ENSO Teleconnections to Land Regions in Precipitation, etc.

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I. Teleconnections …

II. Where is ENSO stress balanced?

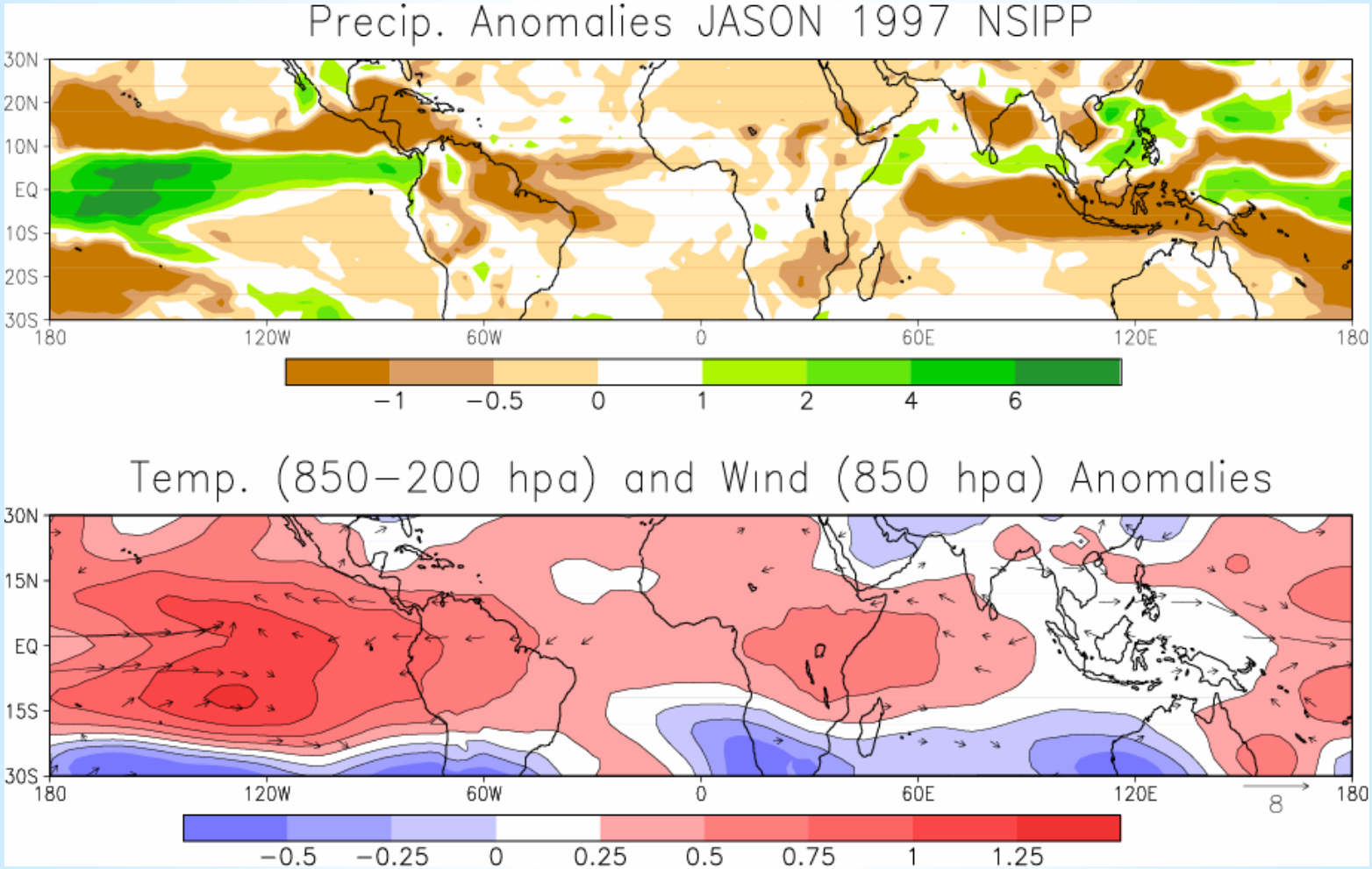
III. The scatter of tropical-average precipitation anomalies*

