Research Activities at the Program for Climate Model Diagnosis and Intercomparison

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Program for Climate Model Diagnosis and Intercomparison

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- *Data used are the Monthly-Averaged Reanalyses Fields over 1979-92 (N=168).*

- *We Examine the Magnitude and Variability of the Annual Cycle of Level Temperatures*

- *Time Series of Temperature Anomalies*

- *Large Scale Trends and Variability*

- *Measures of Surface Sensitivity*

Nomenclature Used:

*NCEP/NCAR Reanalysis = **R1***

*NCEP/DOE AMIP-II Reanalysis = **R2***

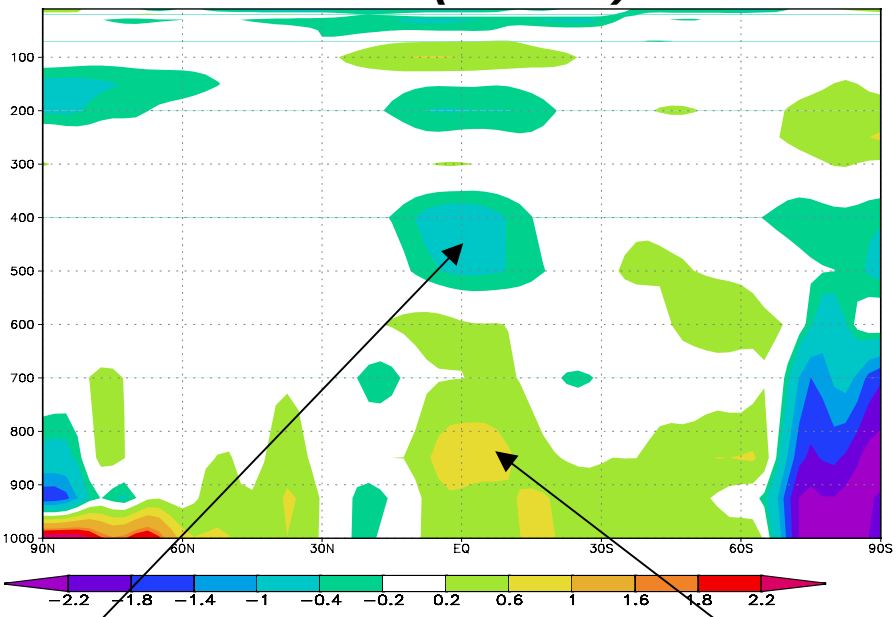
*ECMWF Reanalysis = **ERA***

*2m Temperature = **Tas***

*Surface (Skin) Temperature = **Ts***

The Difference of the average of DJF and JJA for (R2 - R1)

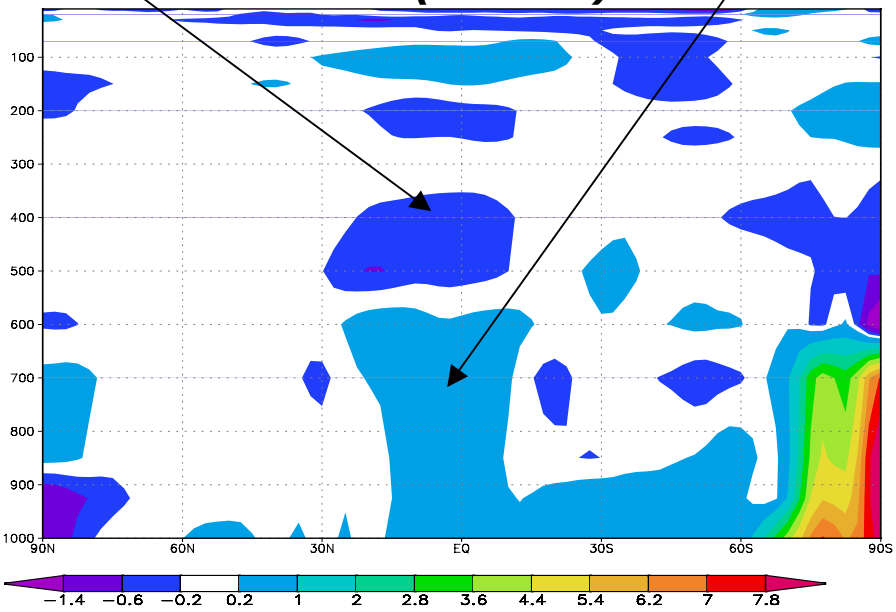
DJF (R2 - R1)



R2 is Cooler

R2 is Warmer

JJA (R2 - R1)



