



**Regional Projections of Climate on
Decadal Time Scales:
High resolution global predictions
and regionally resolved source
response studies**

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Main Foci of the Project

Study the optimal way to obtain **regional** climate information on **decadal** timescales :
Comparing three approaches

- 1) Uniform high resolution
- 2) Local mesh refinement
- 3) Two-way nesting of NRCM

All within the context of experimental decadal prediction



Nuances and Responsibilities

1. Understand modeled decadal variability
 - NCAR team responsible for climate variability, source-response and initialization
2. Pose the problem in terms of source and response targets
 - Sandia responsible (with NCAR) for high resolution and LMR
3. Leverage efforts to assess the validity of Regional Climate Modeling
 - Stony Brook responsible for two-way coupling and NRCM within CAM

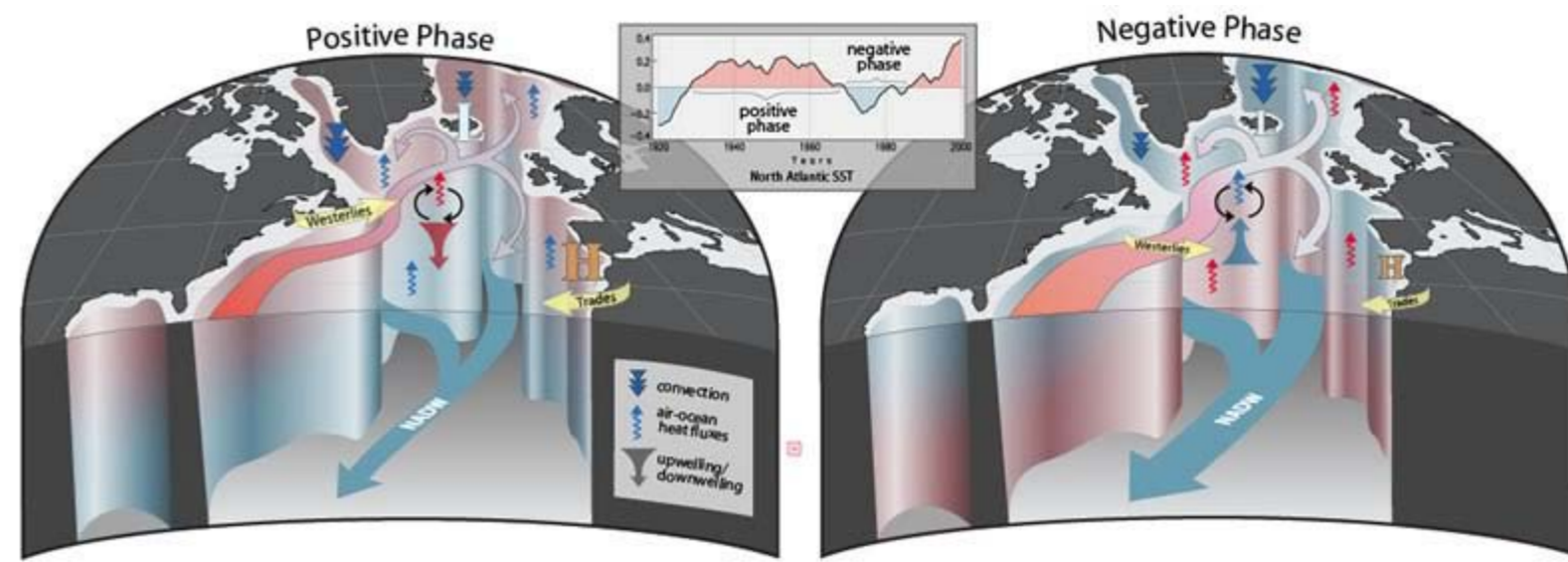


Ambitious program depends on 3 year time line
Highly leveraged(CCA, CSSEF, SciDAC)
Year 1 setting up infrastructure

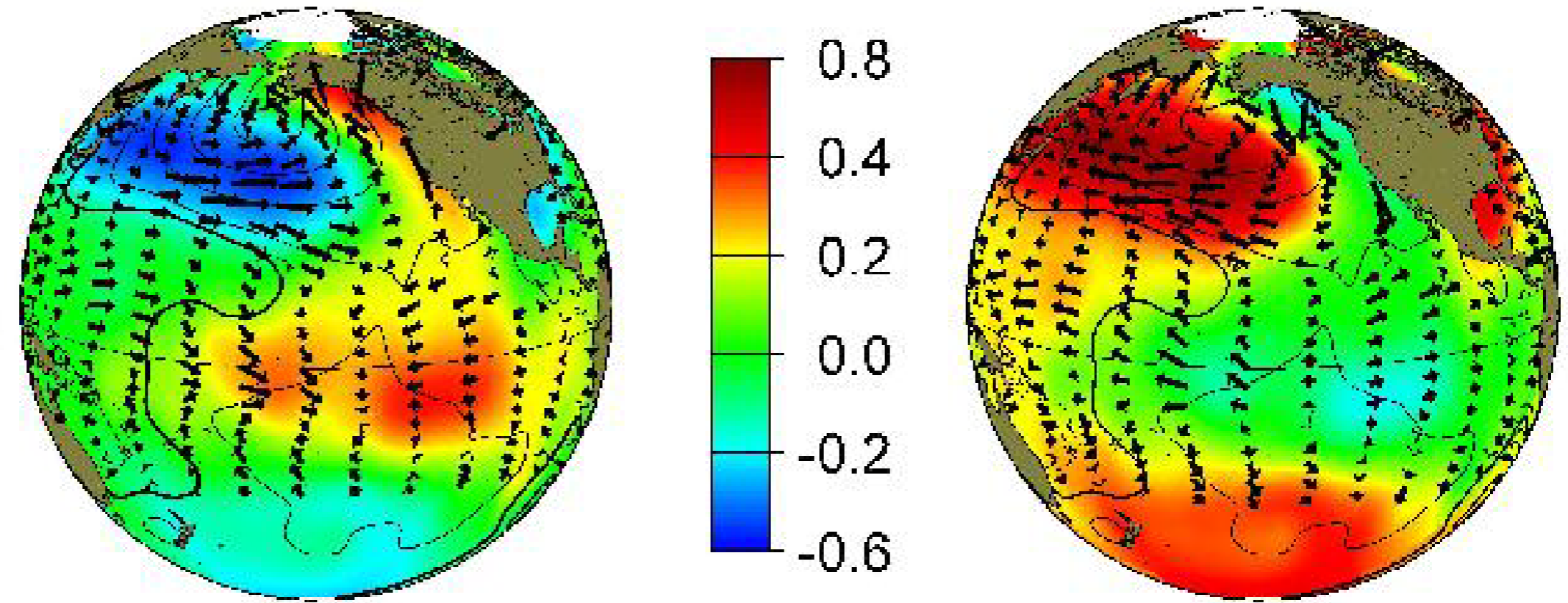
- Study decadal variability and source-response
- High resolution ($1/4^\circ$) atmosphere tuning
- Local Mesh refinement
- NRCM executed within CAM

Two Sources of Decadal Variability

AMOC and AMV



PDO and PDV

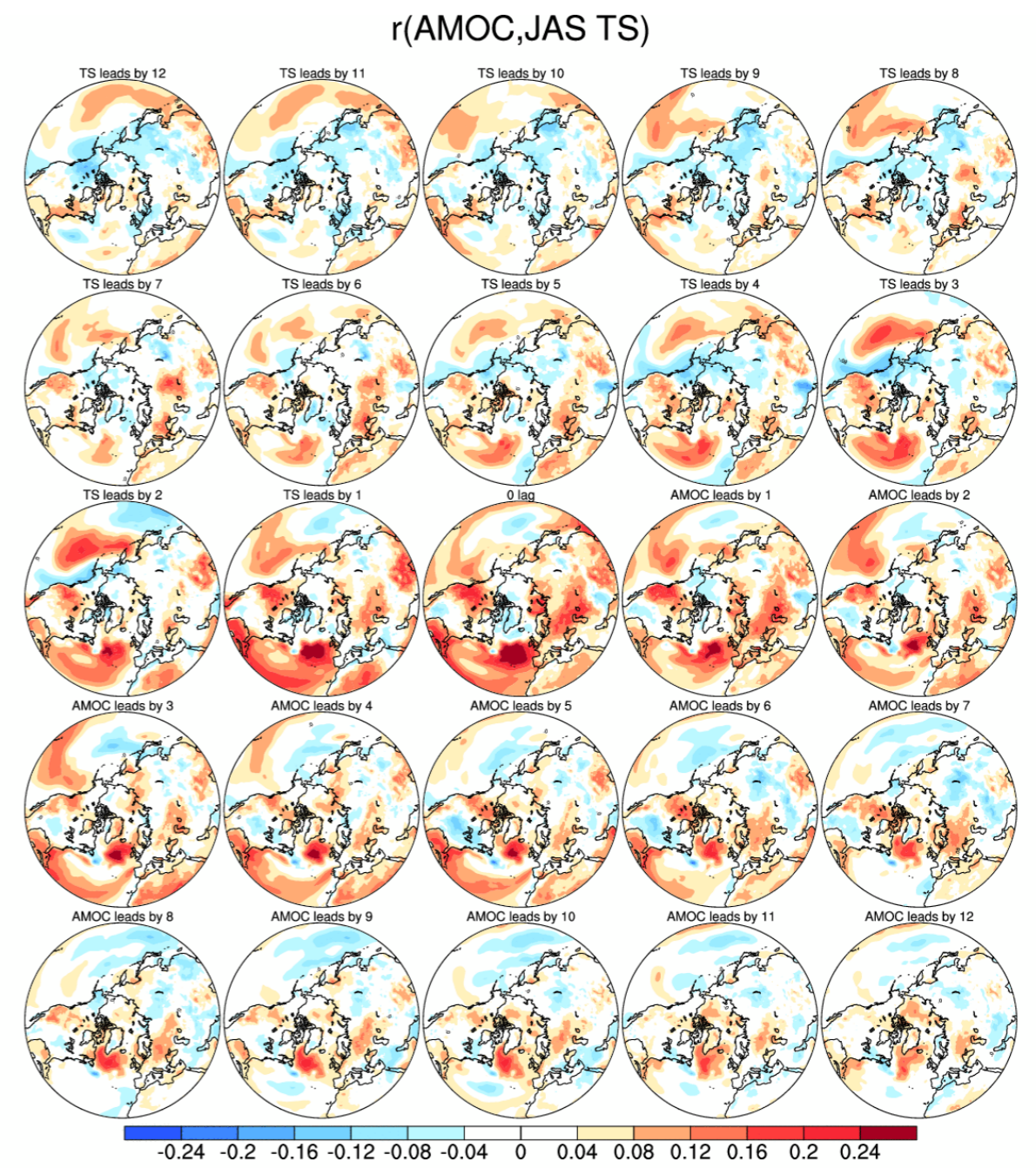
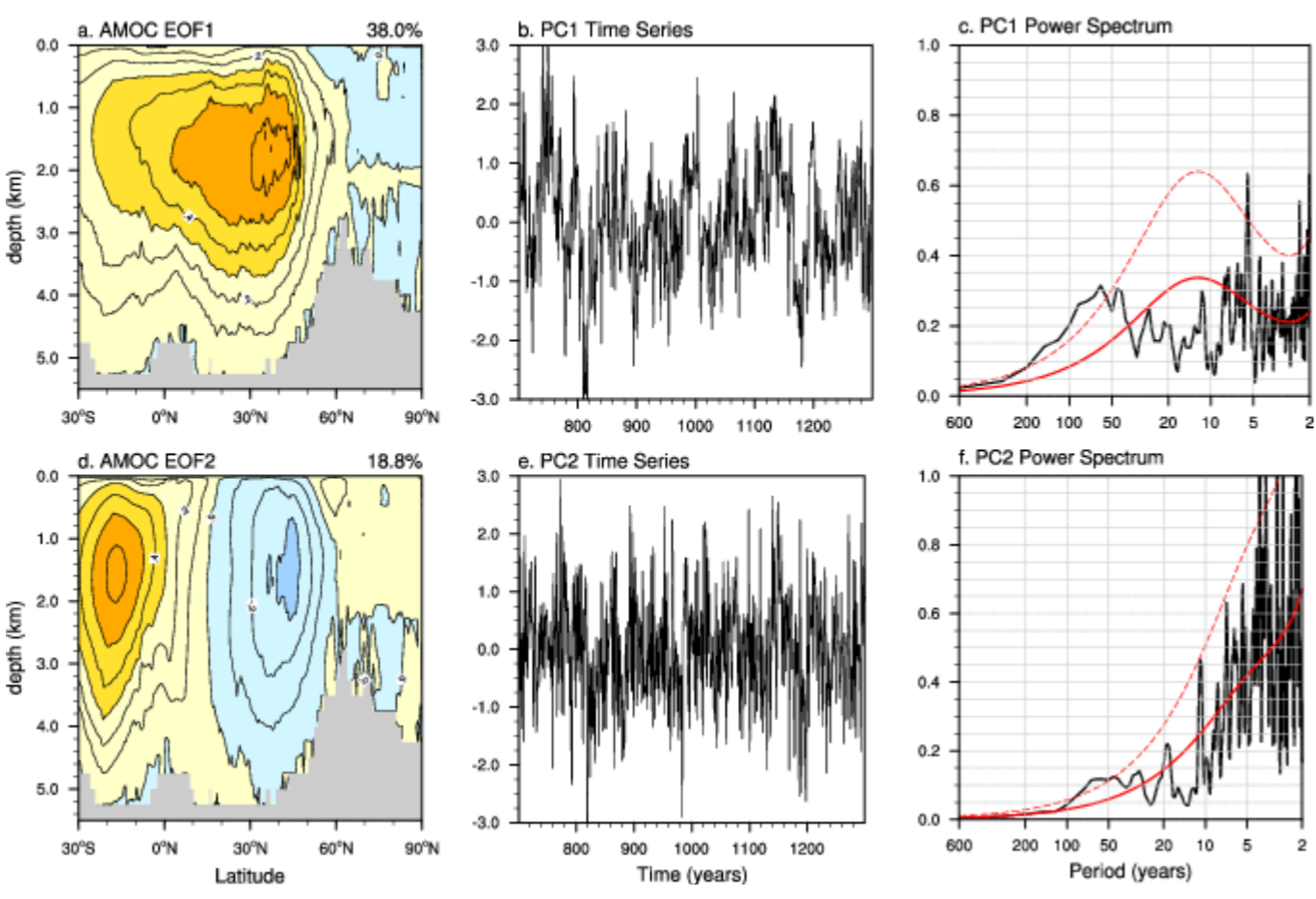


