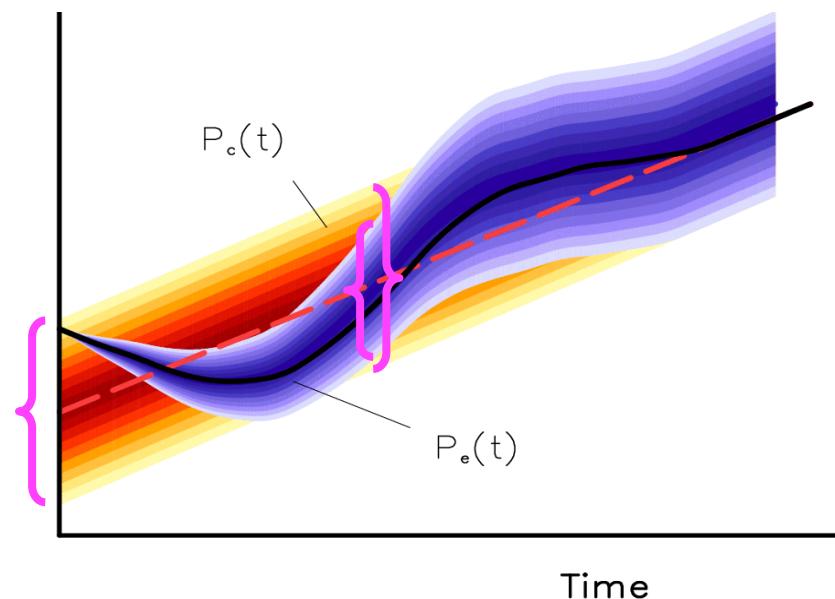
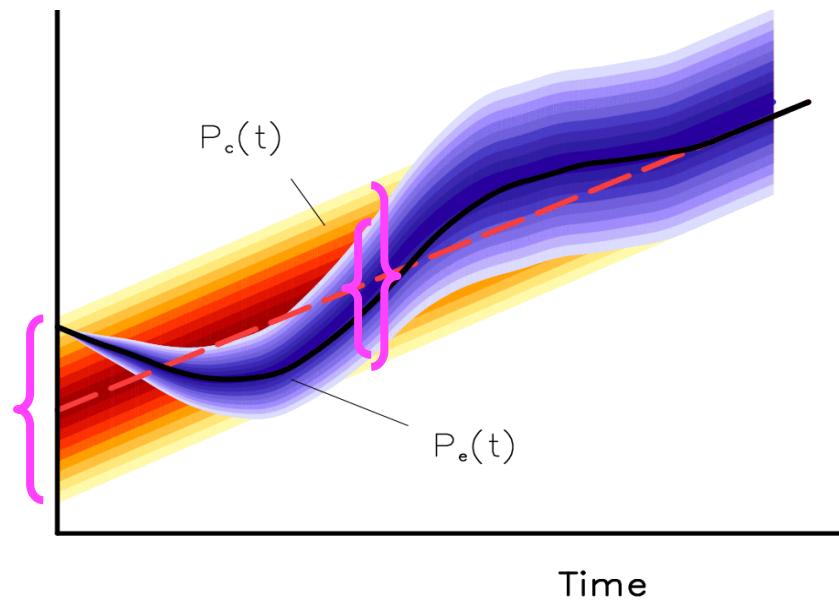


Is AMOC More Predictable than North Atlantic Heat Content?

Grant Branstator & Haiyan Teng
NCAR



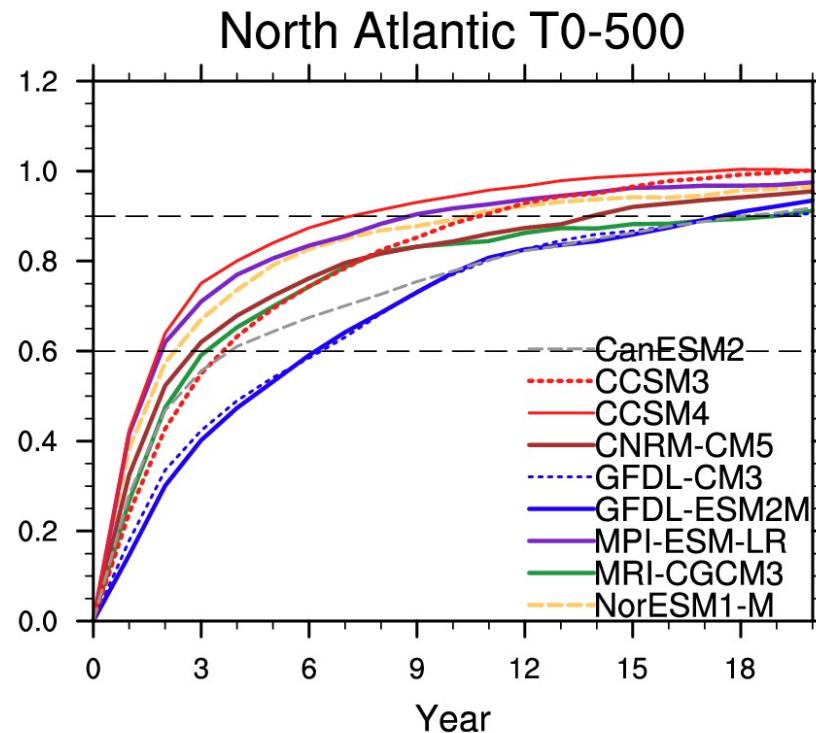
- *Attractor averages*
- *10 EOFs per variable*



Predictability of CMIP5 Models

(forecast distribution variance / climatological variance)

