

# **Role of Indian Ocean in Biennial Monsoon Oscillation: A Regional-Coupling CGCM Study**

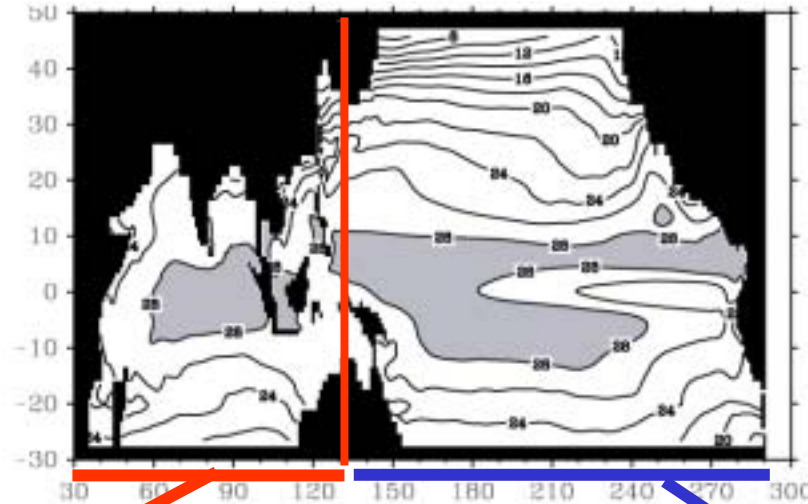
Jin-Yi Yu

Department of Earth System Science

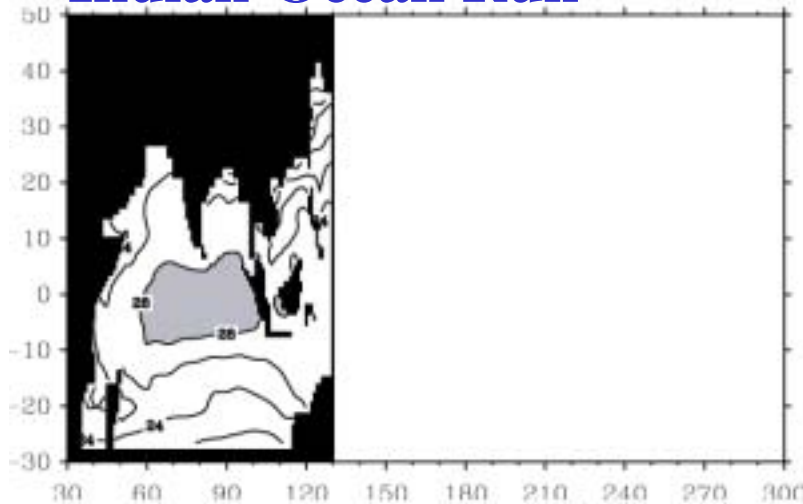
University of California, Irvine

# Regional-Coupling CGCM Experiments

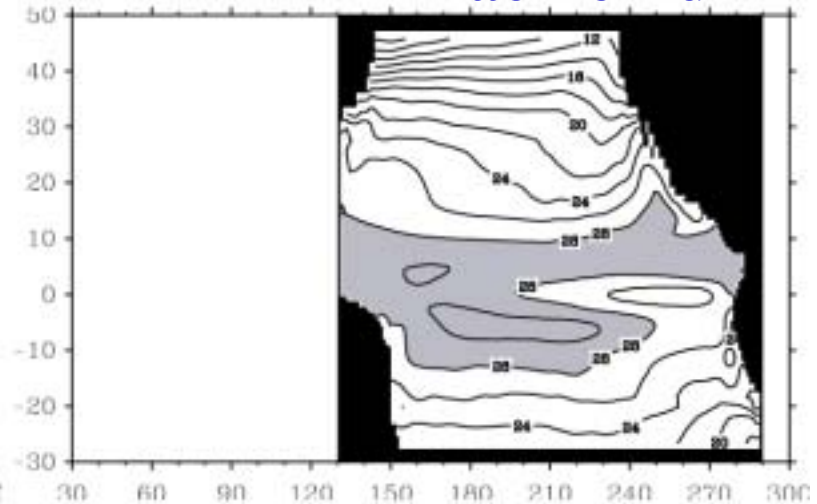
## Indo-Pacific Run



## Indian-Ocean Run

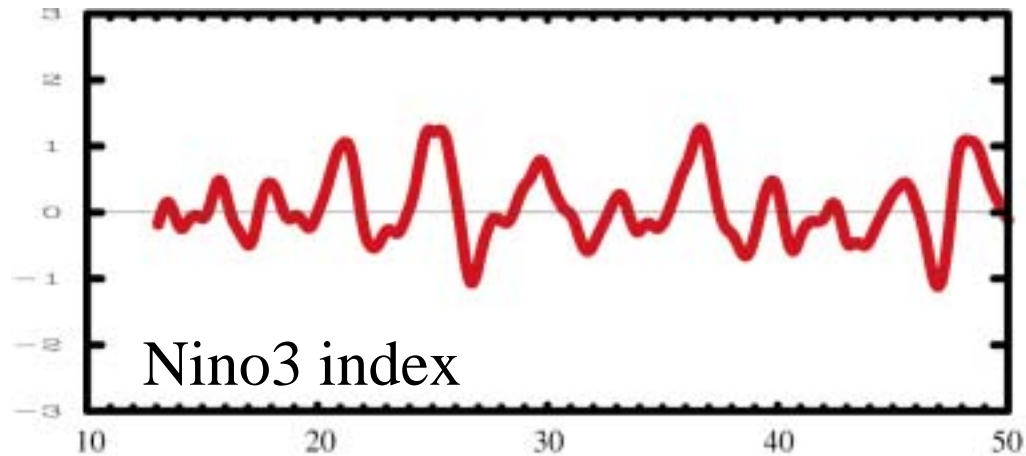


## Pacific Run

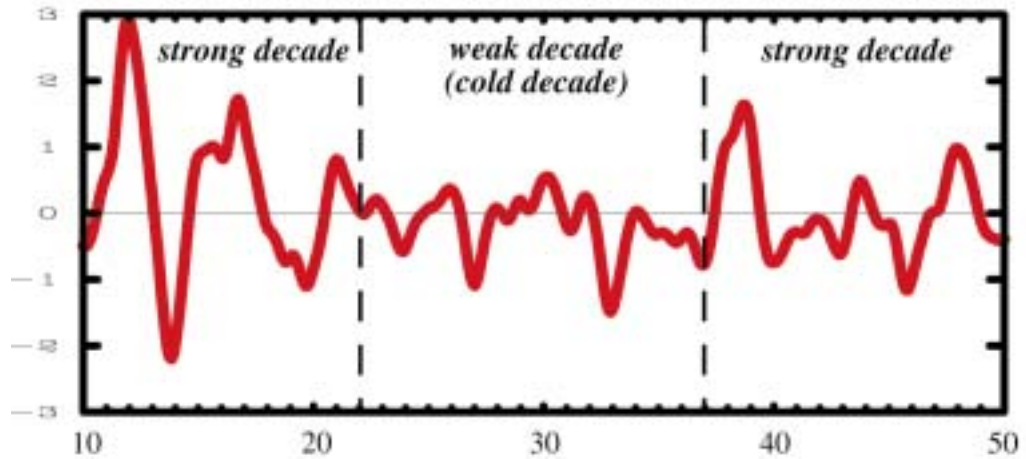