Atlantic Meridional Overturning Circulation leads Surface Temperature fluctuations

Jim Hurrell and
Gokhan Danabasoglu

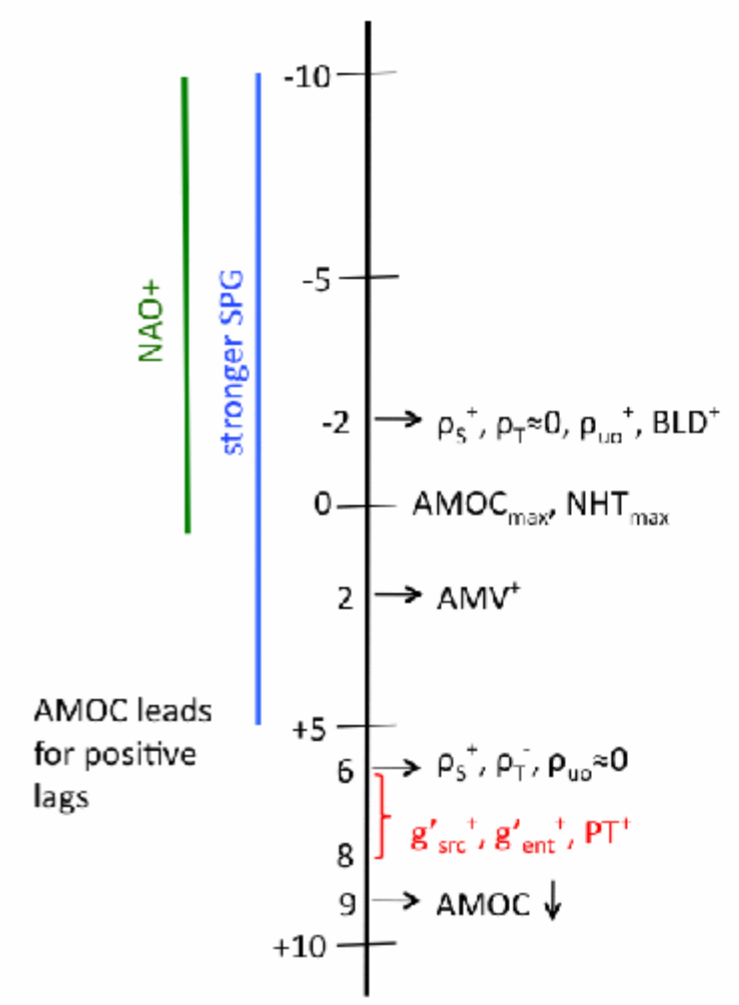
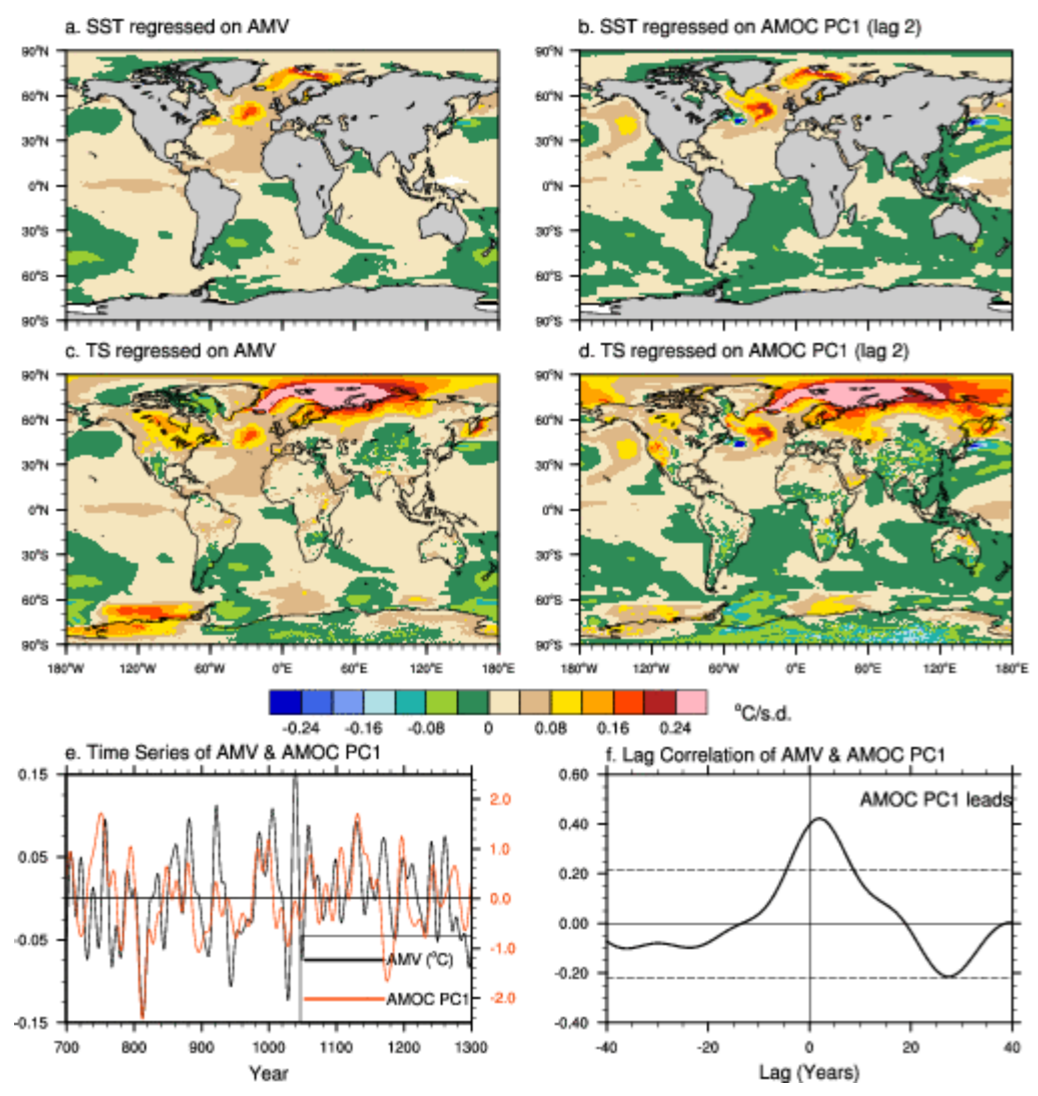
2 Year lead

