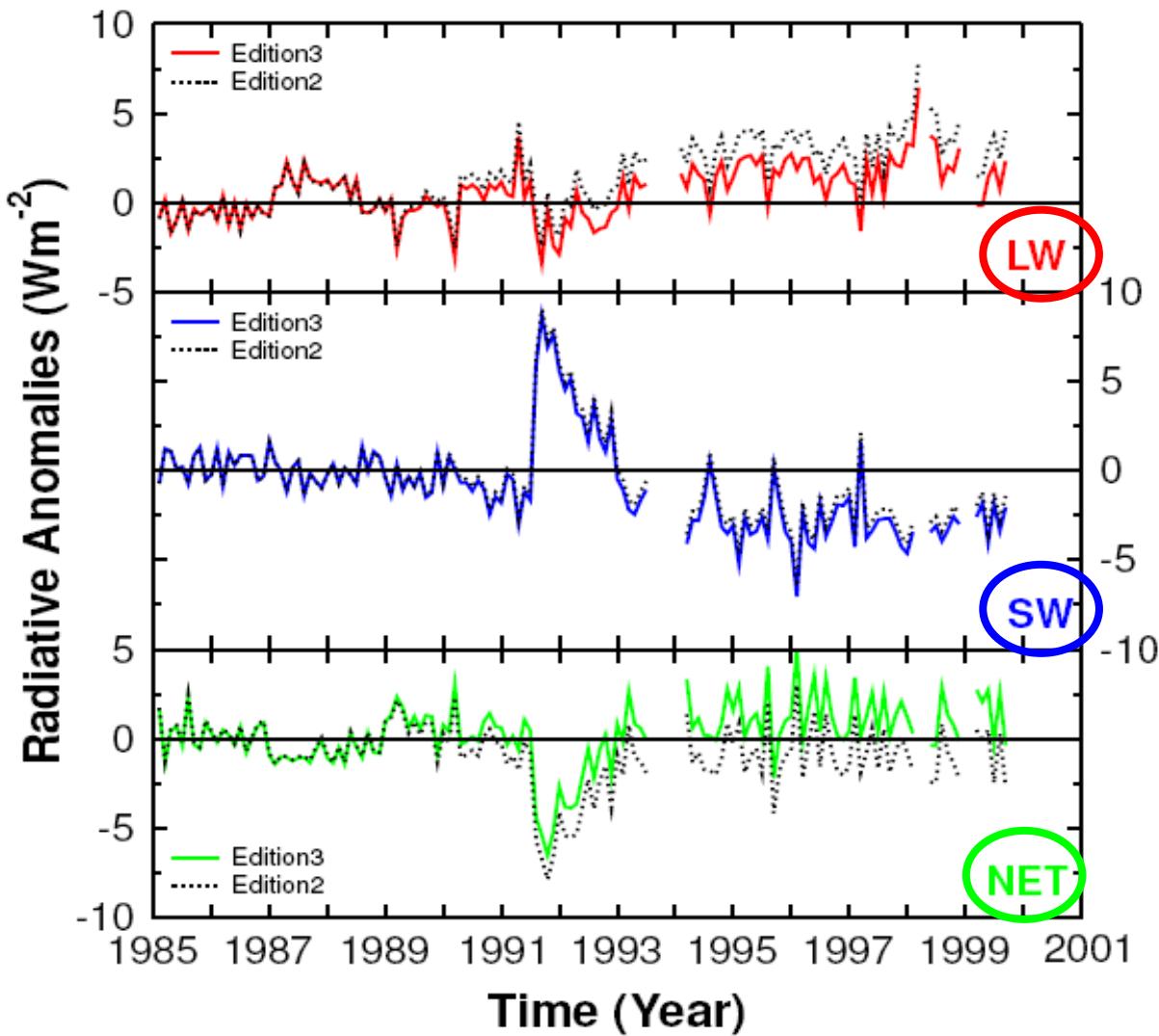


# Characterizing decadal atmospheric variability in multiple datasets