# ENSO with/without Indian Ocean

## Pacific Run

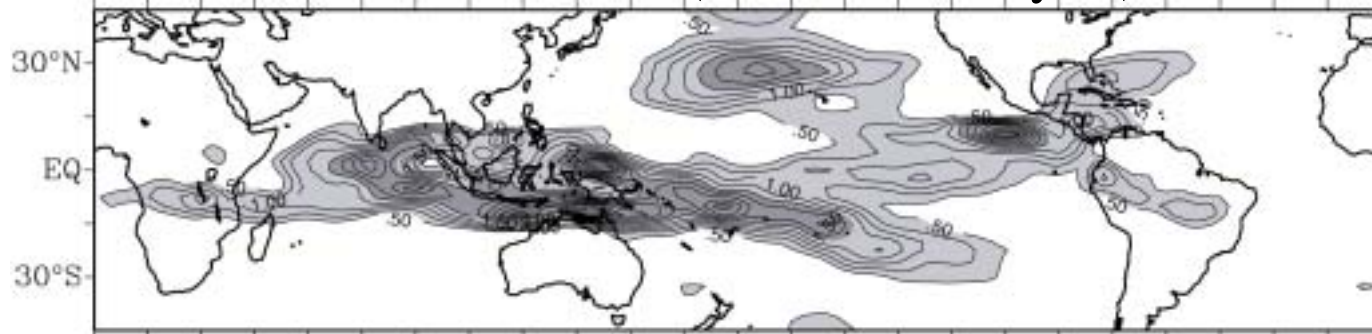


## Indo-Pacific Run

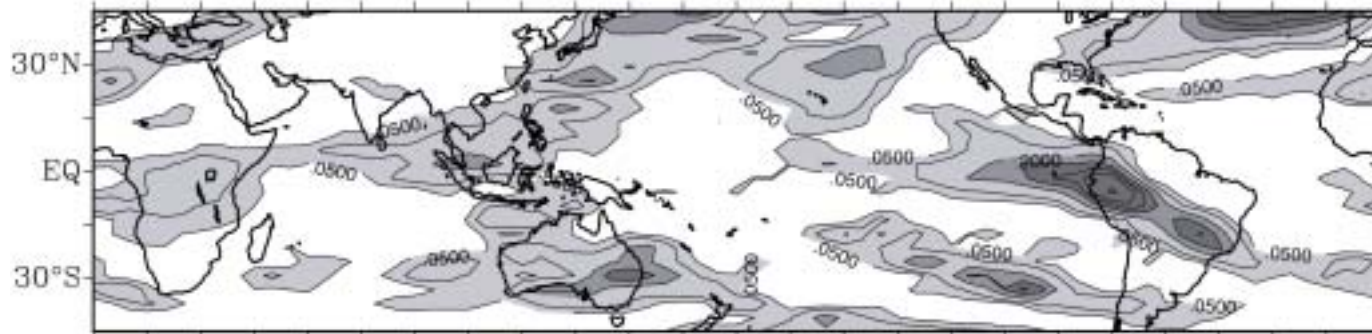


# MJO with/without Indian Ocean

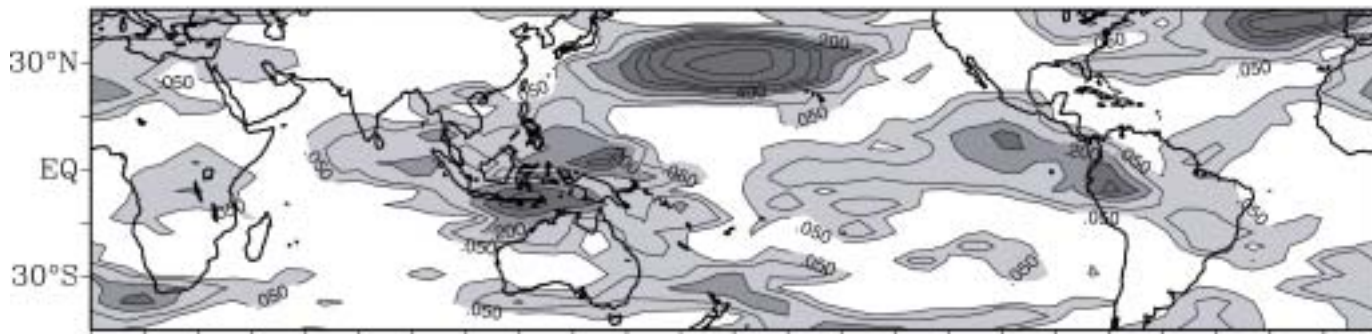
Observation (NCEP Reanalysis)



Pacific Run



Indian Ocean Run



variance of  
band-pass  
filtered  
**U850mb**  
regressed  
with OLR  
Index  
**(Northern  
Winter)**

# Transition between Indian and Australian Monsoons

(during Tropospheric Biennial Oscillation)