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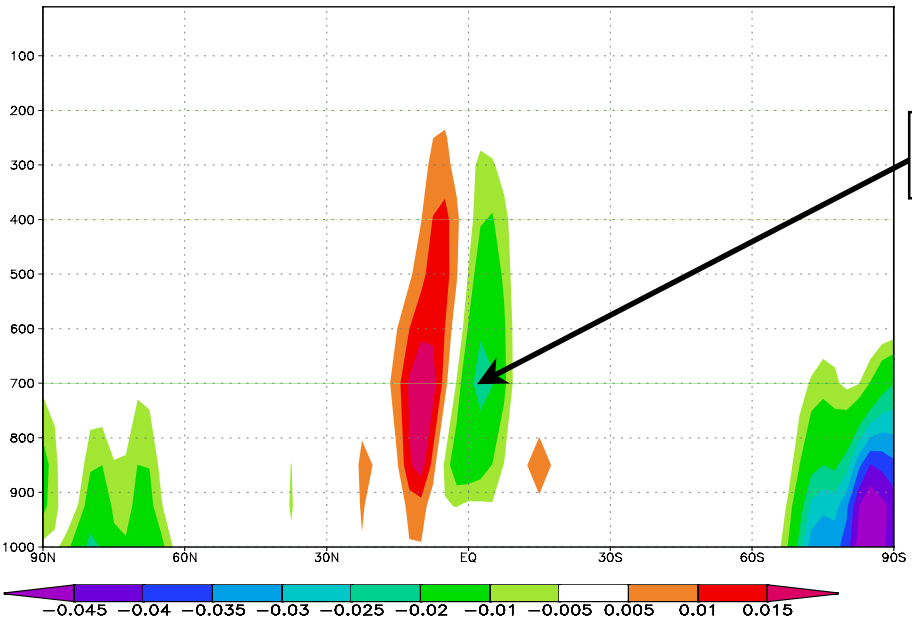
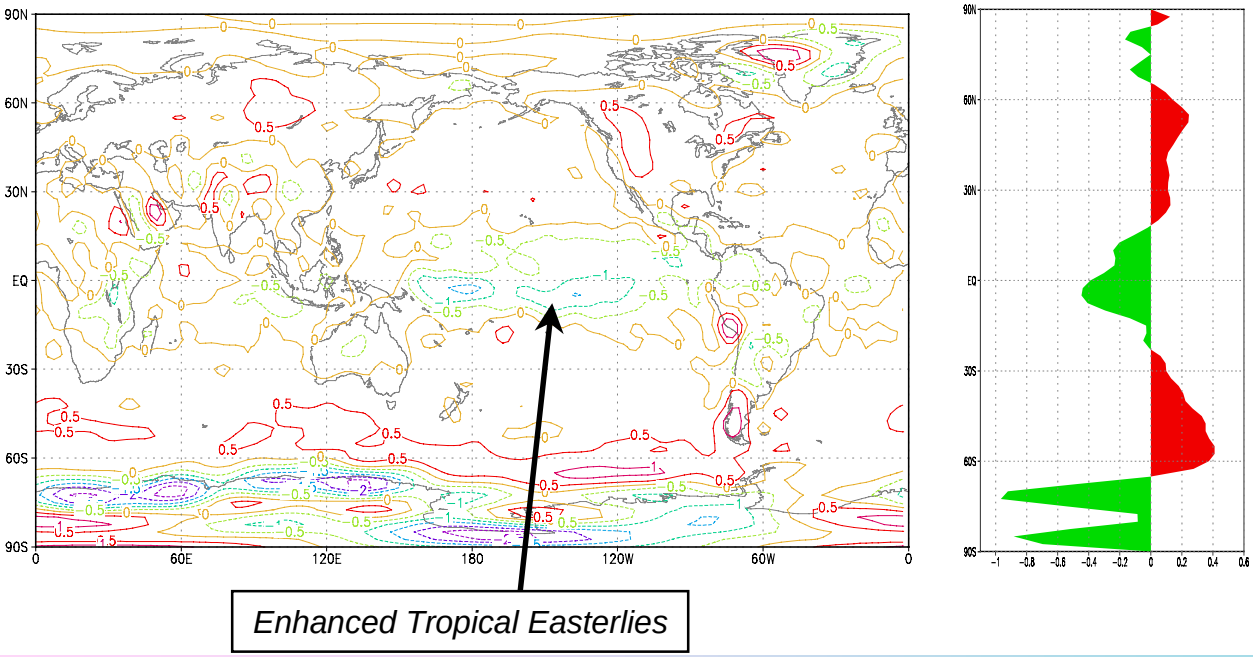
R2-R1 DJF Vertical Motion (Pa/s)



Total Time Period Average (N=168) R2 - R1
1000 hPa Zonal Wind (m/s)



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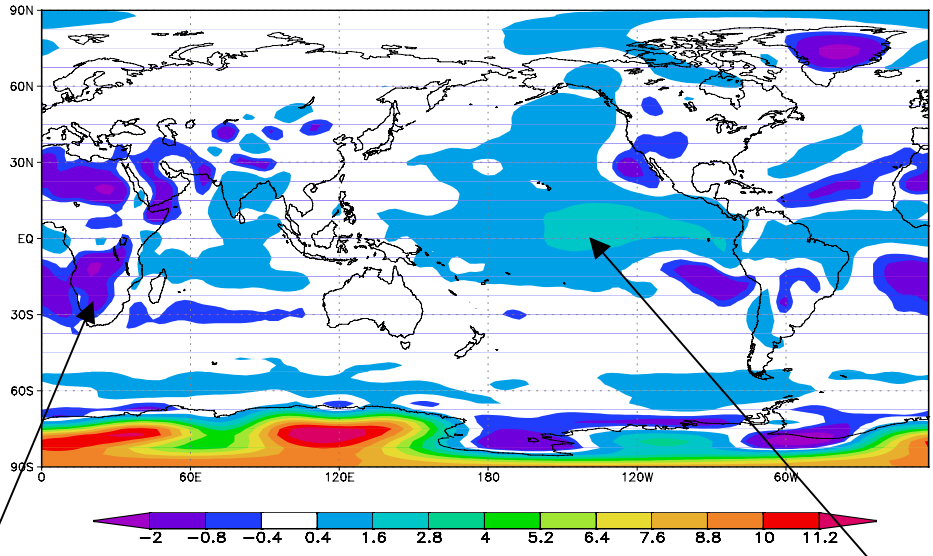
The Difference of the (R2 - R1) 850 hPa Temperature for JJA and DJF