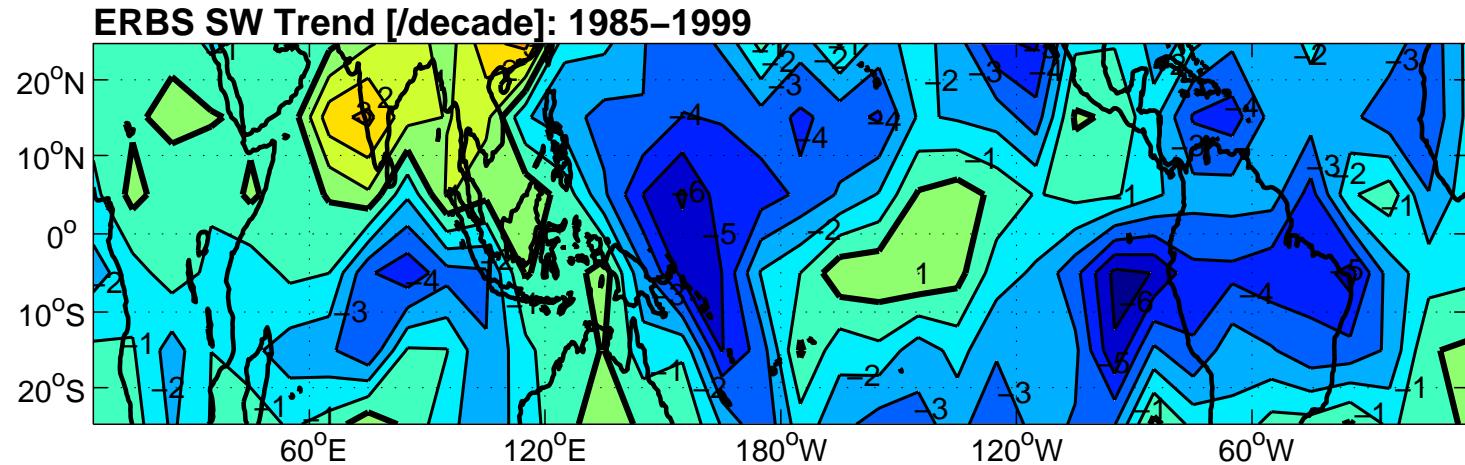
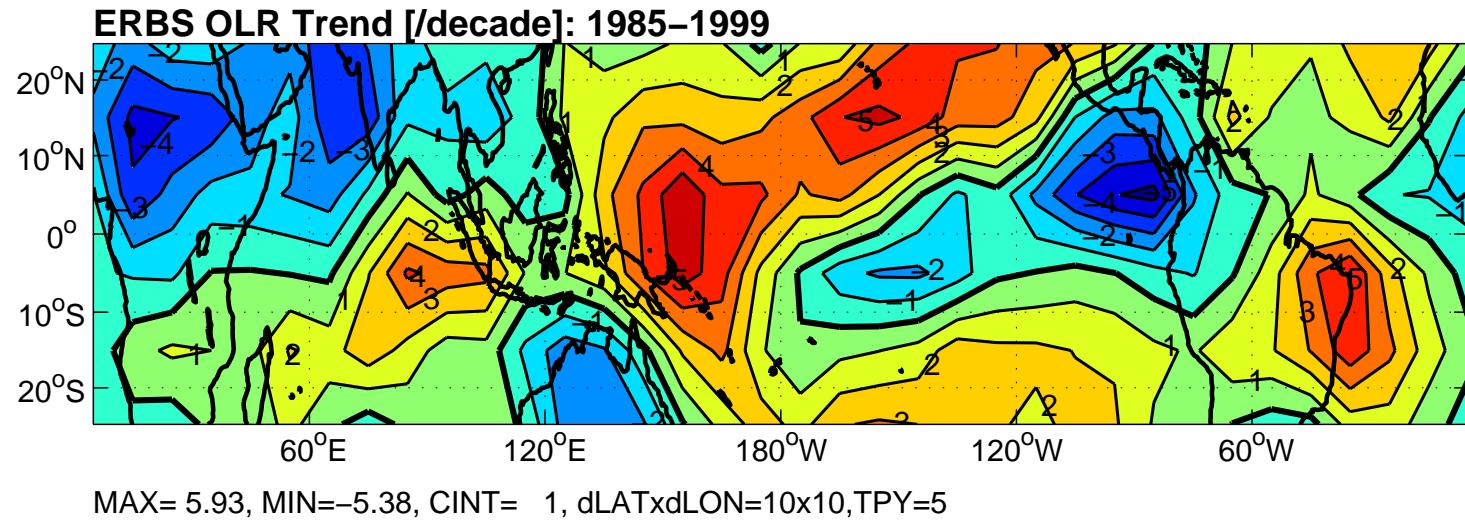
Amy Clement, Christos Mitas and  
Brian Soden