IV. LAI sensitivity*

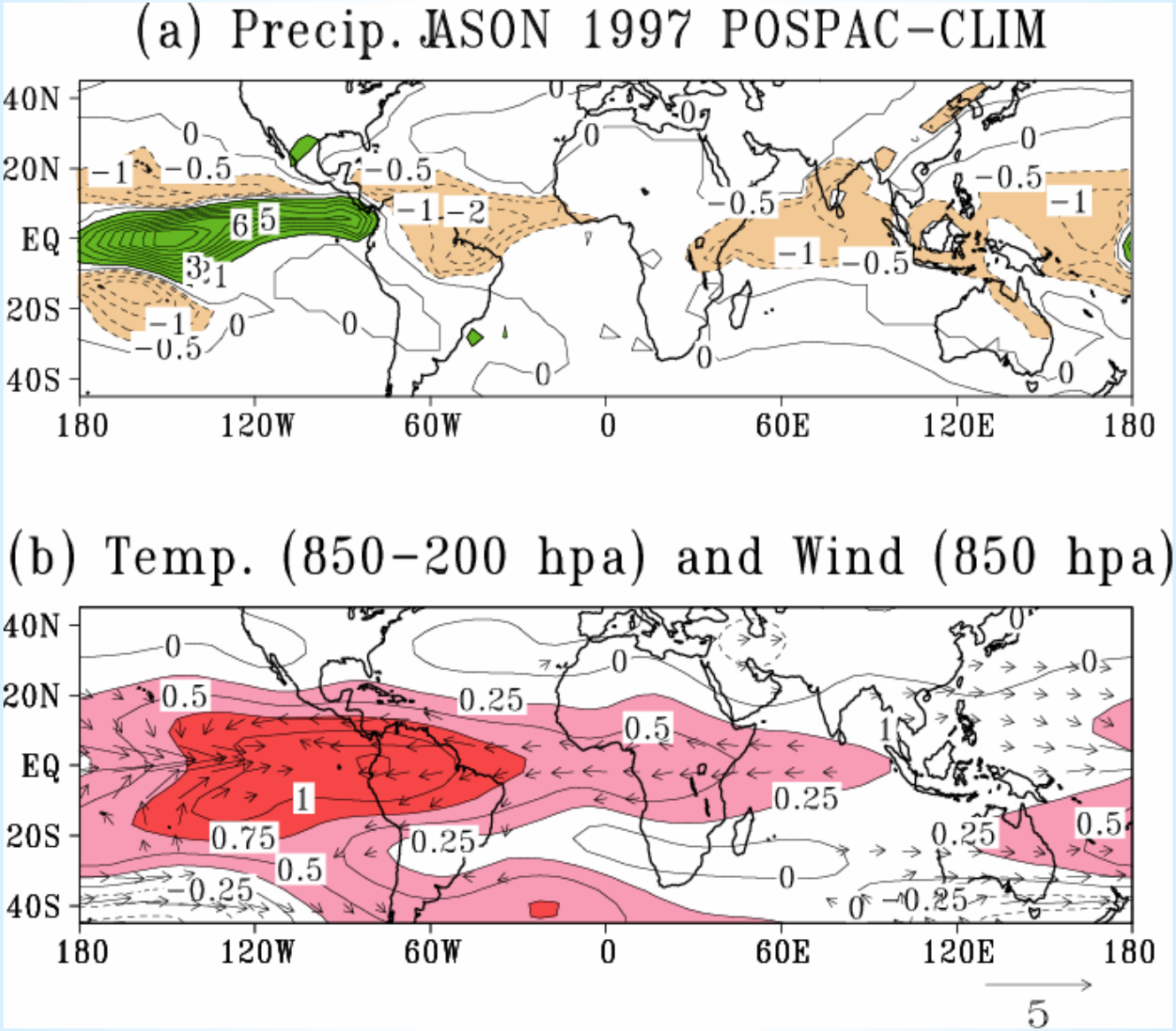
*Not today

NSIPP response to SSTA

July - November

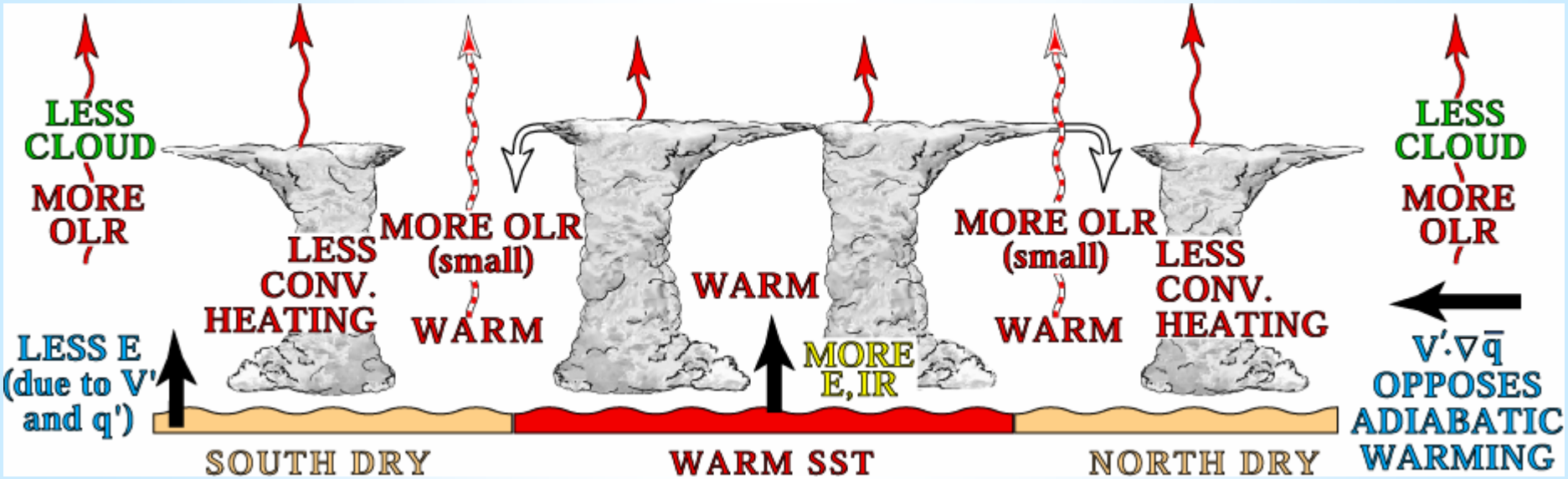


QTCM response to positive Pacific ENSO SSTA



Teleconnections within the Pacific

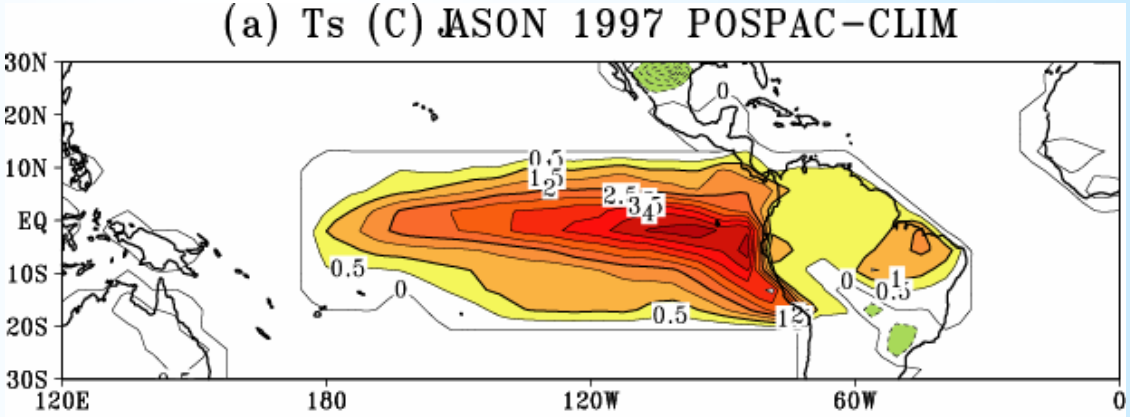
- QTCM and NSIPP budgets and QTCM experiments suggest …