Leading EOFs of AMOC Variability

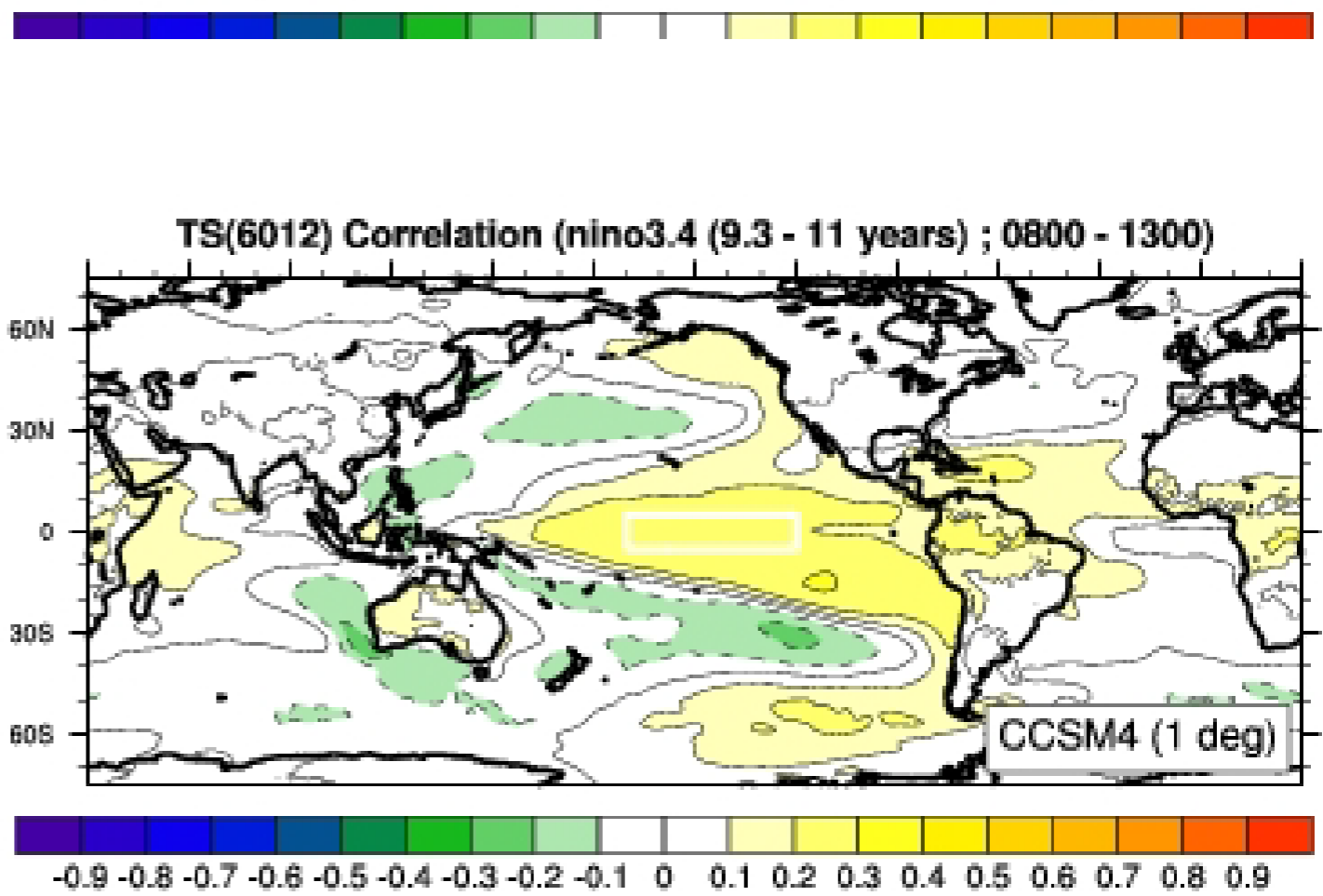
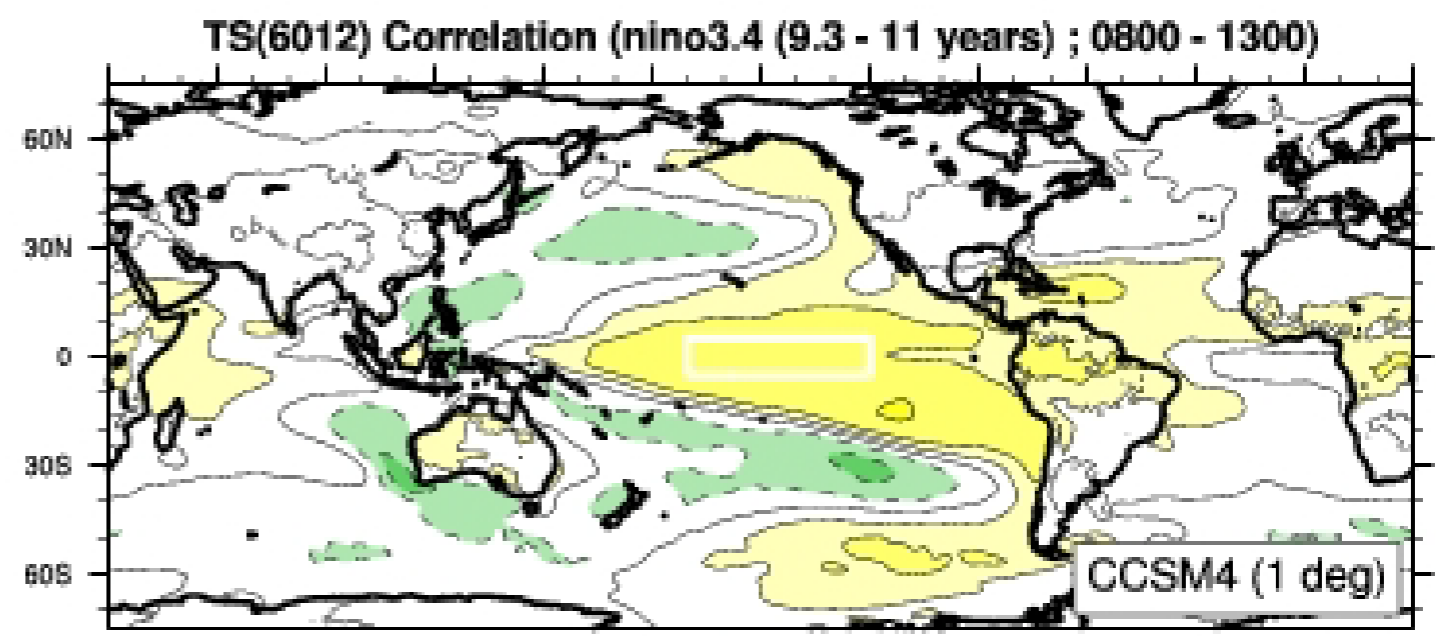
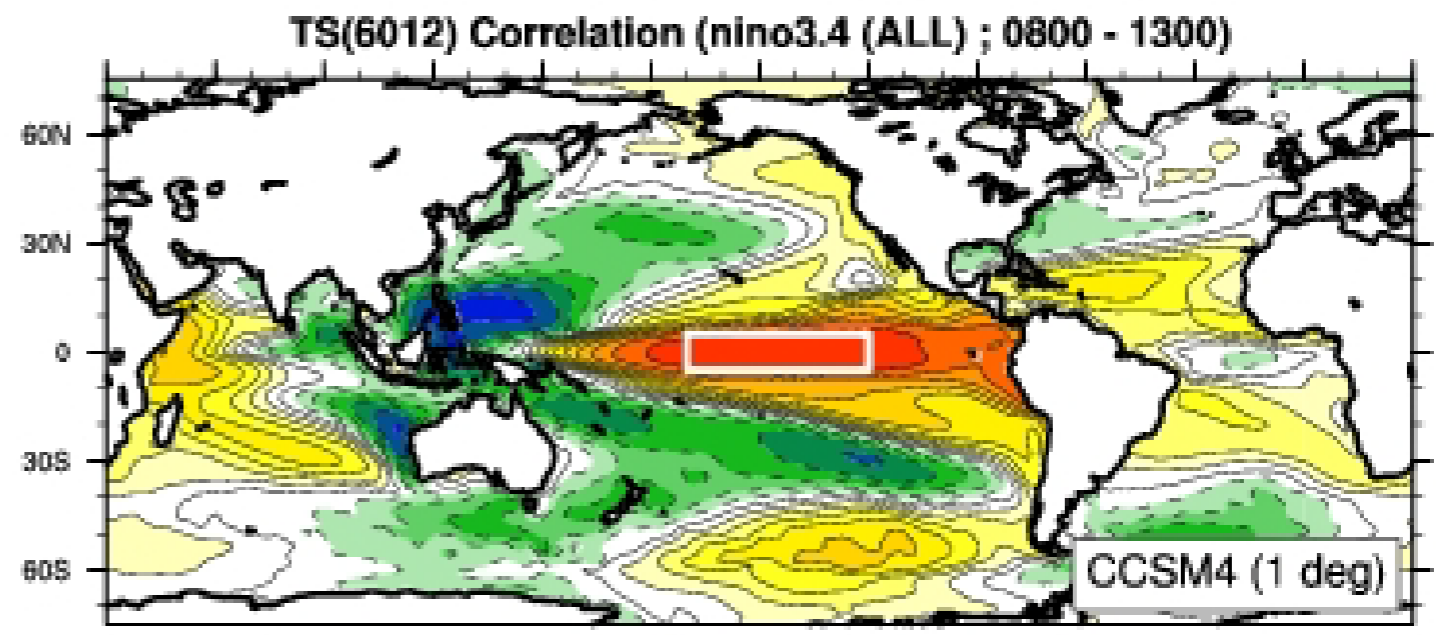
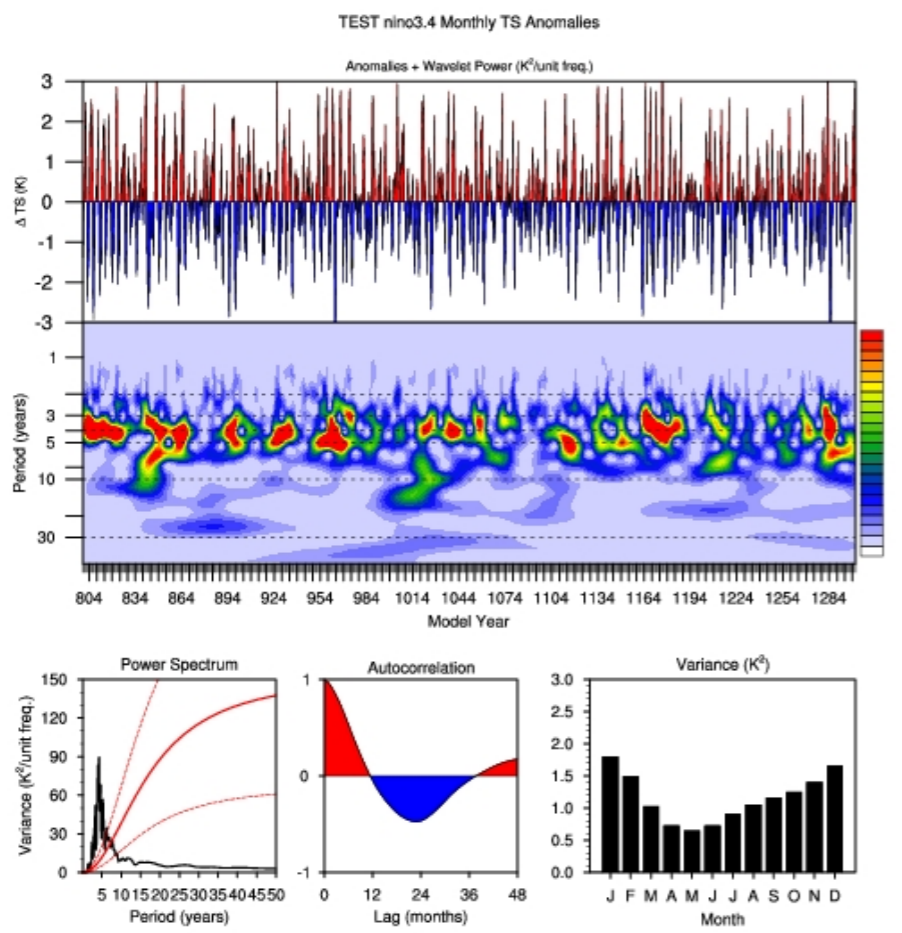




Related to the fact that AMOC Northward Heat Transport leads AMV



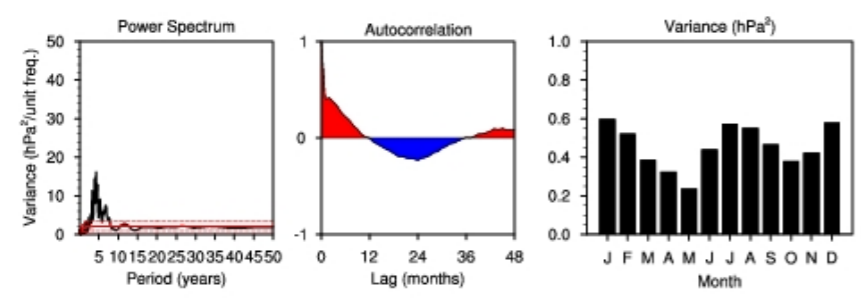
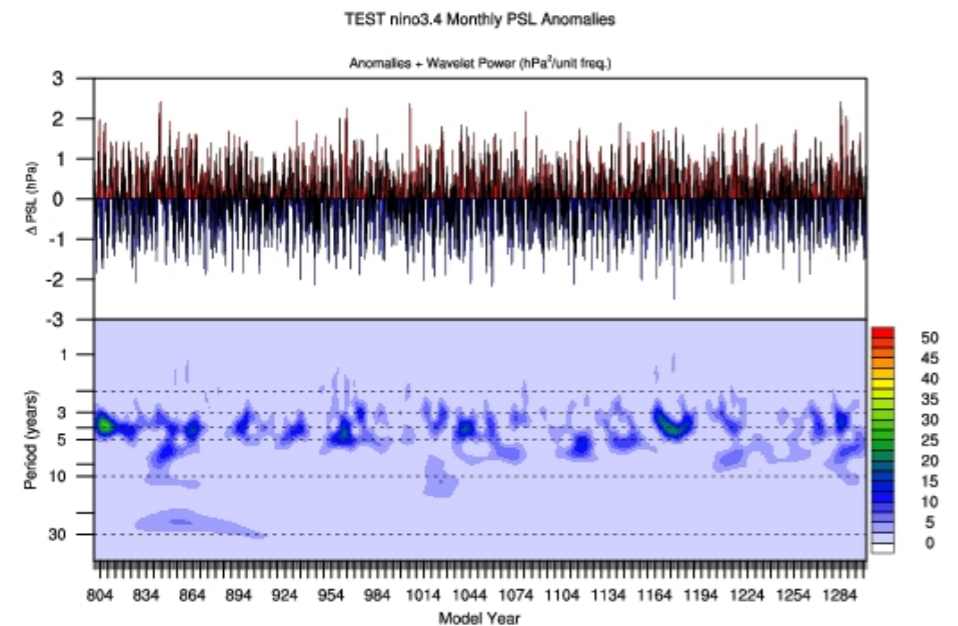
Global TS variations Correlated with decadal Nino3.4