# Wong et al. ERBE/ERBS tropical mean TOA radiative fluxes

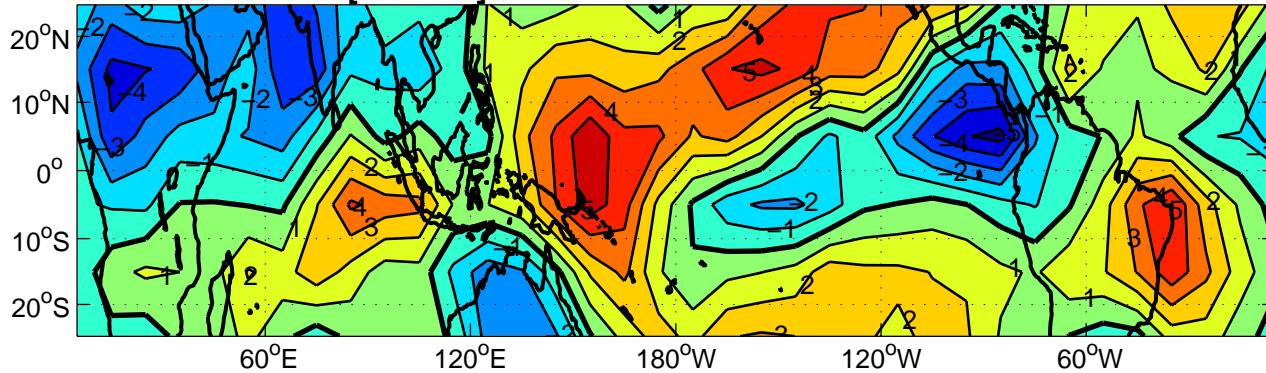


Are there signatures in the spatial patterns of the trends that can help reveal mechanisms?



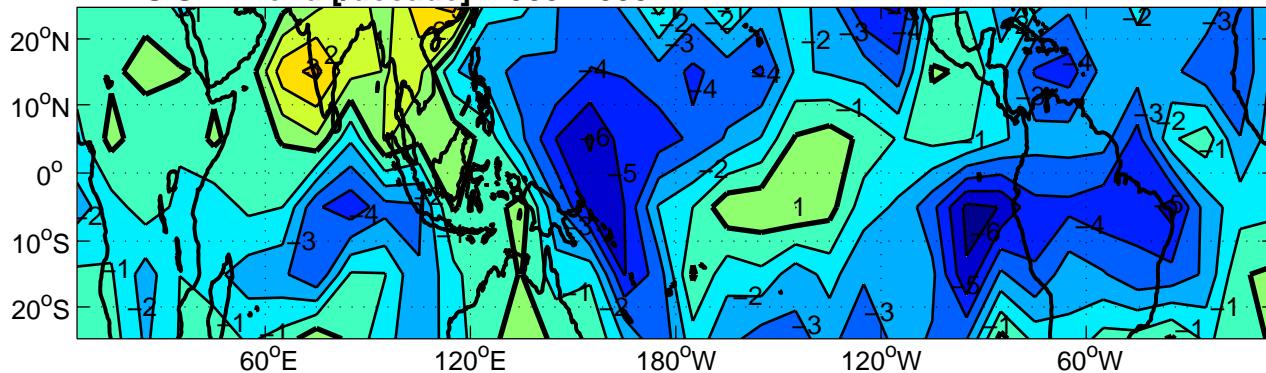
- Are the trends over the 1985-1999 period robust?  
**Use HIRS data**
- Are the spatial patterns physically meaningful?  
**Use other climate data**
- What is the role of ENSO?  
**Remove ENSO**

### ERBS OLR Trend [/decade]: 1985–1999



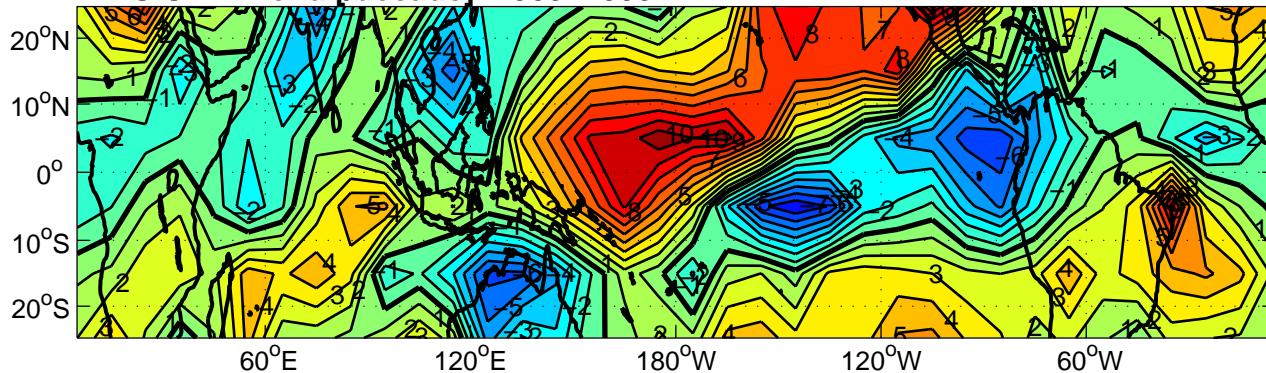
MAX= 5.93, MIN=−5.38, CINT= 1, dLATxdLON=10x10,TPY=5