Attractor average 10PCs

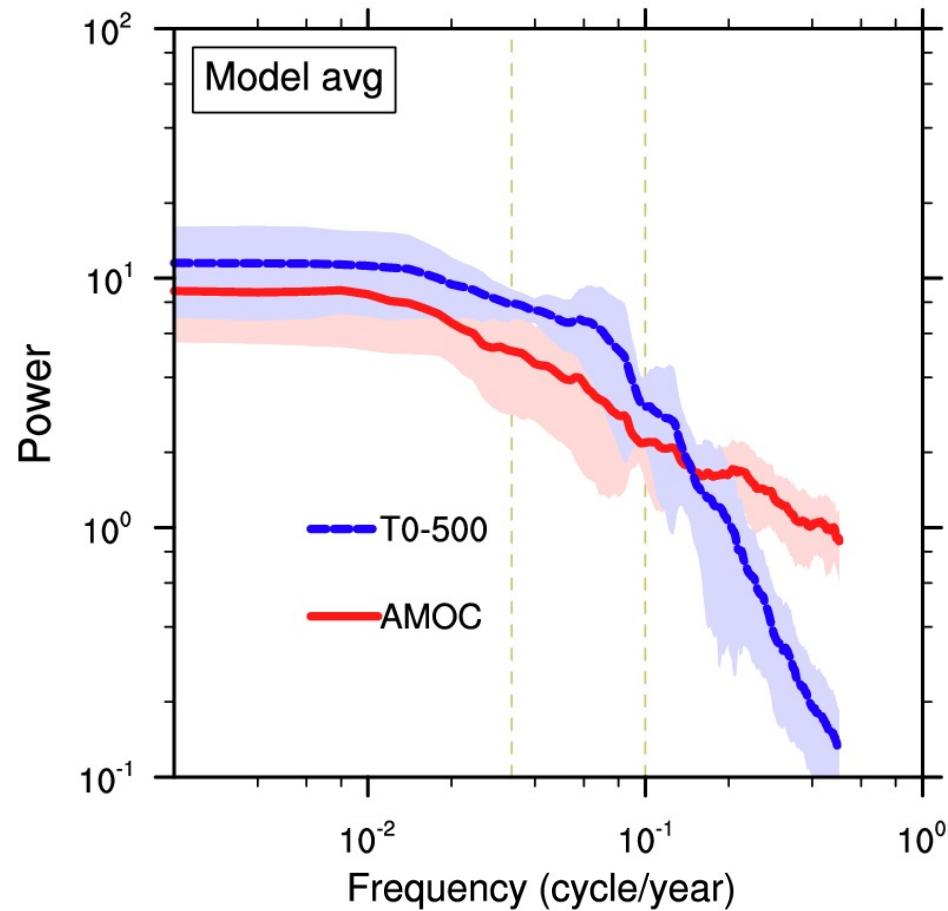


based on approximating model dynamics with linear regression operators

Average Power Spectra AMOC & N Atl Heat Content

9 CMIP5 models

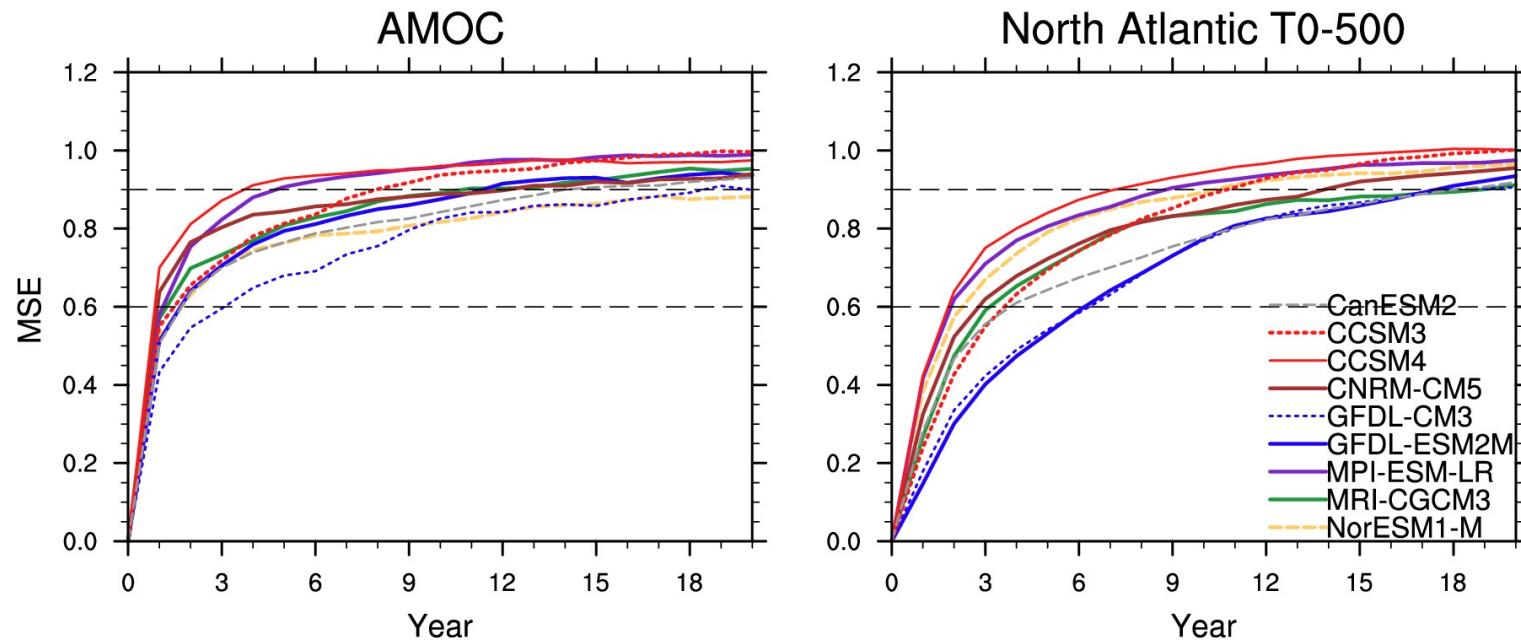
10 PCs



Predictability of CMIP5 Models

(forecast distribution variance / climatological variance)

