Discussion Period 4 : Tropical-Extratropical Interaction

Speakers :

William Lau	The 2010 Pakistan flood and Russia heat wave/wildfires
Prashant Sardeshmukh	Predictability at the intersection of weather and climate
David Reynolds	Pacific atmospheric rivers: Impacts on extreme rainfall, flooding, and water supplies

Posters

Kang	Decadal variations of tropical cyclone activity over western North Pacific in a warming environment
Ashrit	Impact of DWR data assimilation on the high-res. prediction of an intense rainfall event over Delhi
Hu	Mechanisms of poleward expansion of the Hadley circulation: Observations and Simulatons
Hong	Role of European blocking and tropical-extratropical interaction on the Pakistan flood in 2010
Sun	Heat content variation in East China sea and its effect on humidity and heat transports into China
Ryoo	A lagrangian trajectory model of atmospheric rivers over Pacific-North America during YOTC
Chang	Anatomizing the ocean's role in the Pacific Decadal Oscillation.
Dong	The tropospheric biennial oscillation over east Asia and its effect on precipitation and circulation
Guan	Does the MJO influence wintertime atmospheric rivers and precipitation in caifornia ?
Liu	Relationship between the Mei-Yu over the Yangtze basin and tropical cyclogenesis over west Pacific
Jiang	An A-train view of the atmospheric response to El Ninio

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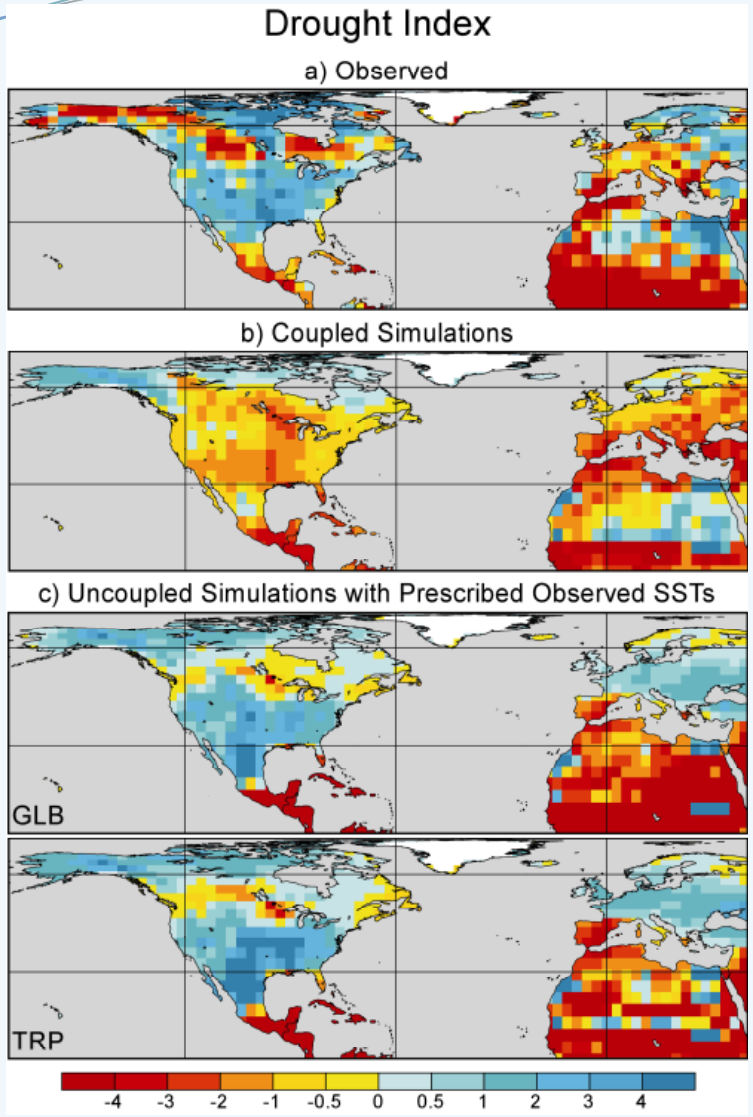
Some issues to consider