**JJA(0)**

**DJF(0)**

**JJA(+1)**

**STRONG**  
Indian Summer Monsoon

**WEAK**  
Indian Summer Monsoon

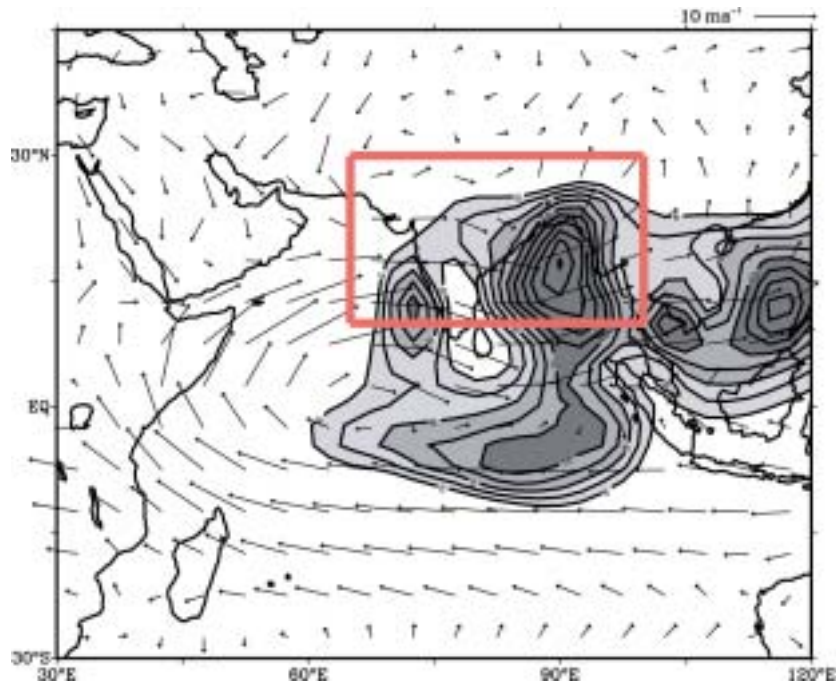
in-phase  
transition

out-of-phase  
transition

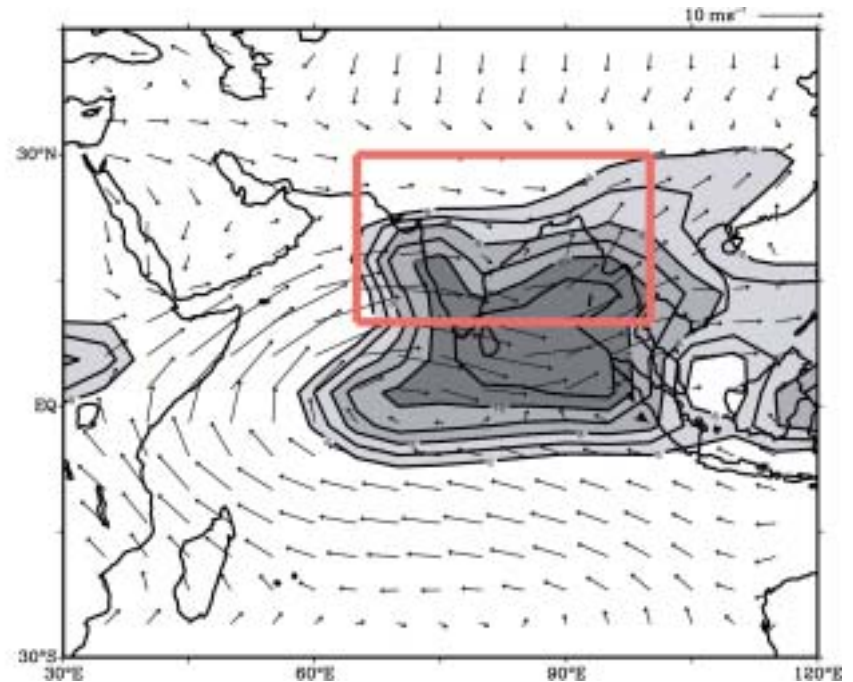
**STRONG**  
Australian Summer Monsoon

# Simulated Indian Summer Monsoons

## Observations



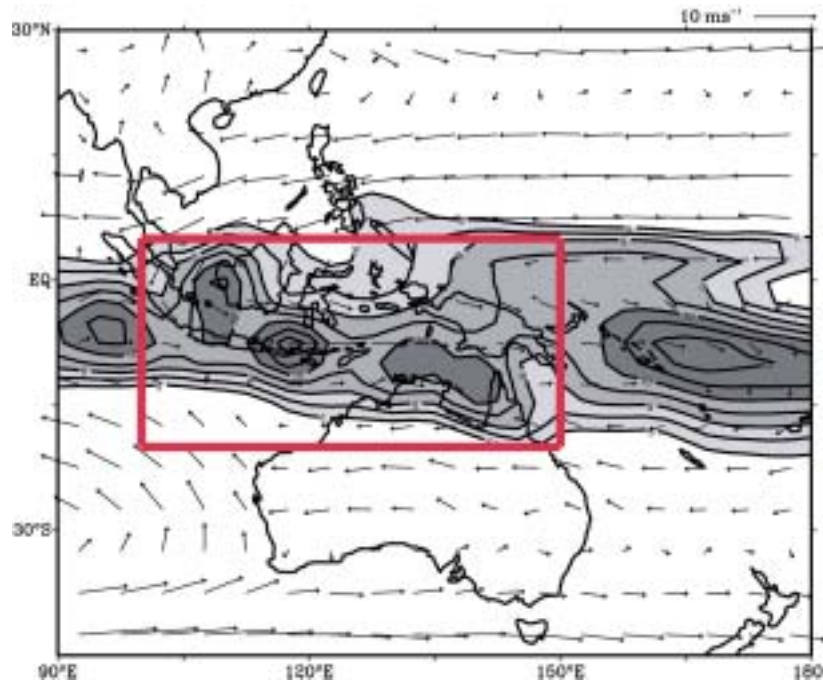
## Indo-Pacific Run



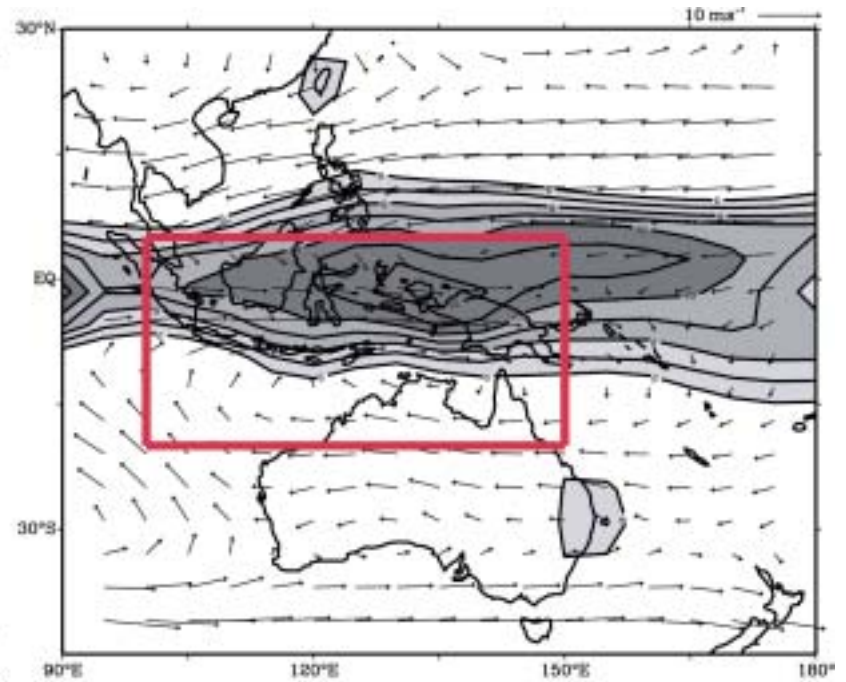
(precipitation and 850mb wind)

