A link of heat transport variability and interannual surface temperature predictability in the North Atlantic

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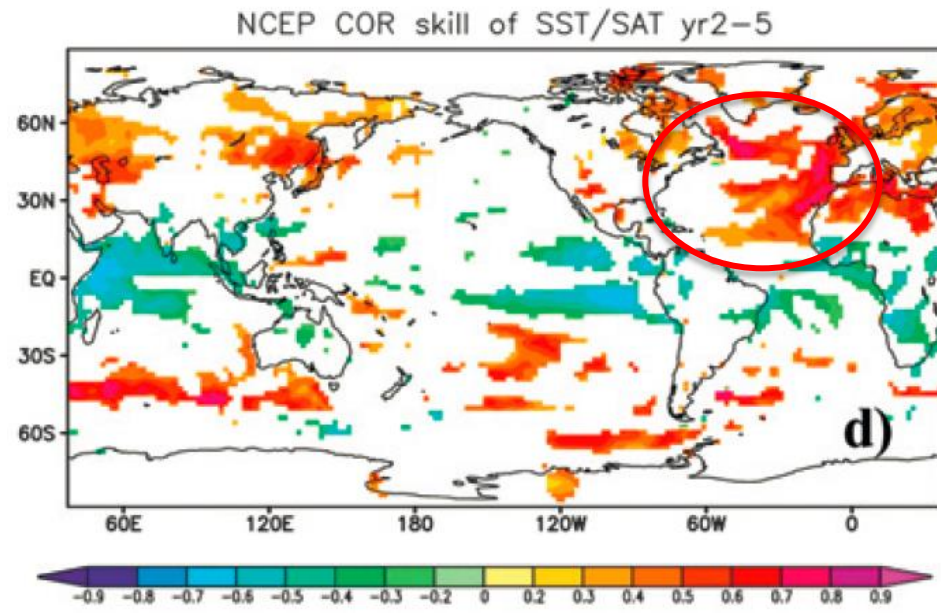
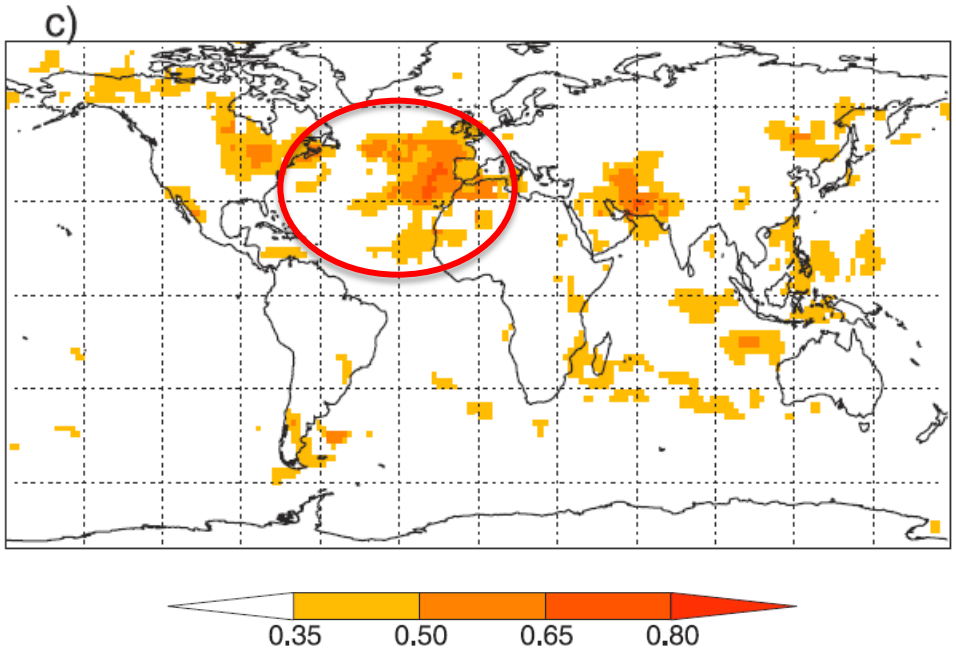
Previous Studies found Decadal SST/ SAT Predictability in the North Atlantic

