Is AMOC More Predictable than North Atlantic Heat Content?

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Predictability of CMIP5 Models

(forecast distribution variance / climatological variance)

Attractor average 10PCs

based on approximating model dynamics with linear regression operators
Average Power Spectra
AMOC & N Atl Heat Content

9 CMIP5 models
10 PCs

Model avg

Power

Frequency (cycle/year)

T0-500
AMOC
Predictability of 5- & 10-year means
CMIP5 Models

![Graph showing MSE over years for annual and 10-year means of AMOC and Heat](image)

- Annual mean AMOC
- Annual mean Heat
- 10yr mean AMOC
- 10yr mean Heat

Legend:
- AMOC_ann
- AMOC_5yr
- AMOC_dec
- TEMP_ann
- TEMP_5yr
- TEMP_dec
- 10yr-avg(AMOC_ann)
- 10yr-avg(TEMP_ann)
Predictability of Most Predictable Patterns

*(canonical correlation analysis)*

10 degrees of freedom

- Generic AMOC
- Generic Heat
- MPP1 AMOC
- MPP1 Heat

MSE vs Year

- T0-500_MPP1
- T0-500
- AMOC_MPP1-5
- AMOC_MPP1-2
- AMOC_MPP1
- AMOC
Most Predictable Pattern

CCSM3 T42

Optimize AMOC

yr 0

yr 10
Most Predictable Pattern

**CNRM-CM5**

**yr 0**

**yr 10**

Optimize AMOC
The answer to “Is AMOC more predictable than N Atl heat content?” depends on

- Time scale (*annual mean, decadal mean*)
- Mode/pattern
- Model (*CNRM-CM5, CanESM2, ..., nature*)
- Particular initial condition
- Geographical location (*subpolar gyre, ...*)
- Initial value or forced predictability
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Good news:
There is predictability beyond a decade…for
time averages and particular patterns
Most Predictable Pattern

CNRM-CM5

yr 0
Optimize AMOC

yr 10
Optimize Heat Content

yr 10
Most Predictable Pattern

CCSM4 1°

yr 0

yr 10

yr 10

Optimize AMOC

Optimize Heat Content
Most Predictable Pattern

$GFDL$-CM$3$

yr 0

Optimize AMOC

yr 10

Optimize Heat Content

yr 10