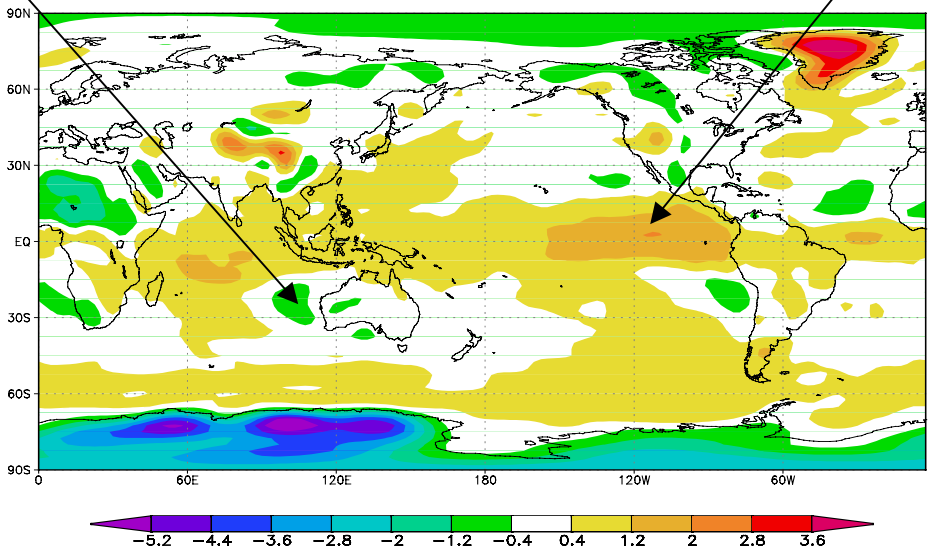
JJA



R2 is Cooler

R2 is Warmer

DJF



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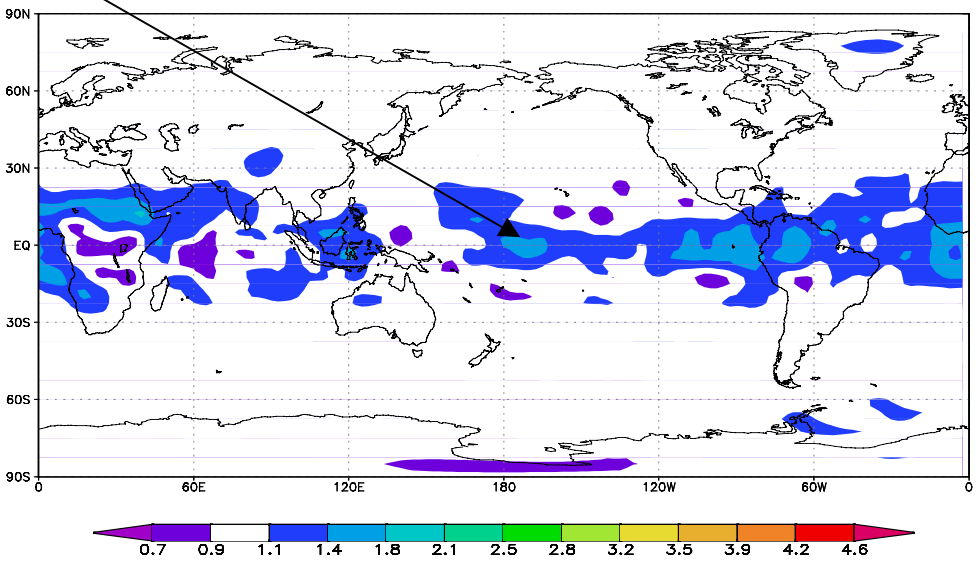
A Ratio of the Variance of Pressure Level Temperature Derived over 1979-92 (N=168)