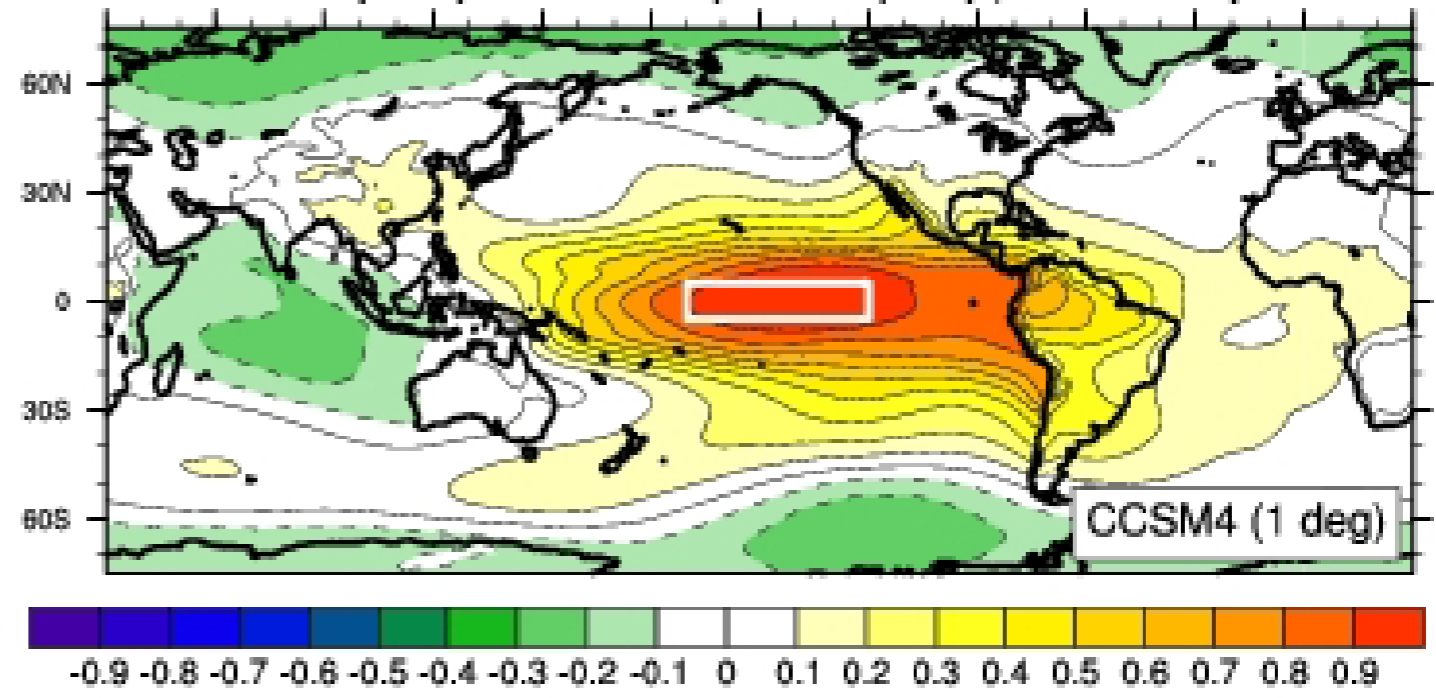


UCAR-DOE Cooperative Agreement

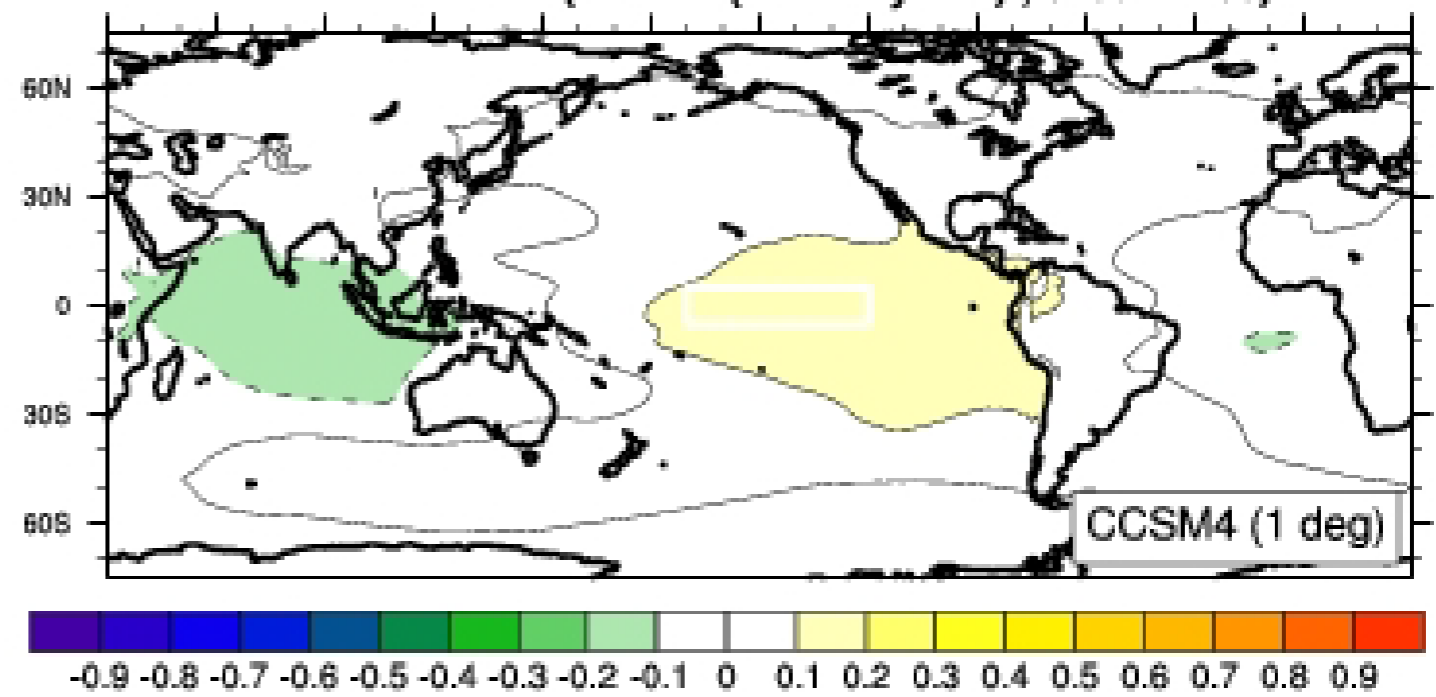
DOE/SC/BER Climate Change Prediction Program



PSL(6012) Correlation (nino3.4 (ALL) ; 0800 - 1300)



PSL Correlation (nino3.4 (9.3 - 11 years) ; 0800 - 1300)



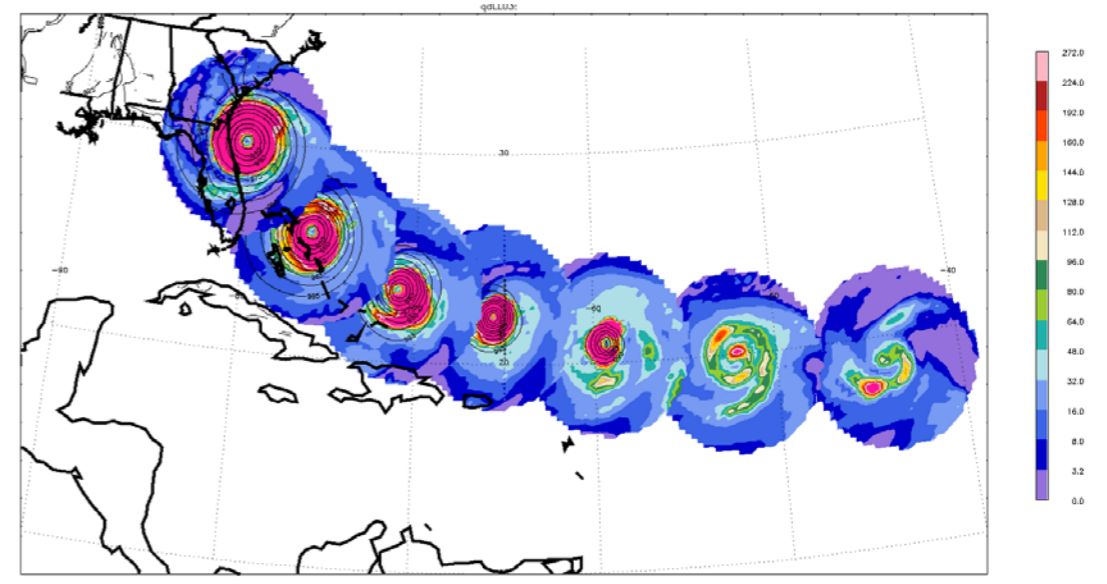
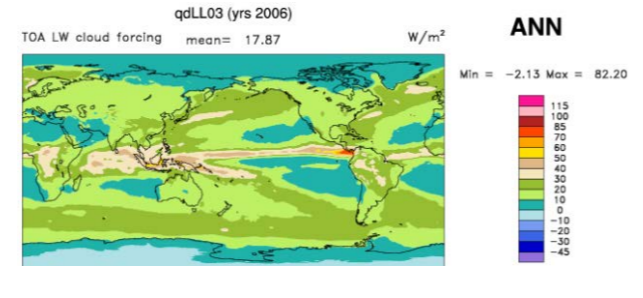
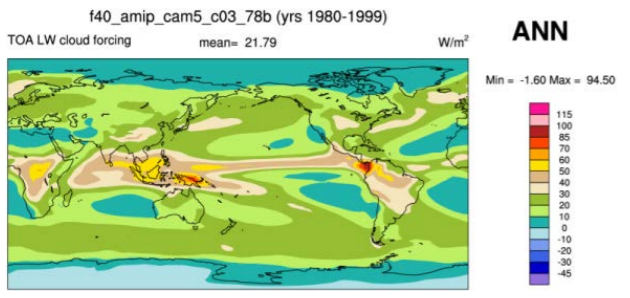
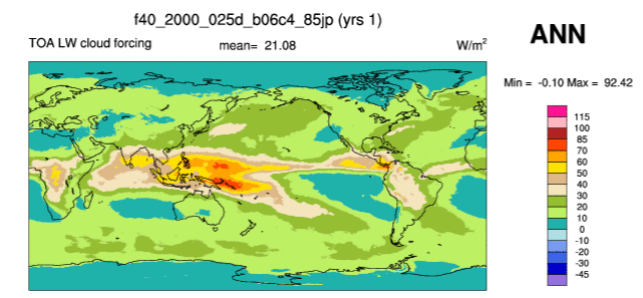
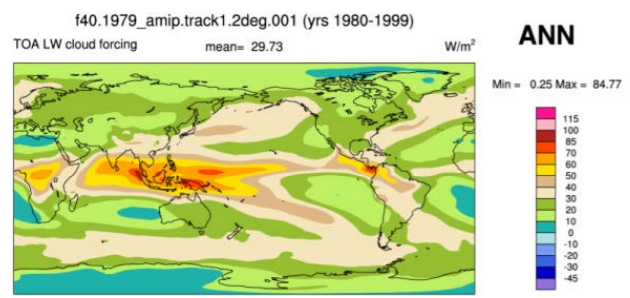
PSL



Likely change to CAM5 physics for high resolution

Advantage of CAM5 for clouds:
Little resolution dependence

Tropical Cyclone at 1/4°
In CAM5

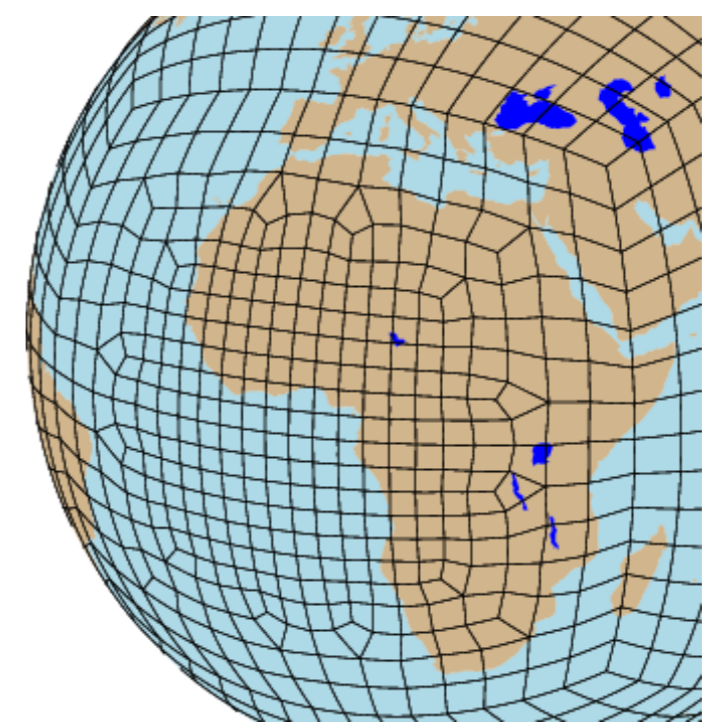
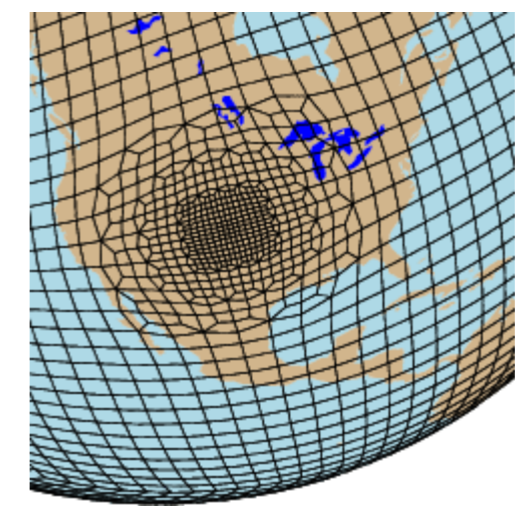


Local Mesh Refinement

Uniform Low (1°) Resolution



**High resolution ($1/4^\circ$)
Response and source regions**



Mike Levy and Marl Taylor



"WEAKLY" COUPLED EnKF DATA ASSIMILATION

Force each ocean ensemble member with a different member from an atmospheric ensemble reanalysis:

- Run an 80-member ensemble of CAM assimilation with 6-hourly coupler output files from each member,
- Run a 46-member ensemble of POP assimilation forced with output from 46 of the CAM assimilation runs.

This technique is already operational (starting from 1 January 1998) and preliminary analyses indicates much increased ensemble spread.



Two way Nesting of NRCM and Conclusions

He and Zhang have poster on Two Way nesting

Mike Levy's poster on LMR in HOMME (yesterday)

We started to complete proposed
work in the 3 year timeline- all work shown
in preparation, draft or to be published stage



The End

Questions?