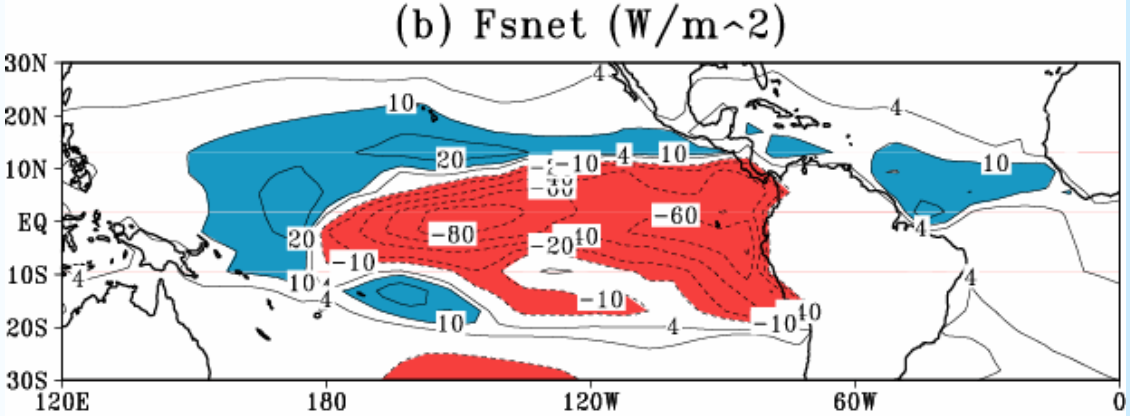
Su & Neelin, 2002

QTCM POSPAC - fluxes

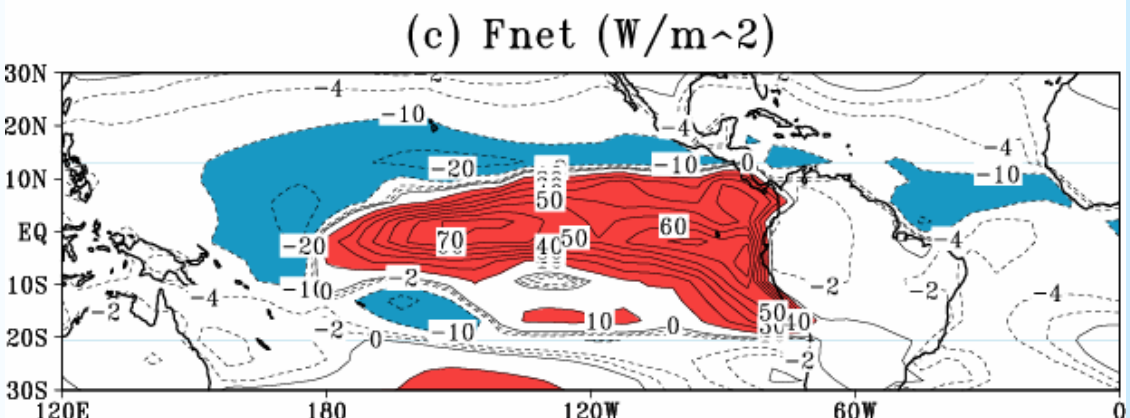
Surface temperature



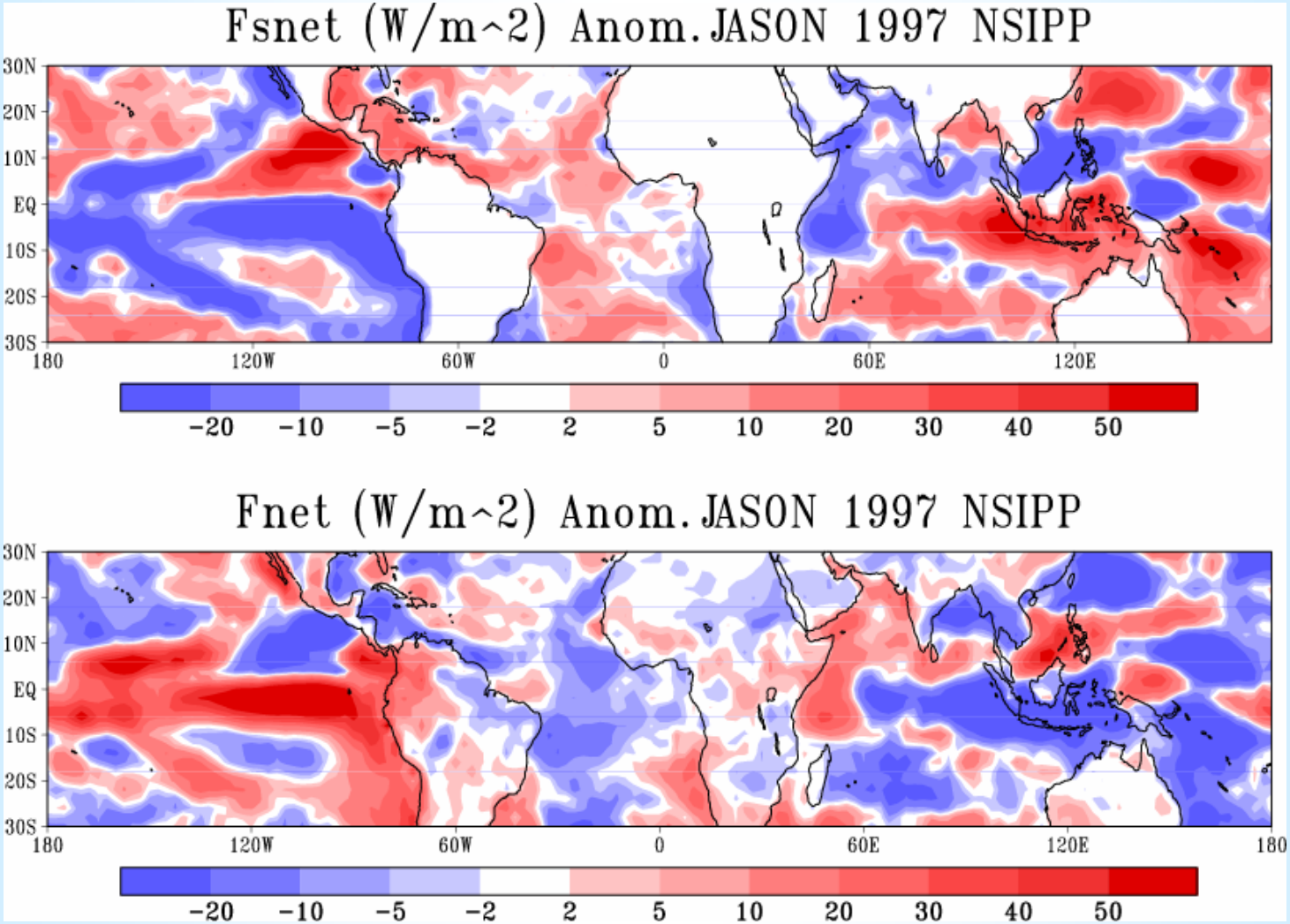
Net surface flux



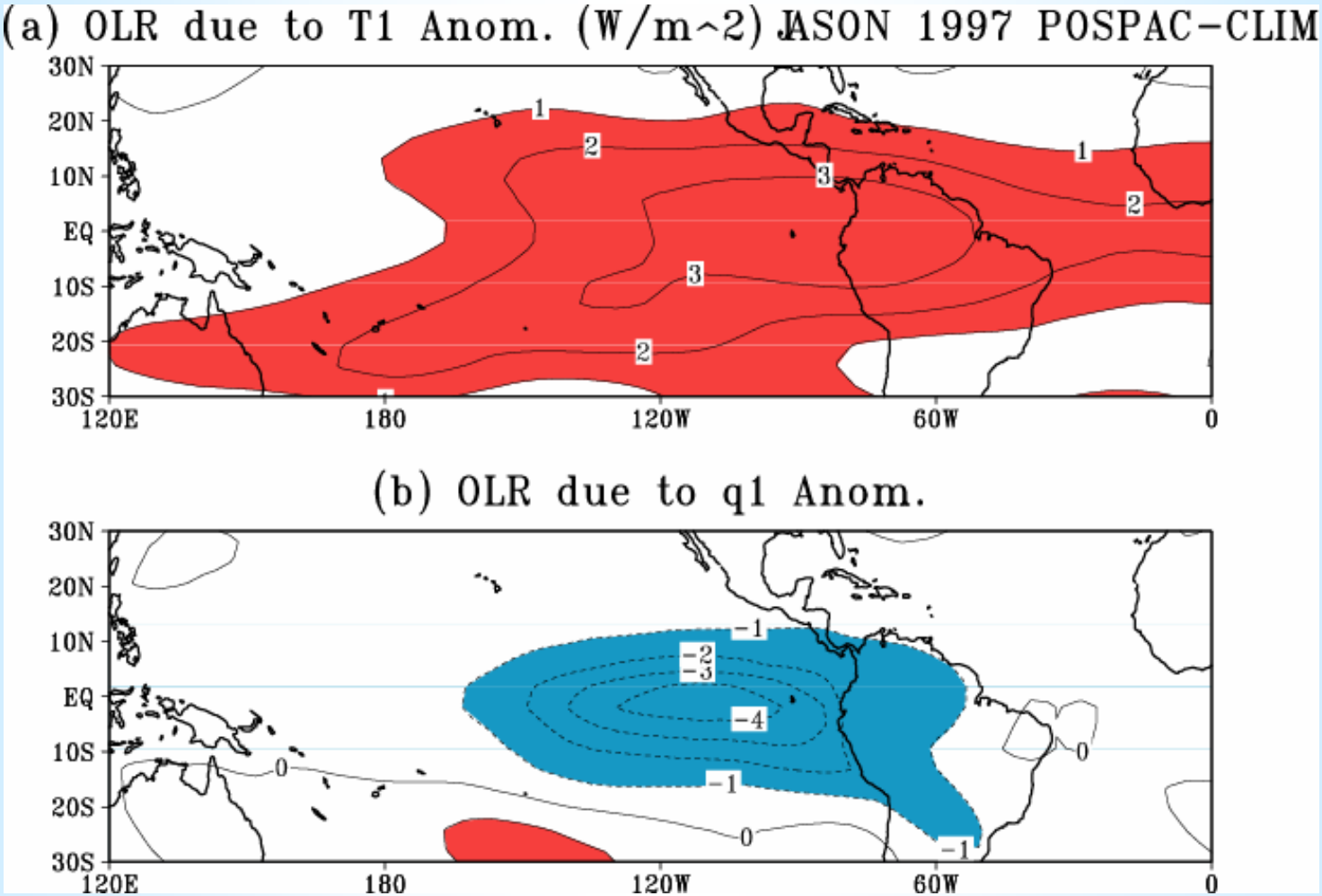
Net flux into atmospheric column



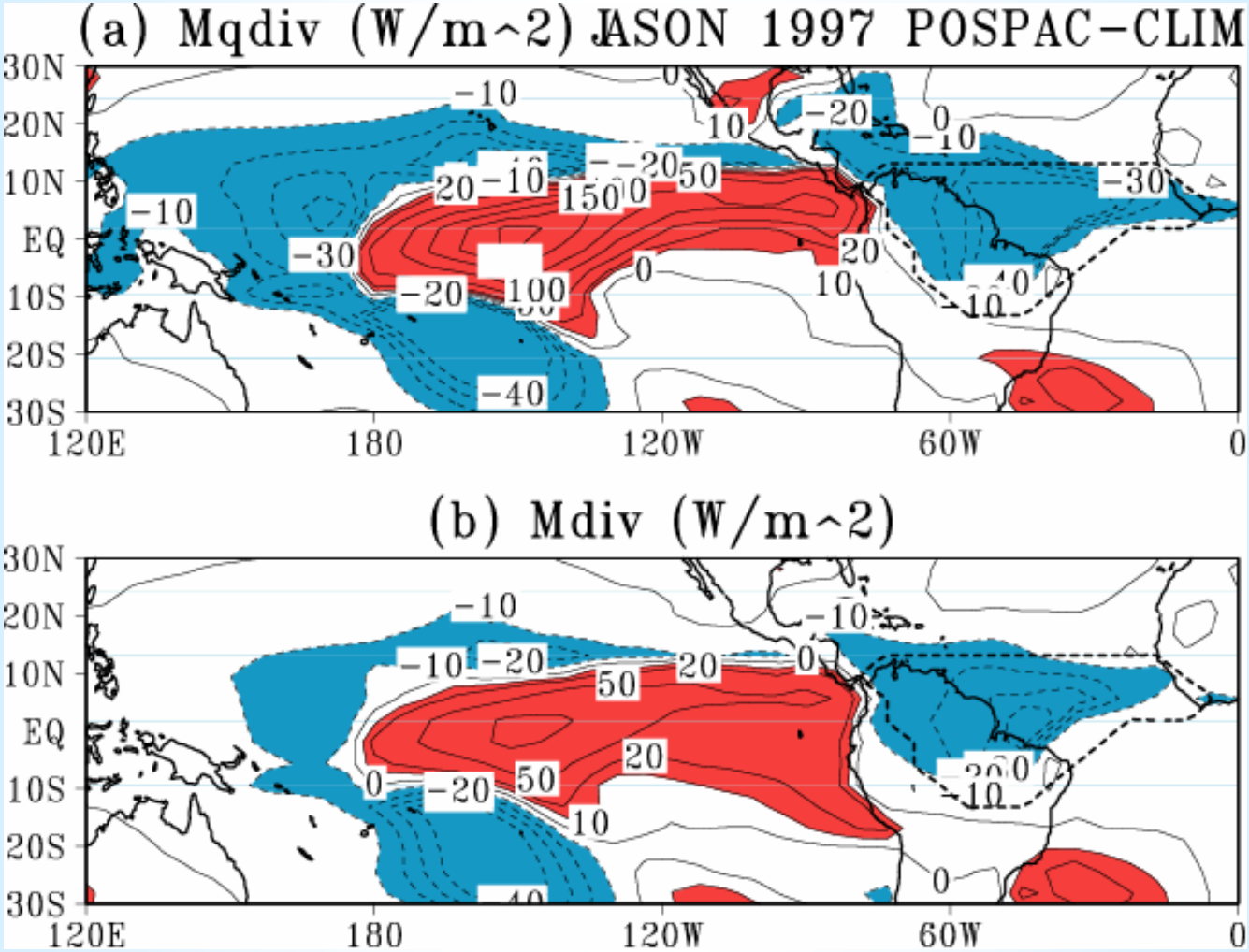
NSIPP - fluxes



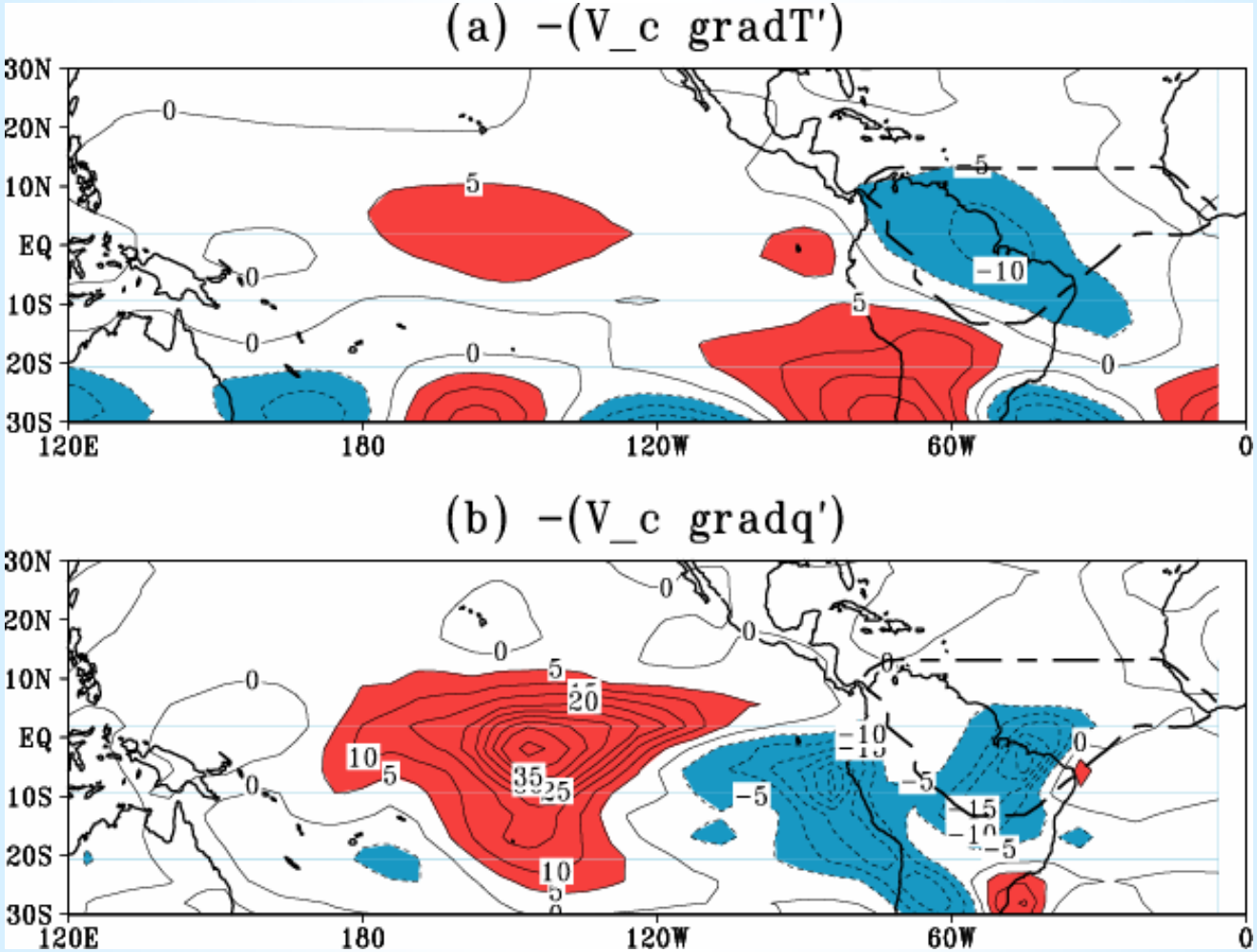
QTCM POSPAC - contributions to OLR