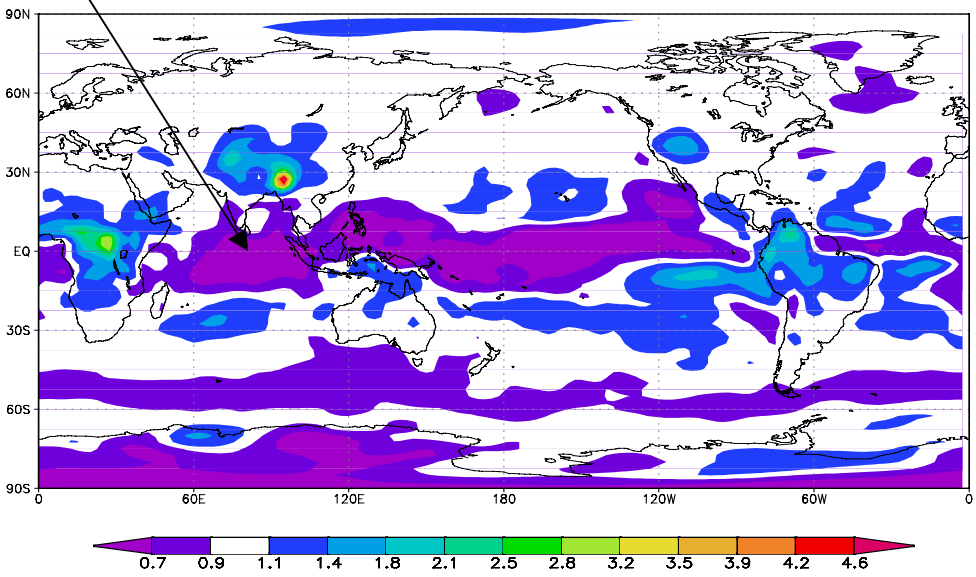
More Variability

500 hPa ($\sigma^2_{R2} / \sigma^2_{R1}$)



Less Variability

850 hPa ($\sigma^2_{R2} / \sigma^2_{R1}$)



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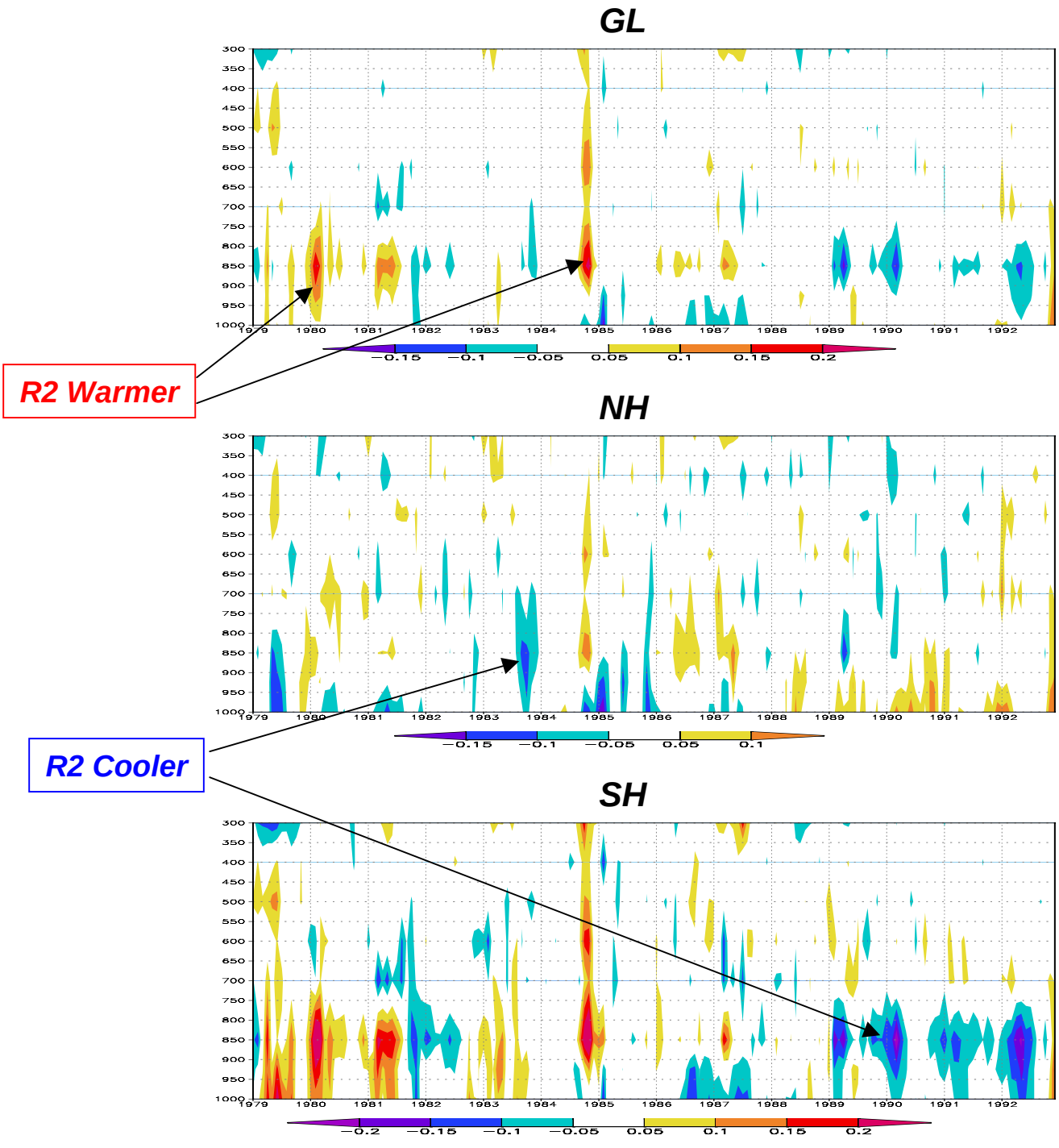
Time Series of Area-averaged Temperature Anomaly Differences (R2 - R1) over 1979-92 (N=168).