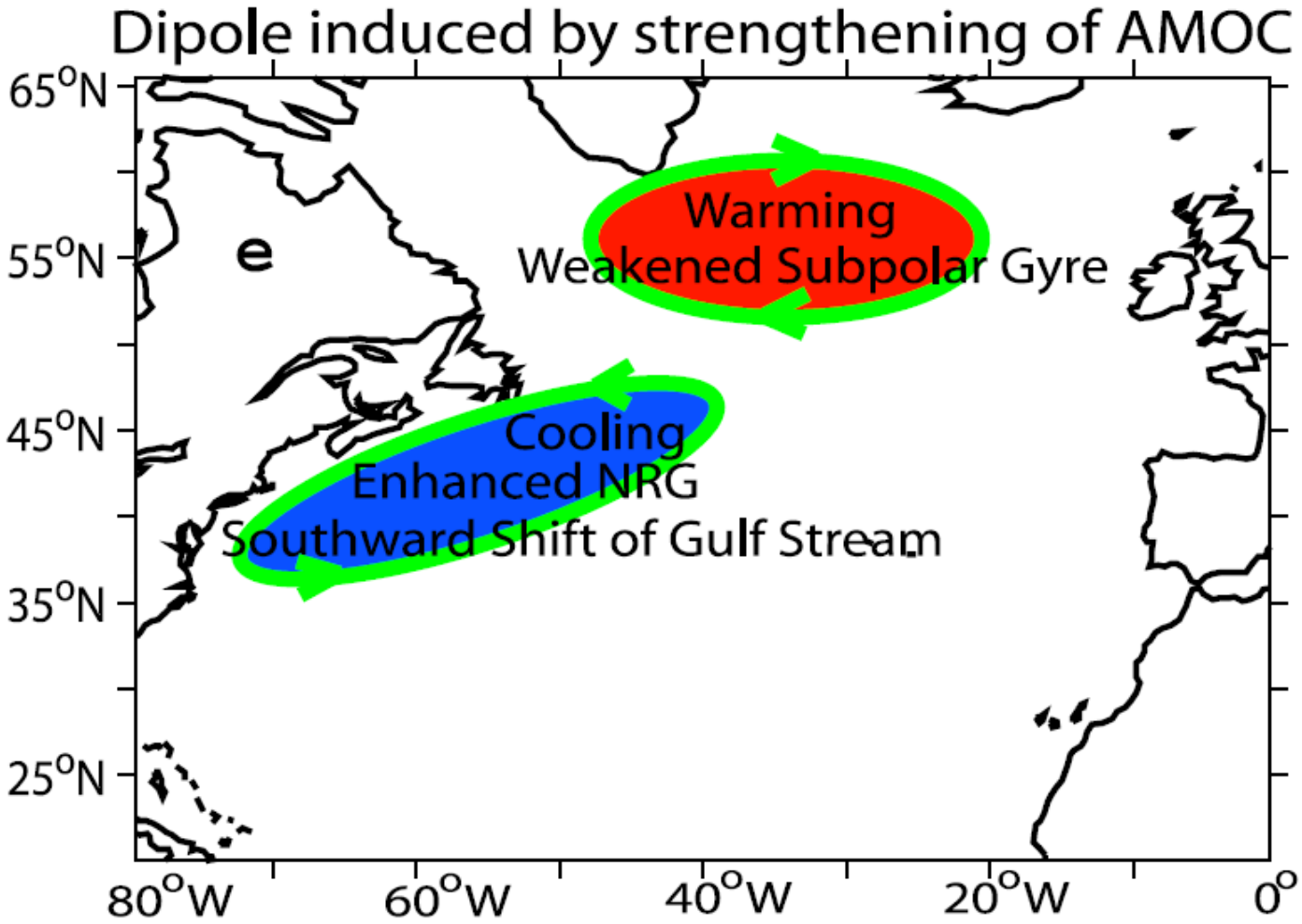


Matei et al, 2012



Pohlmann et al, 2009

SST influenced by strong AMOC/OHT interannually



Zhang, 2008

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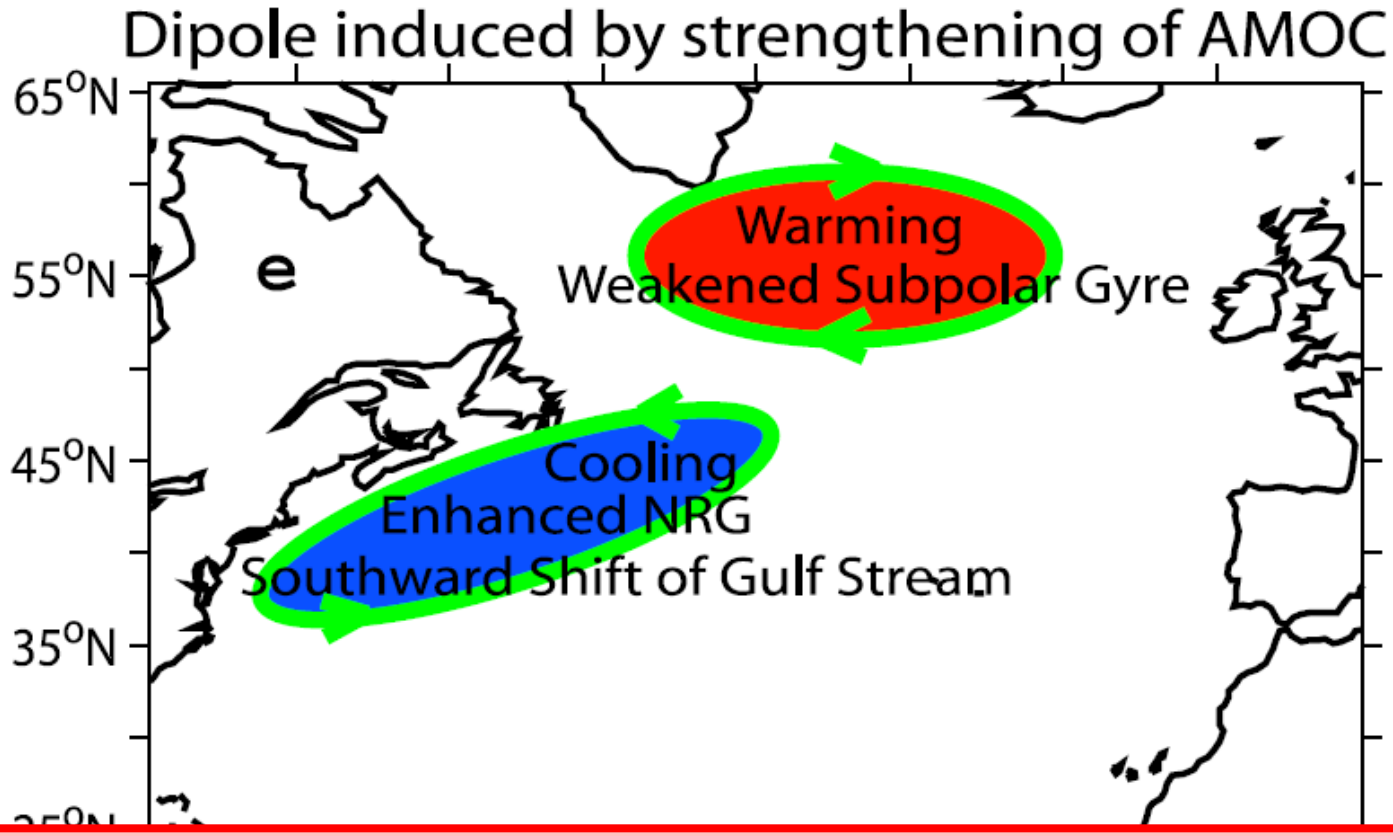

Is there value in knowing whether the OHT in the North Atlantic is strong at the beginning of an SST prediction?

The Model

- MPI-ESM-LR
  - ECHAM6 (T63, 47 vertical levels)
  - MPIOM (nominal 1.5°, 40 vertical levels)

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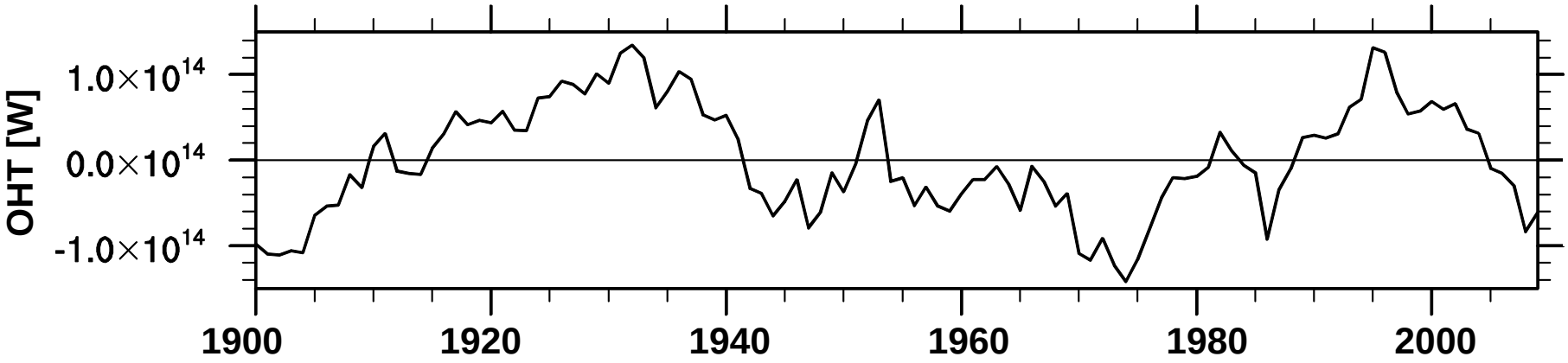
➢ Long assimilation model experiment

➢ Ocean component physically consistent

Subsampling by OHT strength at 50°N



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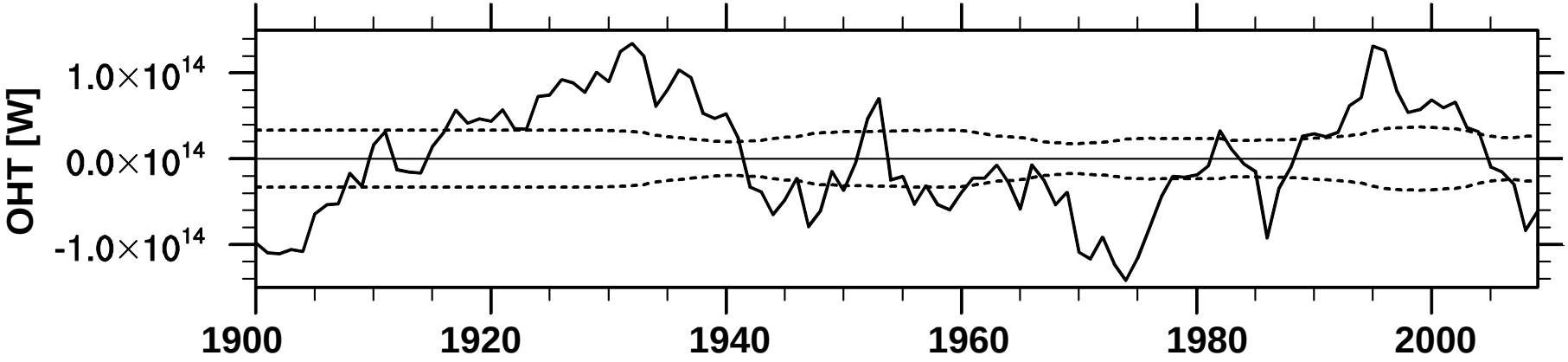