### ERBS SW Trend [/decade]: 1985–1999



MAX= 3.42, MIN=−6.27, CINT= 1, dLATxdLON=10x10,TPY=5

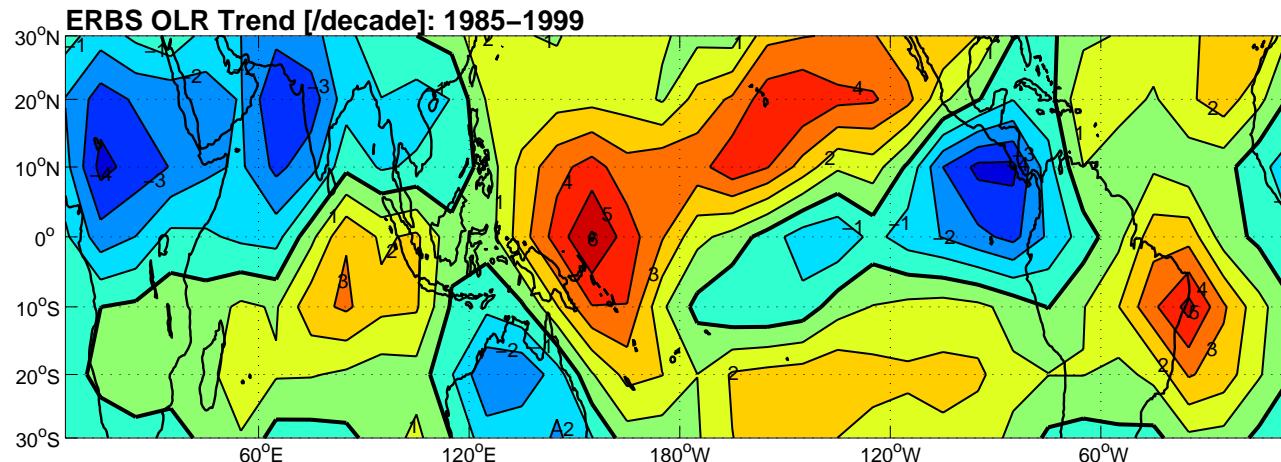
### HIRS OLR Trend [/decade]: 1985–1999



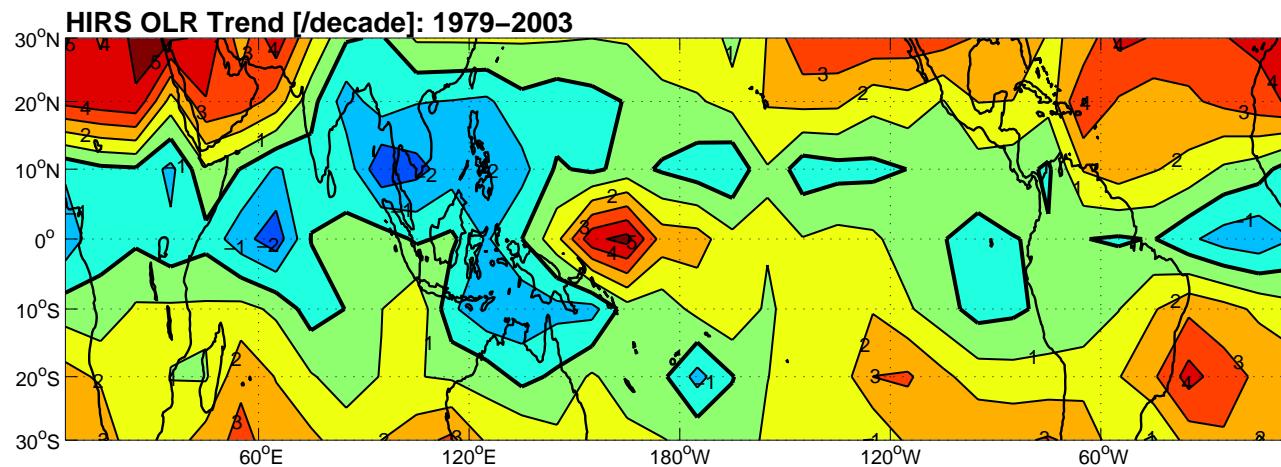
MAX=10.88, MIN=−7.89, CINT= 1, dLATxdLON=10x10,TPY=5