Attractor average 10PCs

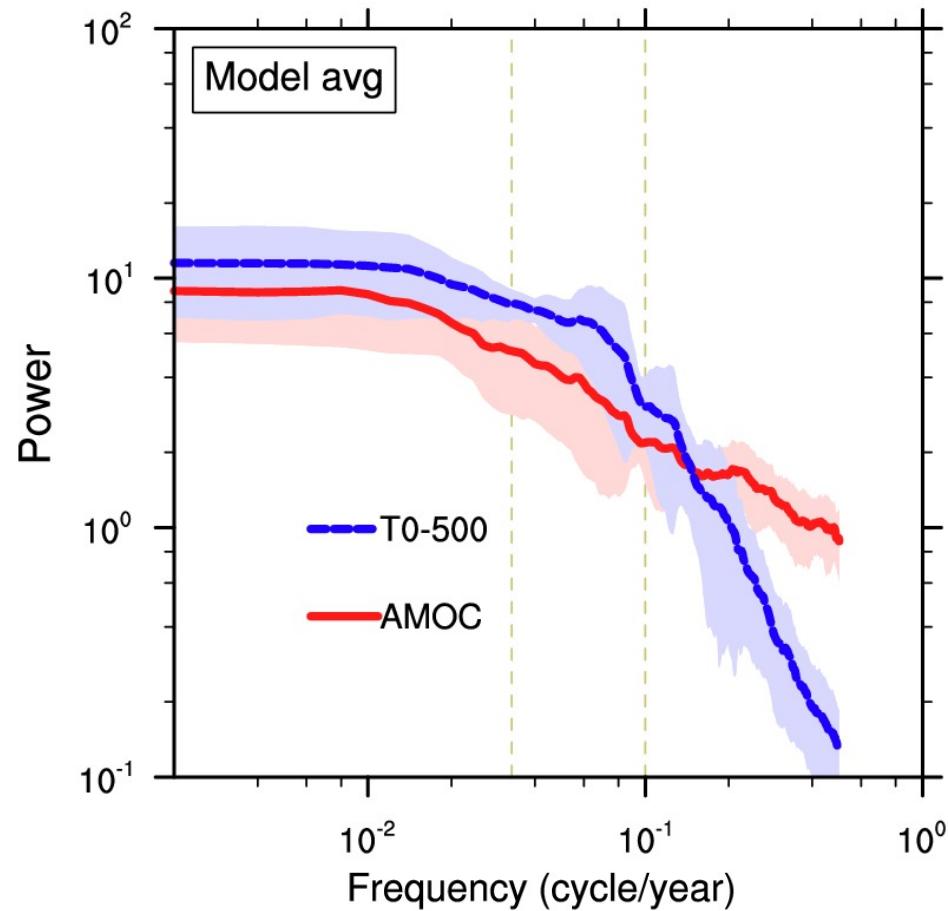


based on approximating model dynamics with linear regression operators

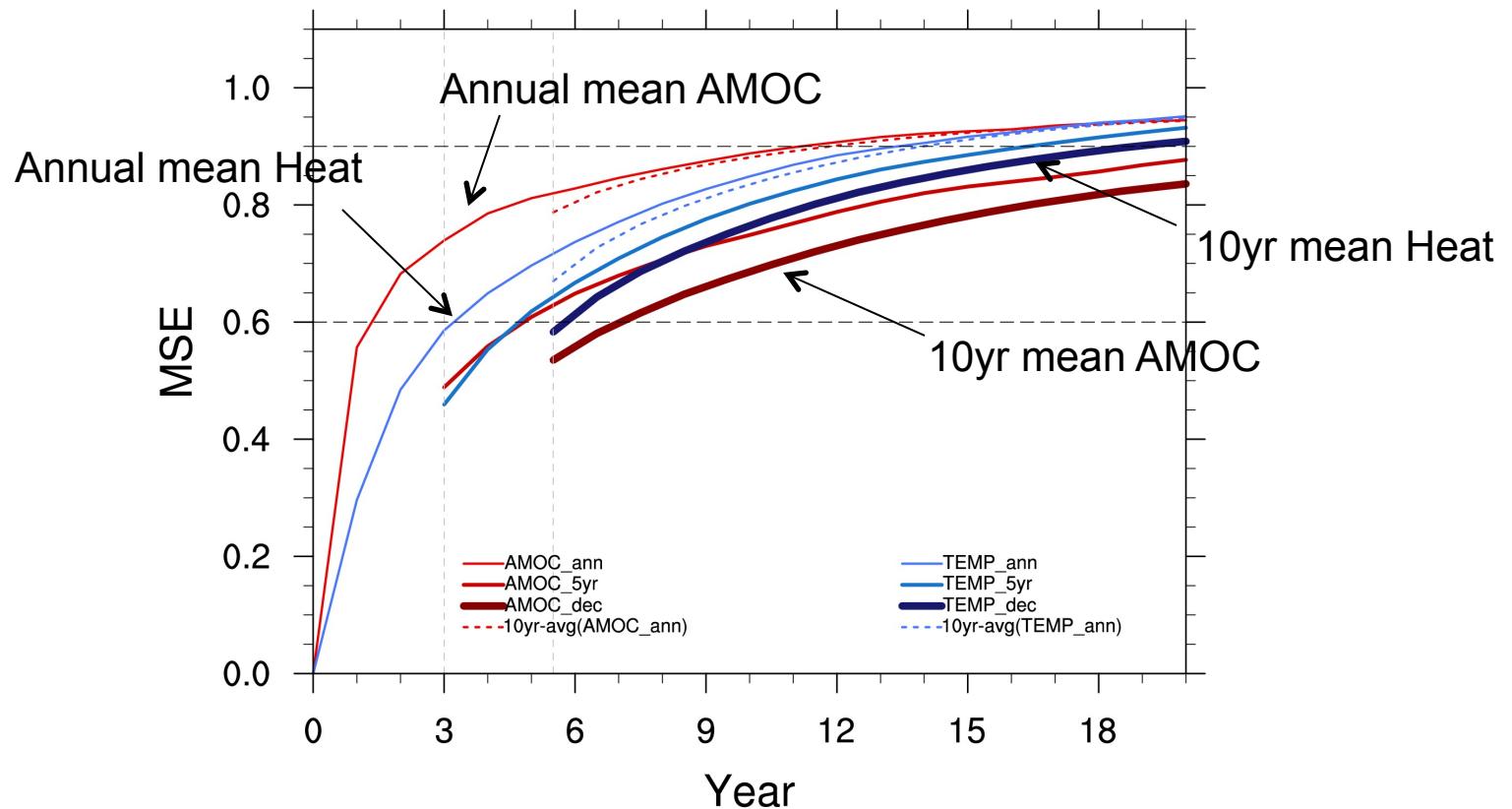
Average Power Spectra AMOC & N Atl Heat Content