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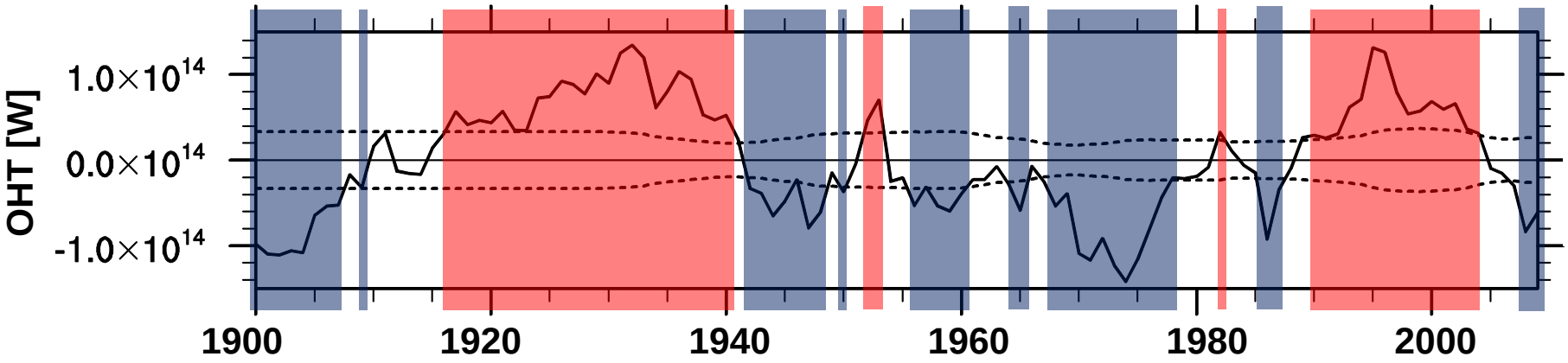
Subsampling by OHT strength at 50°N



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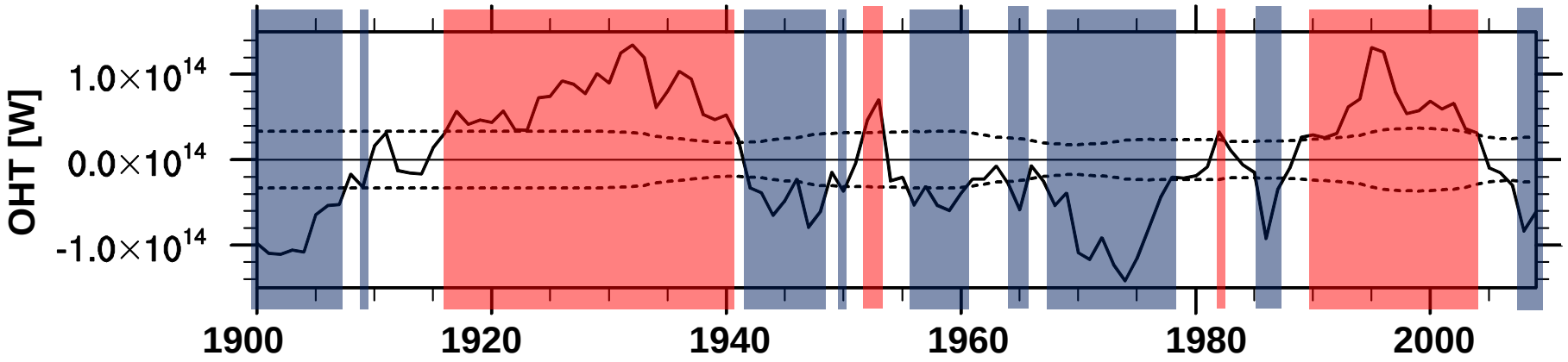

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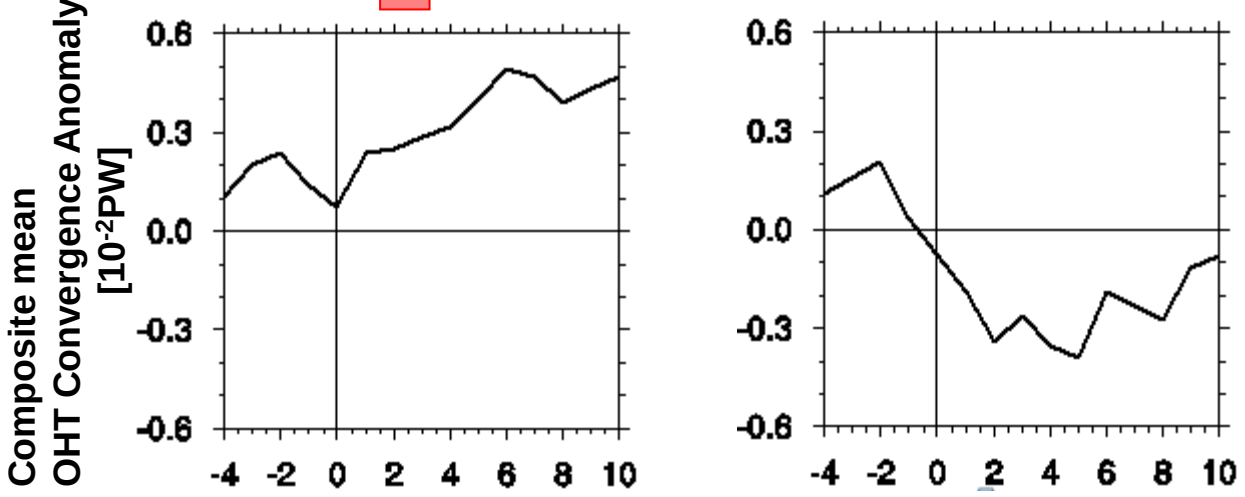
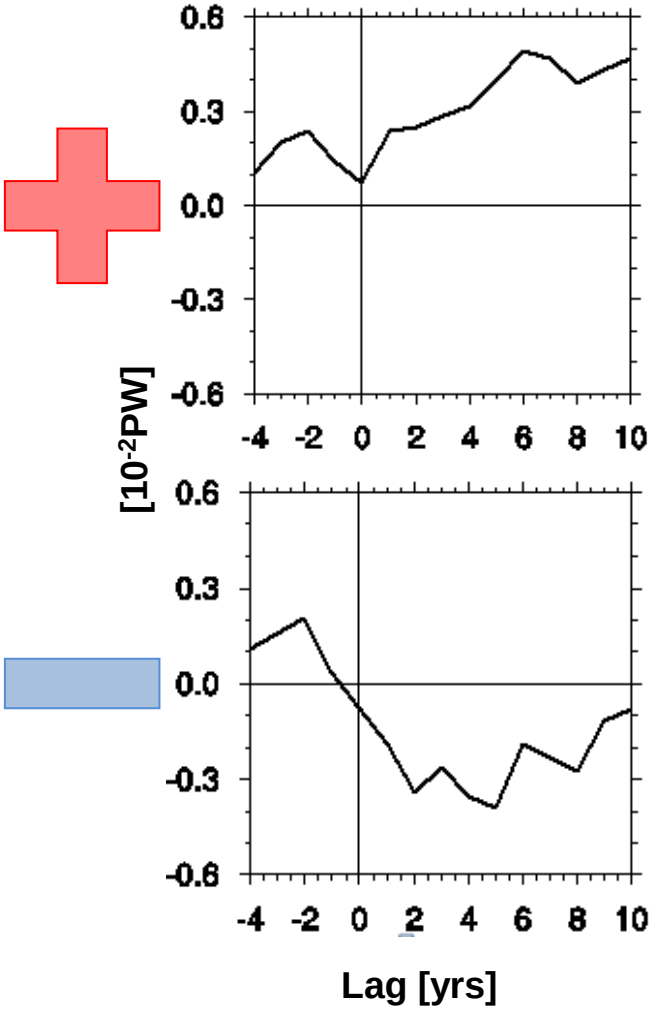