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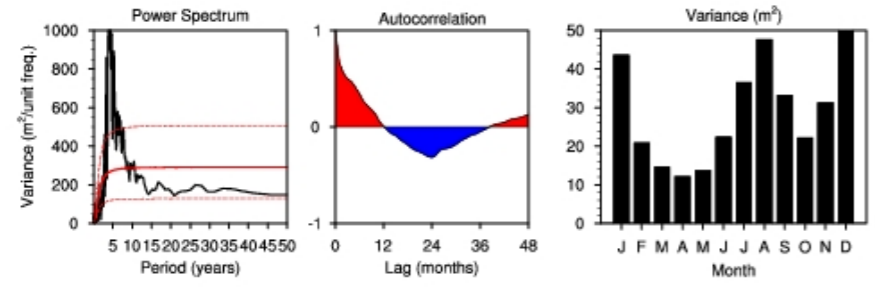
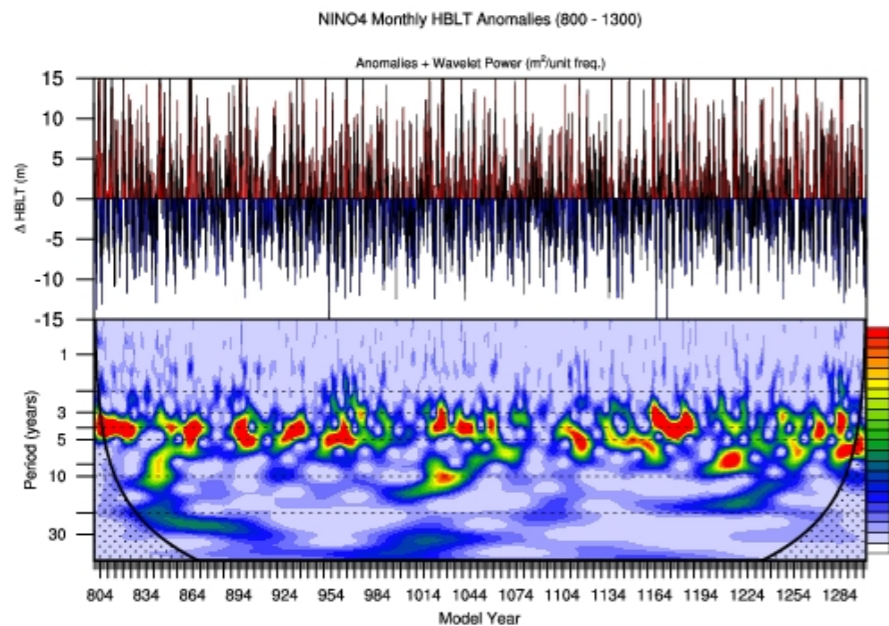
DOE/SC/BER Climate Change Prediction Program



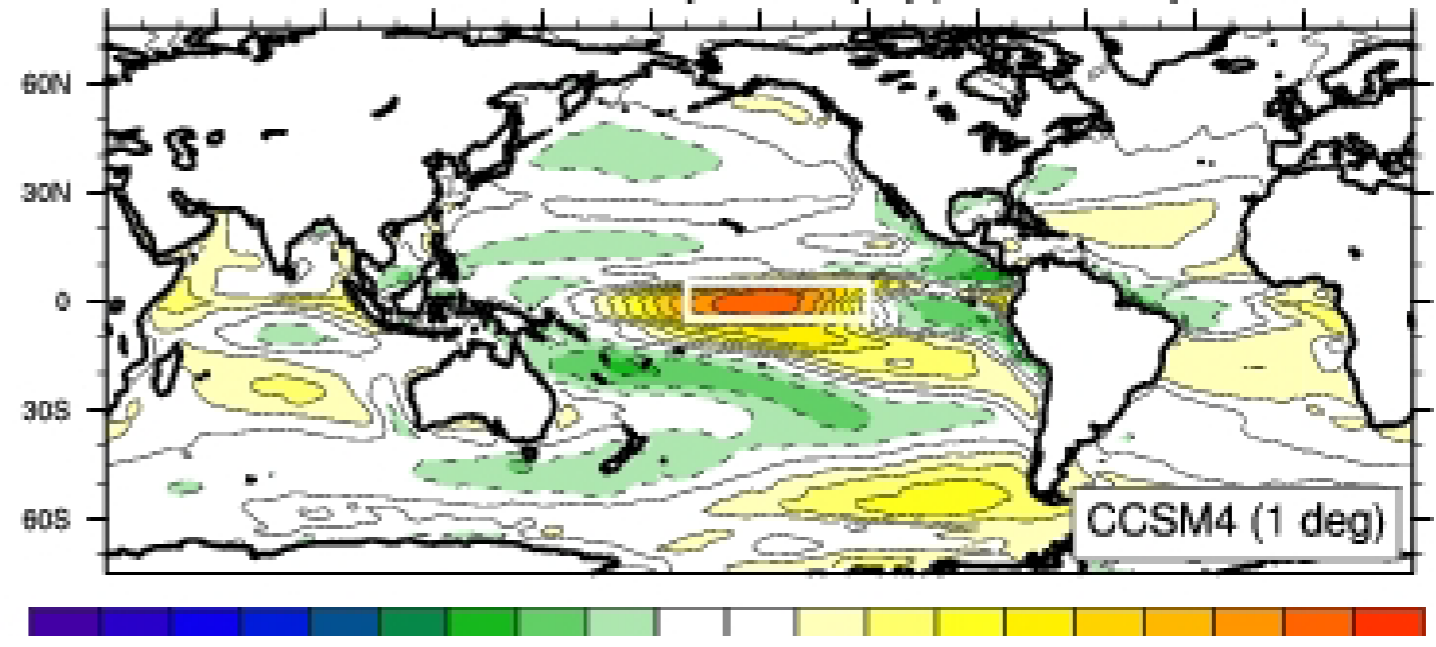


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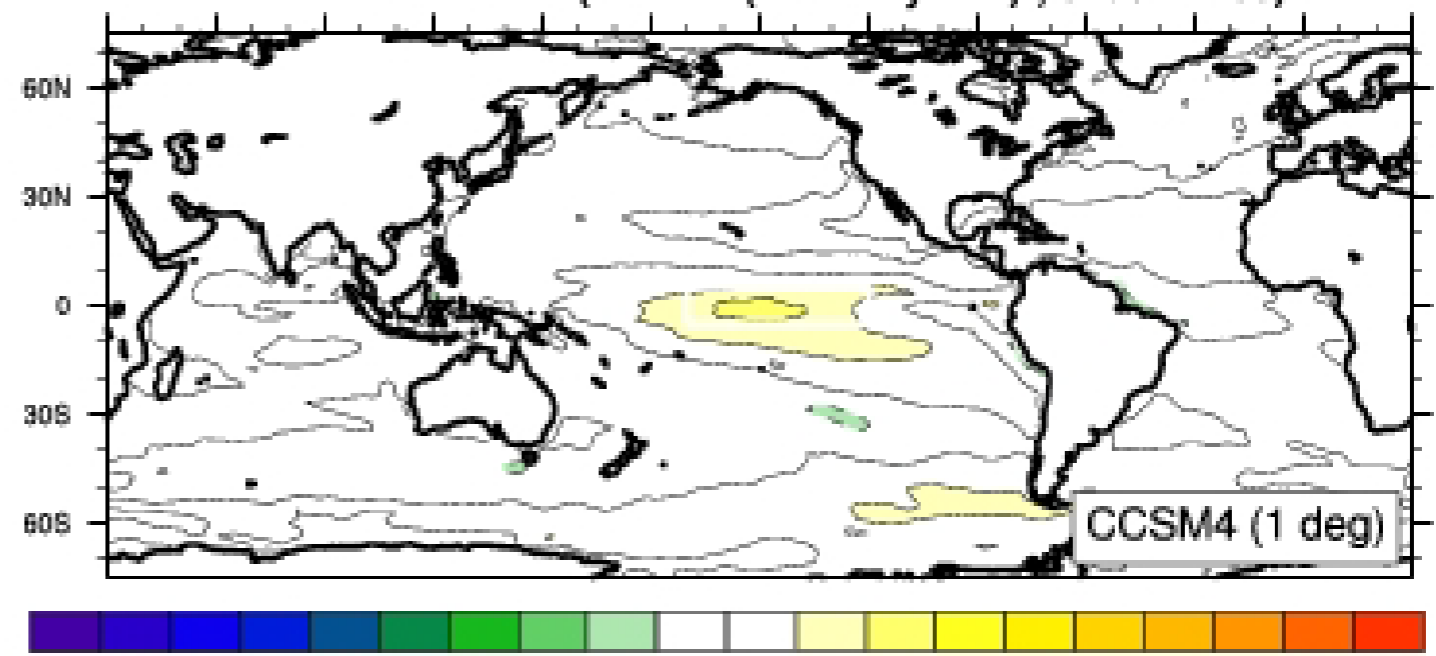
DOE/SC/BER Climate Change Prediction Program



HBLT Correlation (nino3.4 (all) ; 0800 - 1300)



HBLT Correlation (nino3.4 (9.3 - 11 years) ; 0800 - 1300)