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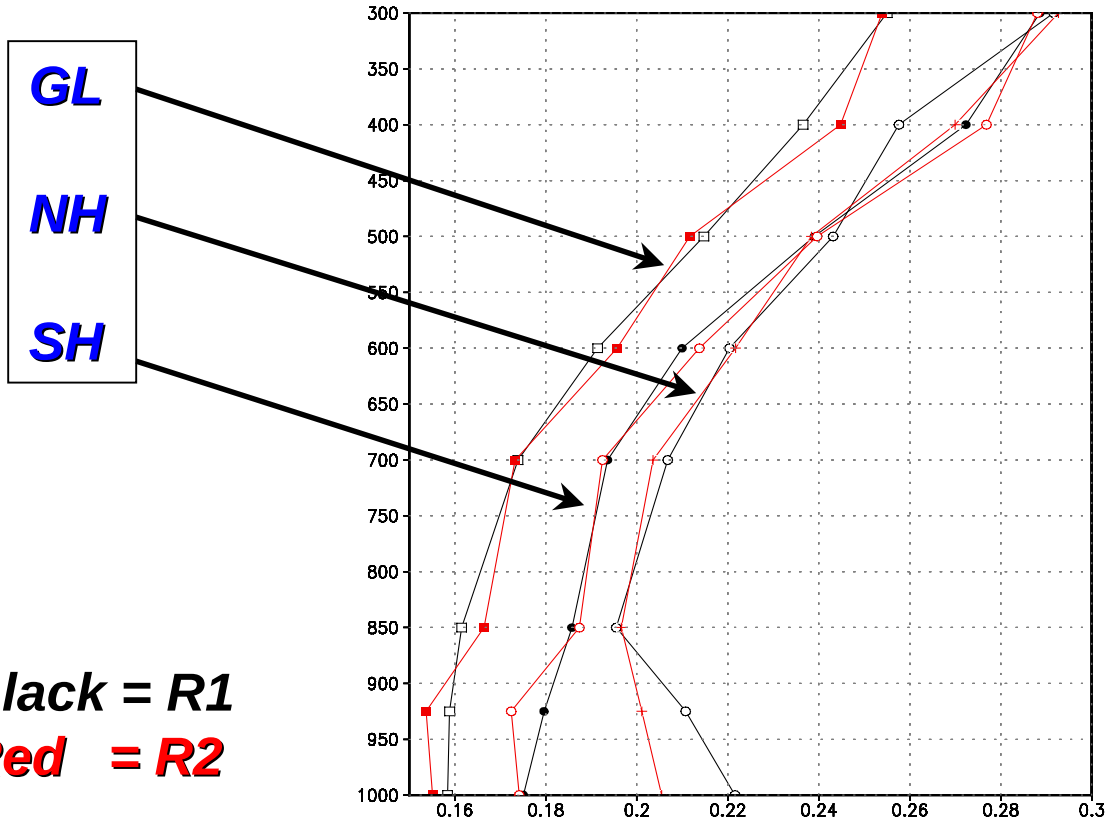
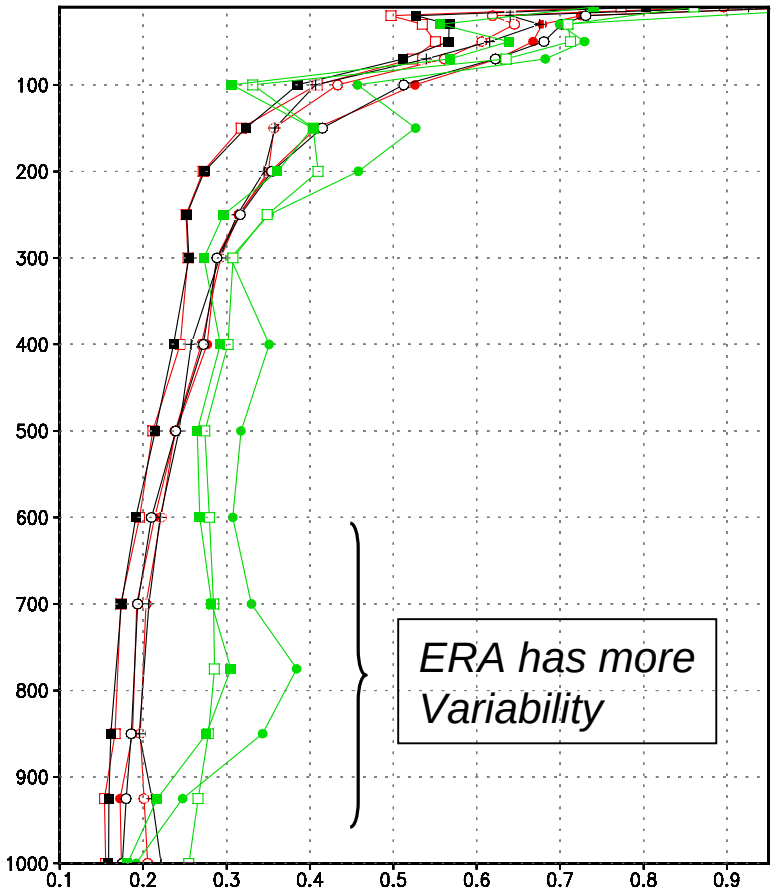
A Comparison of the Standard Deviations of Level Temperatures for the NCEP R1 & R2 Reanalyses (1979-1992, N=168)