Data  
courtesy of  
Hai-Tien  
Lee

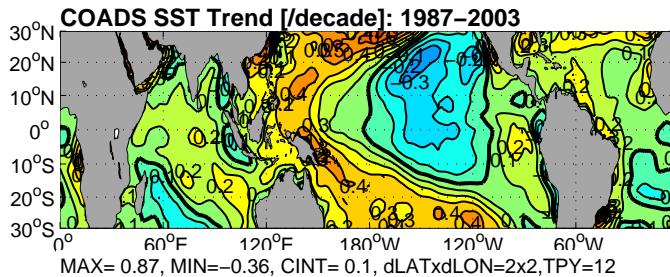
# ERBS OLR 1985-1999



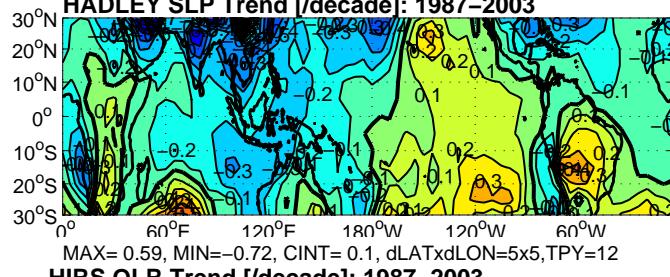
# HIRS OLR 1979-2003



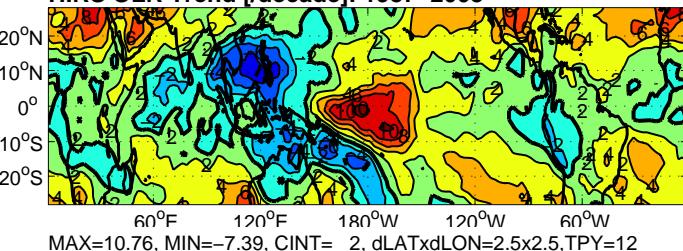
# SST



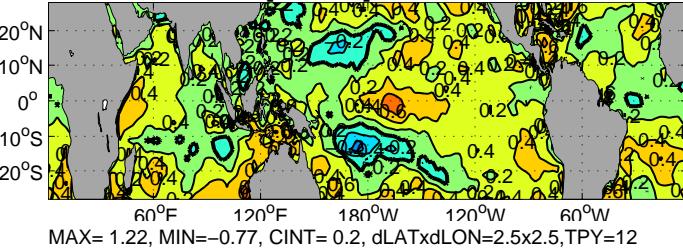
# SLP



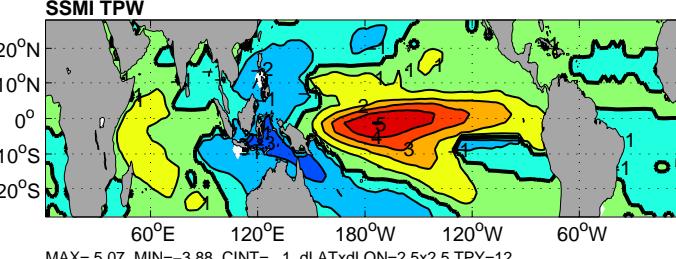
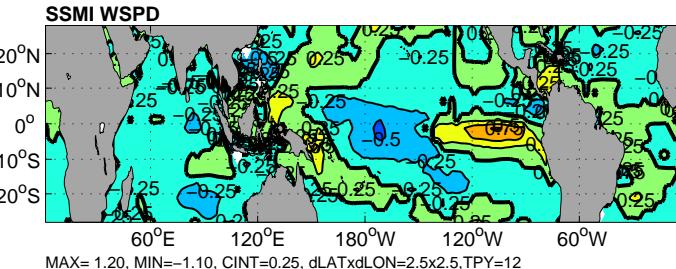
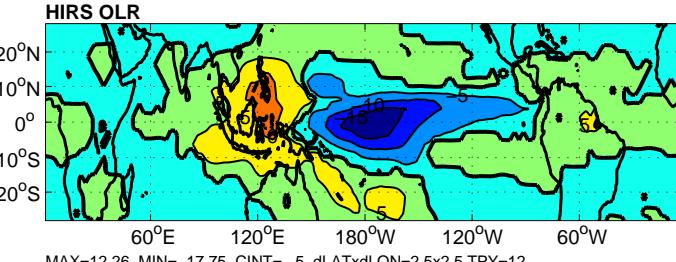
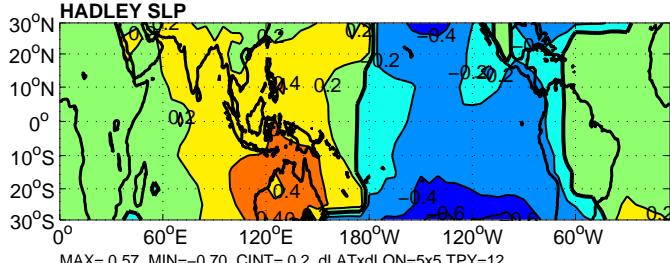
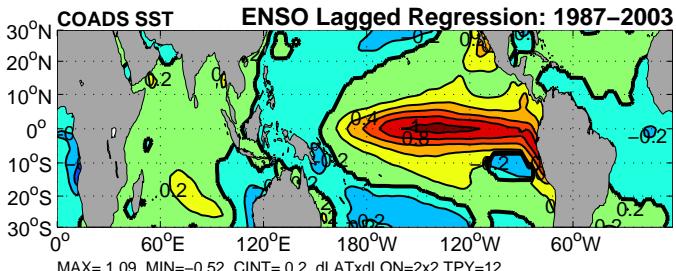
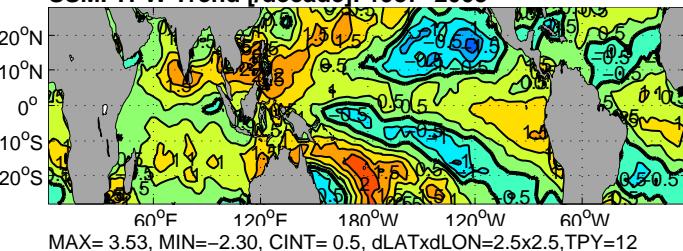
# OLR