Composite Means: SST pattern following strong/weak OHT phases



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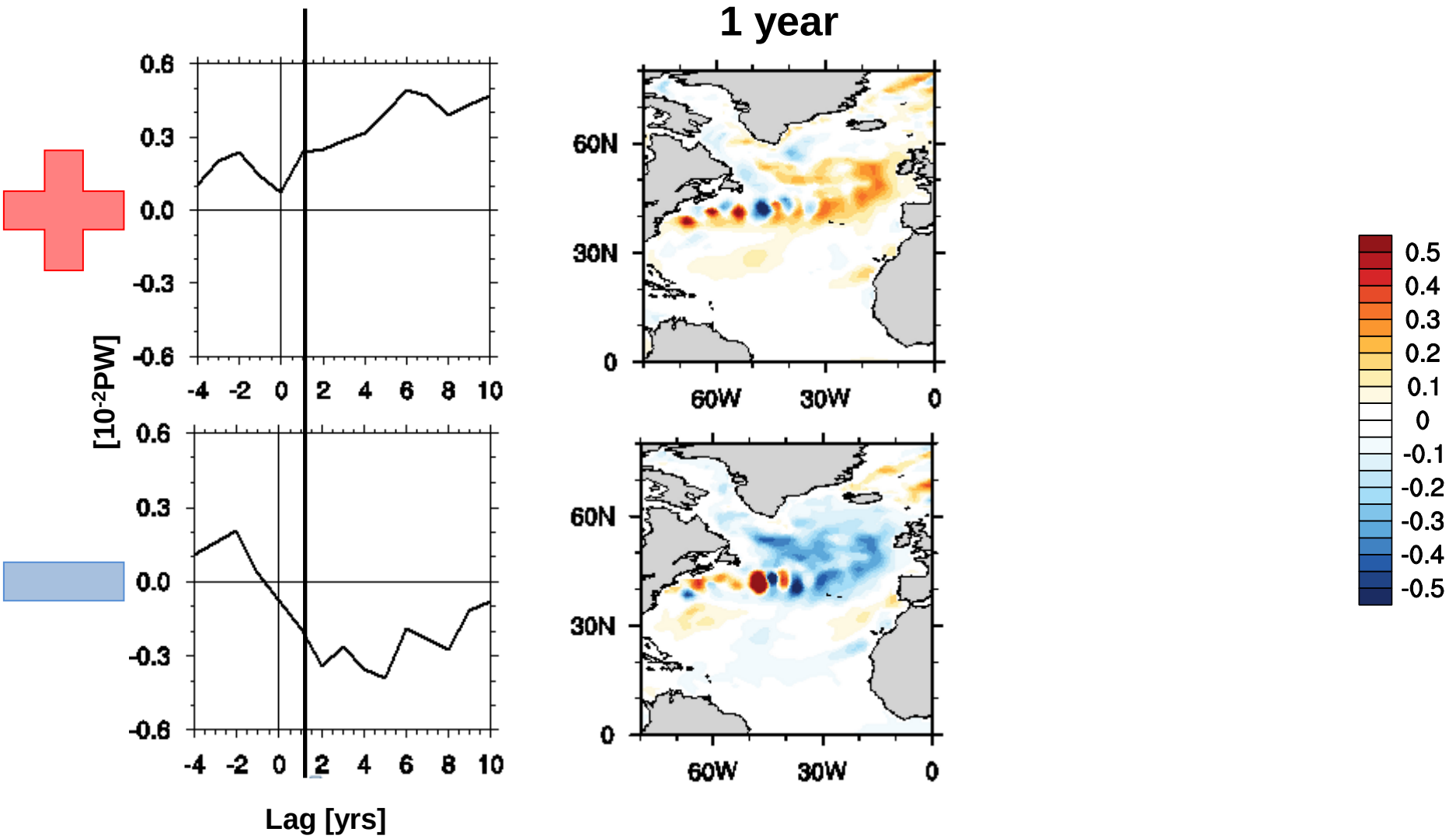

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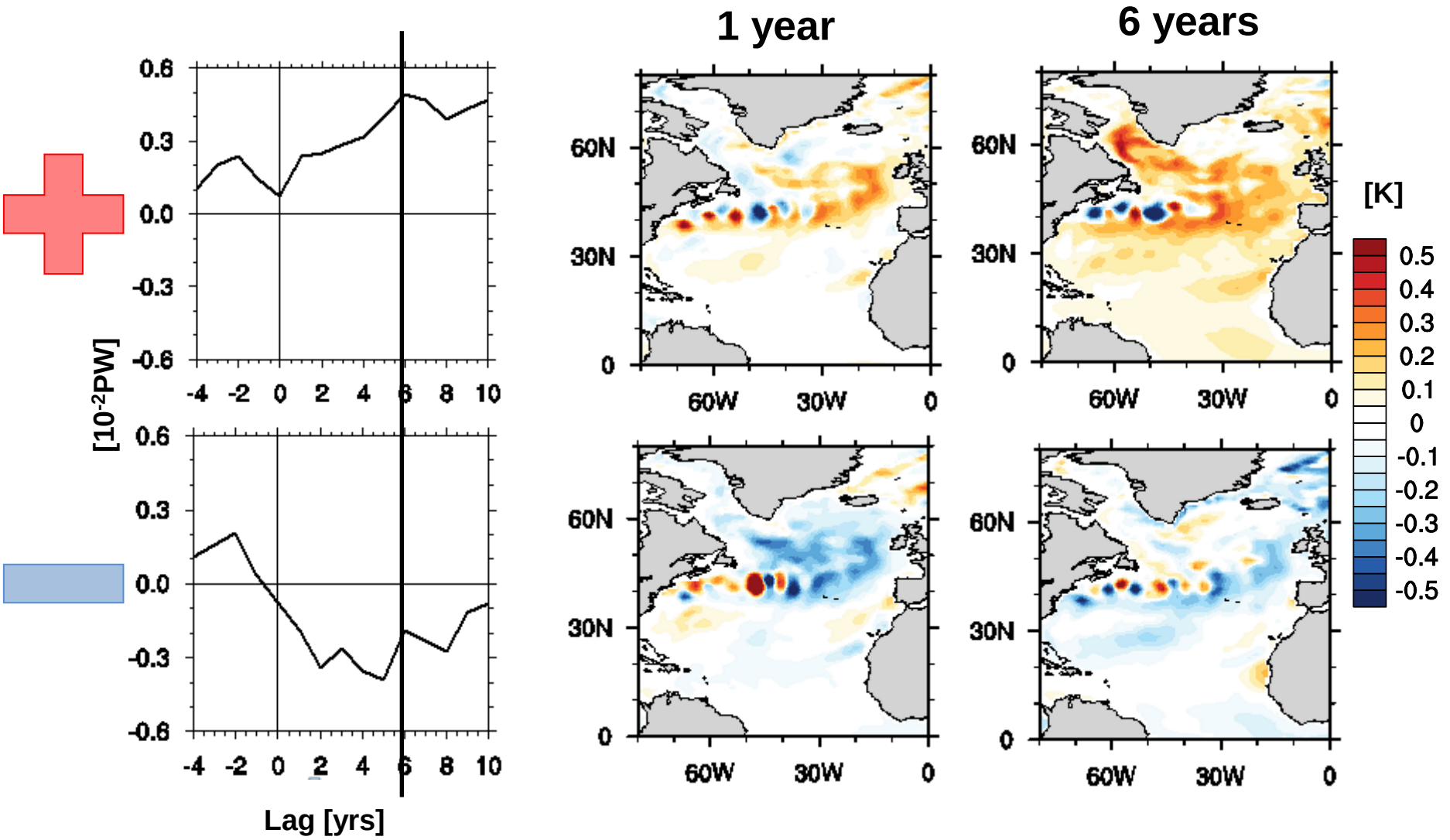
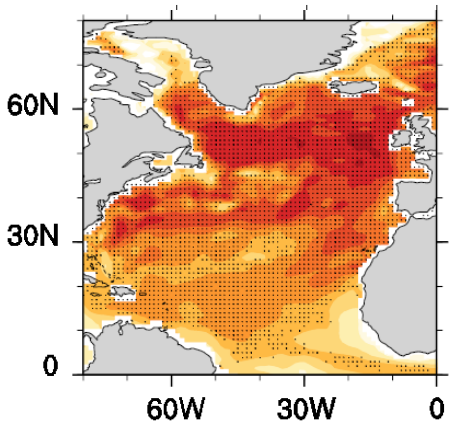
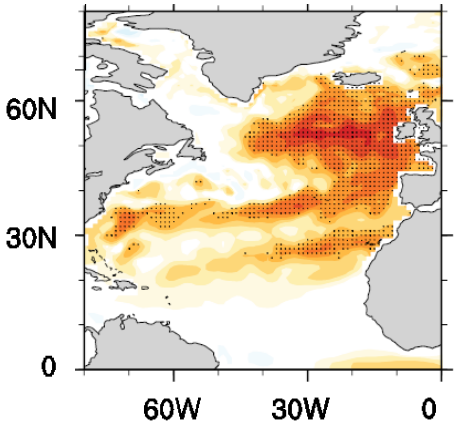


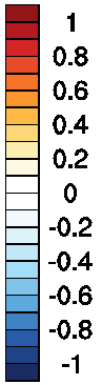
Potential predictability in the North Atlantic in our model simulation

Lead Year 1



Lead Years 3-5





- 10-year-long HindCasts started every year from assimilation
- SST anomalies from HindCasts correlated with SST anomalies from assimilation -> ACCs
- By year of HindCast („Lead Year“)
- The higher the Lead Time, the lower the ACCs