Black = R1
Red = R2

- *Differences are exhibited in the Lower and Upper Troposphere*

Comparison of Hemispheric and Global Level Temperature Standard Deviations from 1979-92 (N=168)



Black = R1
Red = R2
Green = ERA

- *The Changes Between R1 and R2 are smaller than the Differences between R1 or R2 and ERA.*

A Measure of Strength of Coupling Between the Surface and 2m Temperature

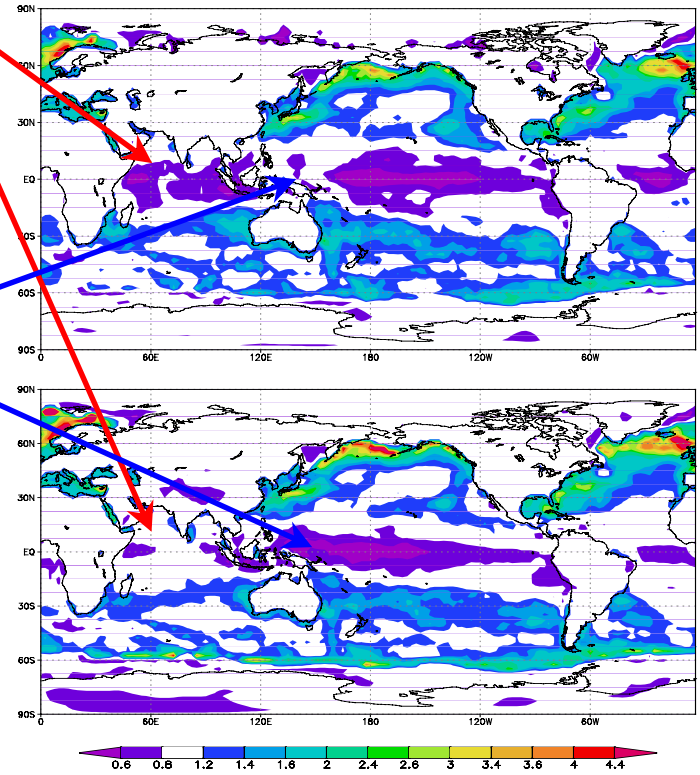
$$(Tas\sigma^2 / Ts\sigma^2)$$

More Responsive in R2 than in R1

Less Responsive in R2 than in R1

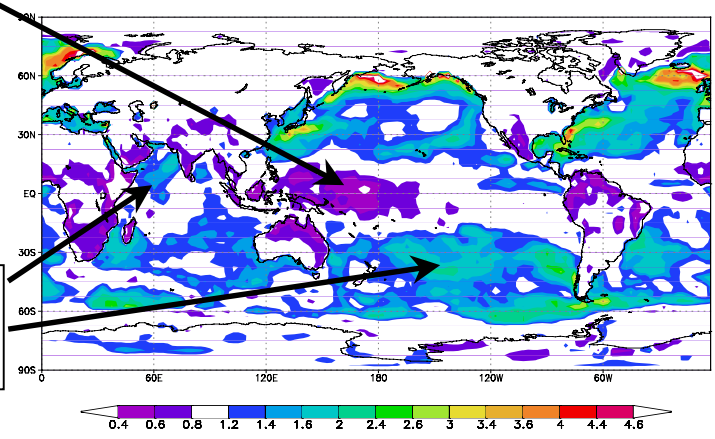
Longitudinal Extent in Tropics is Less

More Responsive than either R2 or R1



R1

R2



ERA

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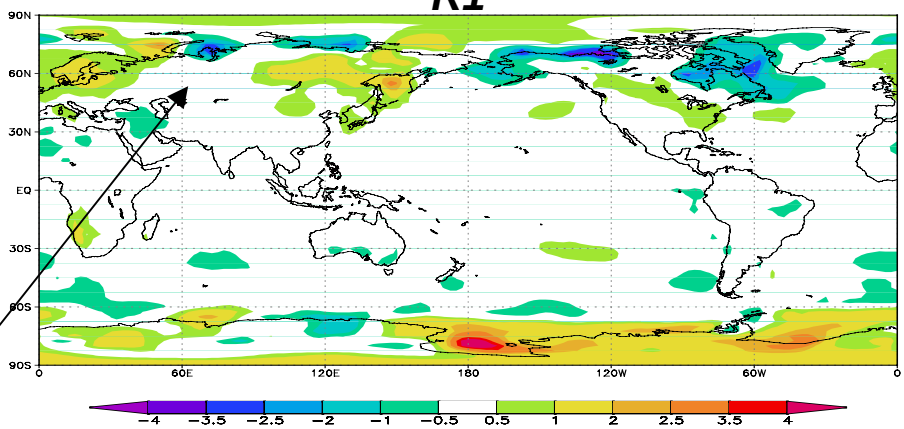
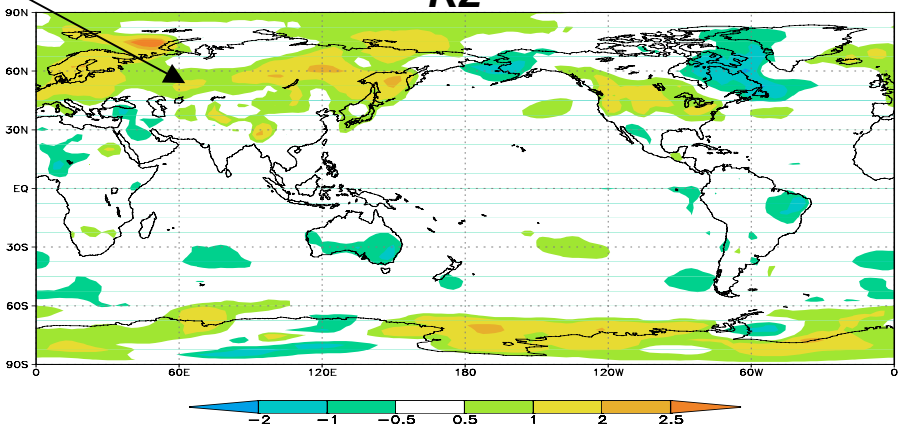
Decadal Surface (2m) Temperature Trends Derived from the period 1979-92 (N=168).

