

Variability and Predictability of SCS Summer monsoon: from interdecadal to intraseasonal timescales in Jan 2008

Wen Zhou and Johnny Chan

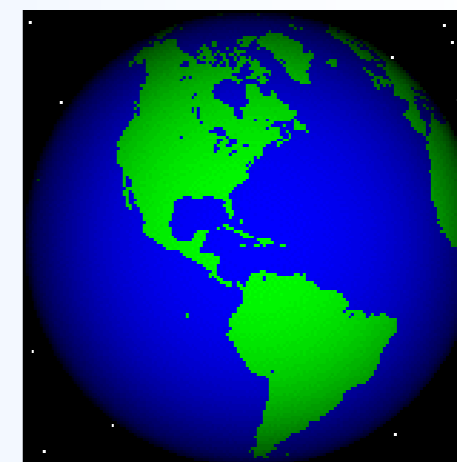
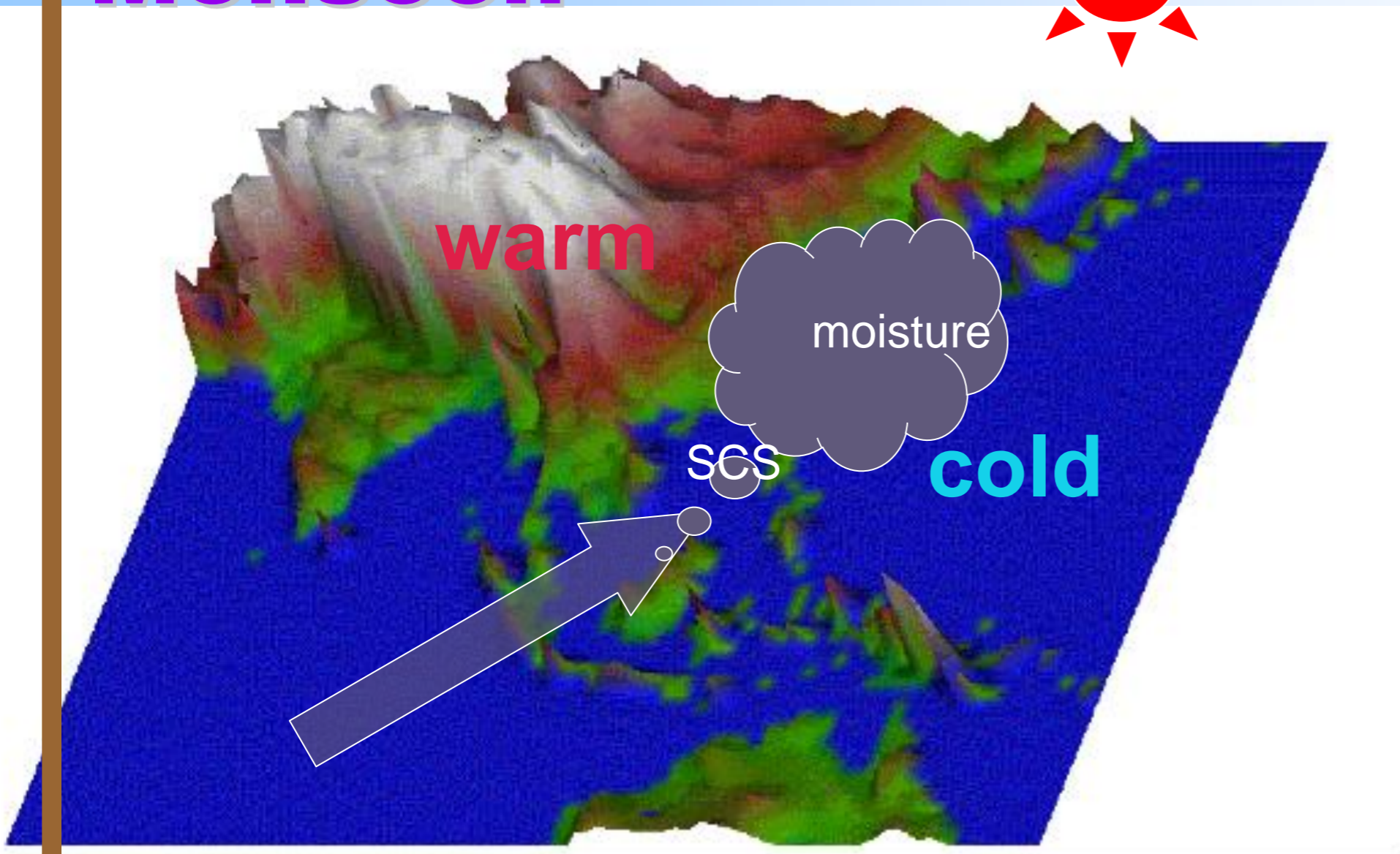
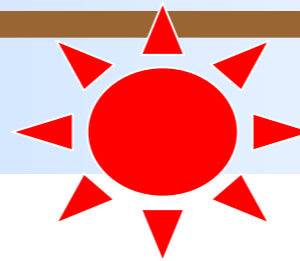
Guy Carpenter Asia-Pacific Climate Impact Centre