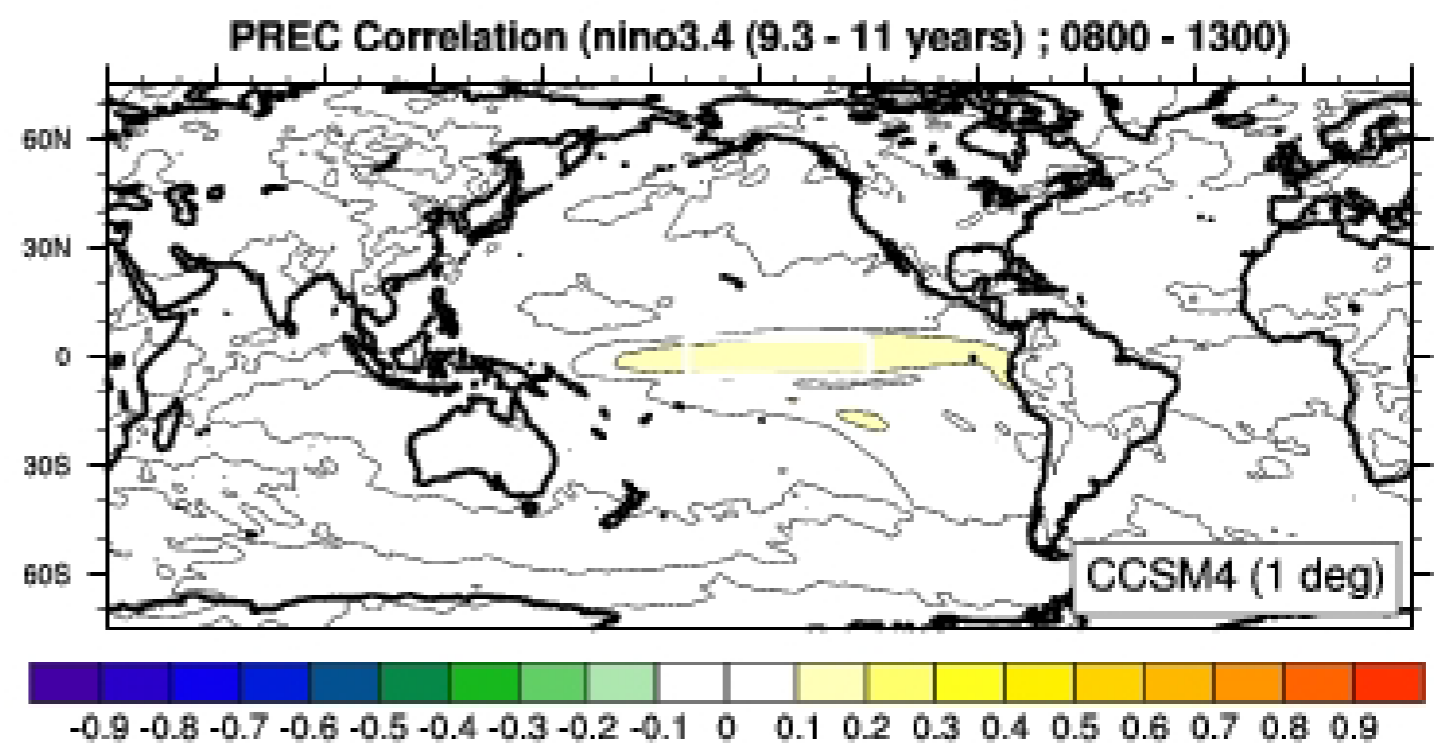
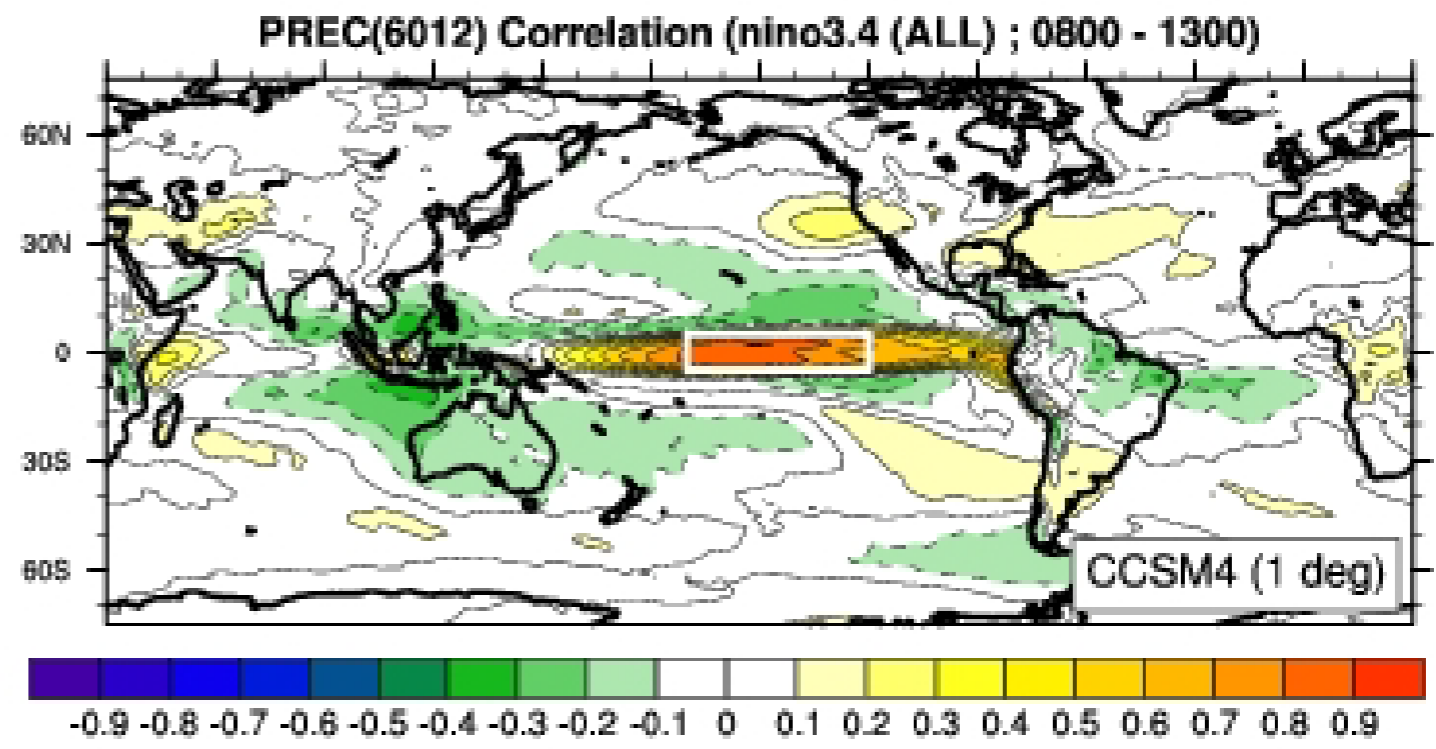
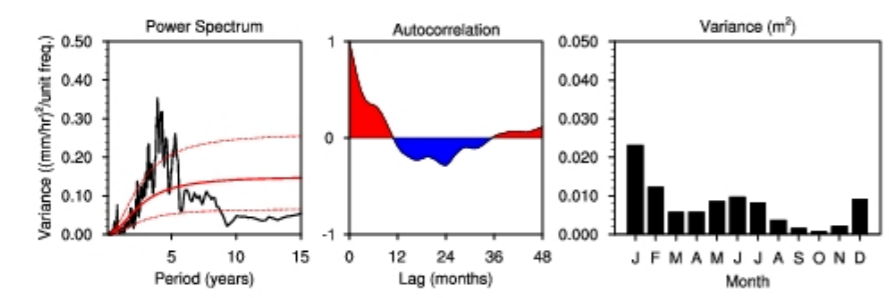
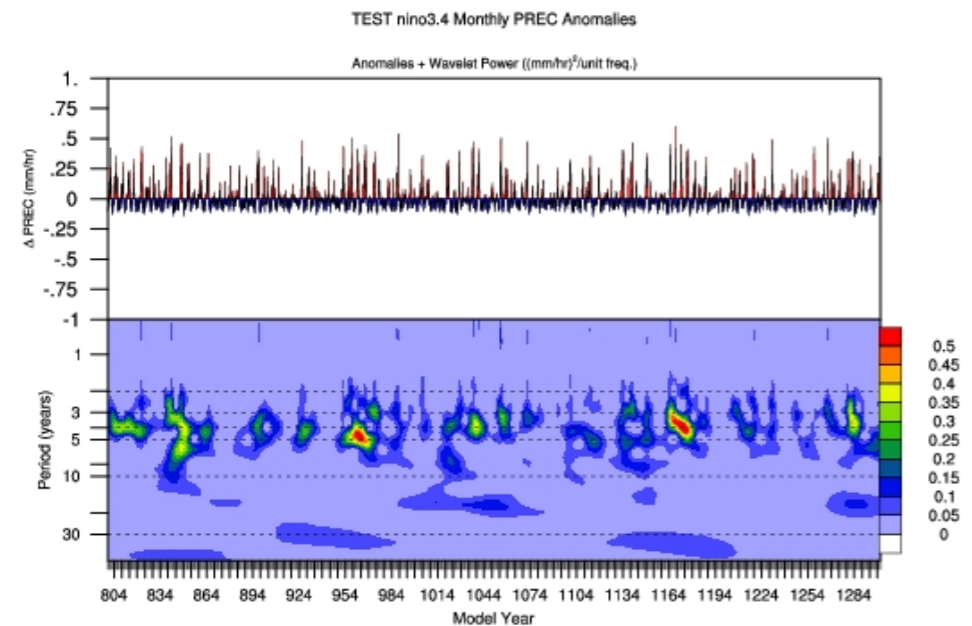


HBLT

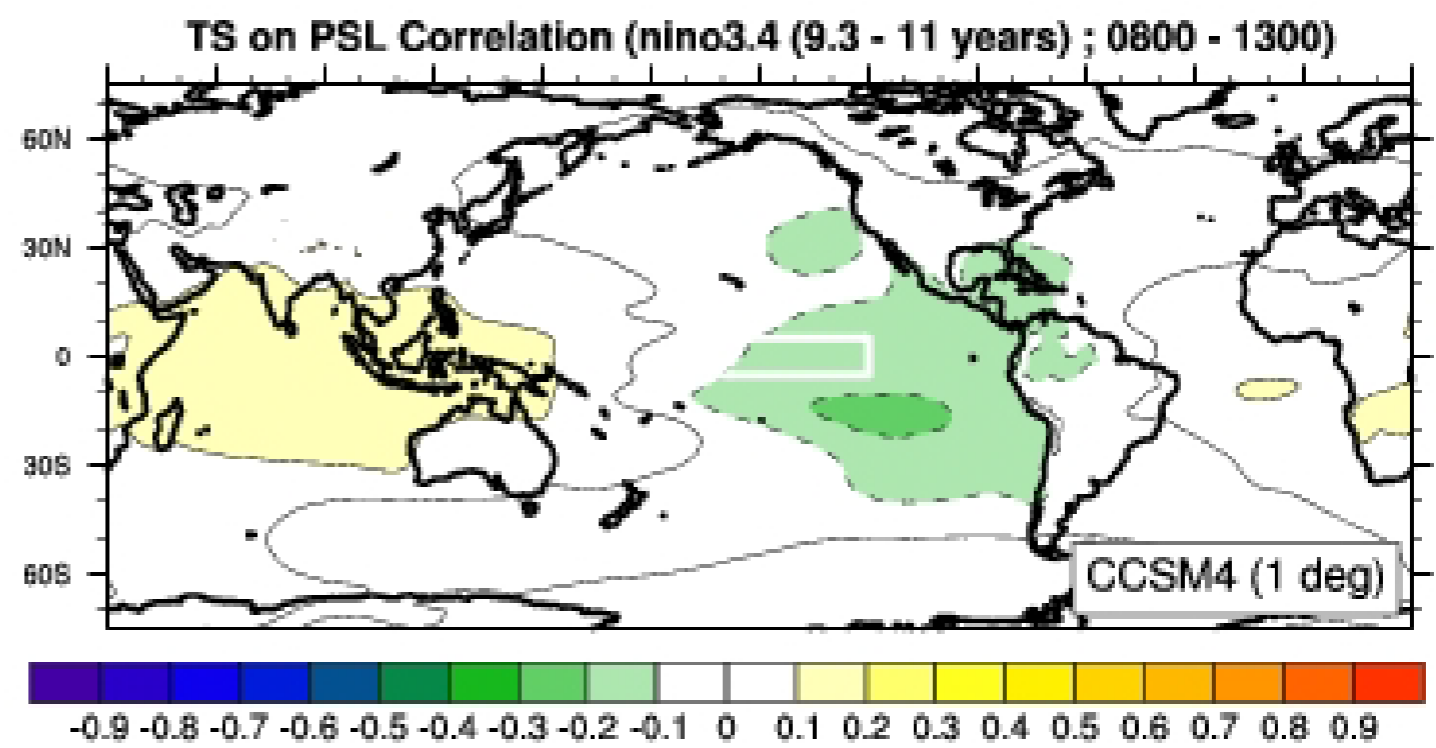
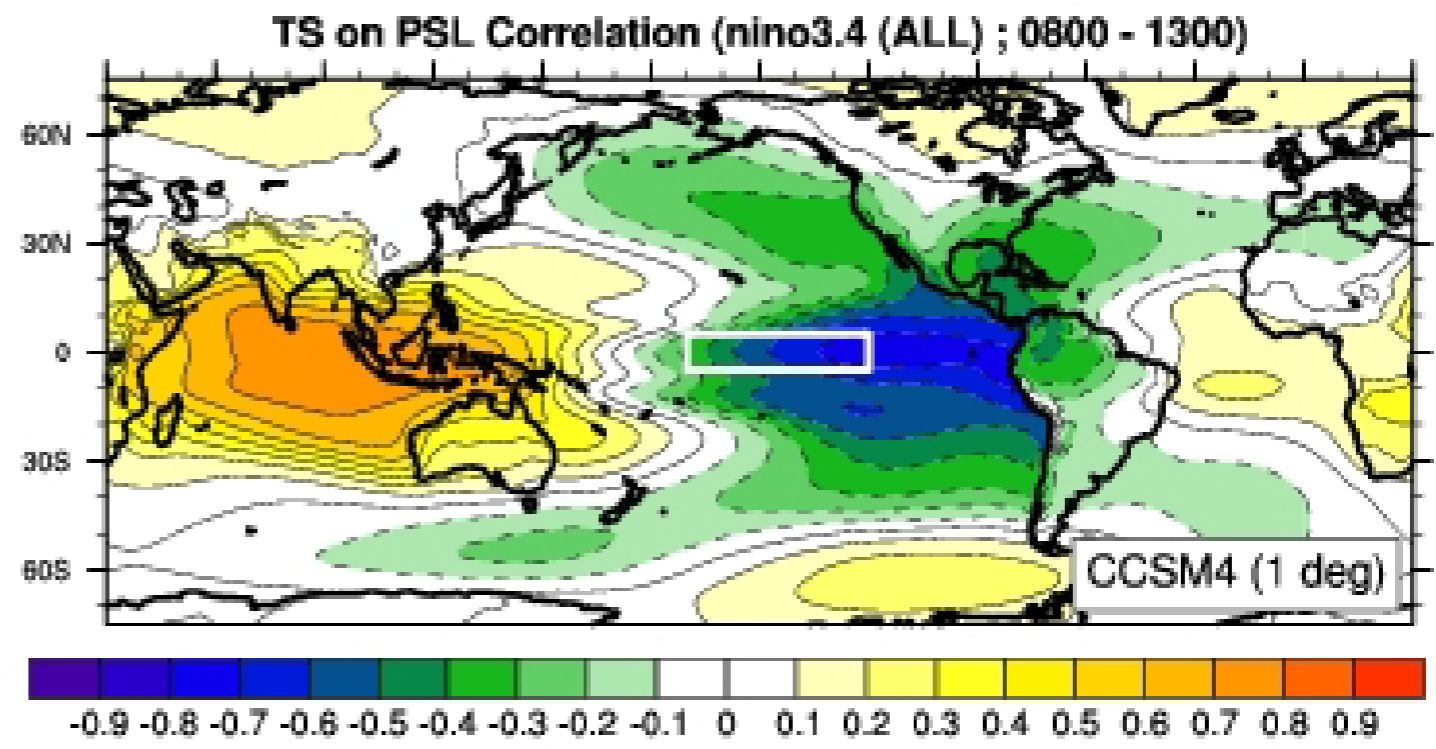