# Simulated Australian Summer Monsoons

## Observations

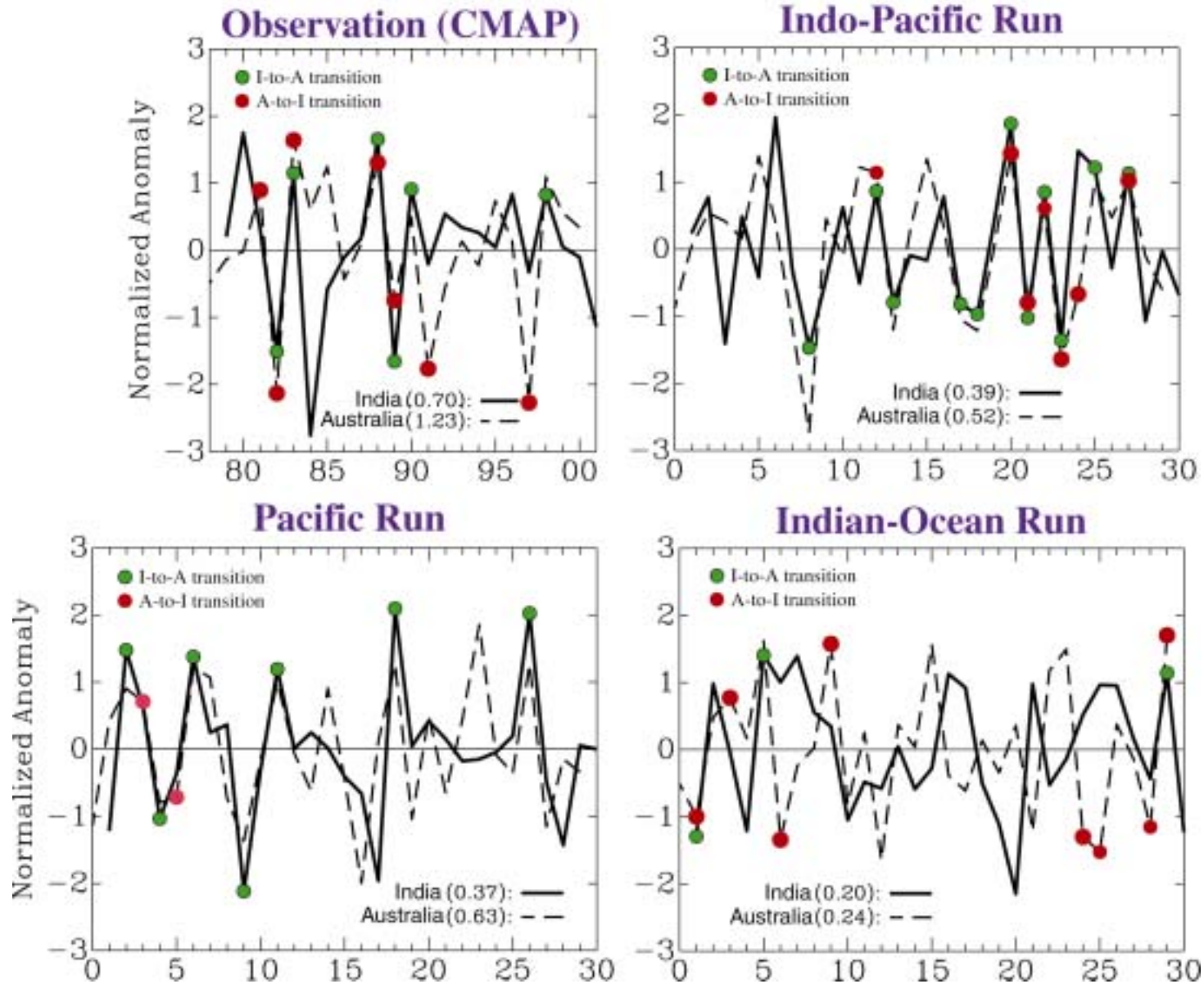


## Indo-Pacific Run



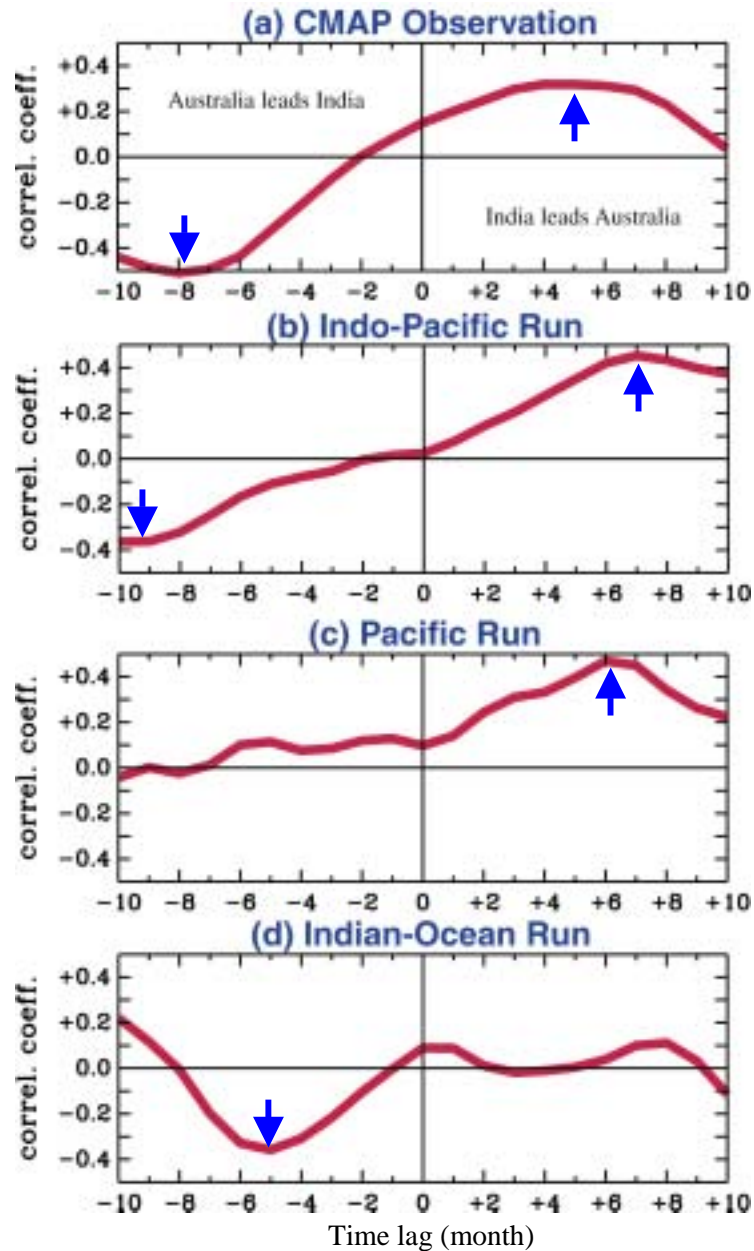
(precipitation and 850mb wind)