9 CMIP5 models

10 PCs

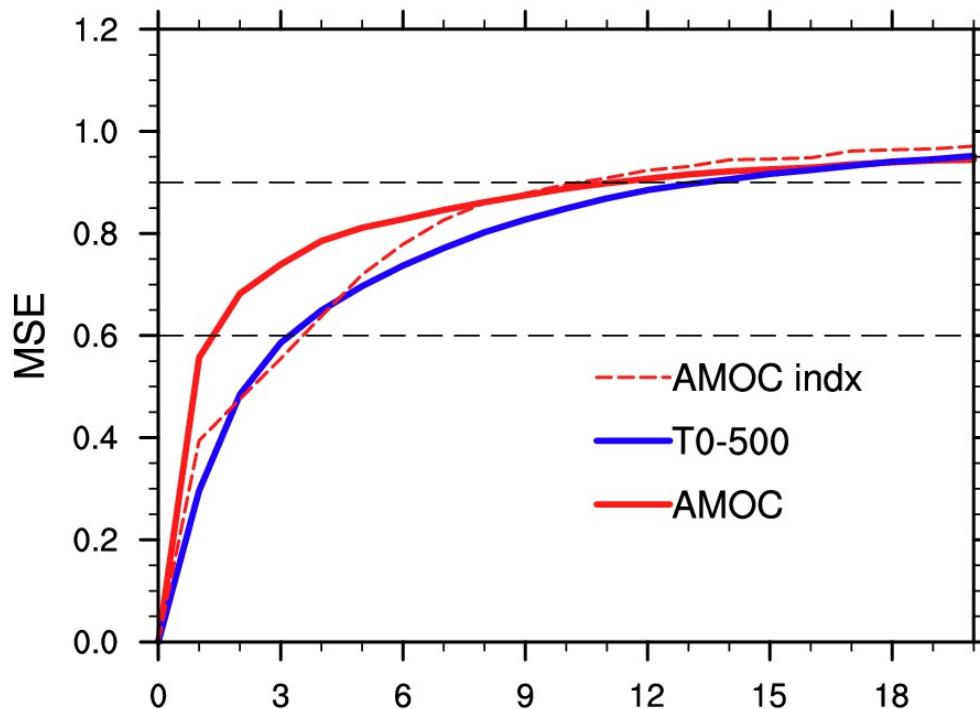


Predictability of 5- & 10-year Means CMIP5 Models



Predictability of the AMOC index

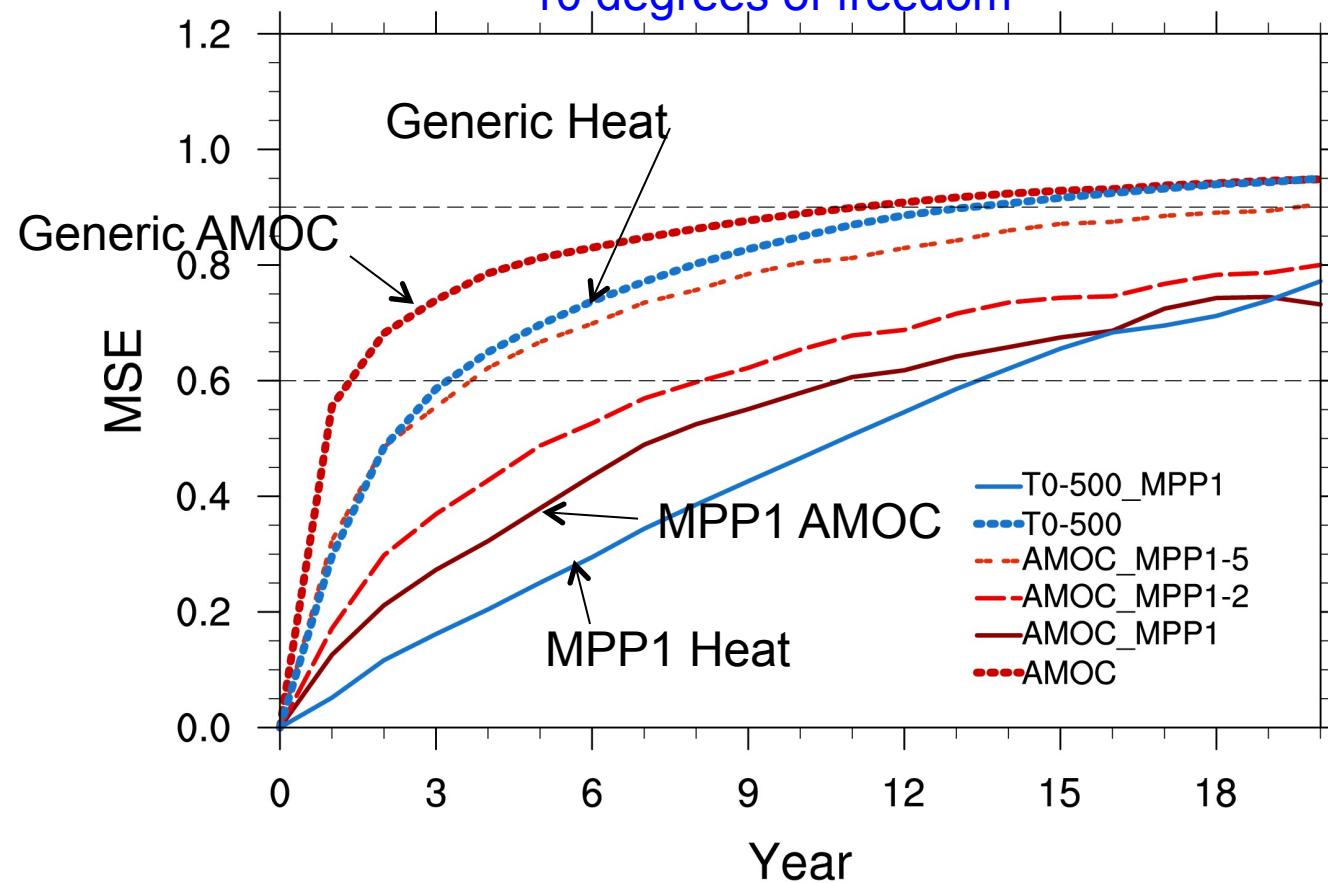
9 CMIP5 models



Predictability of Most Predictable Patterns

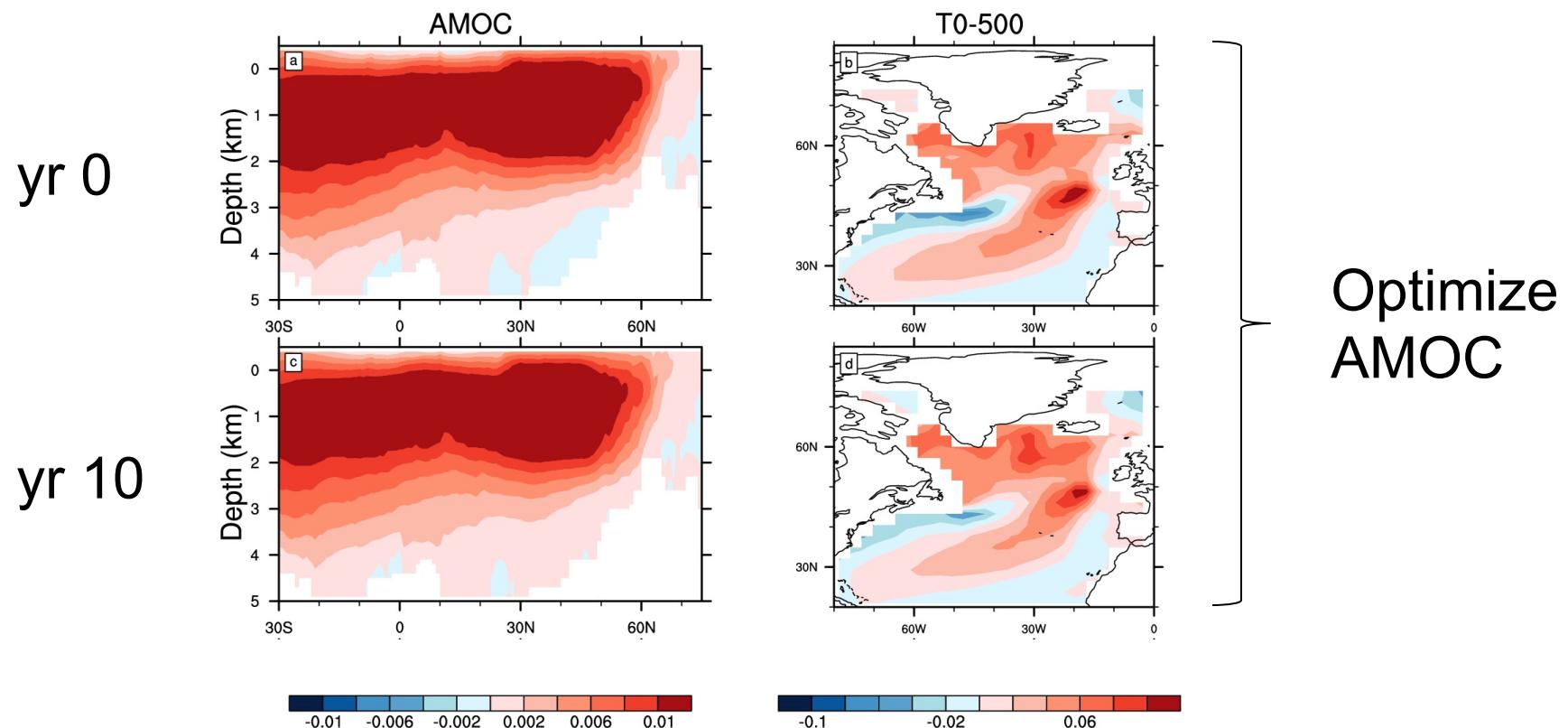
(predictable component analysis)