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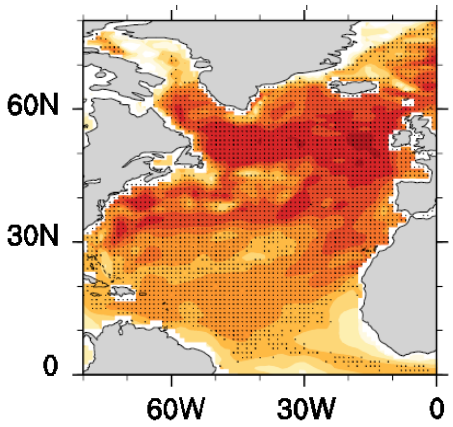

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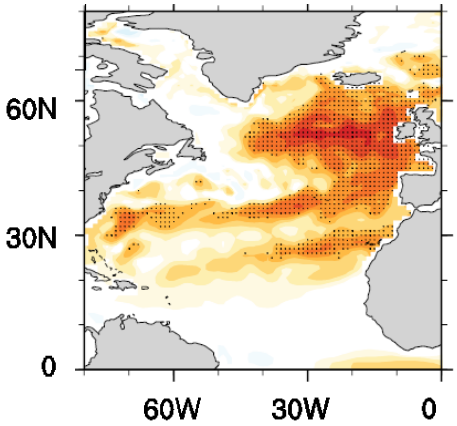

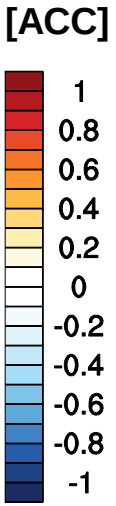

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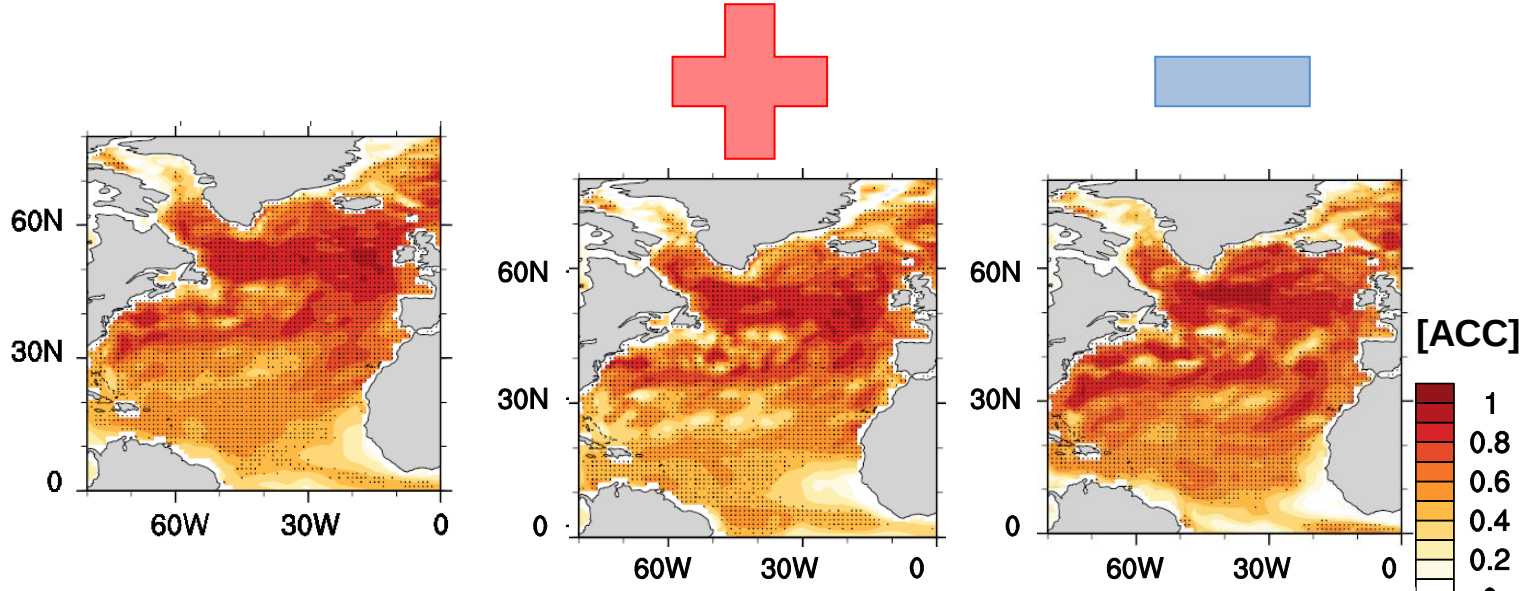

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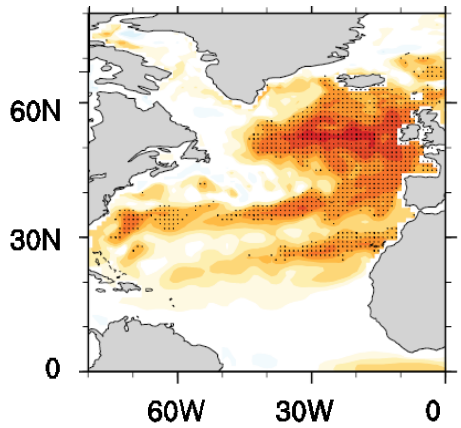