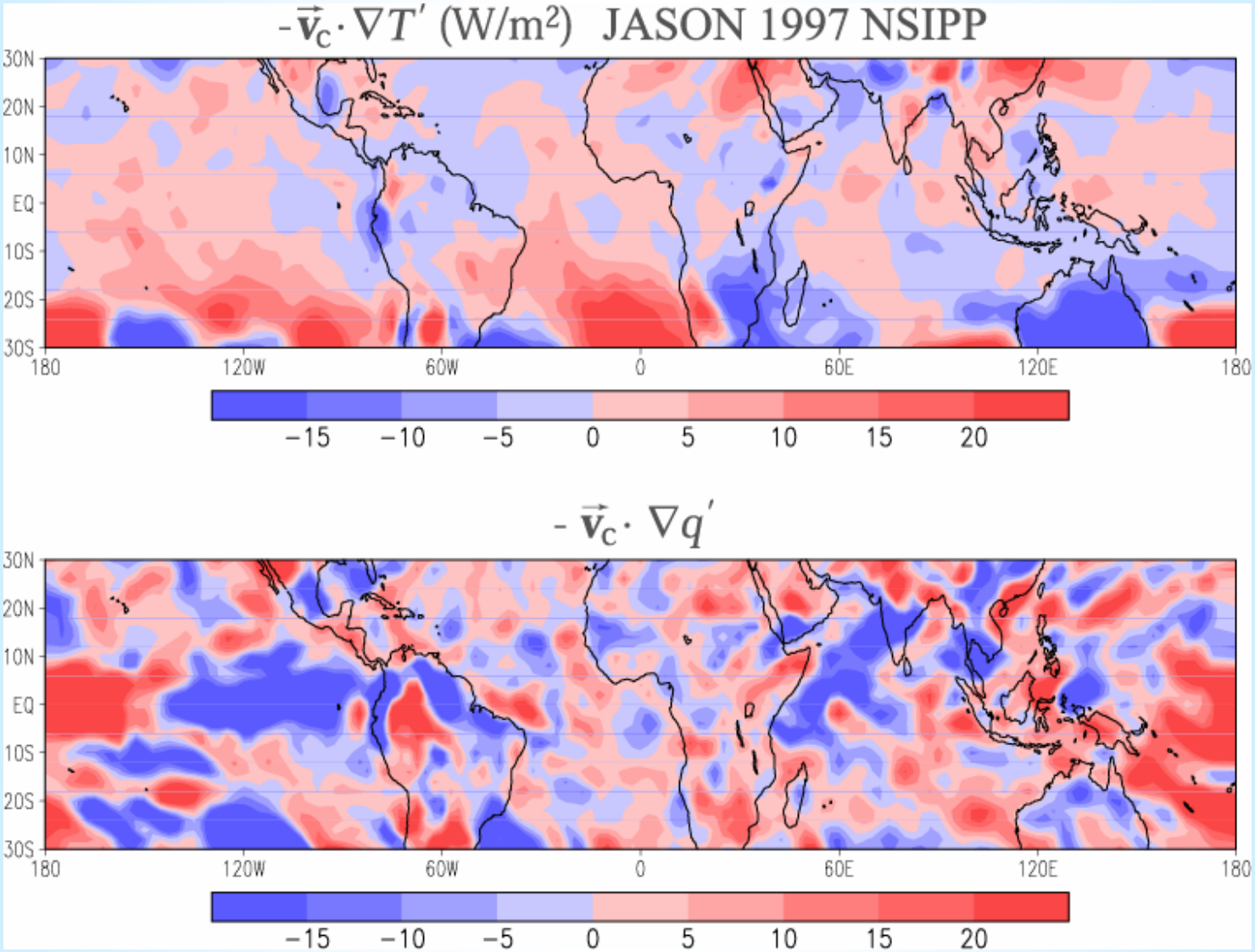
Divergence Contributions to Moisture and Moist Static Energy Divergence



QTCM Advection - main contributions



NSIPP Advection - contributions



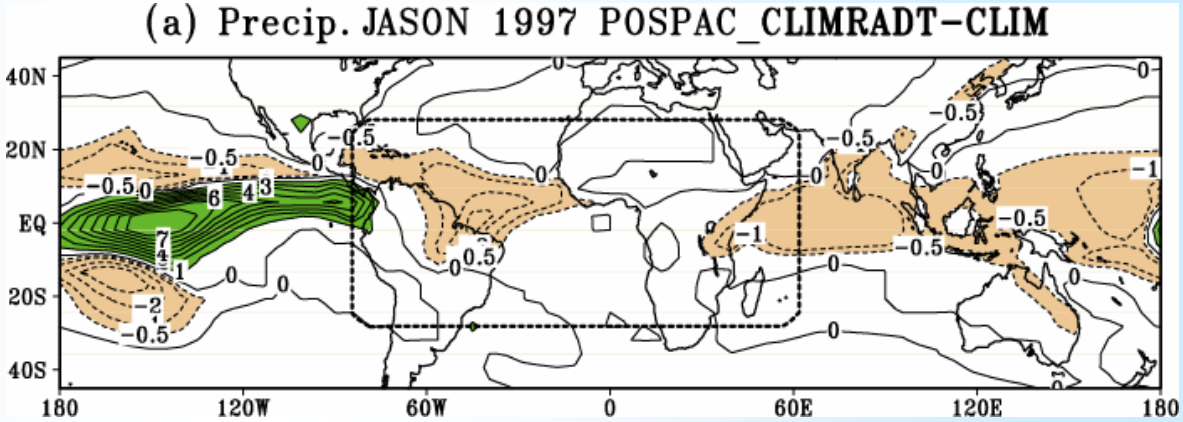
QTCM Experiments suppressing potential mechanisms for descent anomalies

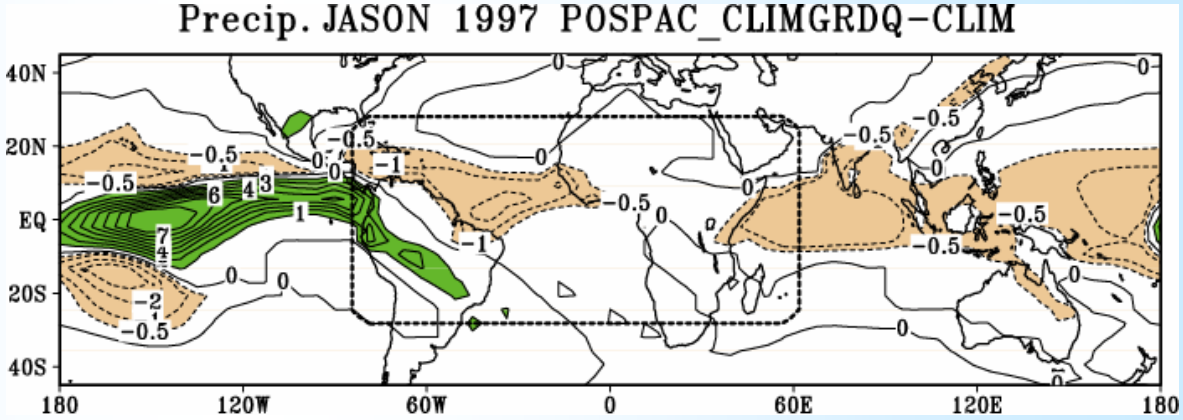
Anomaly $(\ )'$ term suppressed in region:

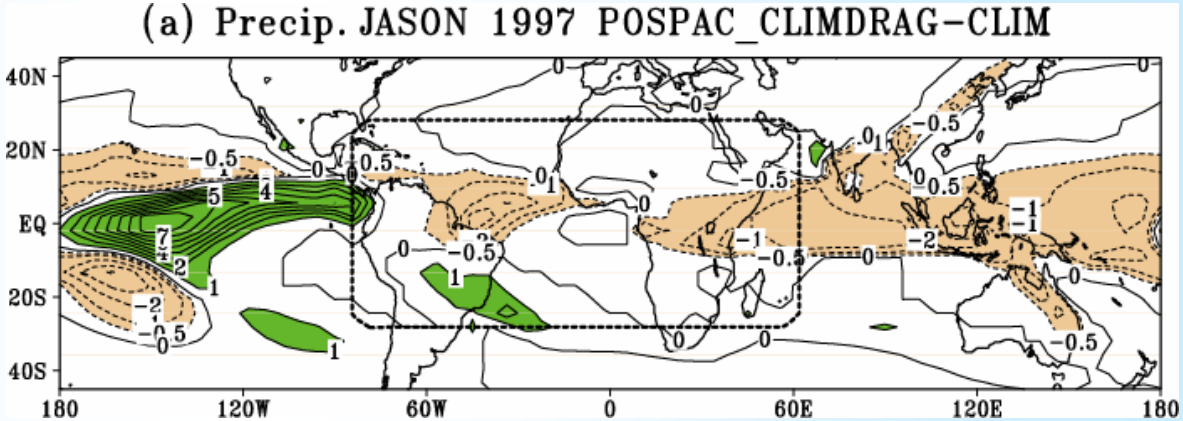
T' radiative effects

$(v \cdot \nabla q)'$

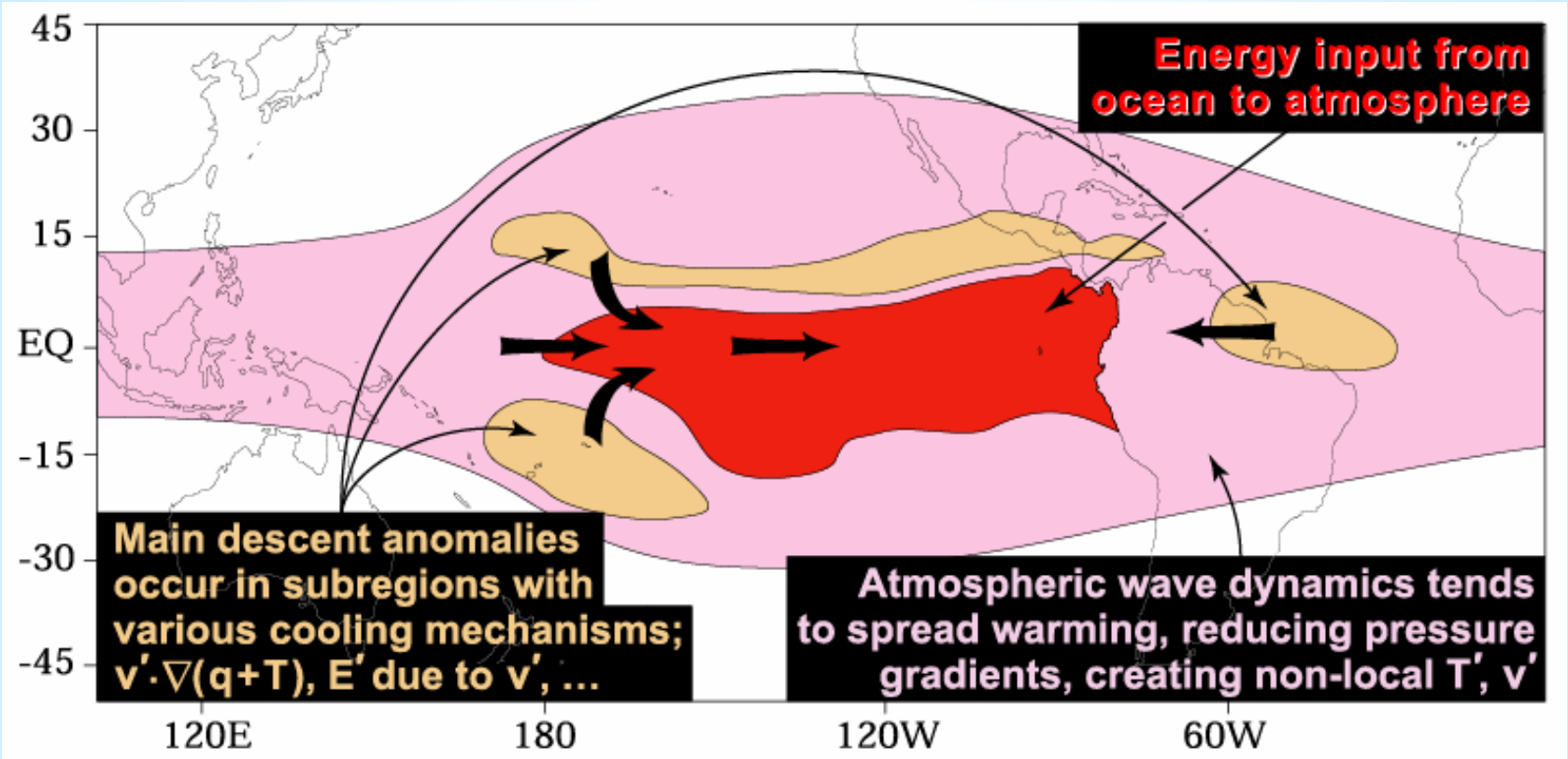
$(surface\ stress)'$



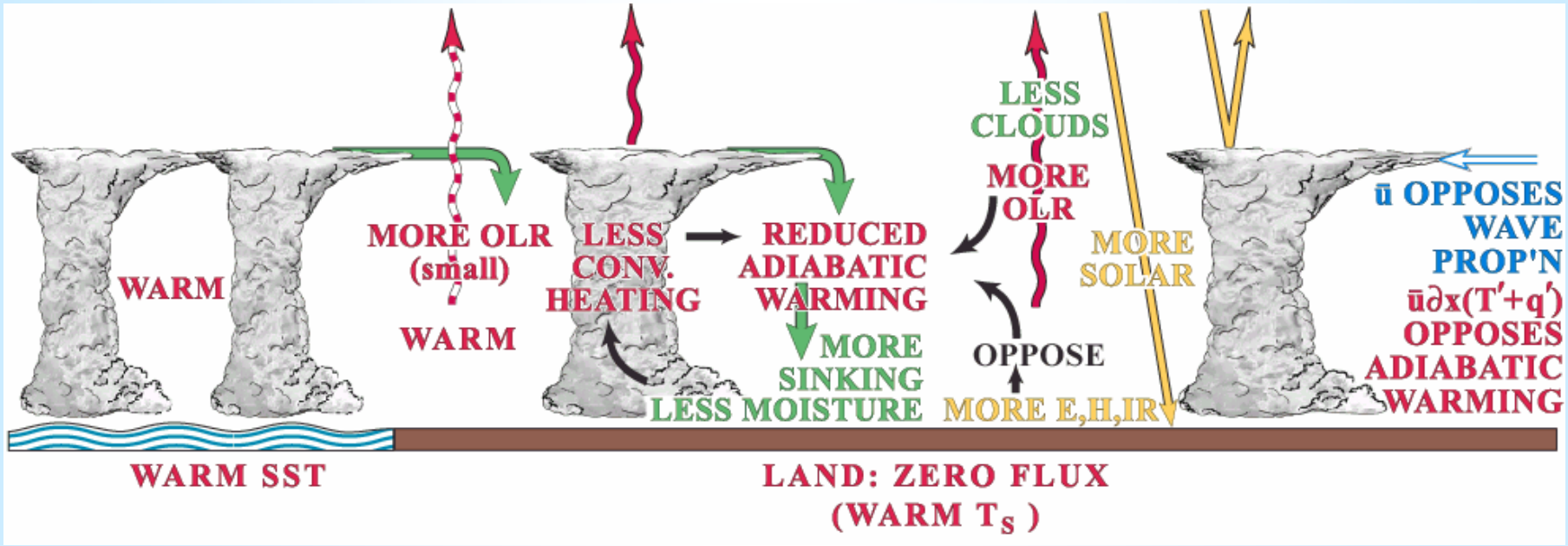




Hypothesis for teleconnections to tropical precipitation anomalies

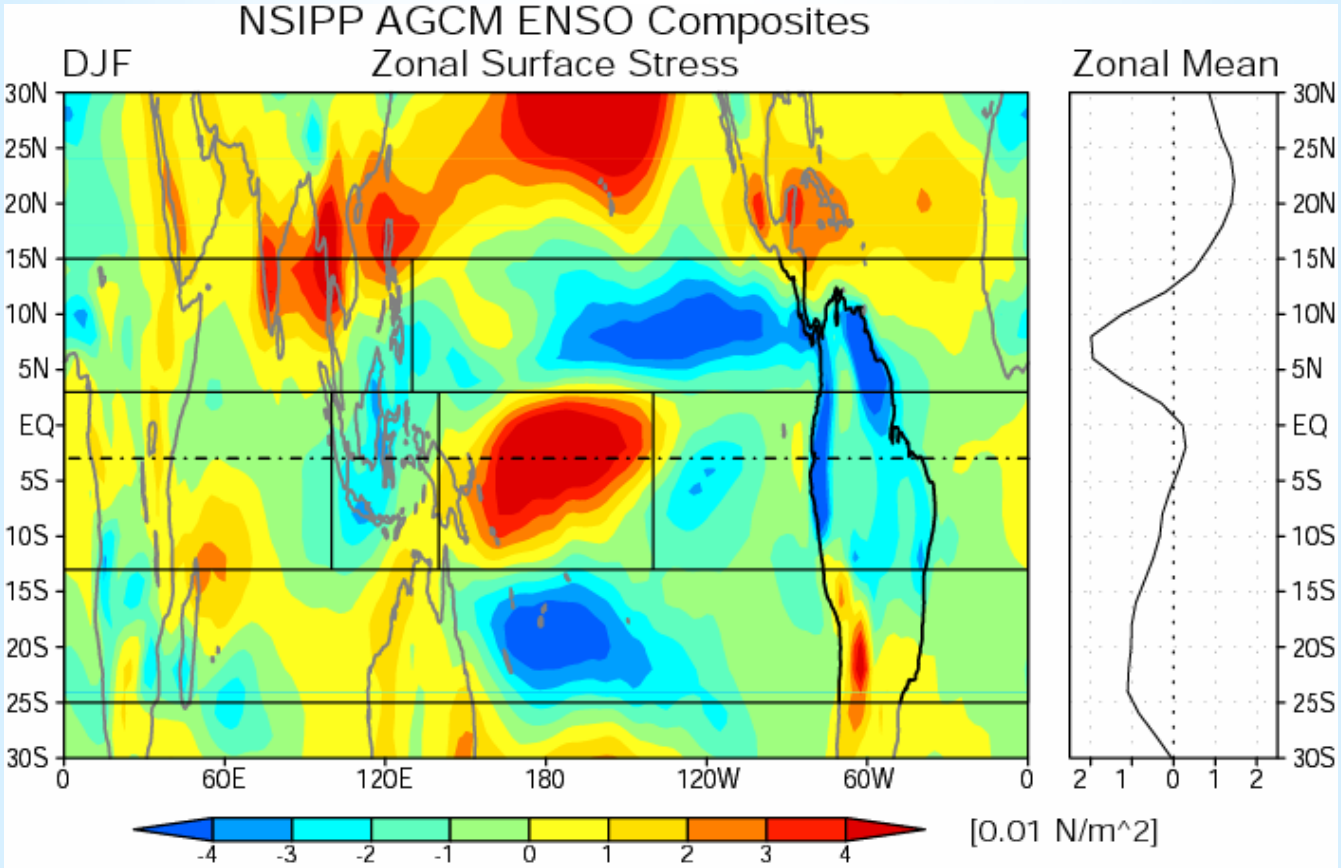


Some processes in tropical teleconnections



- Convection & I.R. Cloud-Rad. Feedbacks
  - Reduce effective static stability
  - Reduce length scale over which descent occurs
  - Tendency to increase descent anomalies
- Land-Surface Feedback Returns Flux Anomalies to Atm.
- Combined with Shortwave Cloud-Radiation Feedbacks
  - Increase effective static stability
  - Increase length scale over which descent occurs
  - Tendency to reduce descent anomalies

Where is ENSO stress balanced?
El Niño (73, 78, 83, 87, 92, 98)
- La Niña (71, 74, 84, 89, 96, 99)