1. **Limited Predictability (of heat waves, floods, Atmospheric rivers)**

2. **Will ultra-high model resolution heal everything ?**

3. **Importance of coupling ?**

Trends of annual Palmer Drought Severity Index (PDSI) over 1951-1999



Observed trends

Simulated in **COUPLED** IPCC/AR4 models with prescribed observed radiative forcings

Simulated in **UNCOUPLED** atmospheric GCMs with prescribed GLOBAL SSTs, but no explicitly specified radiative forcings (GOGA runs)

Simulated in **UNCOUPLED** atmospheric GCMs with prescribed TROPICAL SSTs, but no explicitly specified radiative forcings (TOGA runs)

From Shin and Sardeshmukh Climate Dynamics 2011

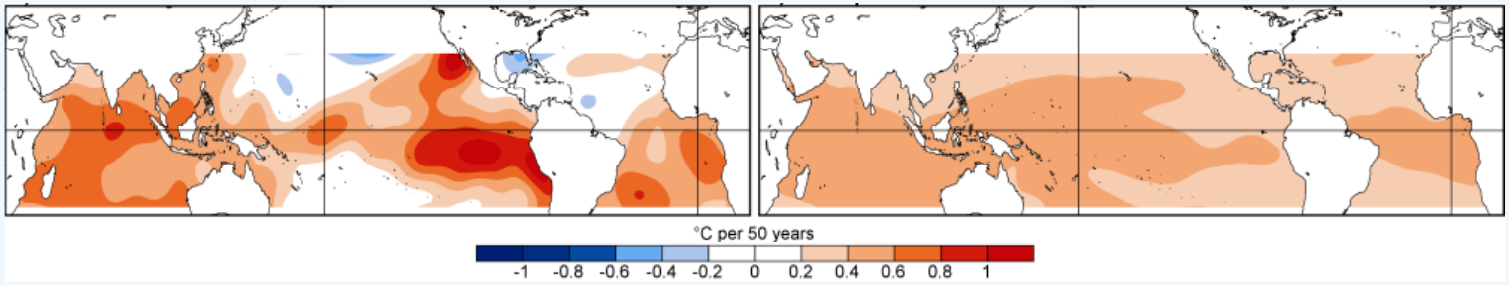
Trends of annual-mean Tropical SSTs over 1951-1999

OBSERVED TREND

(average of 3 datasets)

SIMULATED TREND

(average of 76 coupled IPCC/AR4 simulations)