10 degrees of freedom



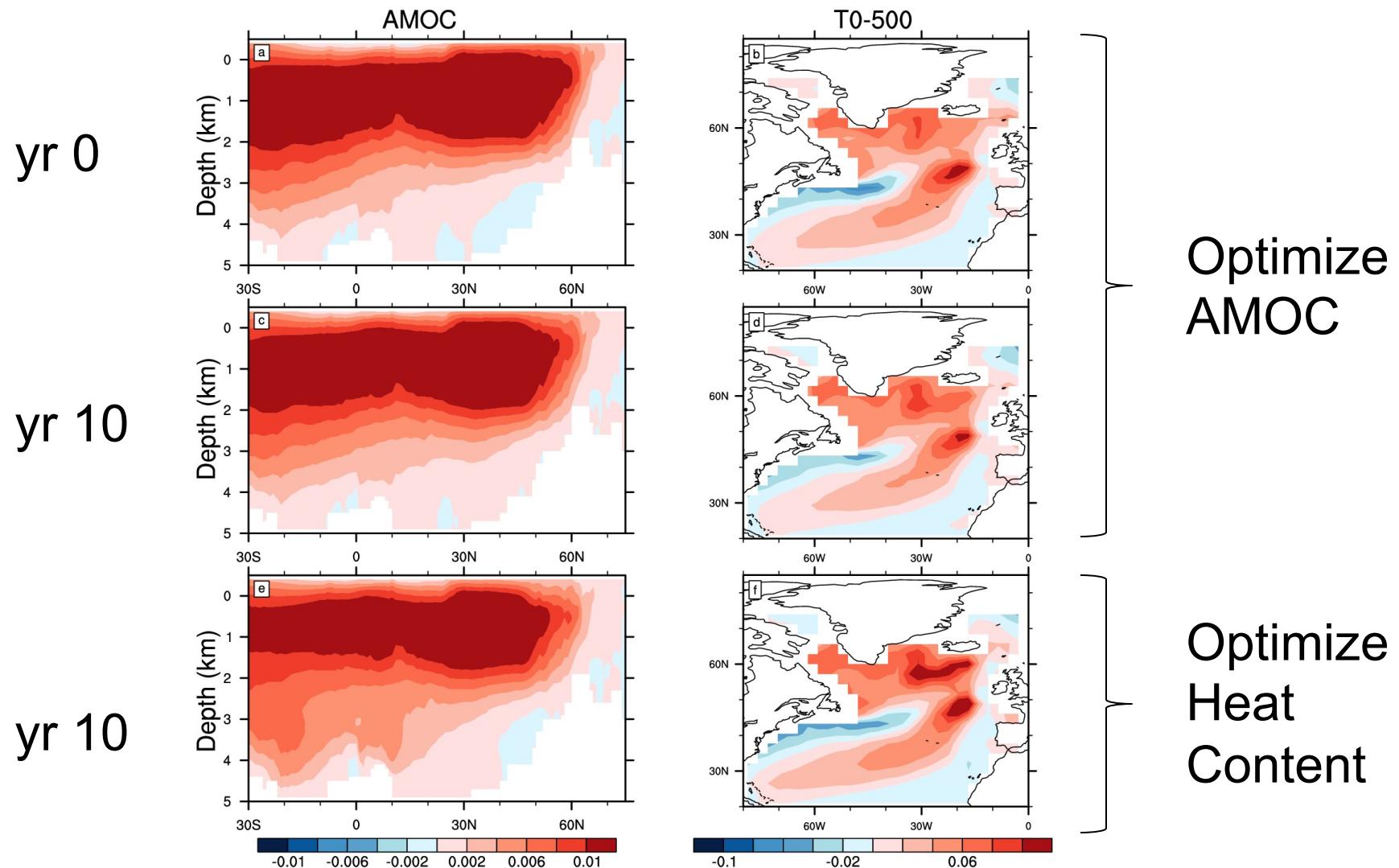
Most Predictable 10-yr Pattern

CNRM-CM5



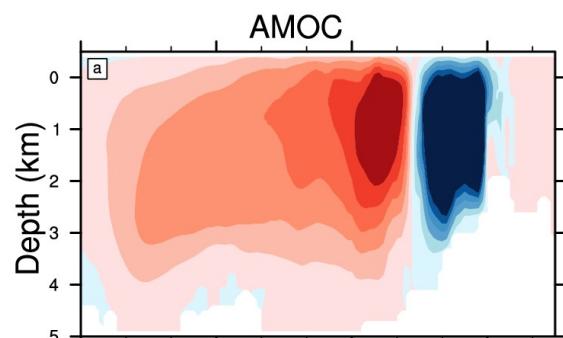
Most Predictable 10-yr Pattern

CNRM-CM5

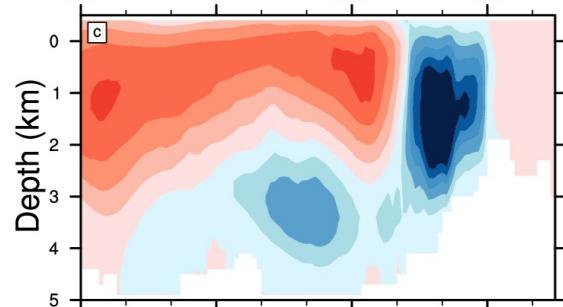


Most Predictable 10-yr Pattern *GFDL-CM3*

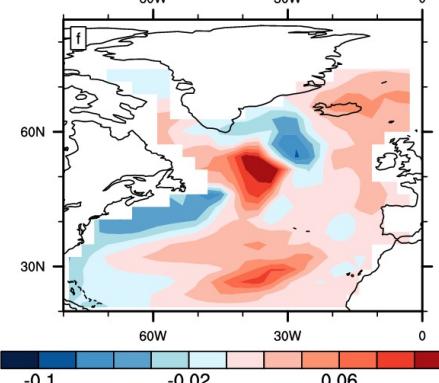
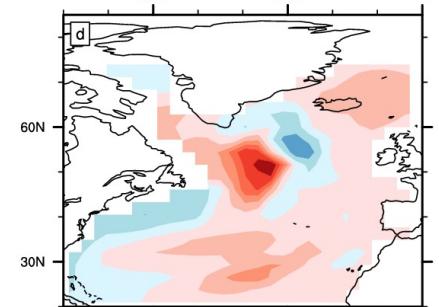
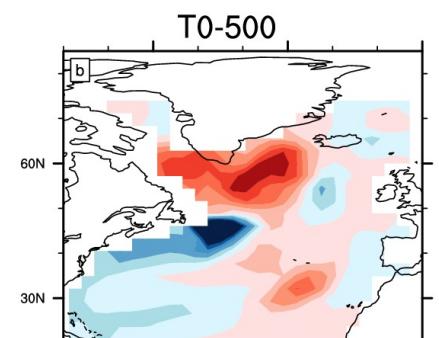
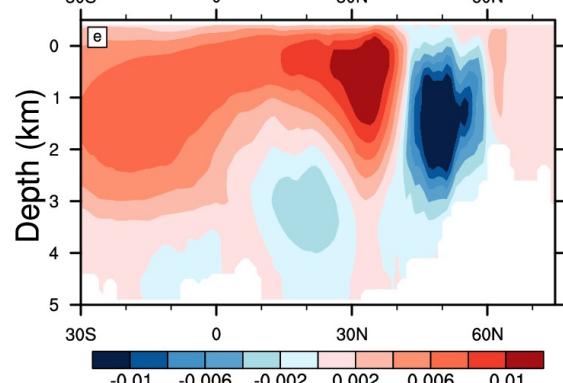
yr 0