# Interannual Anomalies of Monsoon Rainfall Indices

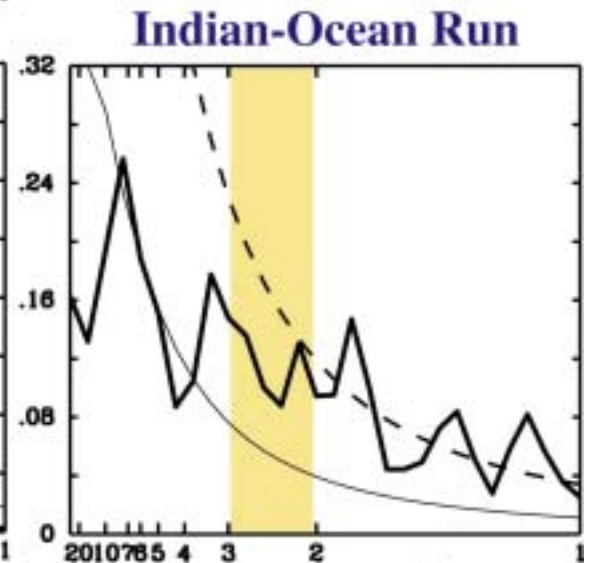
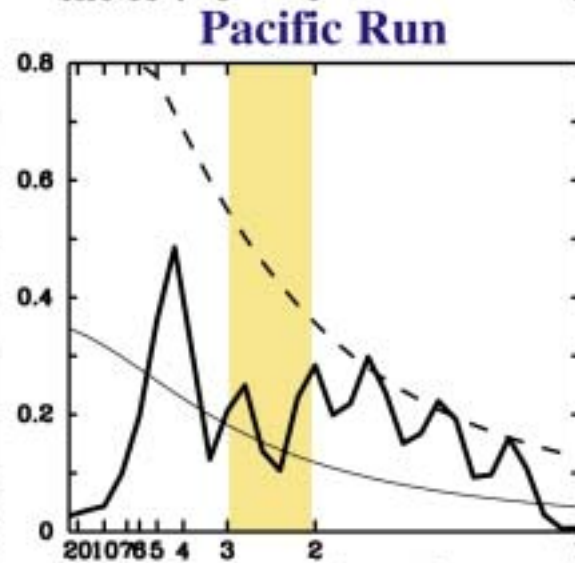
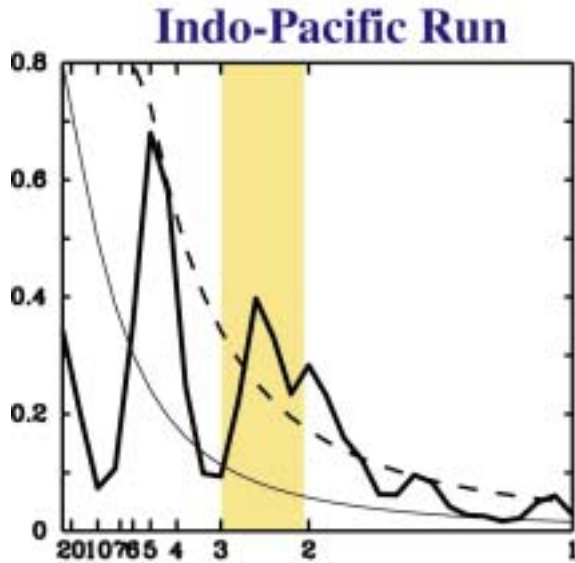
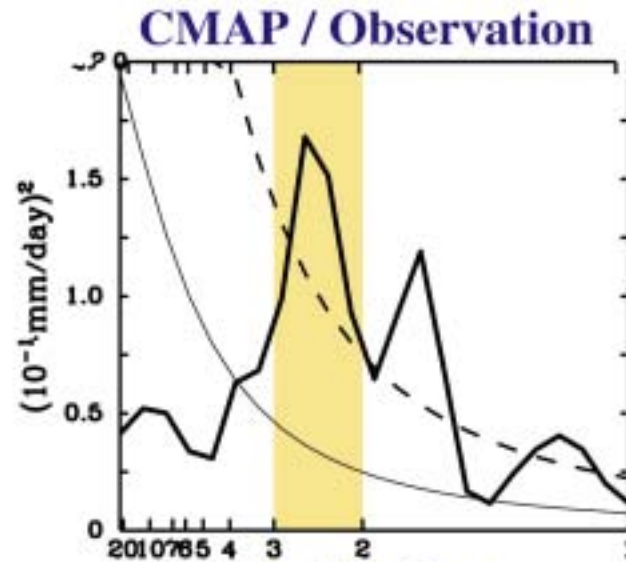