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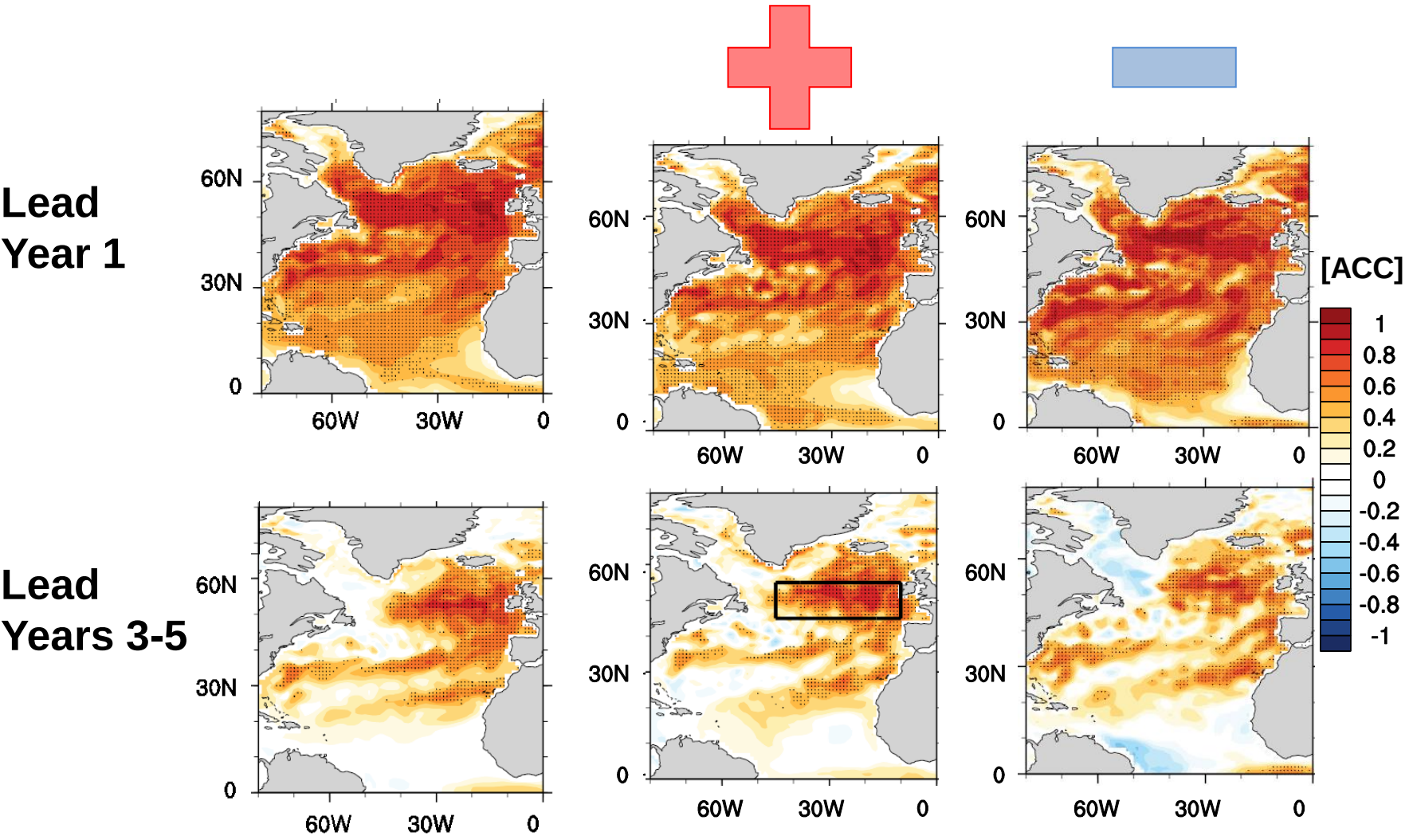
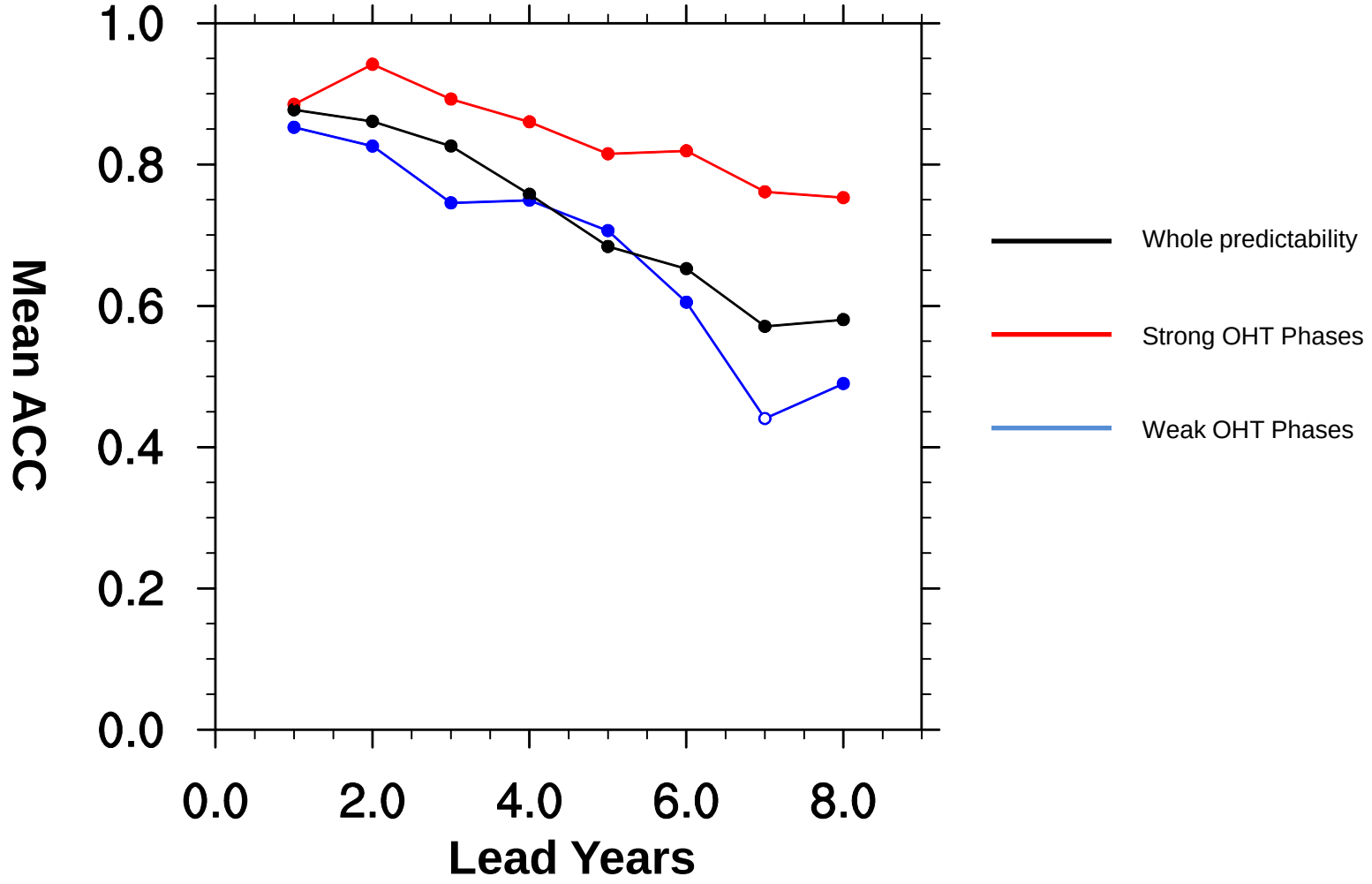


Pot. Predictability for SSTs persists longer following strong OHT phases



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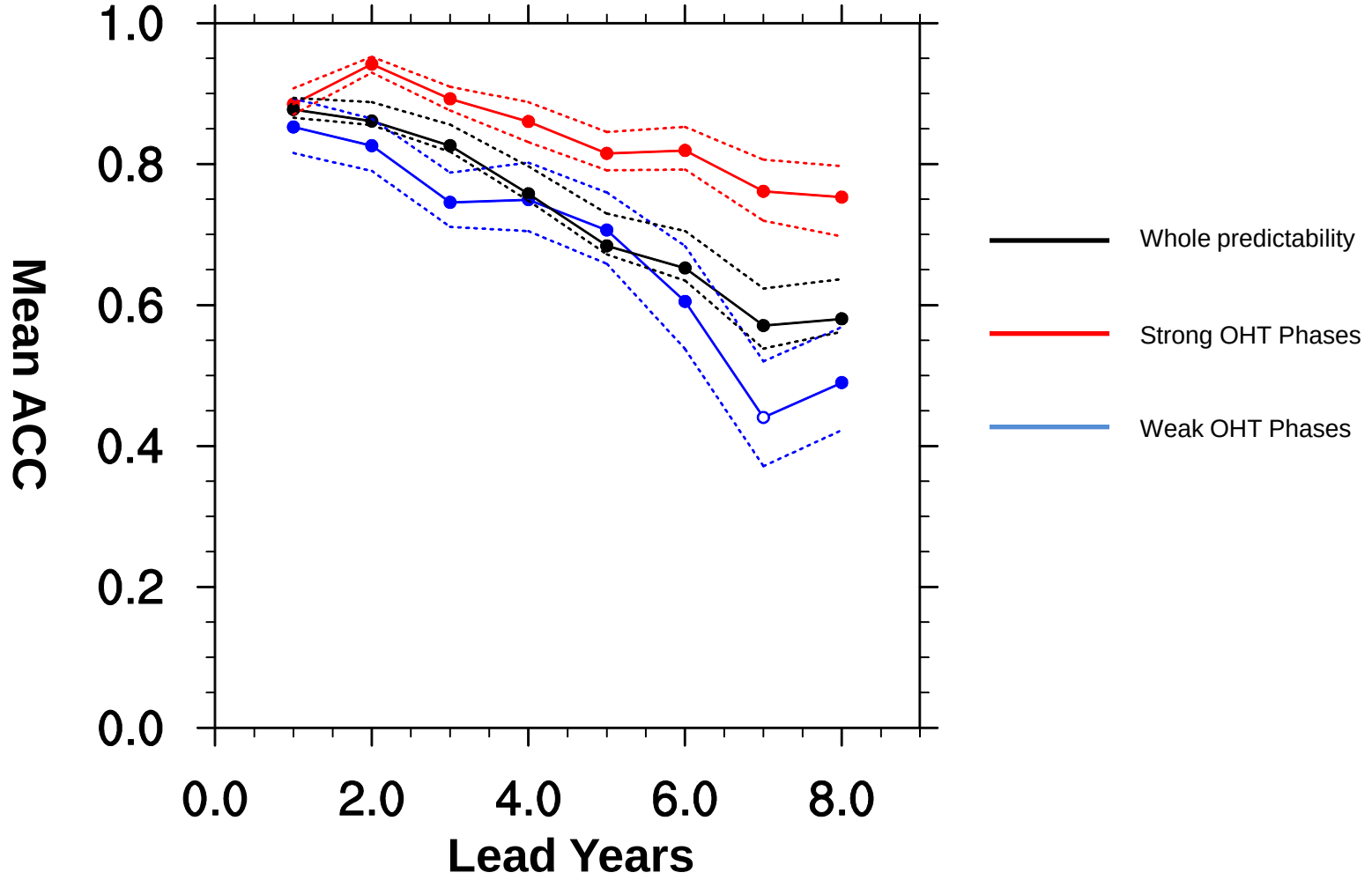
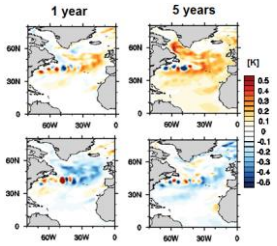