yr 10



yr 10



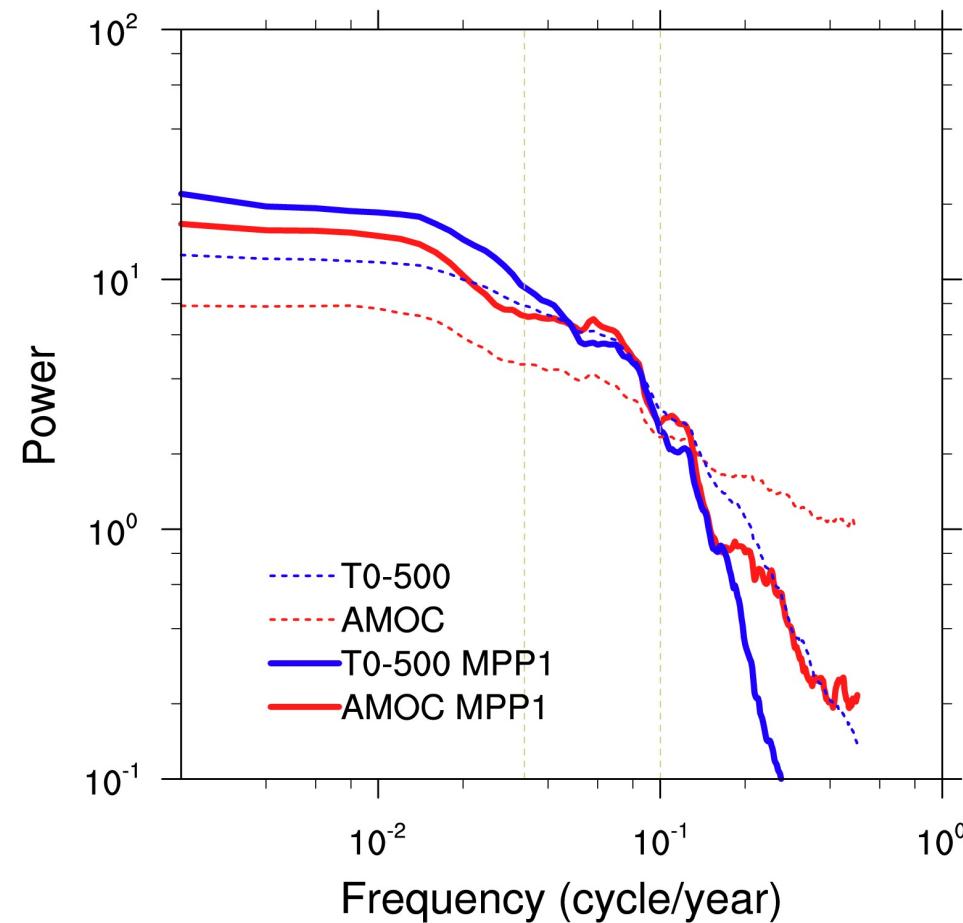
Optimize
AMOC

Optimize
Heat
Content

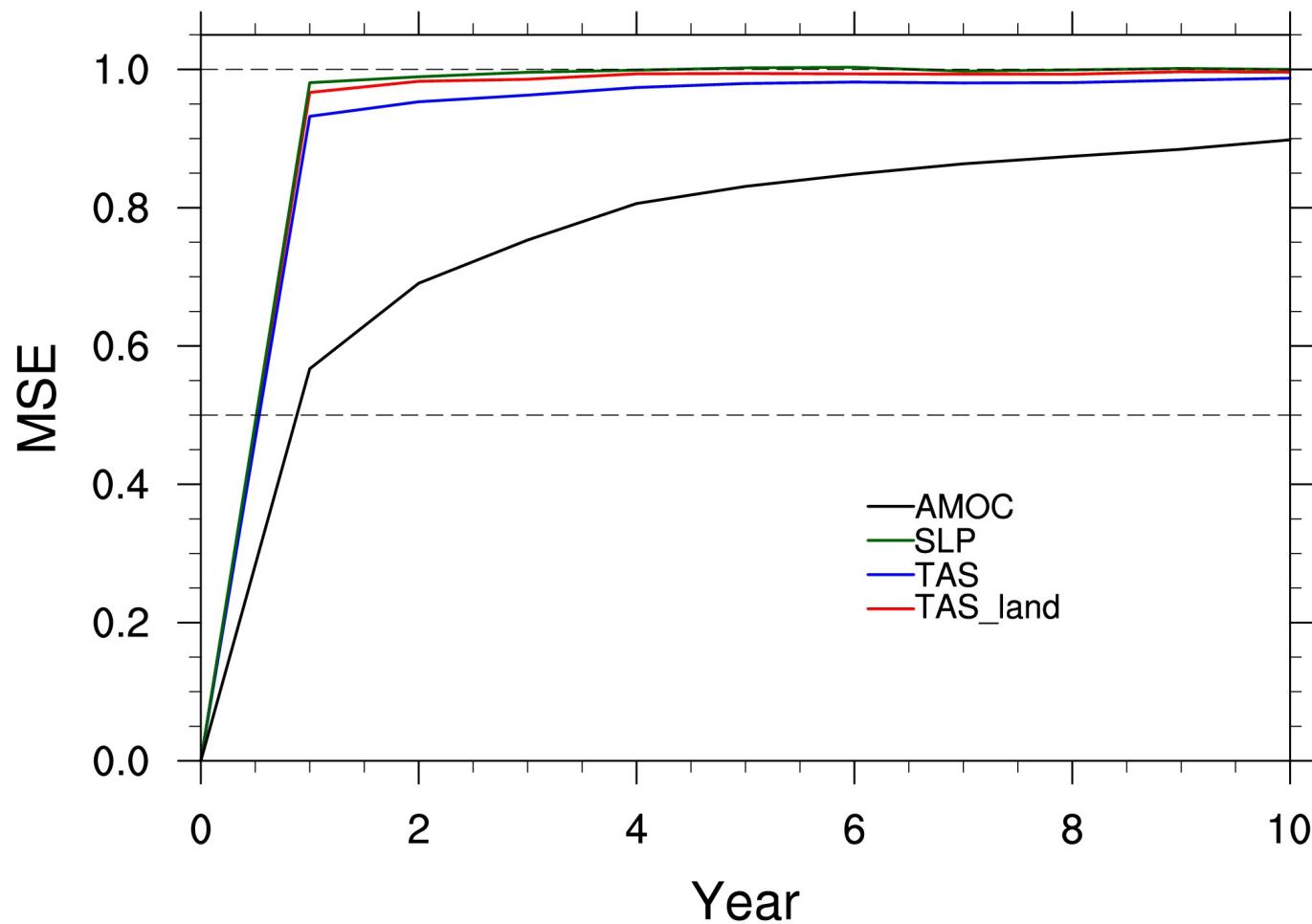
XX

Average Power Spectra of Most Predictable AMOC & Heat Content Patterns

9 CMIP5 models

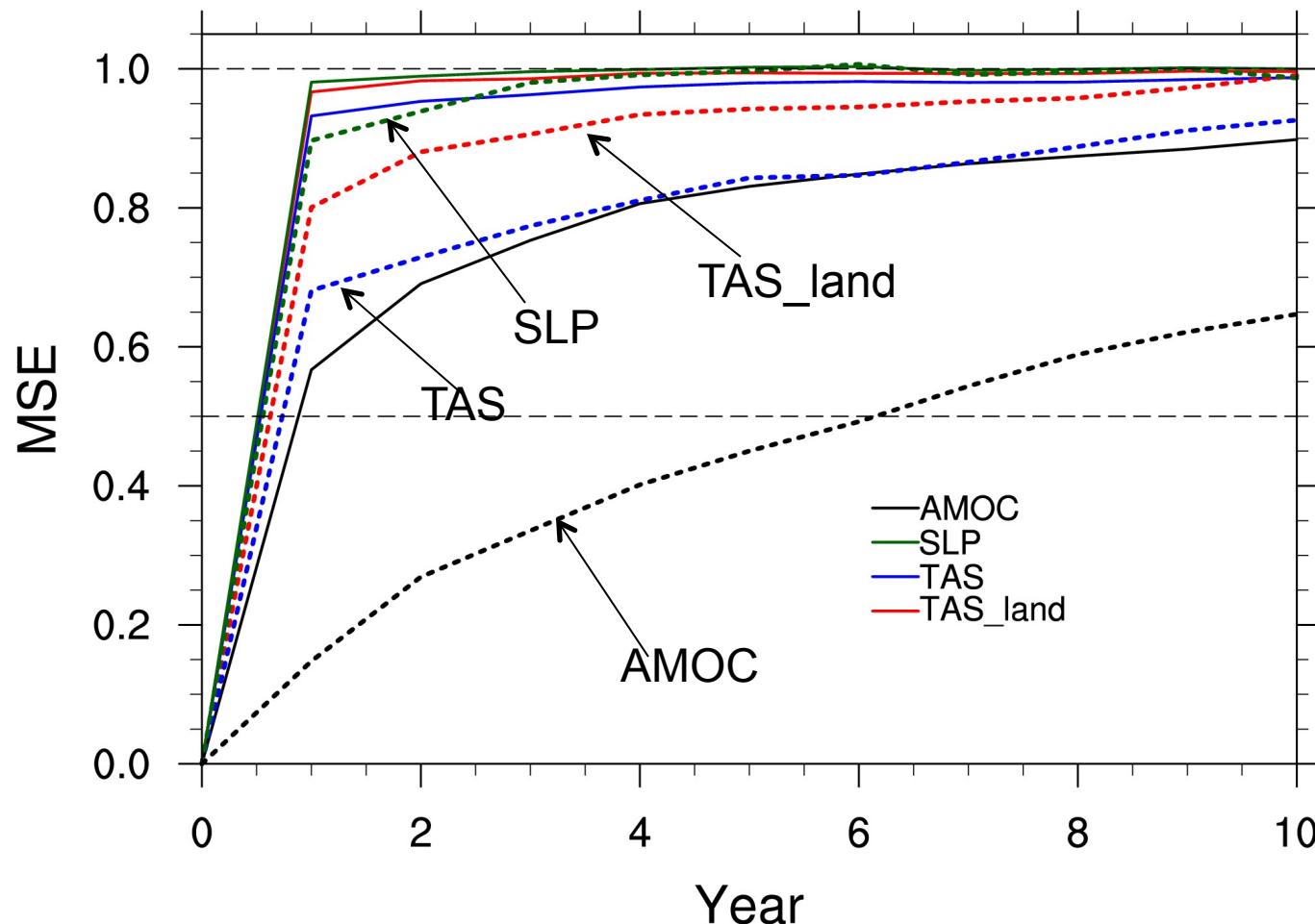


Predictability of AMOC, SLP_{NH}, TAS_{NH}, TAS_{NH_land}



Predictability of Most Predictable Patterns for AMOC, SLP_{NH}, TAS_{NH}, TAS_{NH_land}