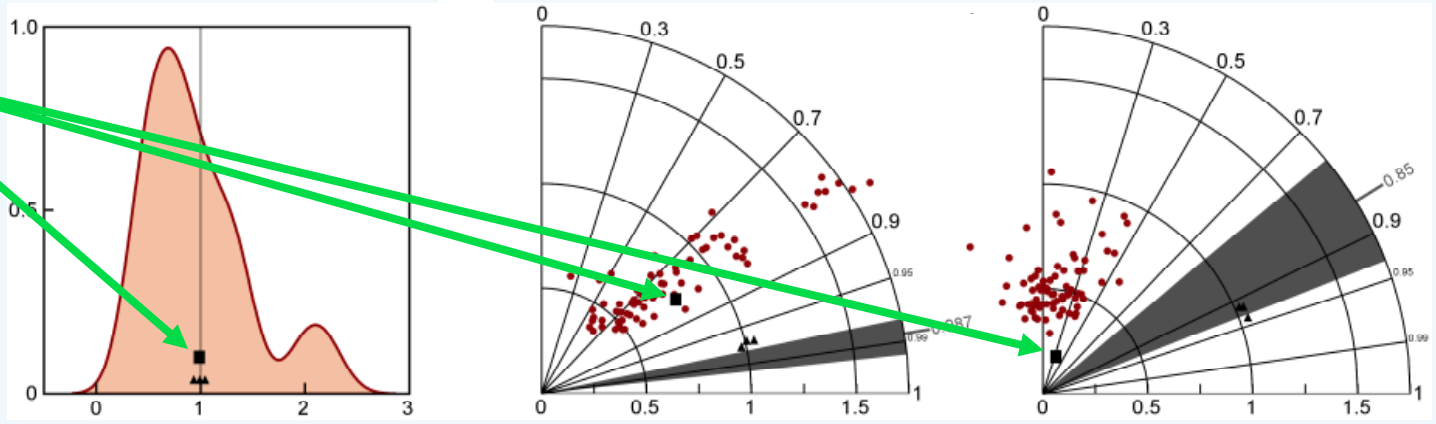
Multi-model Ensemble Mean

Fidelity of all 76 simulated SST trend fields

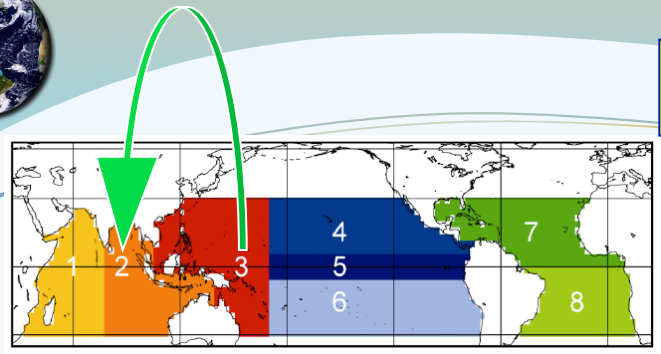
p.d.f. of area-mean trends

Including area-mean trends

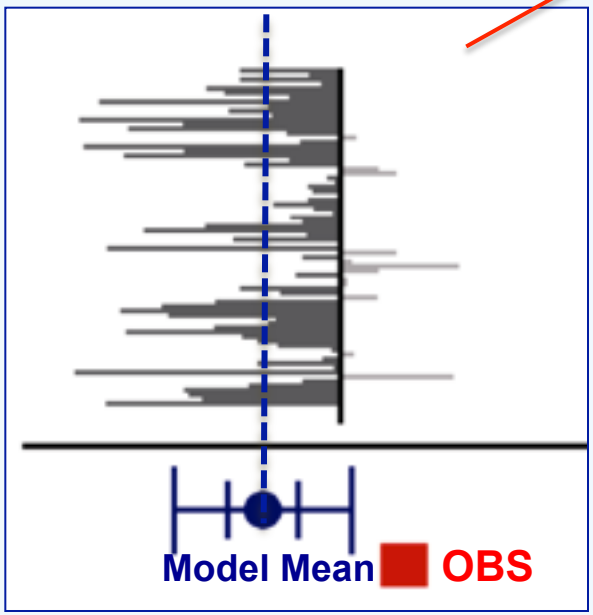
Excluding area-mean trends

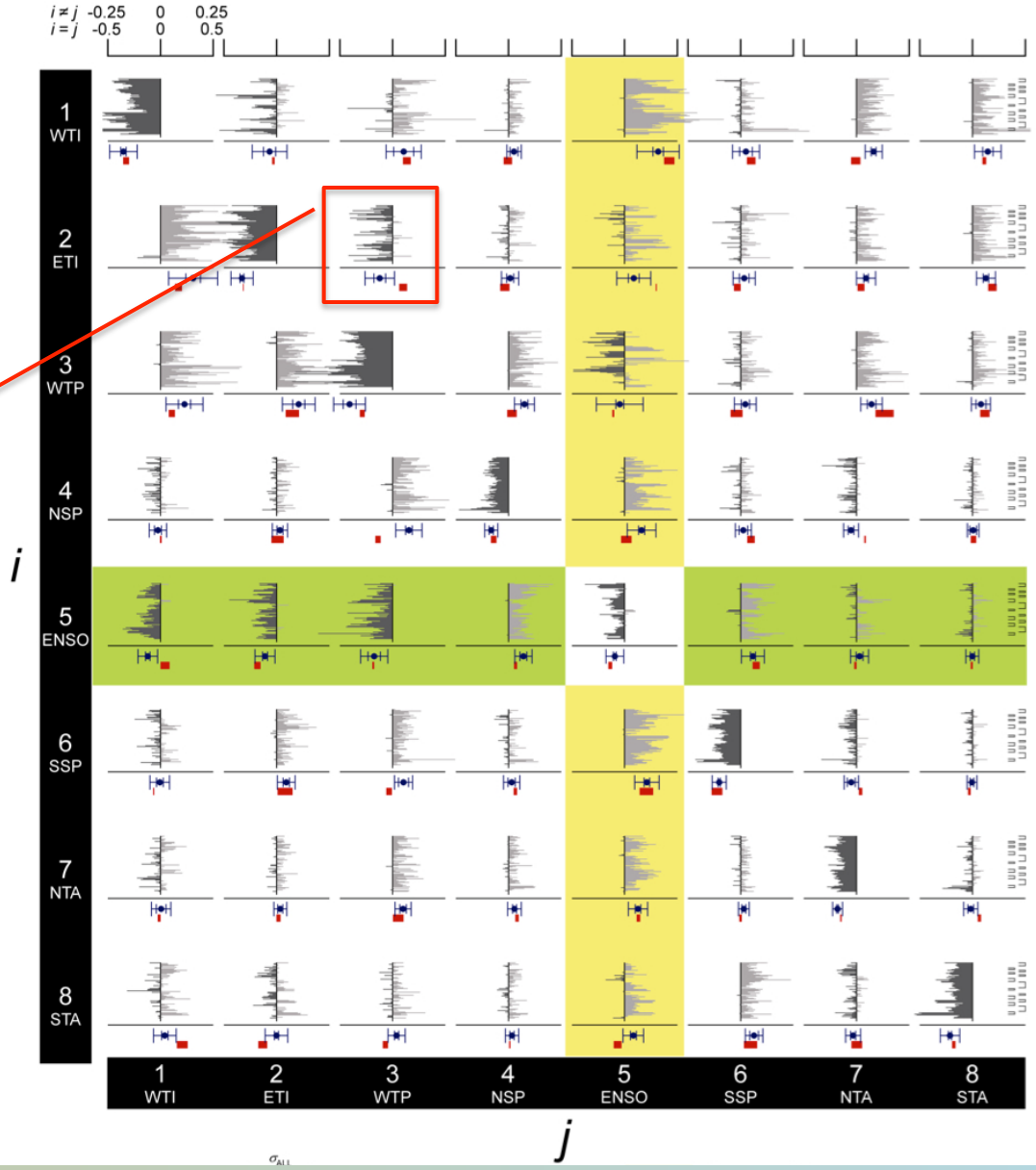


The 8 x 8 Tropical SST Feedback Matrix L



L_{23} = Effect of Region 3 on Region 2





From Shin, Sardeshmukh, and Pegion 2010

Misrepresentation of Tropical SSTs in Climate Models

1. **Coupled climate models have difficulty in capturing regional climate trends around the globe because of their difficulty in capturing the *spatial variation* of tropical SST trends.**
2. The spatial pattern of the recent observed 50-yr tropical SST trend is not consistent with the radiatively forced multi-model mean trend in the IPCC/AR4 simulations.
3. The discrepancy is not just due to natural variability or climate noise but is also, very substantially, due to tropical modeling errors.

Two relevant papers :

Shin and Sardeshmukh *Climate Dynamics* 2010

Shin, Sardeshmukh, and Pegion *JGR-Atmospheres* 2010

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