Climate Dynamics: Why Does Climate Vary?

El Nino: Coupling between the Atmosphere and Ocean in the Presence of Nonlinearity

http://www.esrl.noaa.gov/psd/people/dezheng.sun/lectures/ATOC7500.html
El Nino Southern Oscillation
Tropical Atmosphere and Ocean
The SST Distribution

Climatological SST Distribution

[Map showing global SST distribution with contour lines and temperature values]
Tropical Atmosphere and Ocean

SST over The tropical Pacific

Mean SST (1950–2000)

Warm pool

Cold tongue
Tropical Atmosphere and Ocean: SST and Deep Convection
Tropical Atmosphere and Ocean
Deep Convection and SST

FIGURE 3.2. Mean annual GPCP precipitation over the period 1979-2003 in mm day\(^{-1}\).
Tropical Atmosphere and Ocean

The Walker Circulation

- Warmer water in Asia and Australia
- Cooler water in the Pacific
- Trade winds
- Tahiti
- Air circulation in a vertical plane at the equation

Pacific Ocean
Tropical Atmosphere and Ocean
SST and Wind Over The tropical Pacific
Mean surface wind stress

Trade winds
Tropical Atmosphere and Ocean
The Walker Circulation

Global Walker Circulation

Winter (DJF) Mean

EQ
30°S
90°W
0
90°E
180
90°W

Atlantic Ocean
Indian Ocean
Pacific Ocean

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Tropical Atmosphere and Ocean Connection with the Extra-tropics
Tropical Atmosphere and Ocean
The Walker Circulation and Its Oceanic Counterpart
Tropical Atmosphere and Ocean
The Equatorial Ocean Circulation
Vertical temperature section along the Equator

Tropical Atmosphere and Ocean Connection With Extratropics
The ENSO Phenomenon

La Niña

El Niño

East Pacific (Nino3) SST Anomalies
Tropical Atmosphere and Ocean
The Walker Circulation
The Phase Lock with the Seasonal Cycle
ENSO and Global Climate Variability
ENSO and Global Climate Variability
ENSO and Global Climate Variability
ENSO and Extreme Weather Events
ENSO and Extreme Weather Events

[Bar chart showing the number of hurricanes in the Atlantic Ocean from 1950 to 2000, categorized by La Niña (blue), El Niño (red), and Neutral (green) years.]
Decadal Variability in the Level of ENSO Activity
Decadal Variability in the Level of ENSO Activity
Recommended Readings For The Next Lecture