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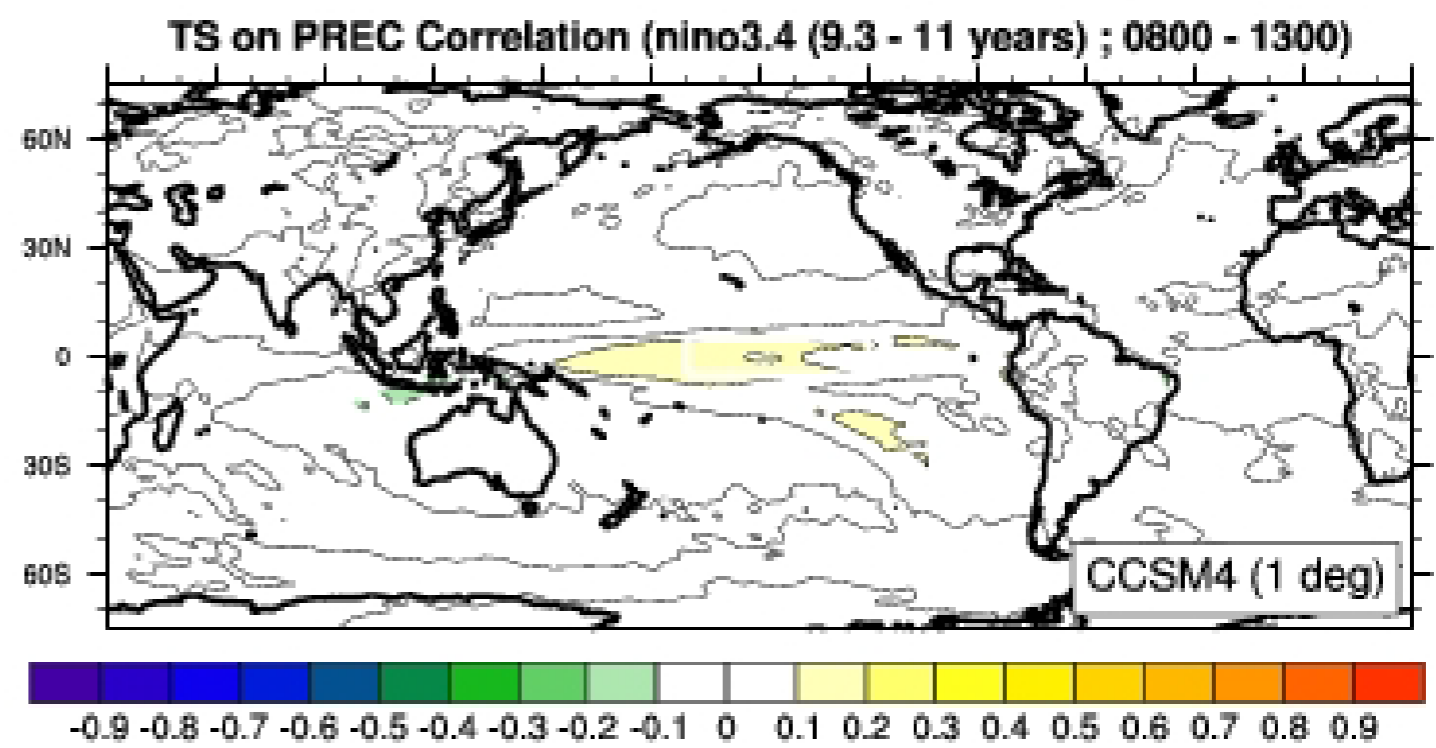
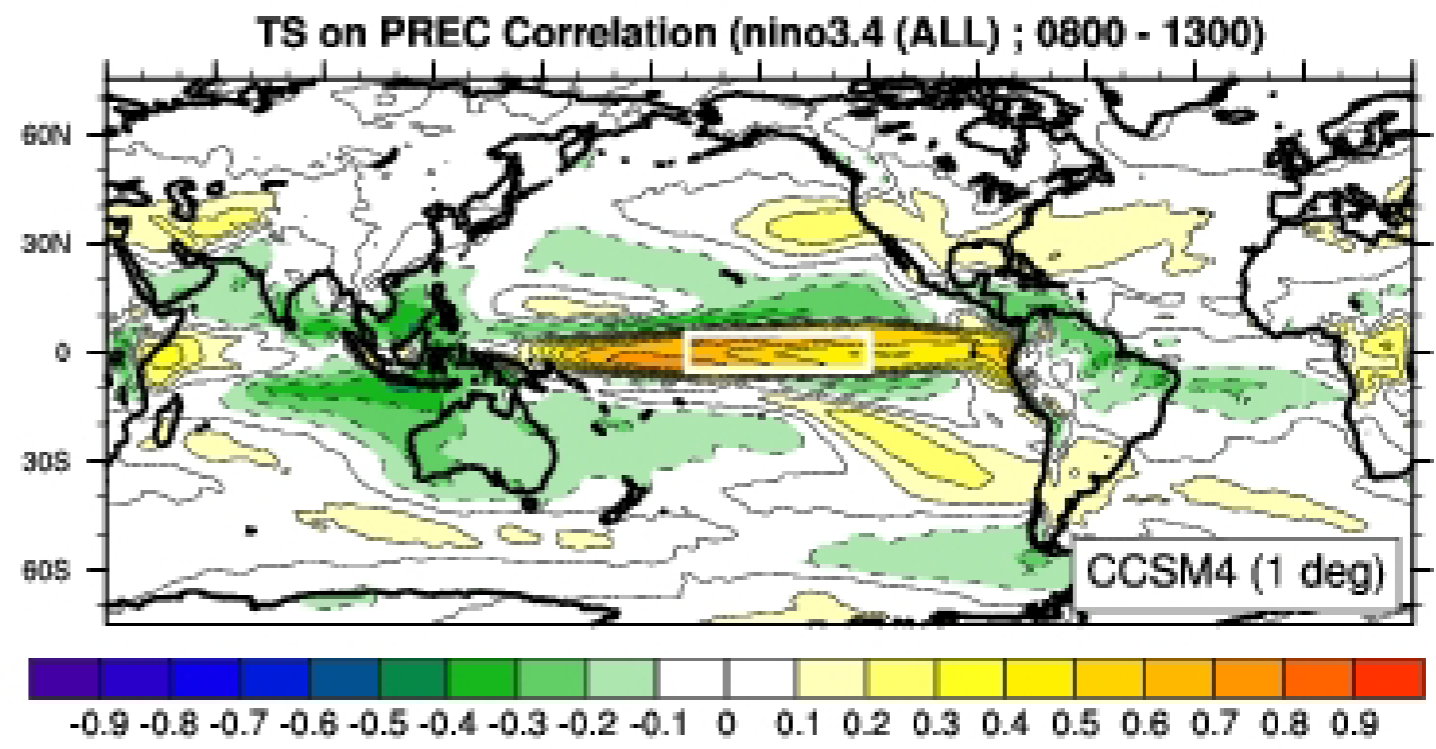
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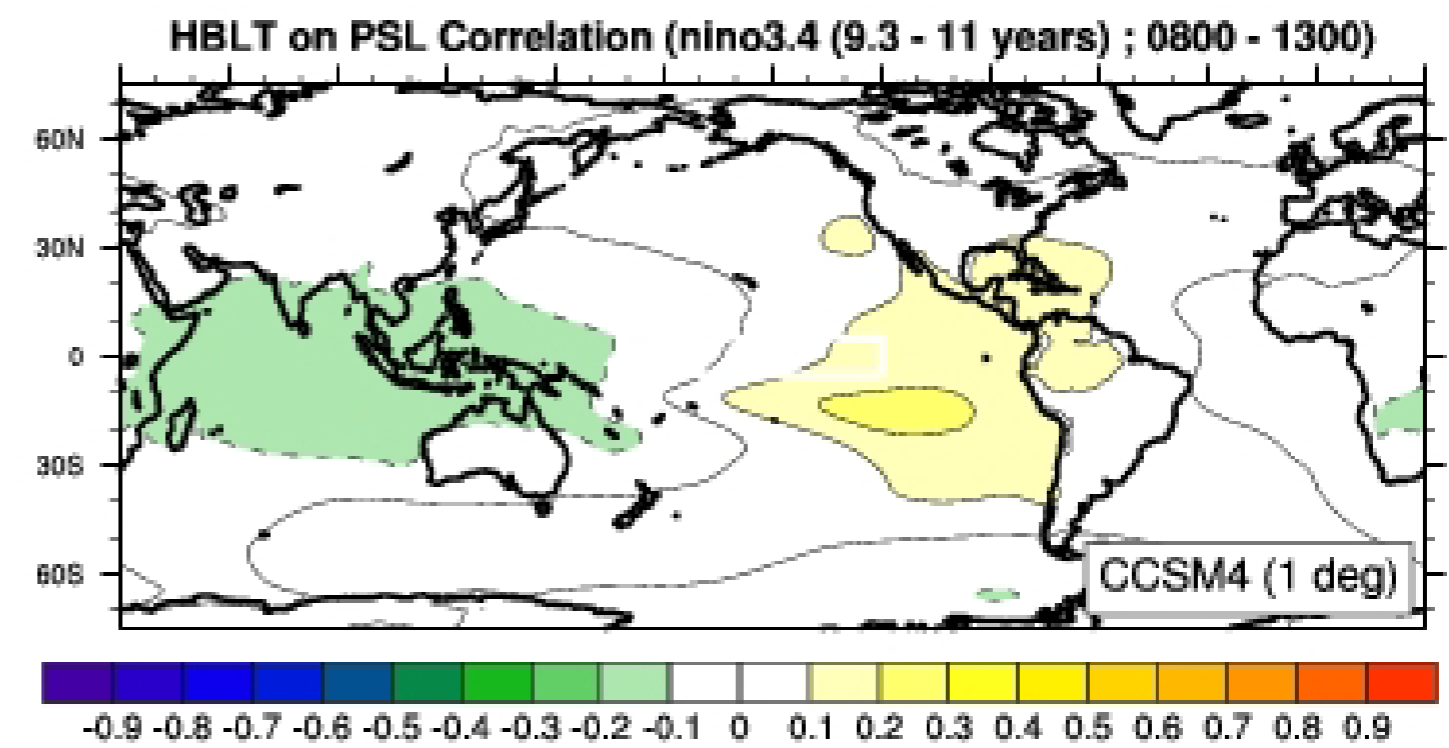
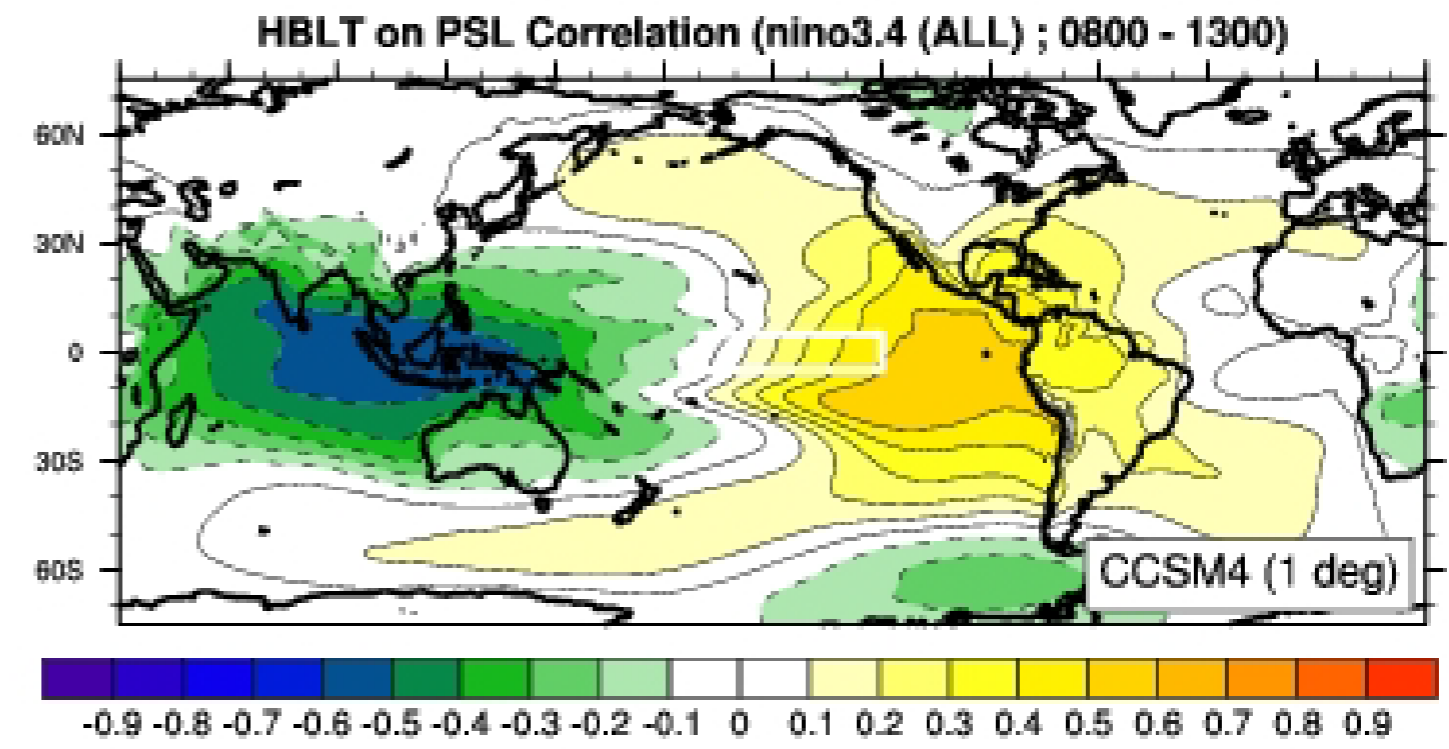
PREC