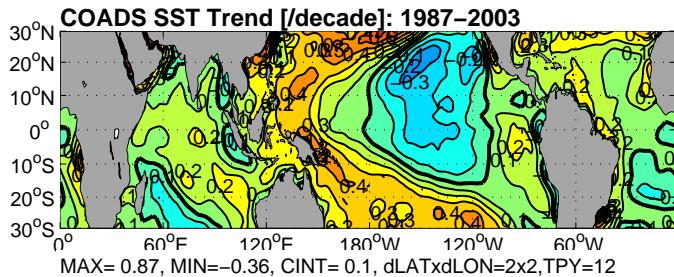
# SSMI Wind speed



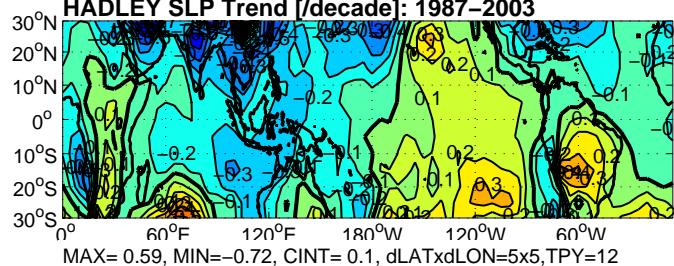
# SSMI Tot precip. water



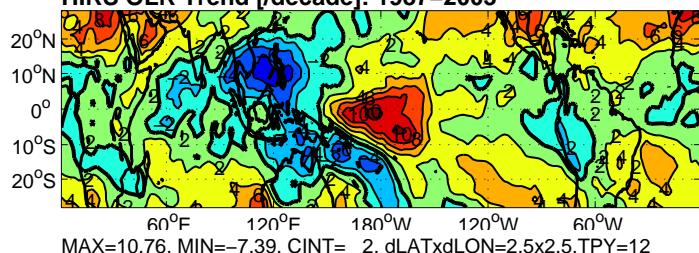
**SST**



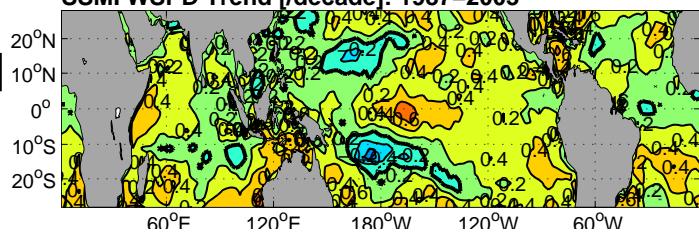
**SLP**



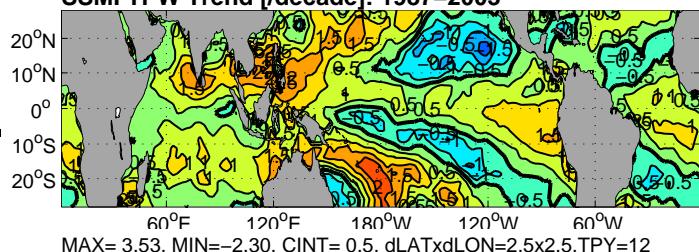
**OLR**



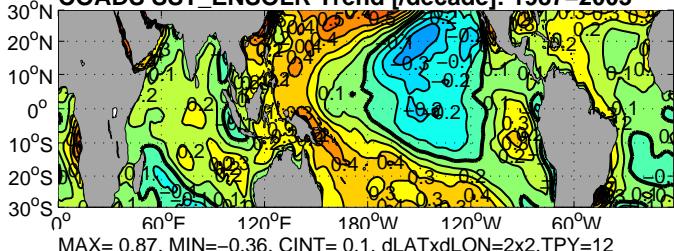