# Time-Lag Correlation btw Monsoon Indices



# Power Spectrum of Indian Summer Monsoon Rainfall

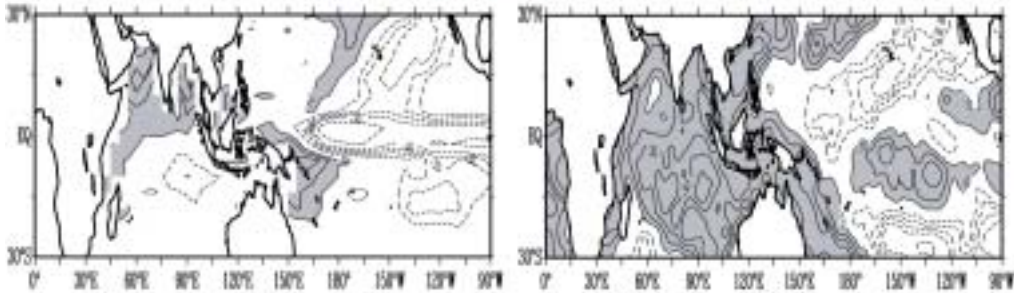


Period (year)

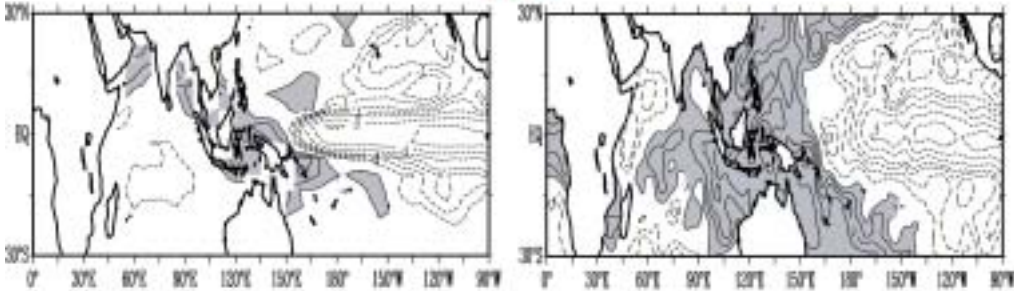
## Indo-Pacific Run MAM

## Observations

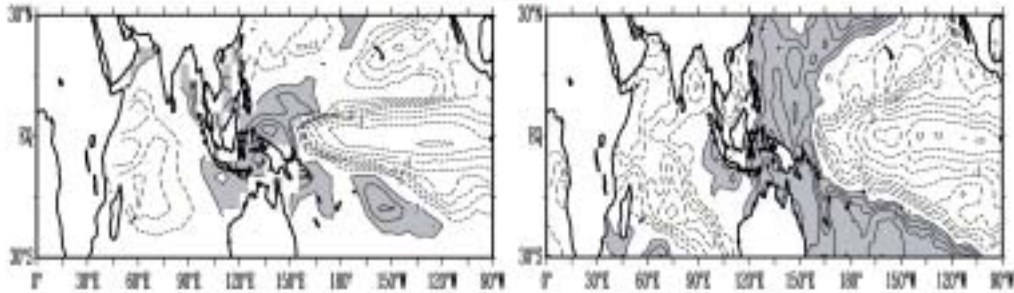
# SST Anomalies During Indian-to-Australian Monsoon Transition