TS on PSL



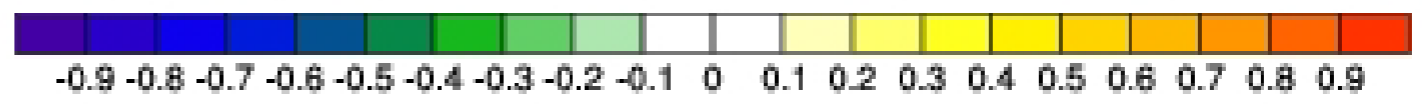
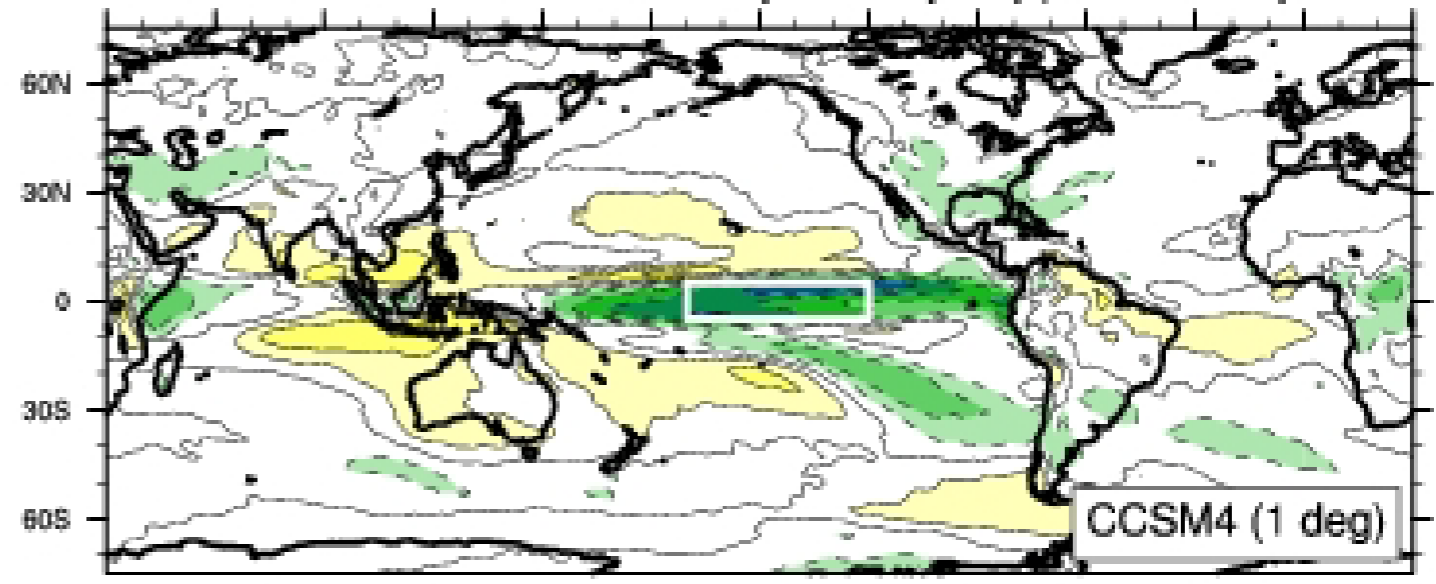
TS on PREC



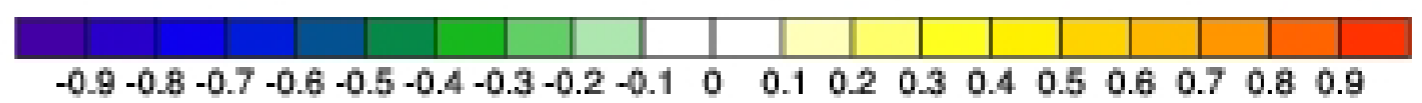
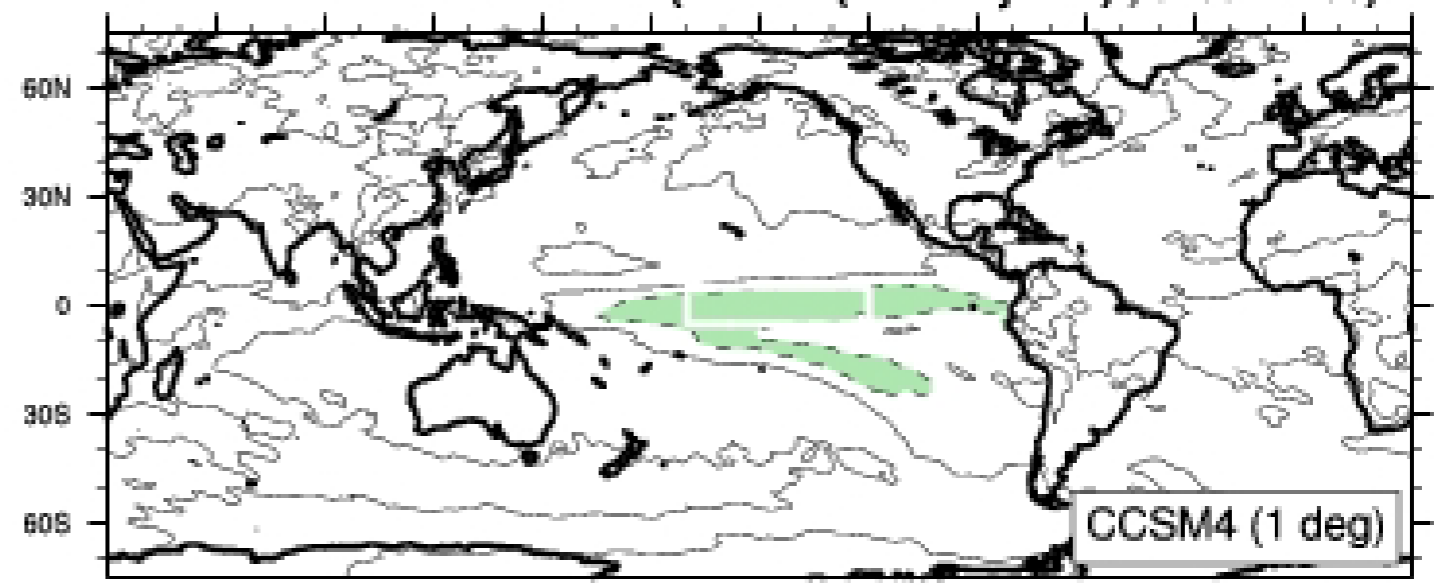
HBLT on PSL



HBLT on PREC Correlation (nino3.4 (ALL) ; 0800 - 1300)



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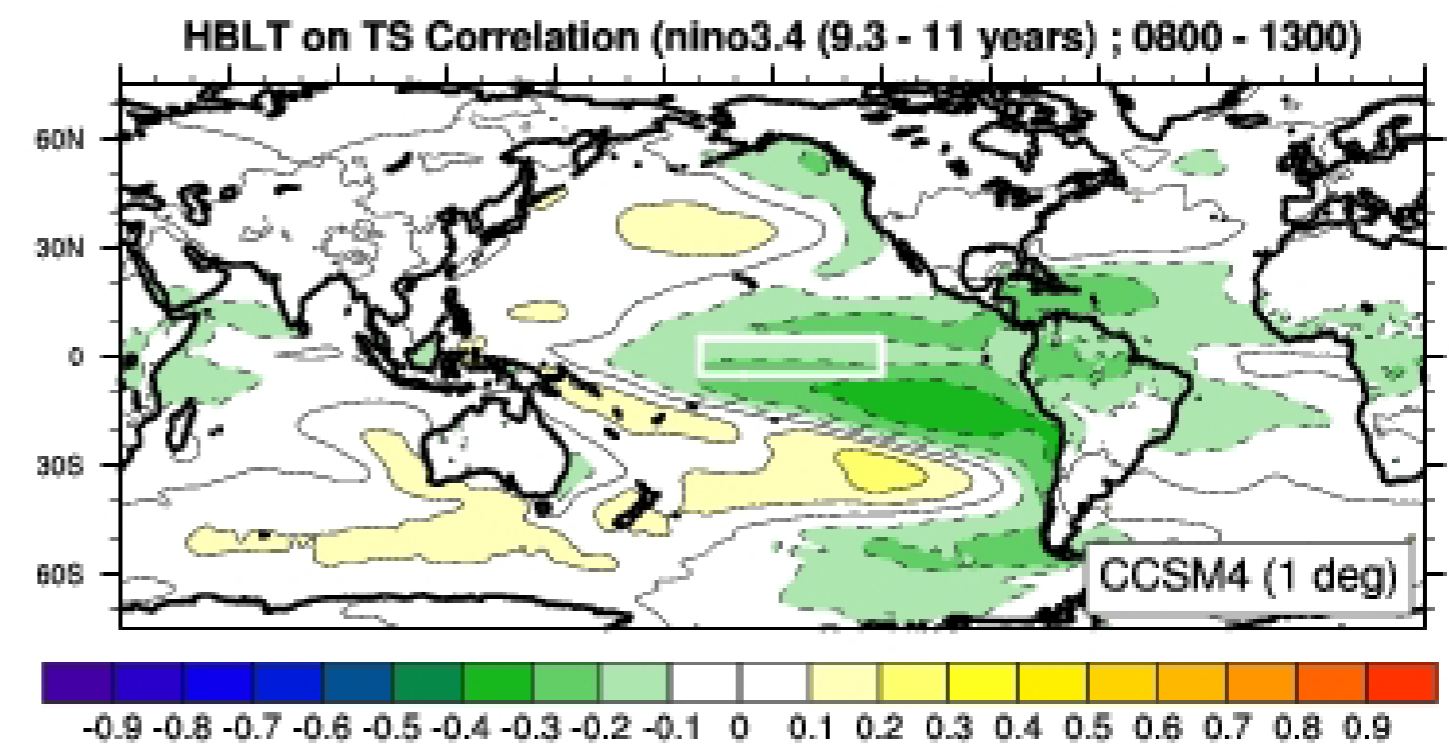
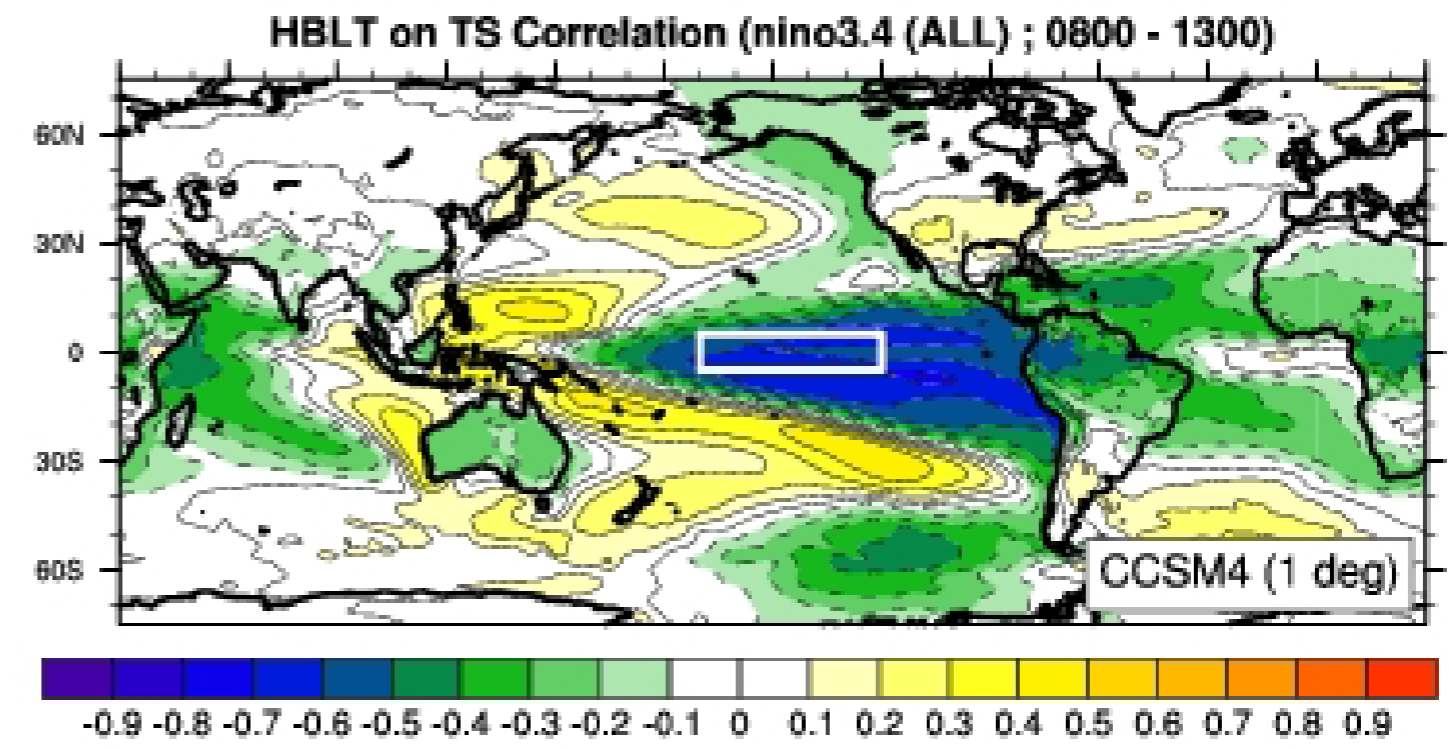
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HBLT on TS