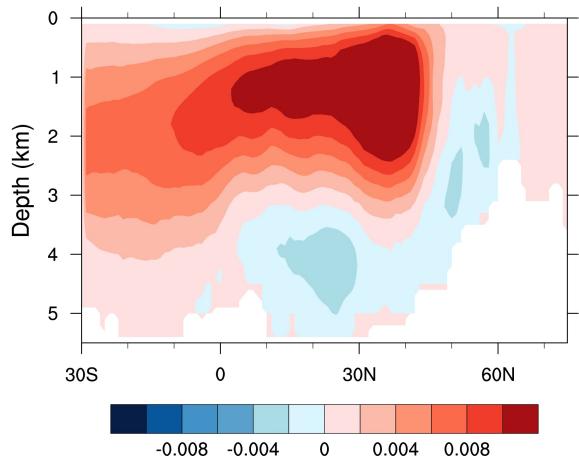
(predictable component analysis)



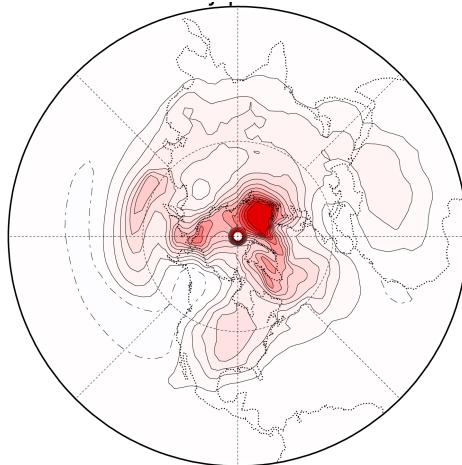
CNRM Most Predictable 5-yr Patterns

Optimize AMOC

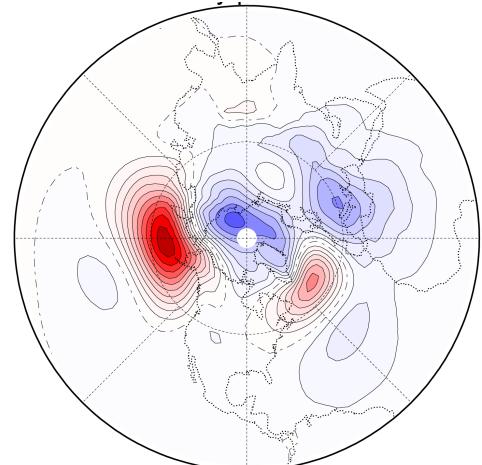
AMOC



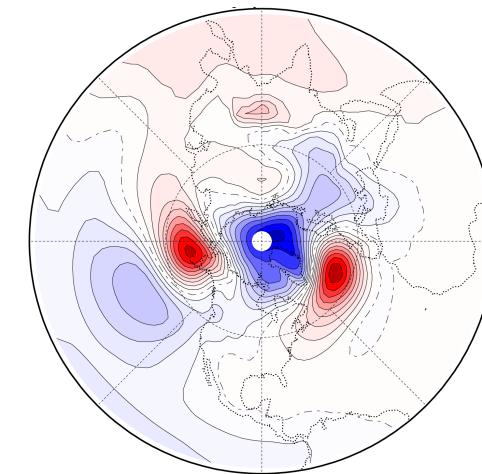
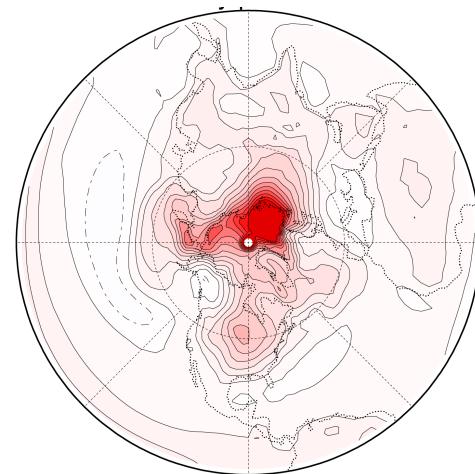
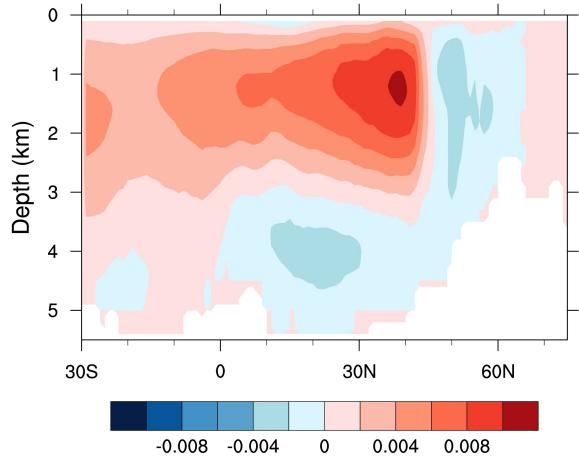
TAS