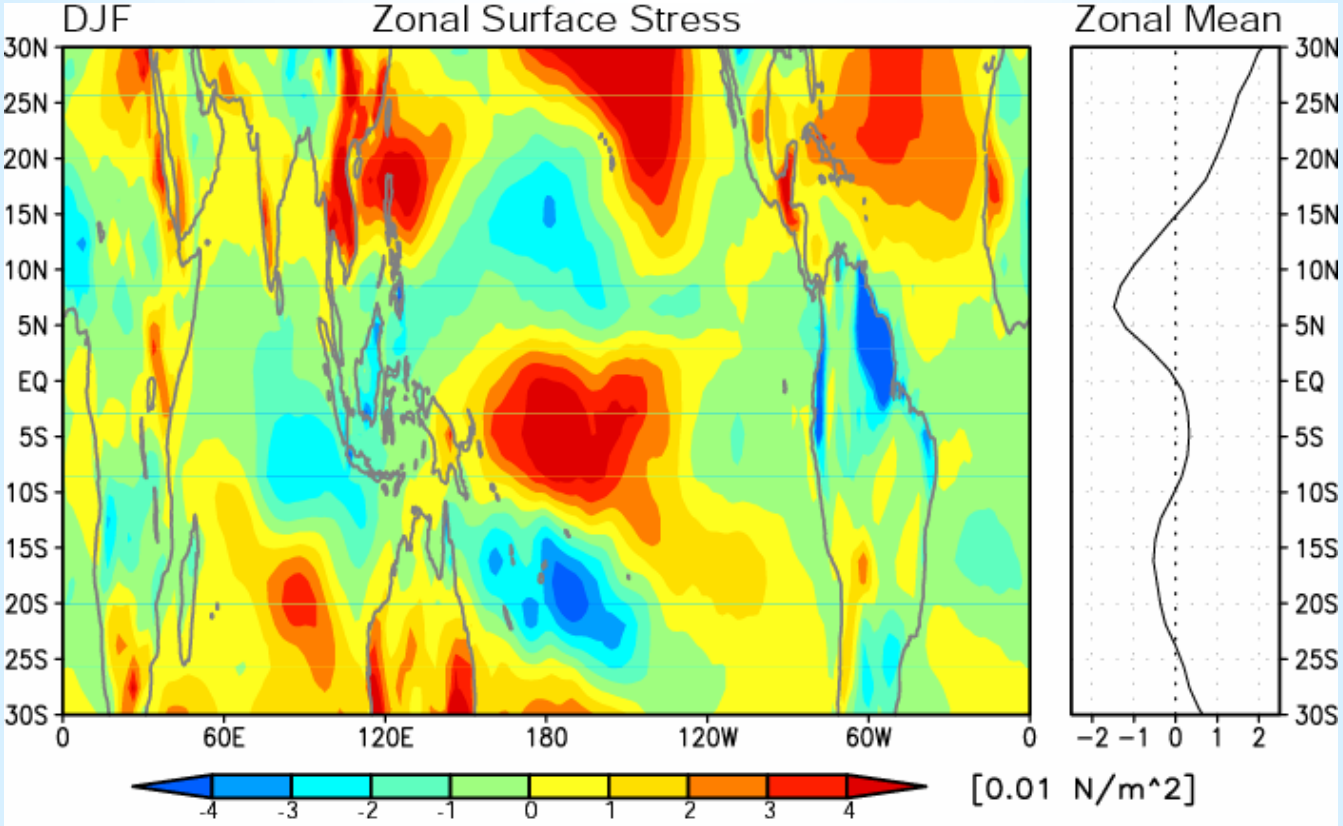


- Central Pacific has received most attention
- Budgets by regions marked

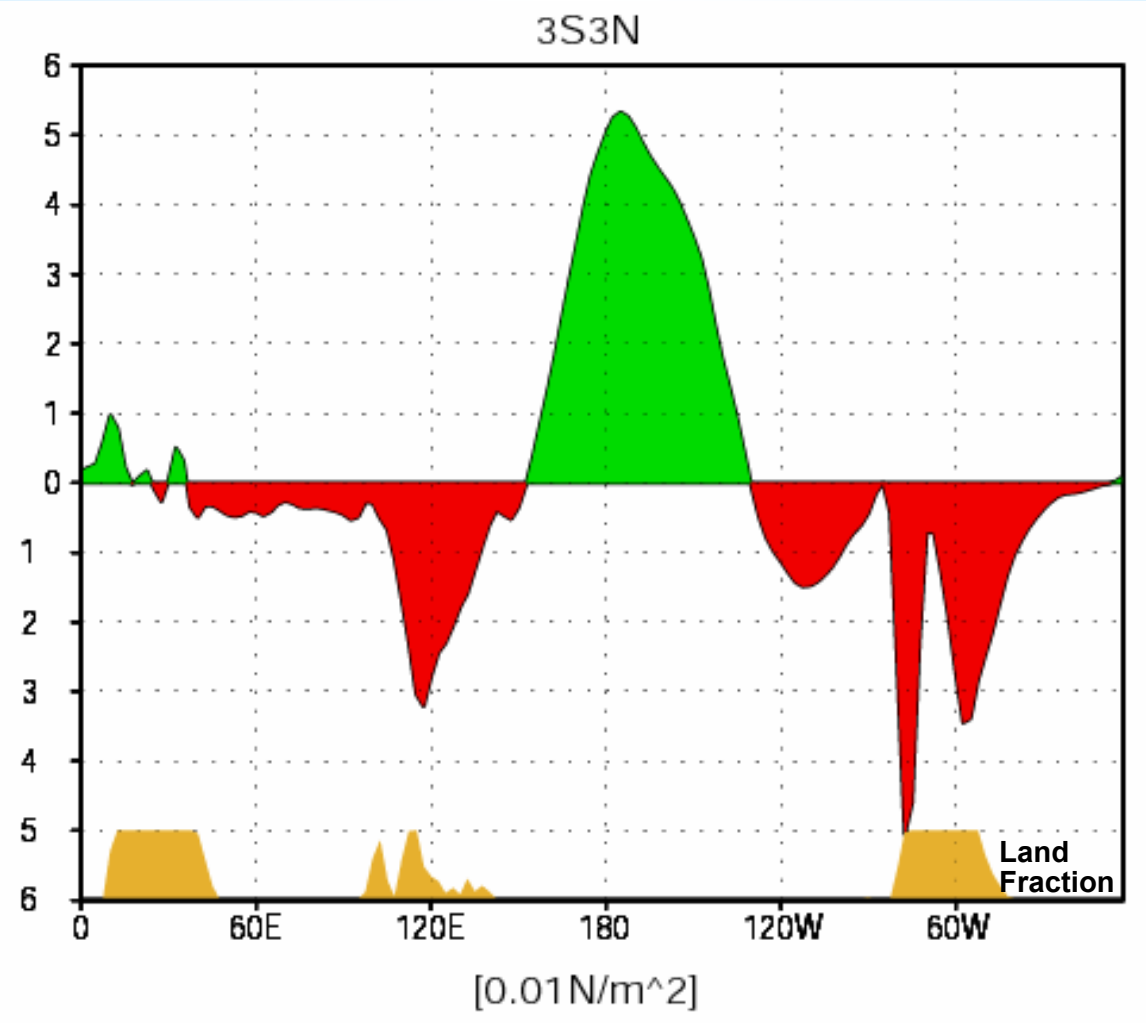
NCEP Reanalysis ENSO composites

El Niño (73, 78, 83, 87, 92, 98)

- La Niña (71, 74, 84, 89, 96, 99)