Summary & Conclusions

- We find an interannual link of strong OHT at 50°N and SSTs
- This link is connected to ocean heat convergence (similar to Zhang, 2008; Zhang & Zhang, 2015)



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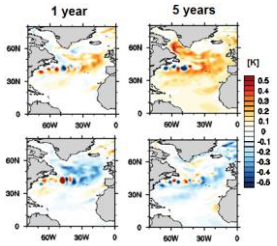

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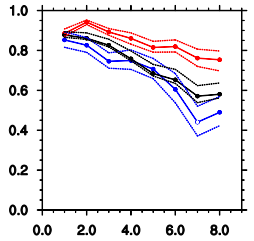
- Time scale and heat convergence suggest that this pot. predictability is connected to the OHT-SST mechanism



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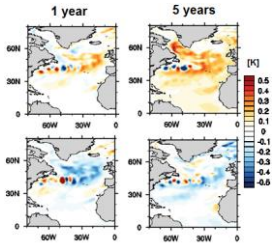

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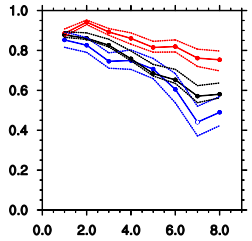

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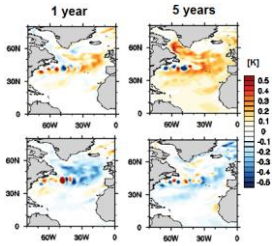

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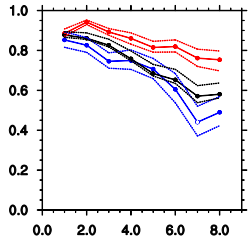

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Thank you! Questions? Here or leonard.borchert@uni-hamburg.de

References

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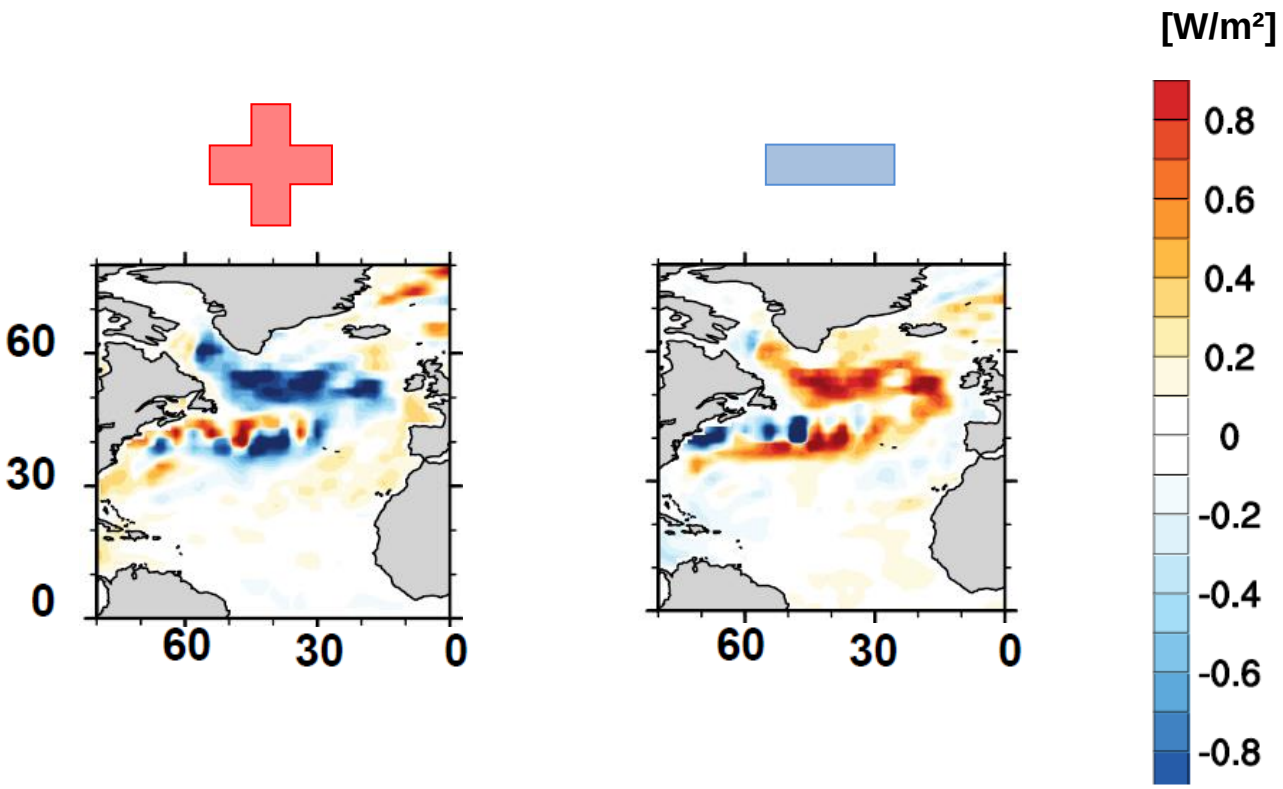
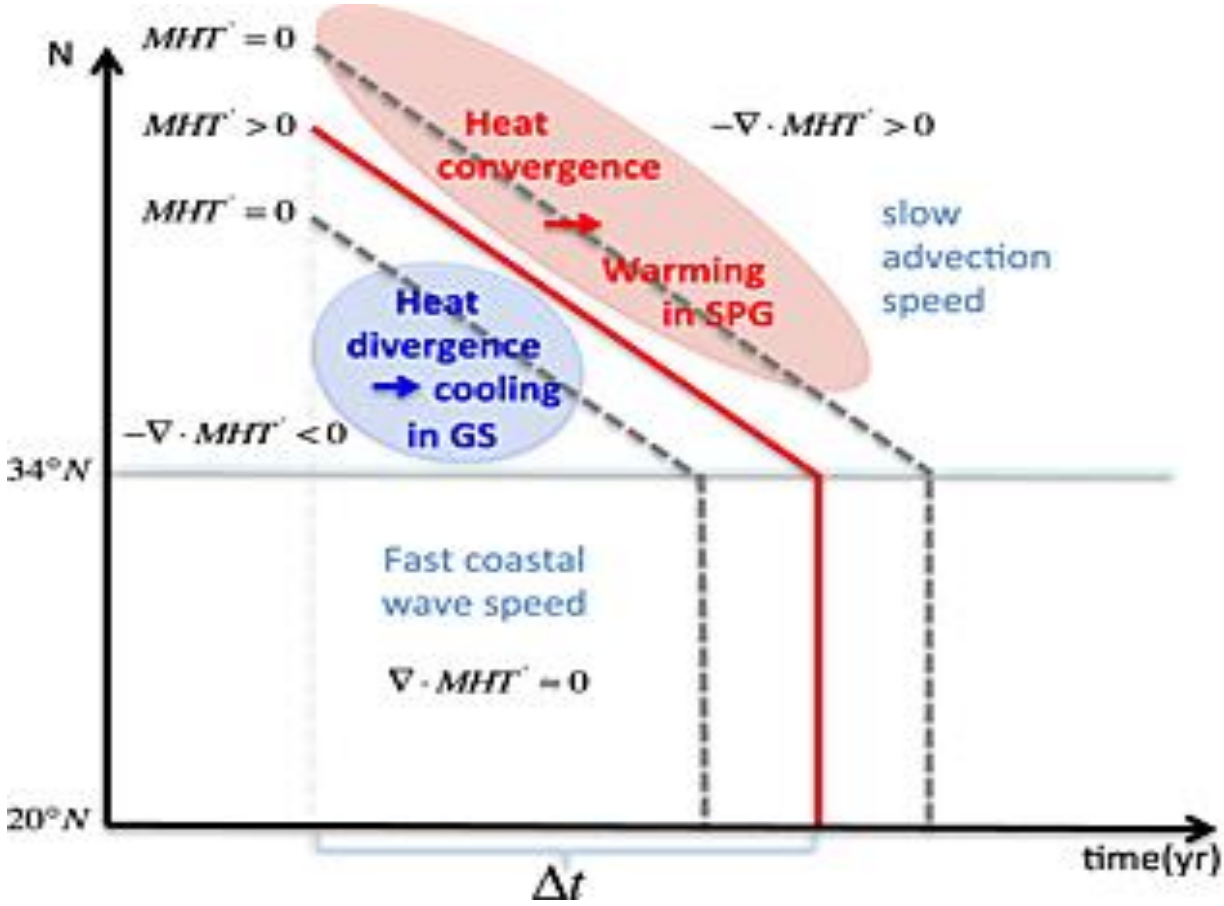
Surface heat flux anomalies: stronger upward signal after strong OHT phases