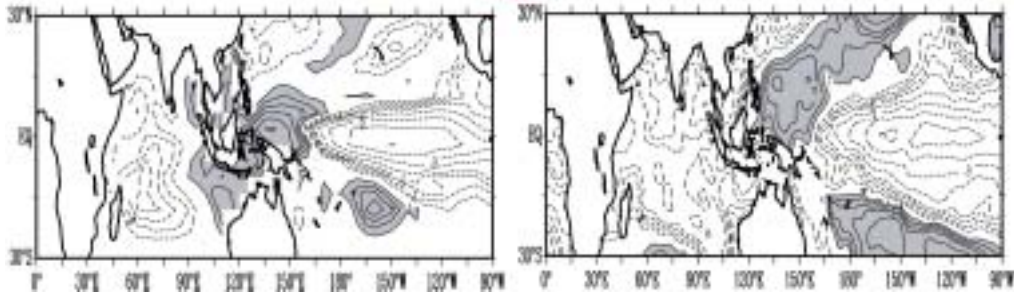
JJA



SON

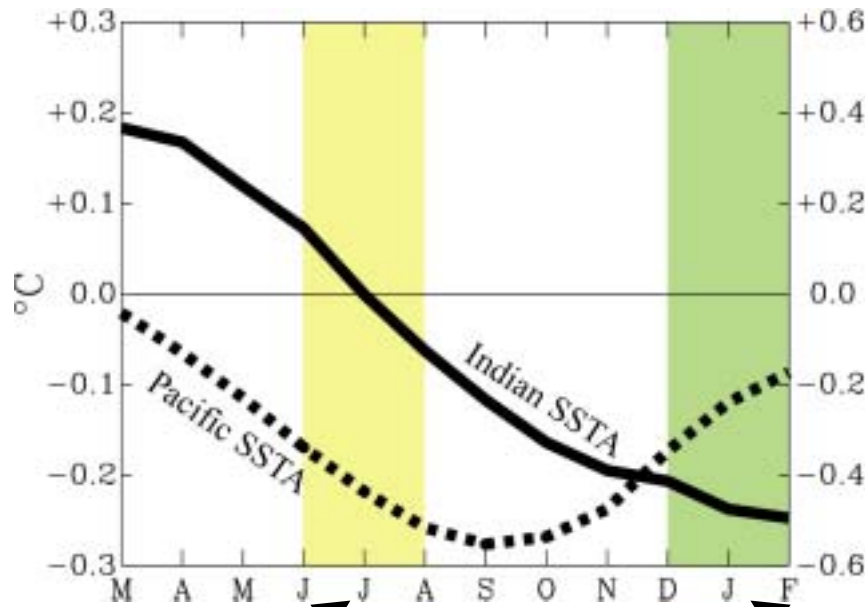


DJF

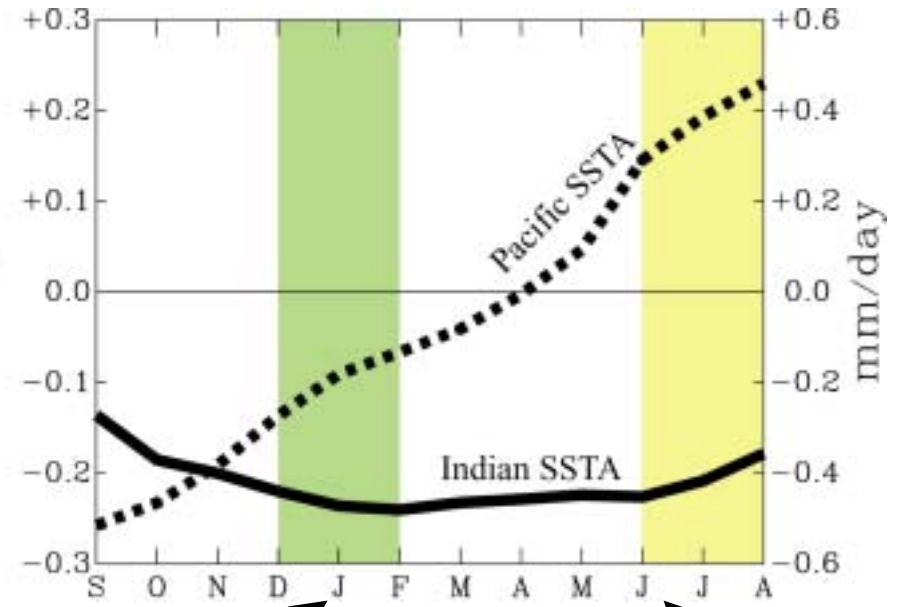


# SST Evolutions During TBO

## In-Phase (autumn) Transition



## Out-of-Phase (spring) Transition

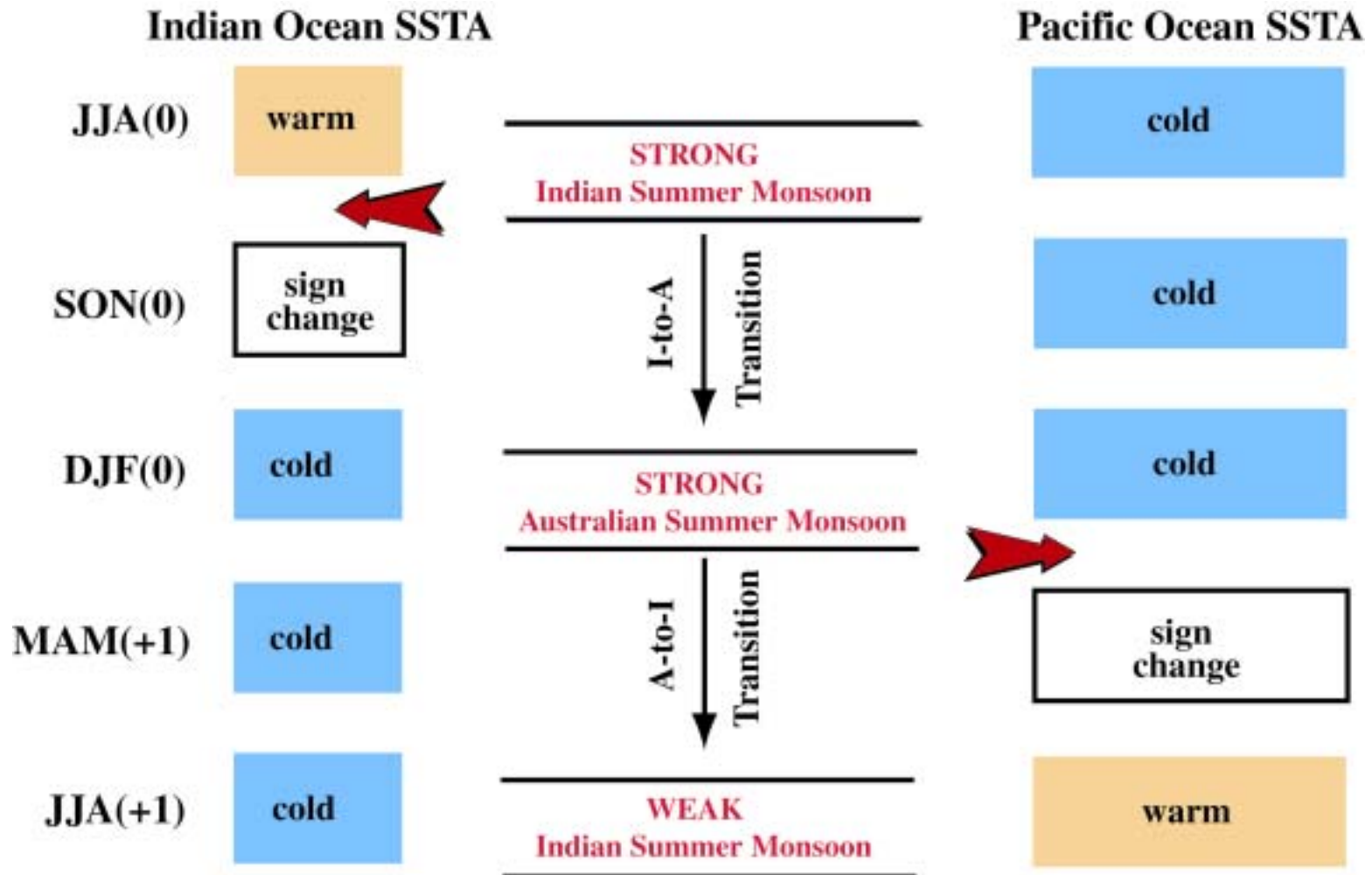


**strong  
Indian  
monsoon**

**strong  
Australian  
monsoon**

**weak  
Indian  
monsoon**

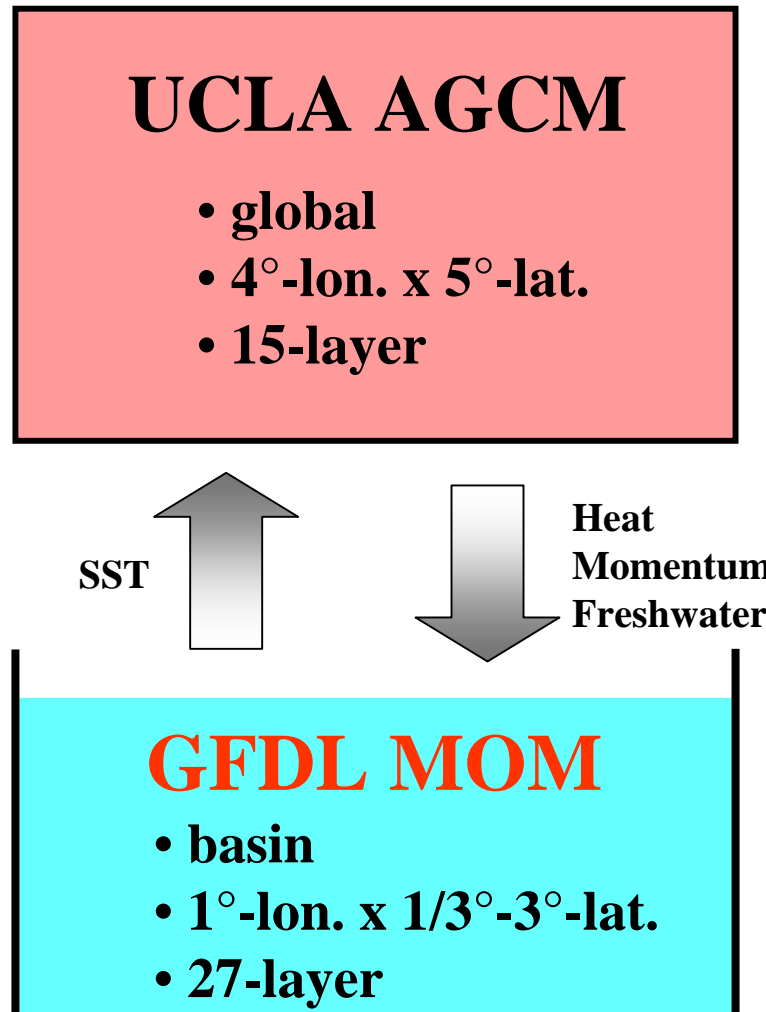
# Monsoon-Ocean Interaction During TBO



# SUMMARY

- ❑ The tropospheric biennial oscillation involves seasonally-dependent monsoon-ocean interactions in both the Indian and Pacific Oceans.