Changes Between R2 and R1

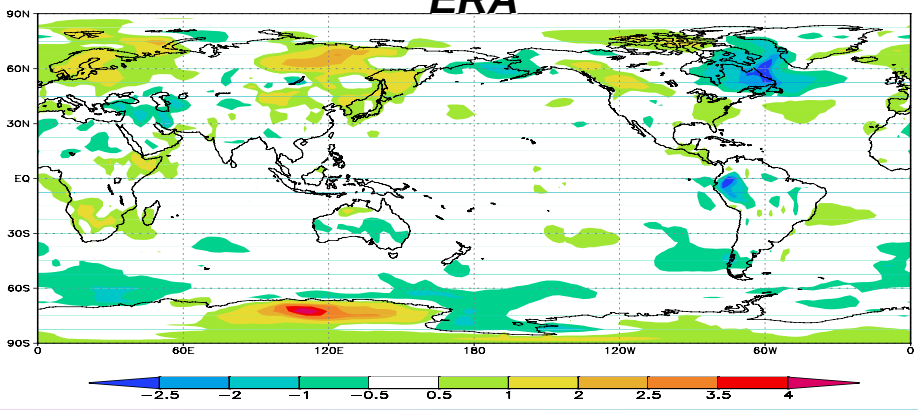
R1



R2



ERA



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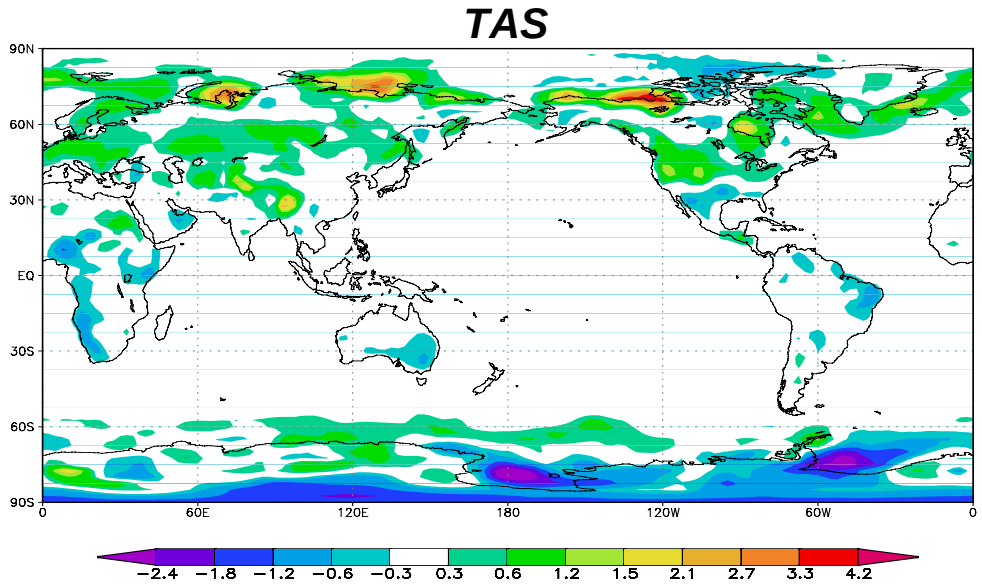
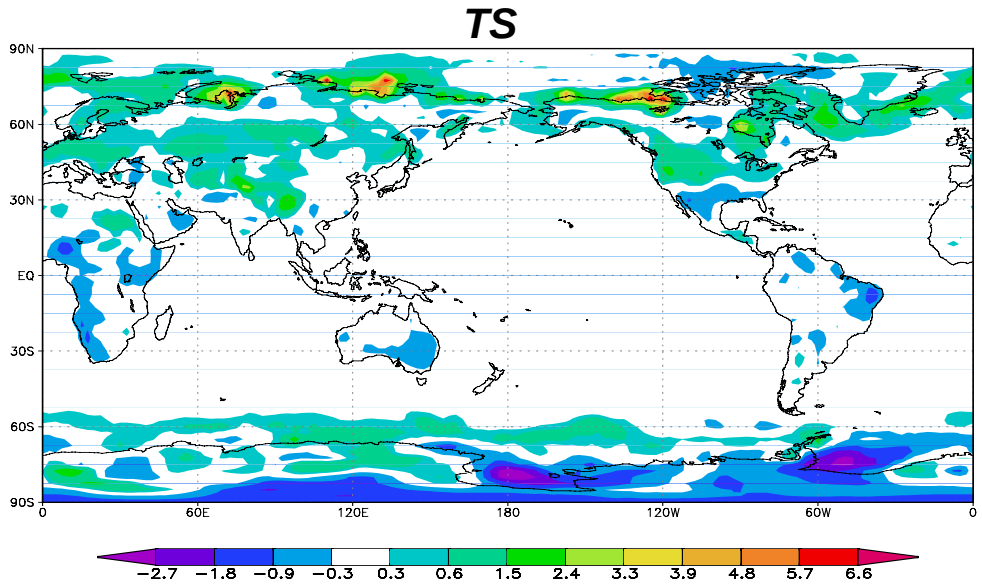
Decadal Temperature Trend Differences for Tas and Ts (R2 - R1)