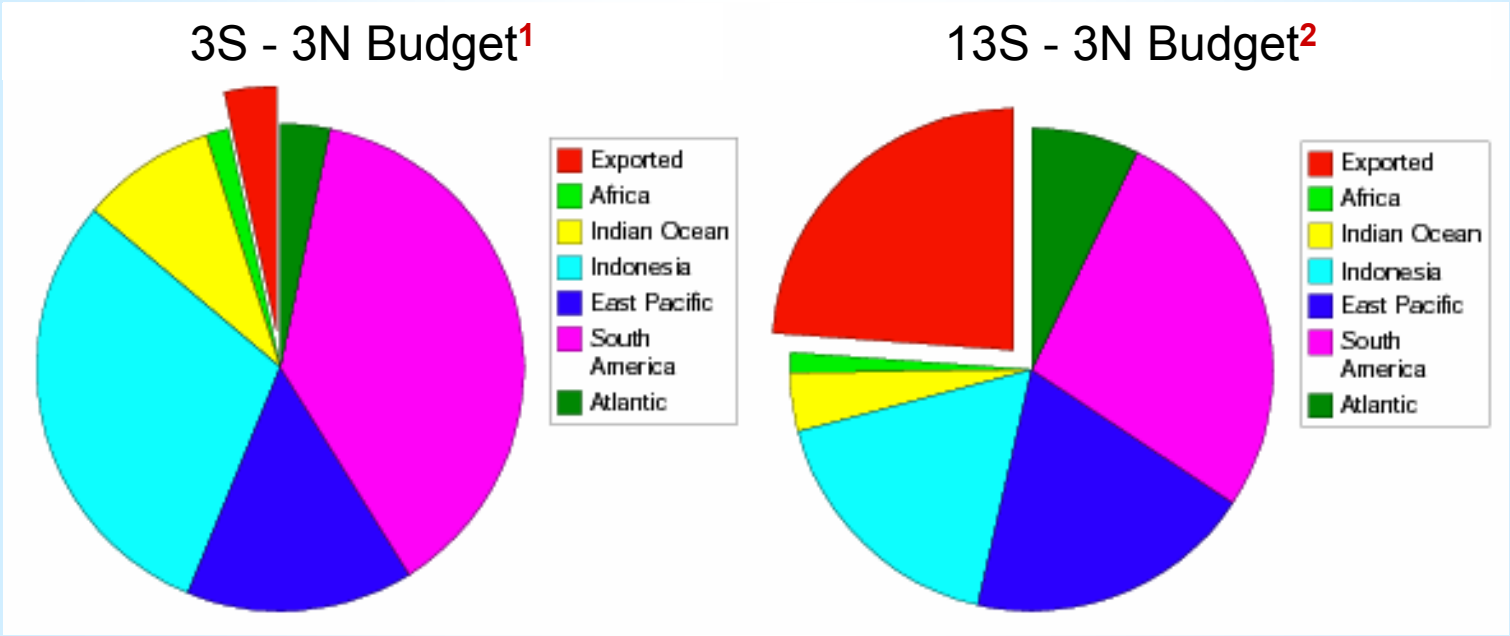
NSIPP ENSO stress composite



- **Zonal mean stress balanced by nonlinear momentum transport**

Equatorial and "ENSO-band" budgets

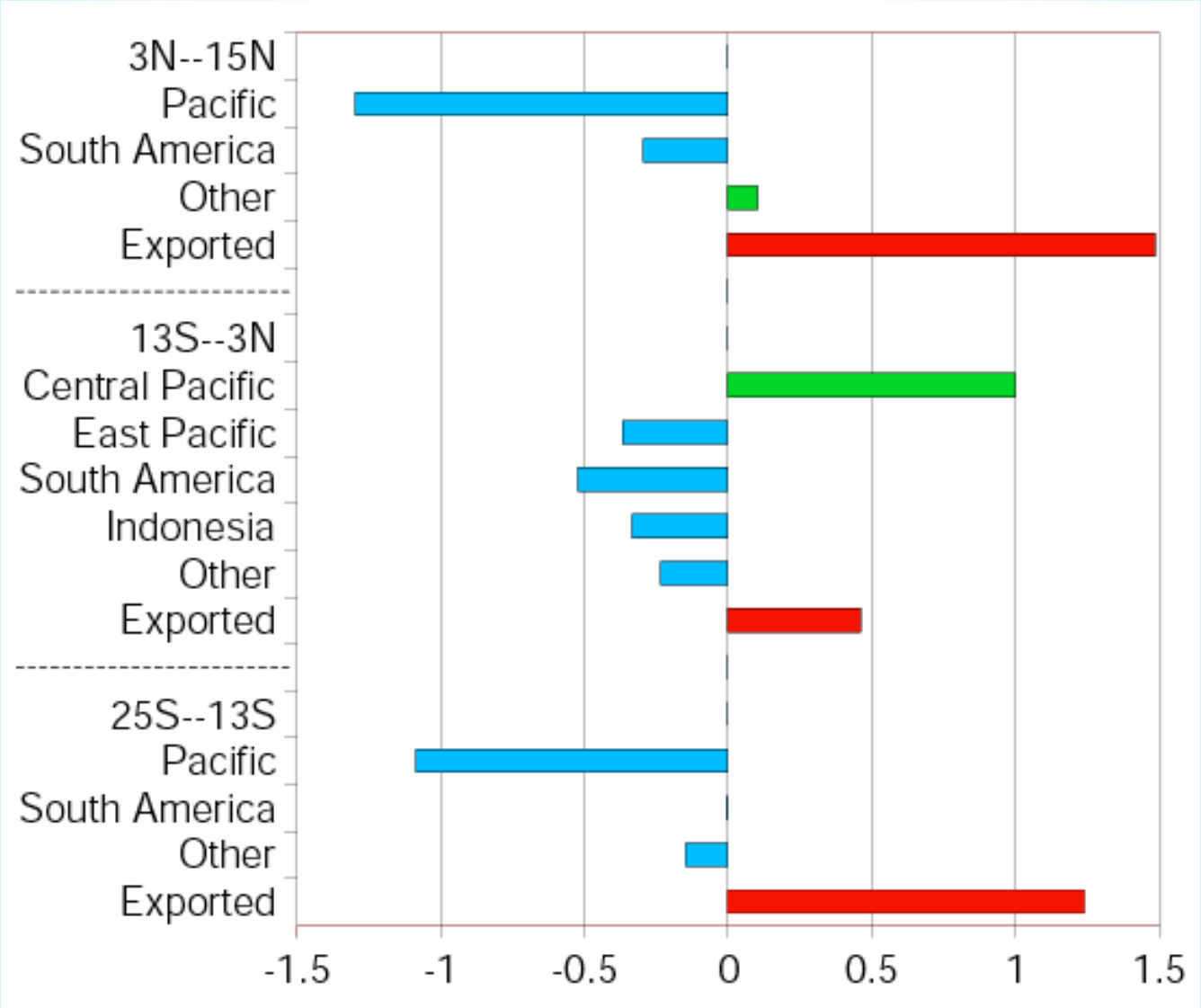
- **Importance of Indonesia and South America in zonal balance**



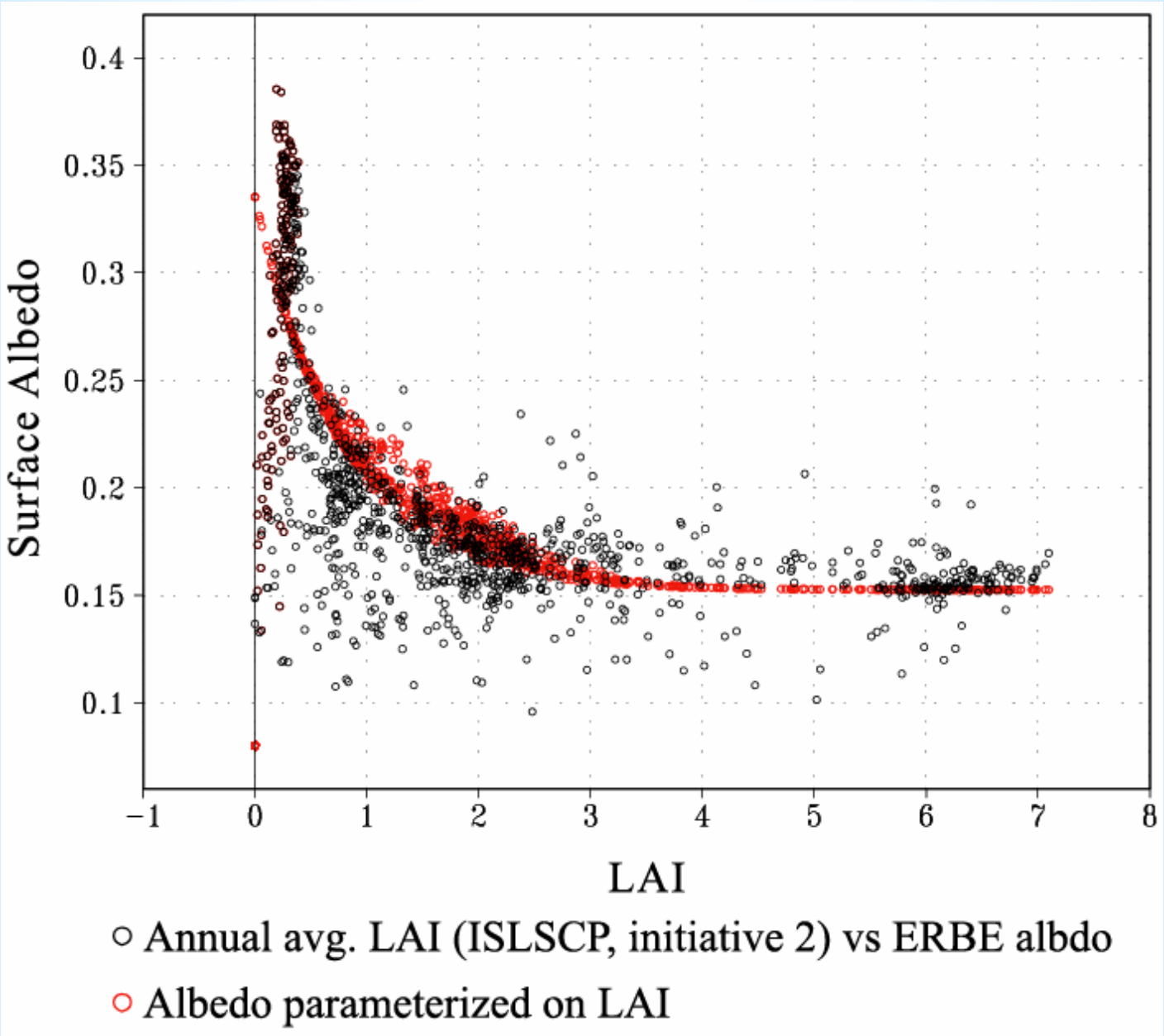
- **3S - 3N most relevant to ocean**
  - **Near balance in zonal mean**
  - **Small input of westerly momentum**
- **13S - 3N latitude band of ENSO Central Pacific anomaly**
  - **Fairly near balance**
  - **Export of westerly momentum**

[Budgets relative to larger of [1]ENSO C.P. anom or [2]Sum of non-C.P.]