5 Years



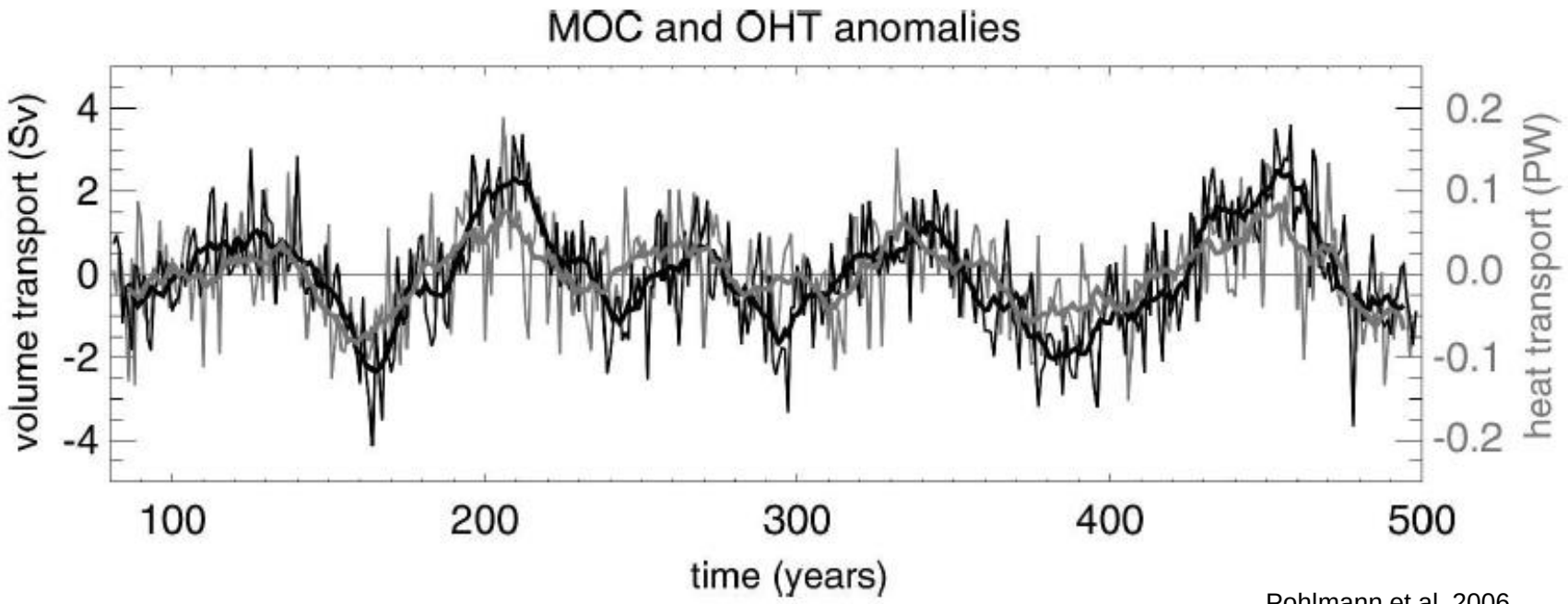
A Mechanism for AMOC Variability & the AMOC Fingerprint

- Slow advection transports a strong AMOC southward
- This results in the „AMOC Fingerprint“ in SSTs
- GFDL CM2.1



(Zhang & Zhang, 2015)

AMOC and Ocean Heat Transport vary on many time scales



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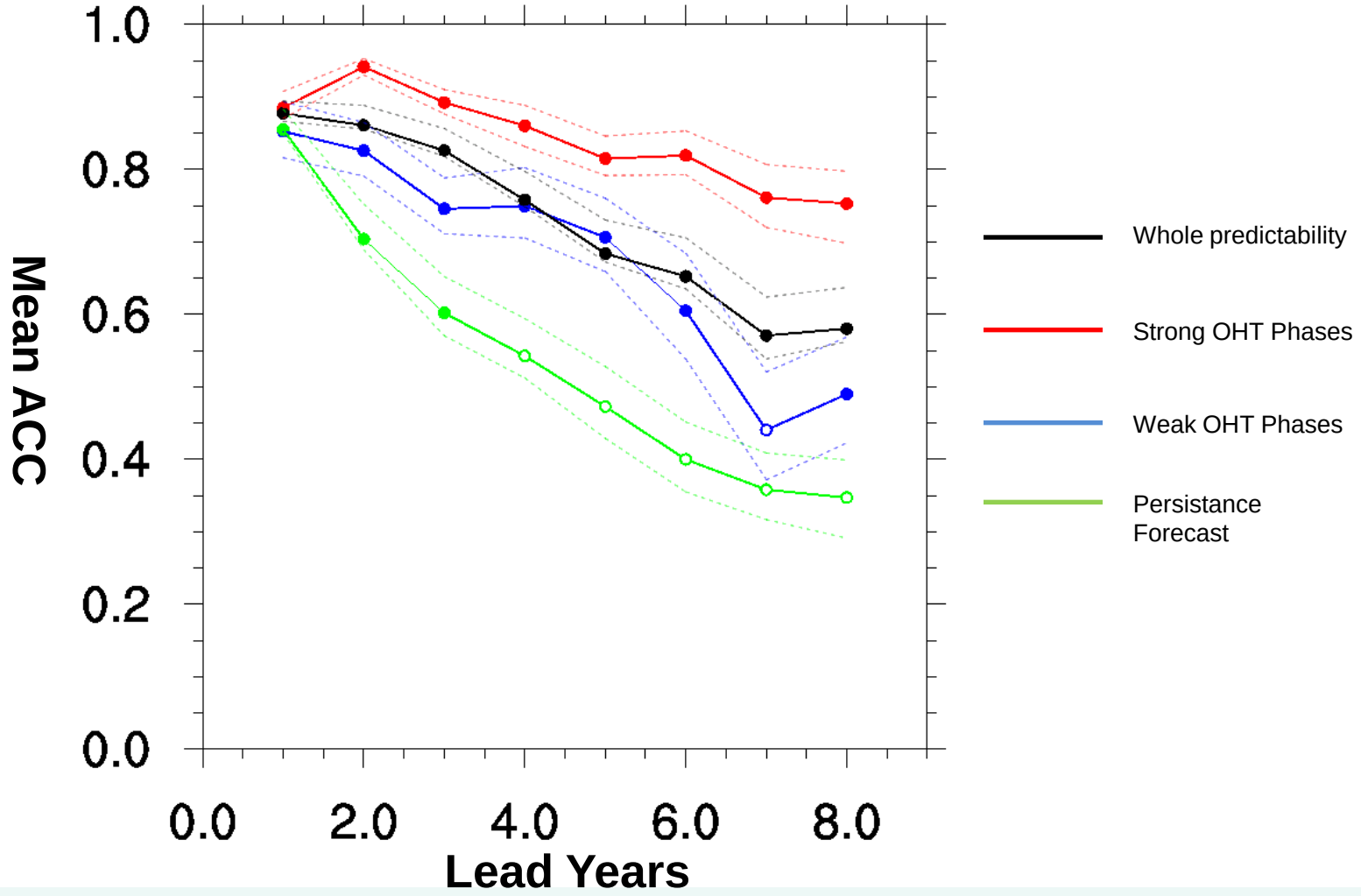

Surface heat fluxes are predictable and show a stronger upward signal after strong OHT phases

Lead Years 3-5