- ❑ The Indian Ocean is more crucial to the spring transition from Australian monsoon to Indian monsoon, and the Pacific Ocean is more crucial to the autumn transition from Indian Monsoon to Australian monsoon.

# The Coupled Atmosphere-Ocean GCM

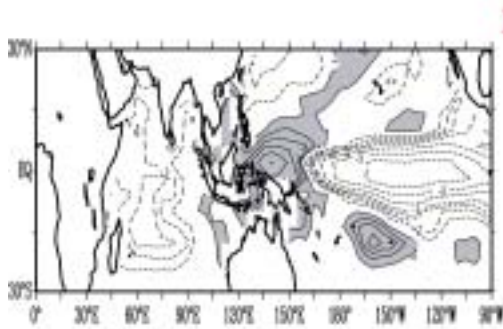
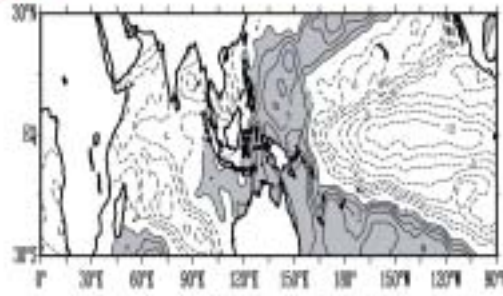
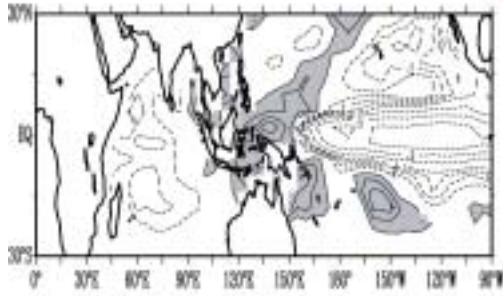


# Indo-Pacific Run

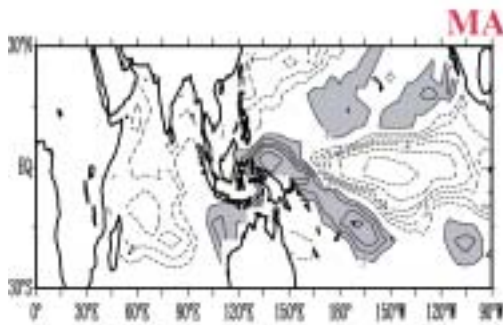
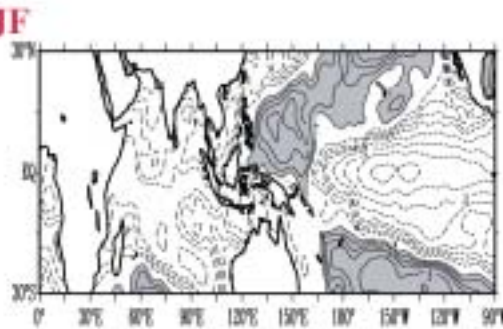
SON

# Observations

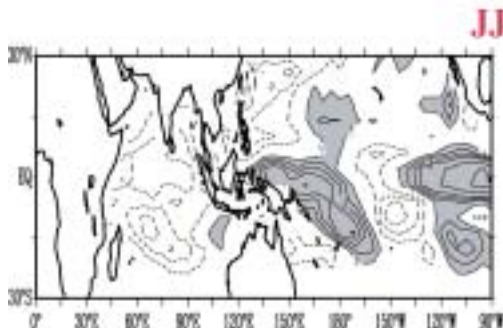
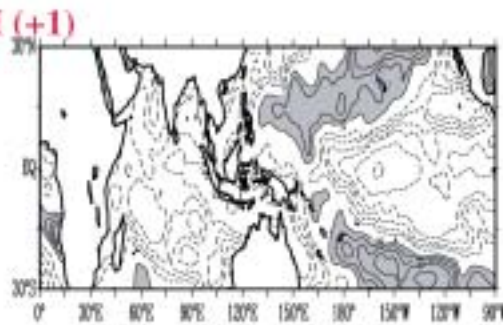
## SST Anomalies During Australian-to-Indian Monsoon Transition



DJF



MAM (+1)



JJA (+1)