NSIPP ENSO composite force budget

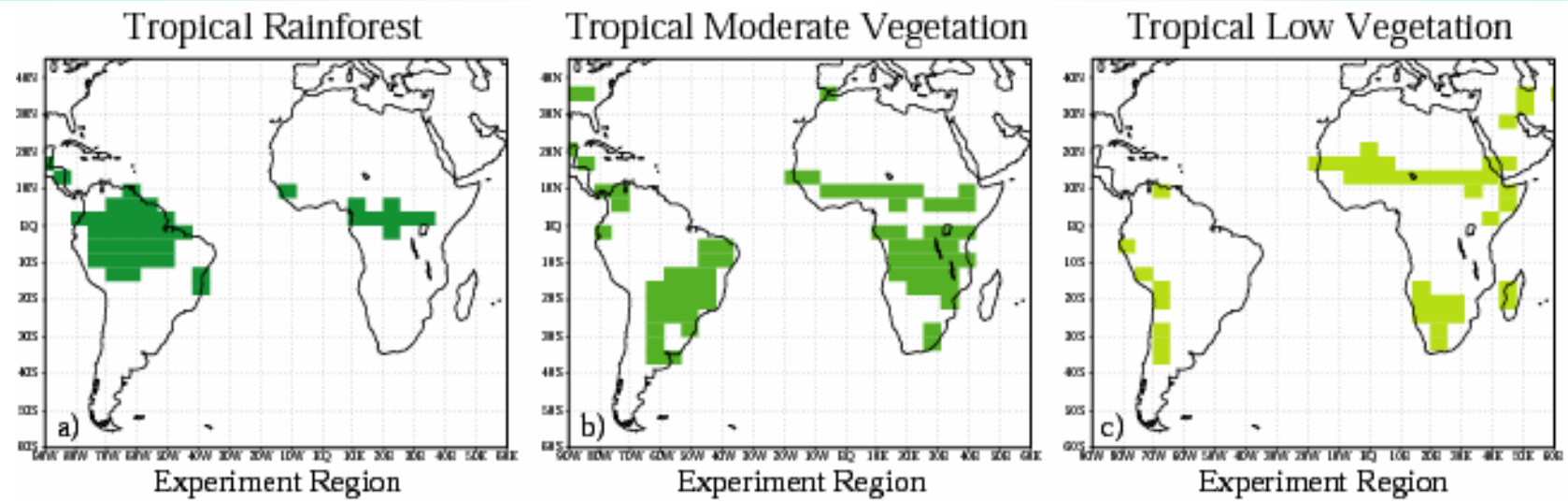


Albedo dependence on LAI

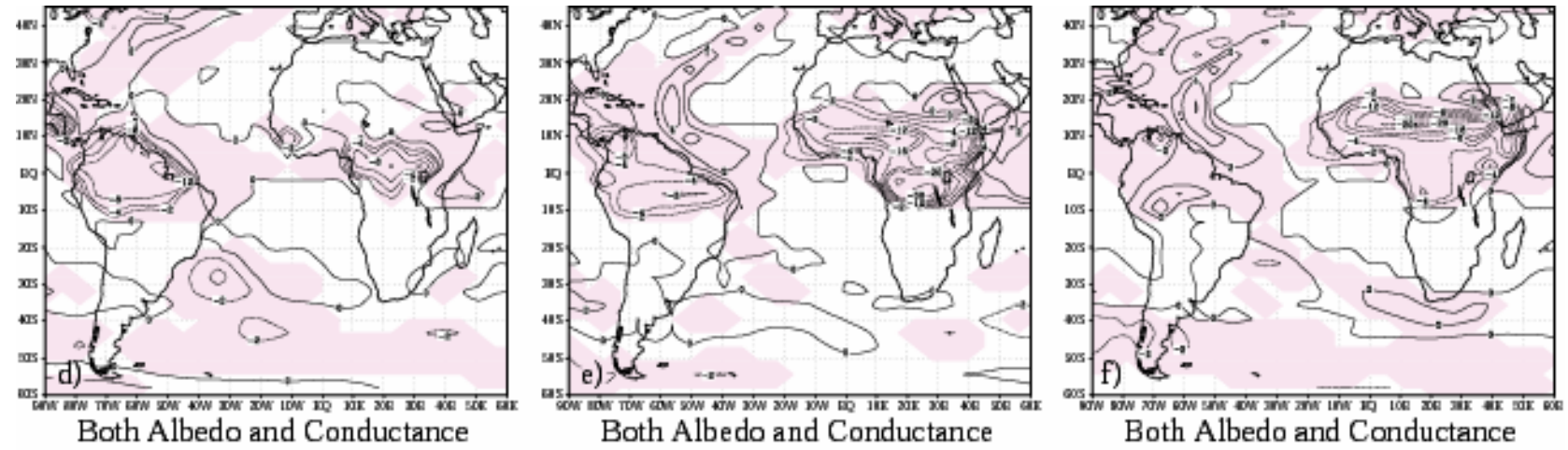


LAI sensitivity experiments

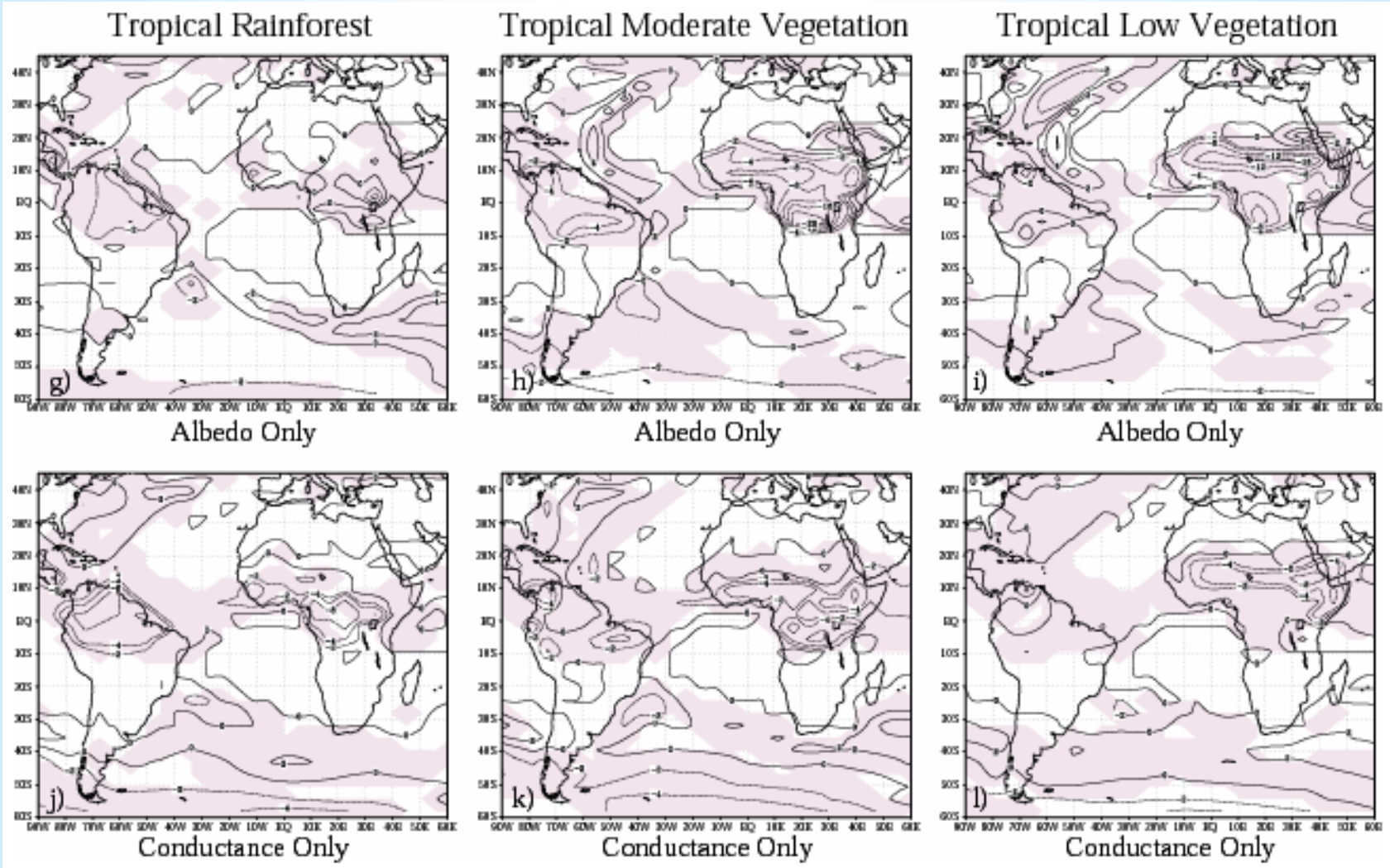
- 33% reduction in target regions



Precipitation anomaly



LAI impacts on precipitation via albedo and evapotranspiration (surface conductance)

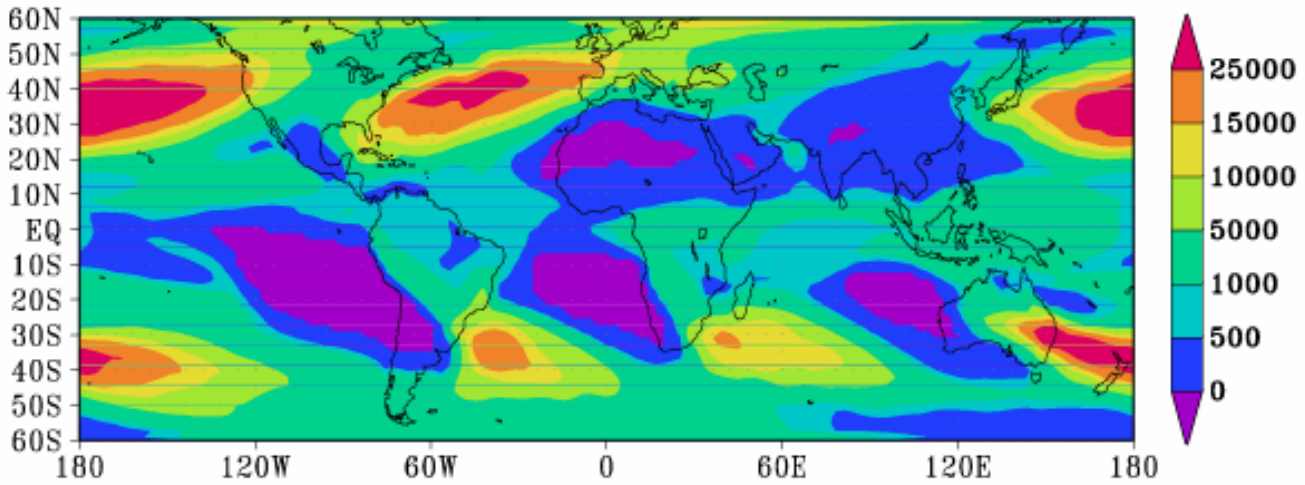


SACZ variability

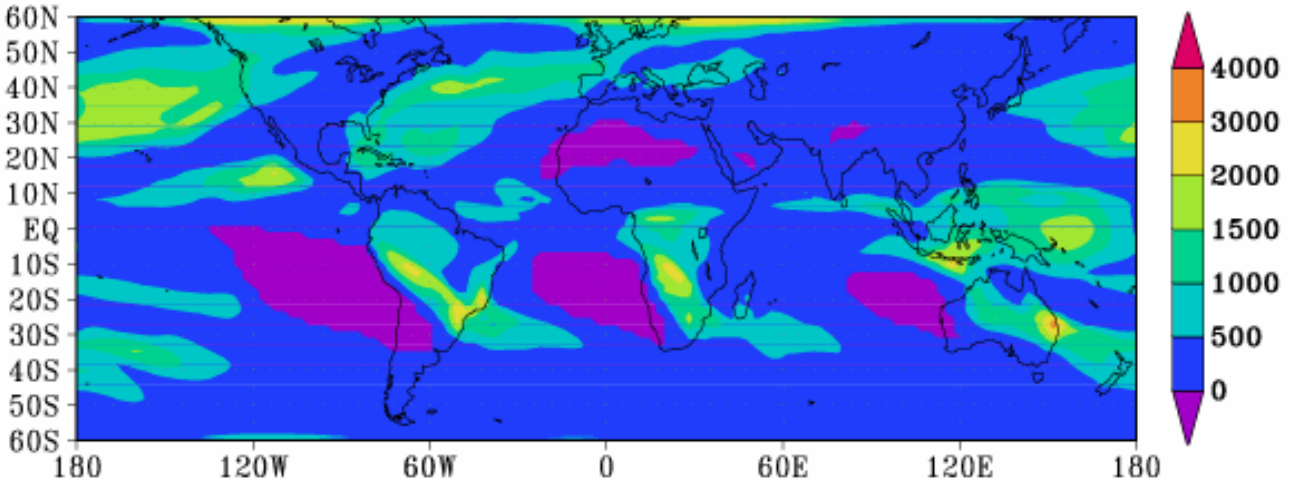
Possibly rel. to SACZ variability of Liebmann et al 1999, Robertson & Mechoso 2000

QTCM with seasonal SST forcing

precipitation variance for DJF



DJF Daily Variance



DJF 12-Day Variance

$(Wm^{-2})^2$ QTCM1V2.2, 2xRes., 5yr.