**SSMI Wind speed**



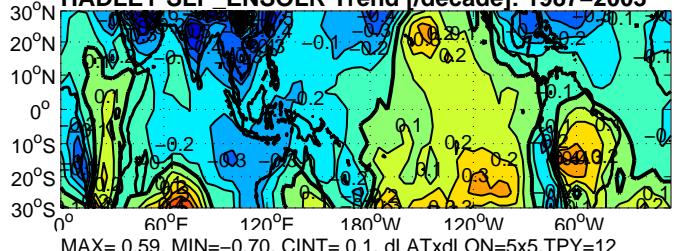
**SSMI Tot precip. water**



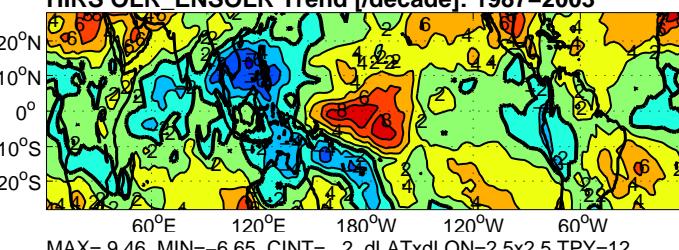
**COADS SST\_ENSOLR Trend [/decade]: 1987–2003**



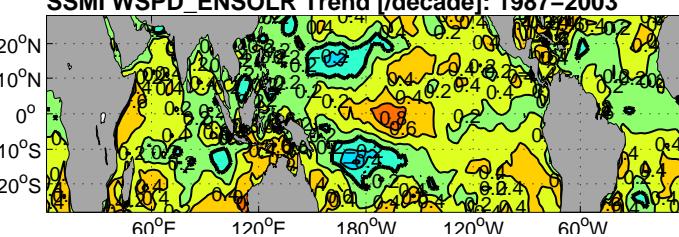
**HADLEY SLP ENSOLR Trend [/decade]: 1987–2003**



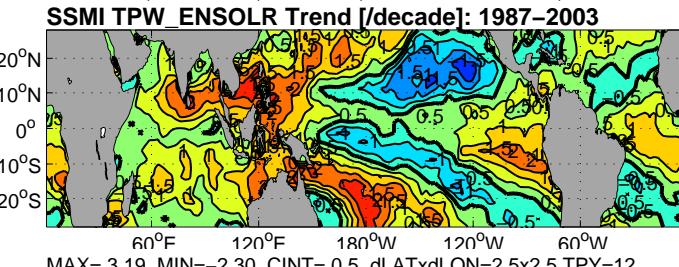
**HIRS OLR ENSOLR Trend [/decade]: 1987–2003**