Note Most Differences occur over land masses



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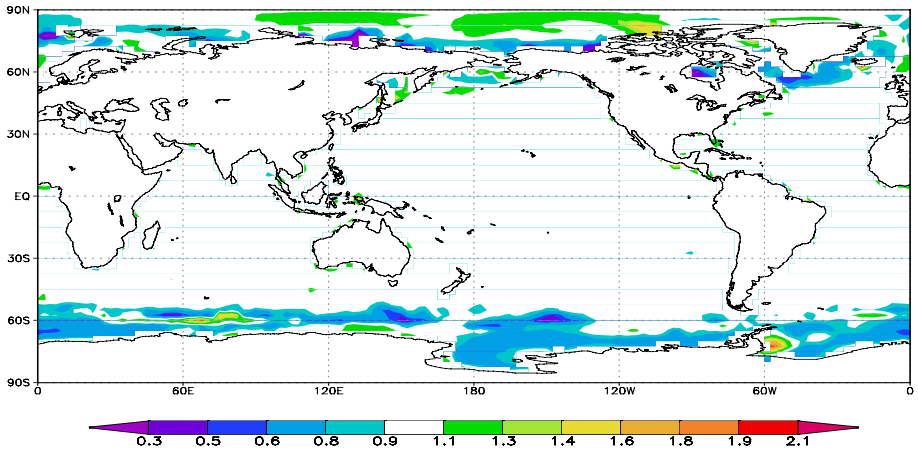
Over the Oceans, a Ratio of Variance (R2 / R1) for Ts and Tas Derived over 1979-92 (N=168).

Land has Been Masked

Ts $(\sigma^2_{R2} / \sigma^2_{R1})$

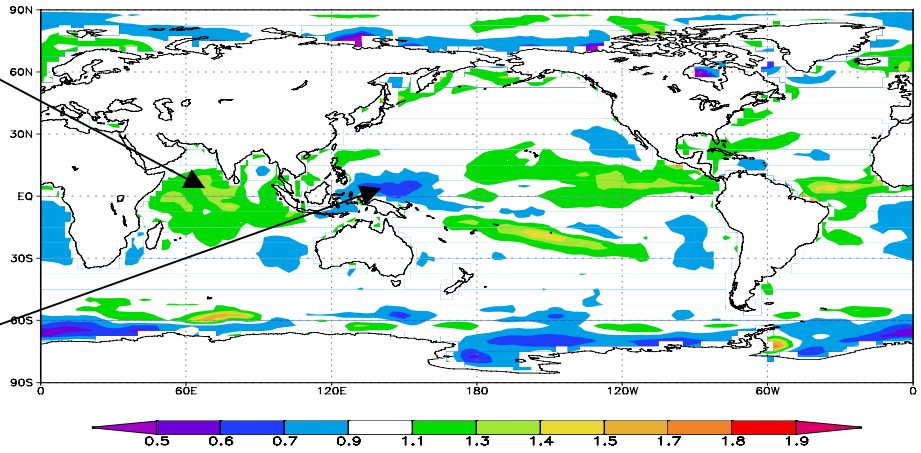


- *For Ts: This ratio exhibits similar numeric value*

Tas $(\sigma^2_{R2} / \sigma^2_{R1})$

More Variability

Less Variability



- *For Tas: This Ratio exhibits significant regional differences*

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GLOBAL DECADAL TRENDS WITH LAND/OCEAN MASK APPLIED

LAND:

Tas	Ts
R1 = 0.09937	R1 = 0.09736
R2 = 0.17663	R2 = 0.19879
ERA = 0.16368	ERA = 0.1811

OCEAN:

Tas	Ts
R1 = -0.01026	R1 = -0.00316
R2 = 0.01913	R2 = 0.04269
ERA = 0.02419	ERA = -0.01486

CONCLUSIONS

Differences Exist Between R2 and R1 Temperature Fields in Both Magnitude, Variability and Decadal Trend.

Some Differences Seem in part, Attributable to Convection Changes Between R2 and R1.

Surface to 2m Temperature Sensitivity is in general similar for each reanalysis but, Surface Temperature Variability alone between R2 and R1 are significantly different.