year*	*Fully Varying*
Boundaries			
Climatological		**OCAC**	**OCAR**
Fully Varying		**ORAC**	**ORAR**

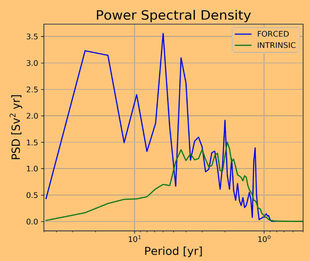
SOME RESULTS (in the context of the AMOC)

Chaos!



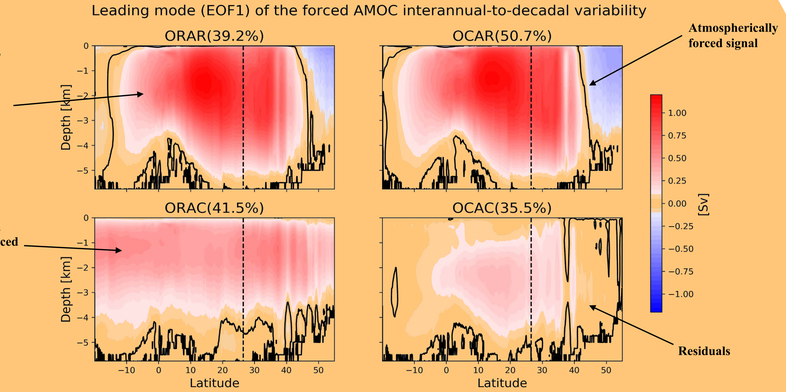
Good Job!





Intrinsic ocean dynamics contributes to about 50% at interannual time scales (0.9 Sv)

Large scales…



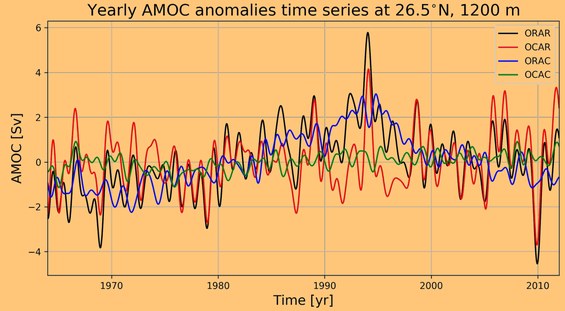
Full signal

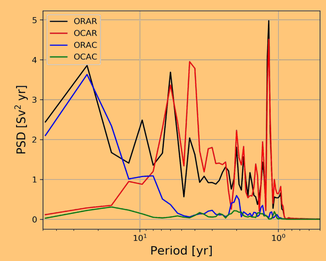
Remotely (open boundaries) forced signal

Atmospherically forced signal

Residuals

At the location of the RAPID-MOCHA-WBTS array





Boundaries are forcing the multidecadal variations. The atmosphere the shorter ones.

SUMMARY

- **Large ensemble of 60 members completed. Still ongoing. Four sub-ensembles.**
- **The Atlantic Overturning is chaotic!**
- **We reproduce the Rapid results.**
- **Leading mode of intrinsic variability is large scale and mostly at interannual scales.**
- **Predominance of atmospherically forced mode.**
- **Time scale separation:**
  - **Internanual (2-10 years): forced locally by the atmosphere**
  - **Multidecadal (10-30 years): forced remotely through boundaries**

NEXT

- **Origins, North Vs South (in the context of the AMOC)**
- **Influence of the number of members in our sub-ensemble?**
- **Forced vs Intrinsic / Local vs Remote at Depth, all over the domain.**