**SSMI WSPD ENSOLR Trend [/decade]: 1987–2003**



**SSMI TPW ENSOLR Trend [/decade]: 1987–2003**

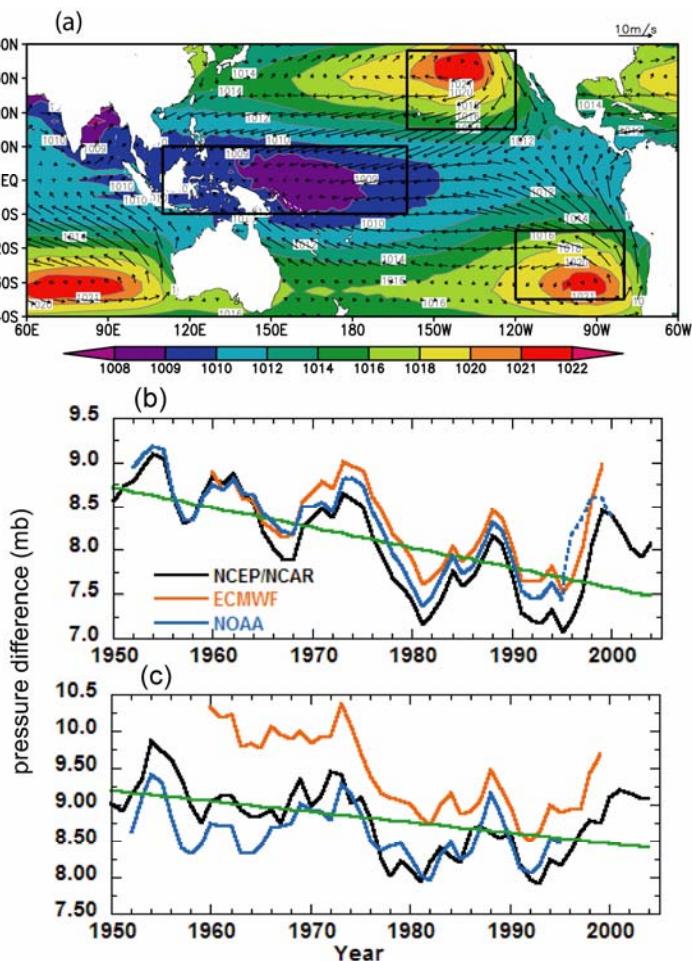


# Final points

- Are the ERBE trends over the 1985-1999 period robust?  
**Some features in the central and subtropical Pacific**
- Are the spatial patterns physically meaningful?  
**There are zonal and meridional structures that appear in other climate fields. For example:**
  - Subtropical Pacific: drier; higher SLP; higher OLR
  - Central Pacific: higher OLR; higher windspeeds; increased zonal gradient in SST and SLP
- What is the role of ENSO?  
**Not much**
- What's causing the trends? PDO? Global warming?
- Other fields to include?

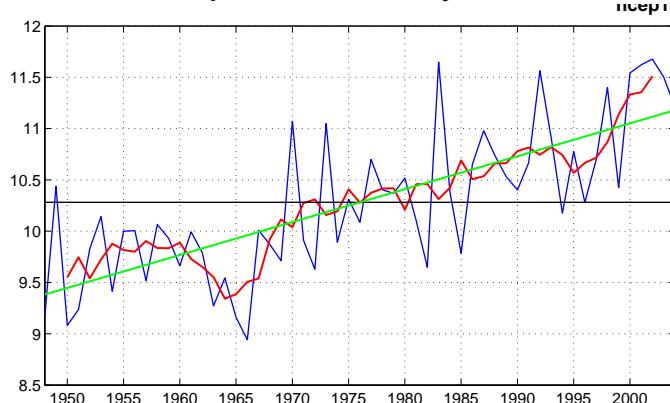
# What is causing these trends?

Weakening Walker circulation?  
(Zhang and Song 2006)

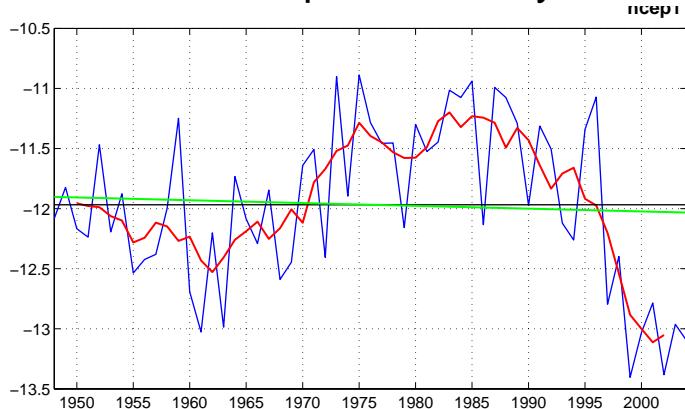


Strengthening Hadley circulation?  
(Mitas and Clement 2004, 2005)

Northern hemisphere Hadley Cell Index (NCEP)



Southern hemisphere Hadley Cell Index



# Circulation changes influence the regional radiative fluxes (Clement and Soden 2004)

Strong – Weak  
Hadley cell