SLP



Optimize TAS_{NH_land}



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

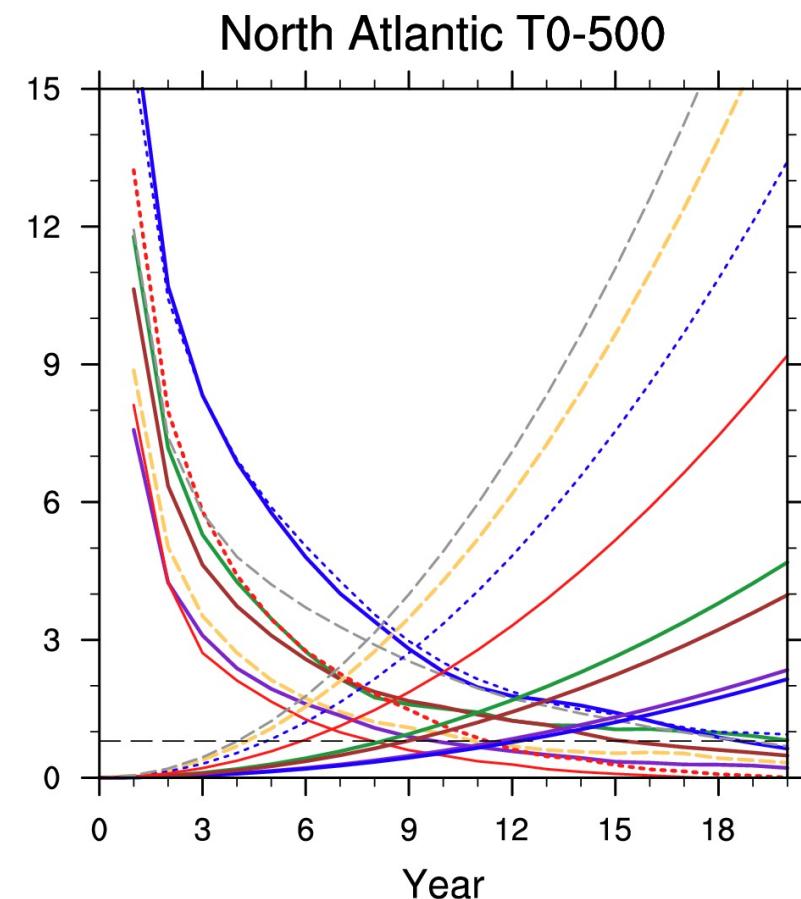
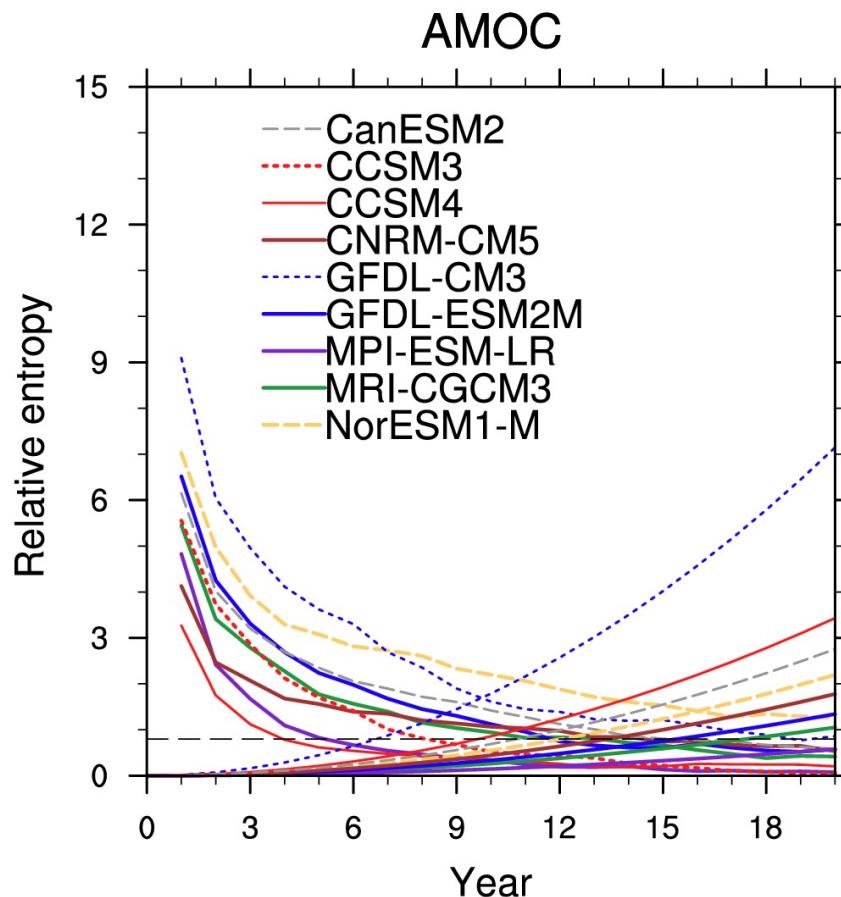
- Time scale (*annual mean, decadal mean...*)
- Mode/pattern
- Model (*CNRM-CM5, CanESM2, ..., nature*)
- Particular initial condition
- Geographical location (*subpolar gyre,...*)
- Initial value or forced predictability

Reasons for Optimism for Decadal Prediction

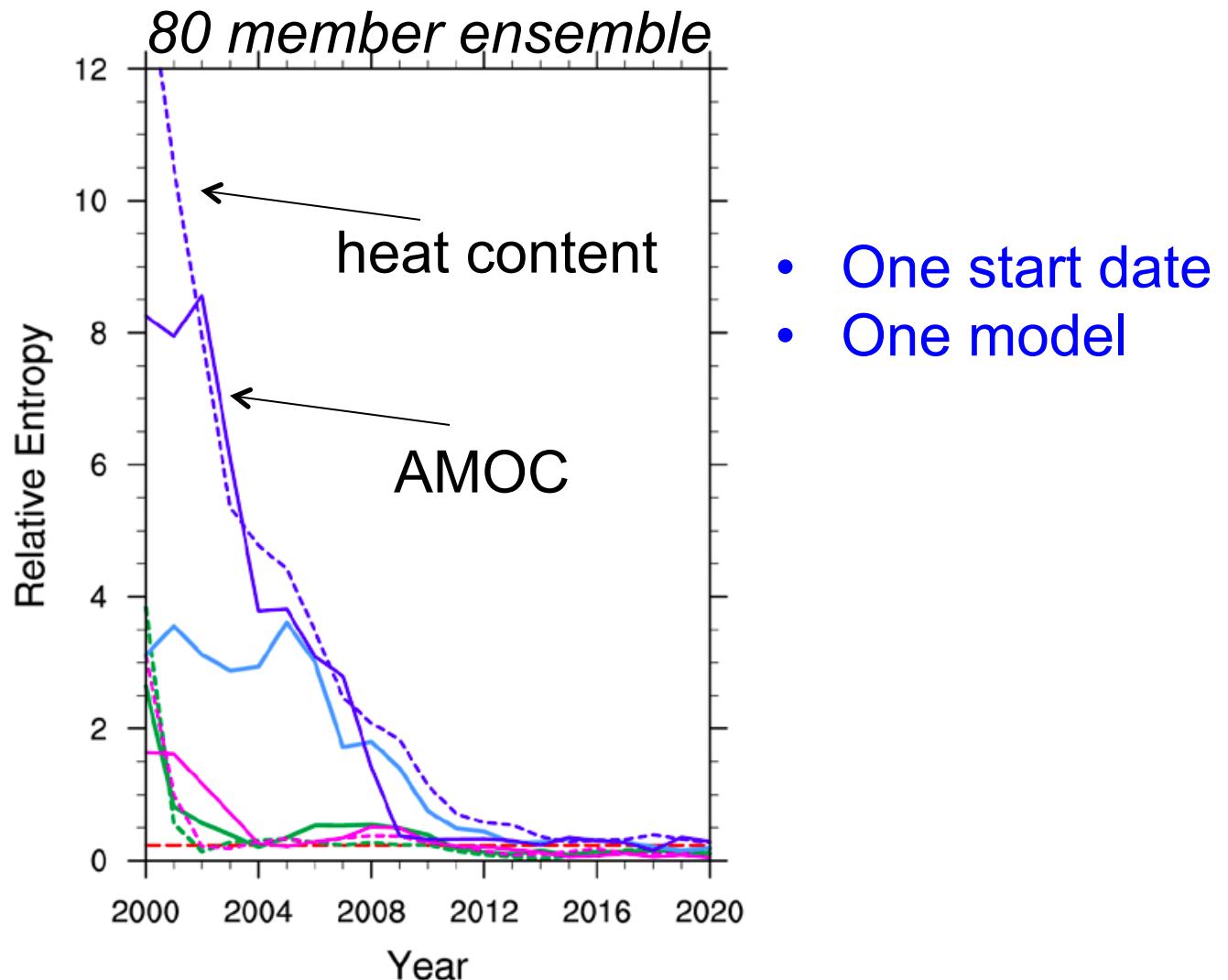
- ✧ There is predictability beyond a decade...
for time averages and particular patterns
- ✧ Ocean predictability carries over to land
and atmospheric circulation

Initial Value & Forced Predictability

10 PCs



CCSM3 Predictability of AMOC & North Atlantic Heat Content



Teng et al. (2011)