School of Energy and Environment

City University Of Hong Kong, Hong Kong, China



Monsoon



Objectives

- To determine specifically to what extent and under what conditions can the occurrence and strength of SCSSM be predicted
- To provide a better understanding of the SCSSM processes and the impact of SCSSM activities on rainfall in South China

PDO

SCSSM

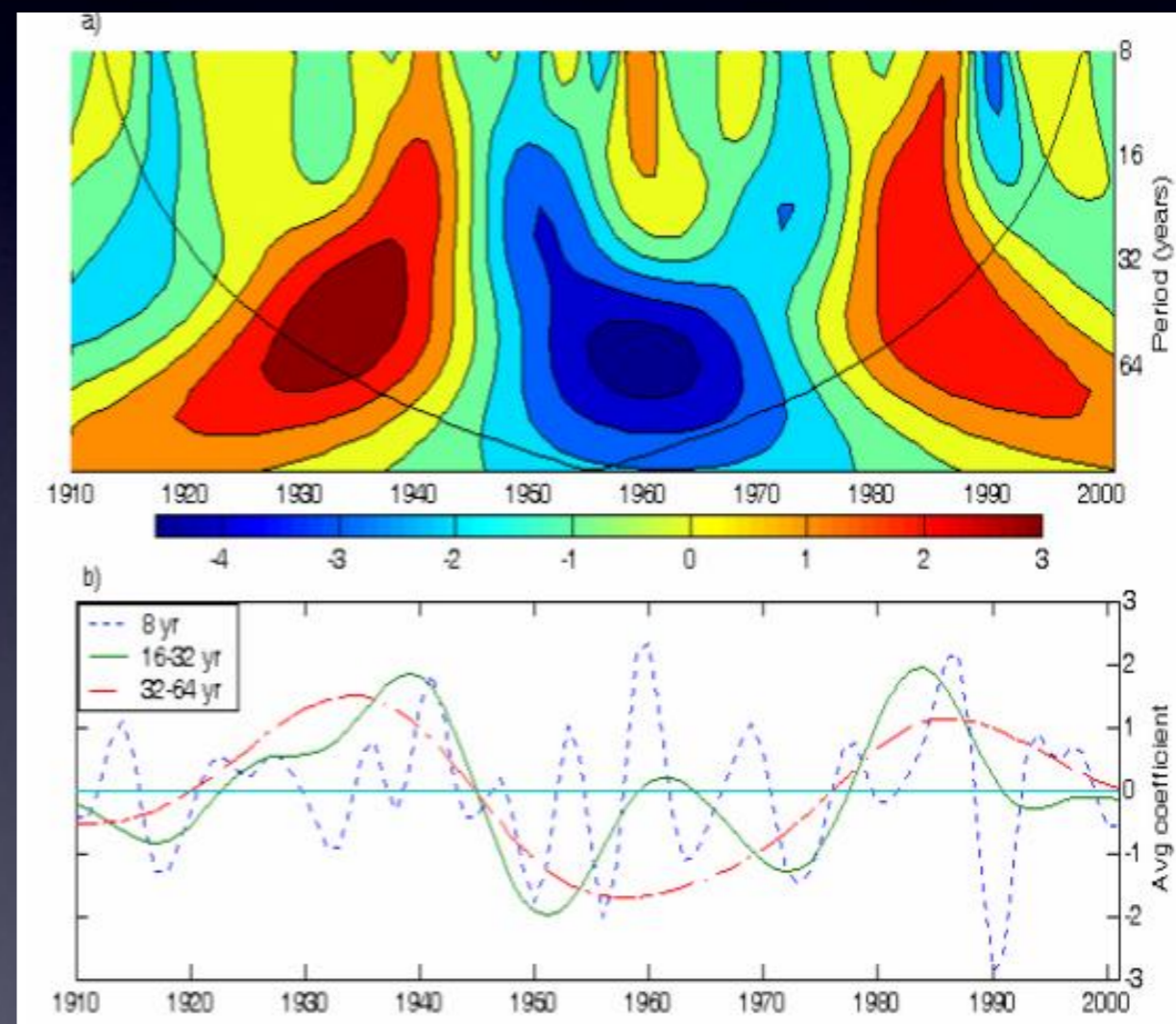
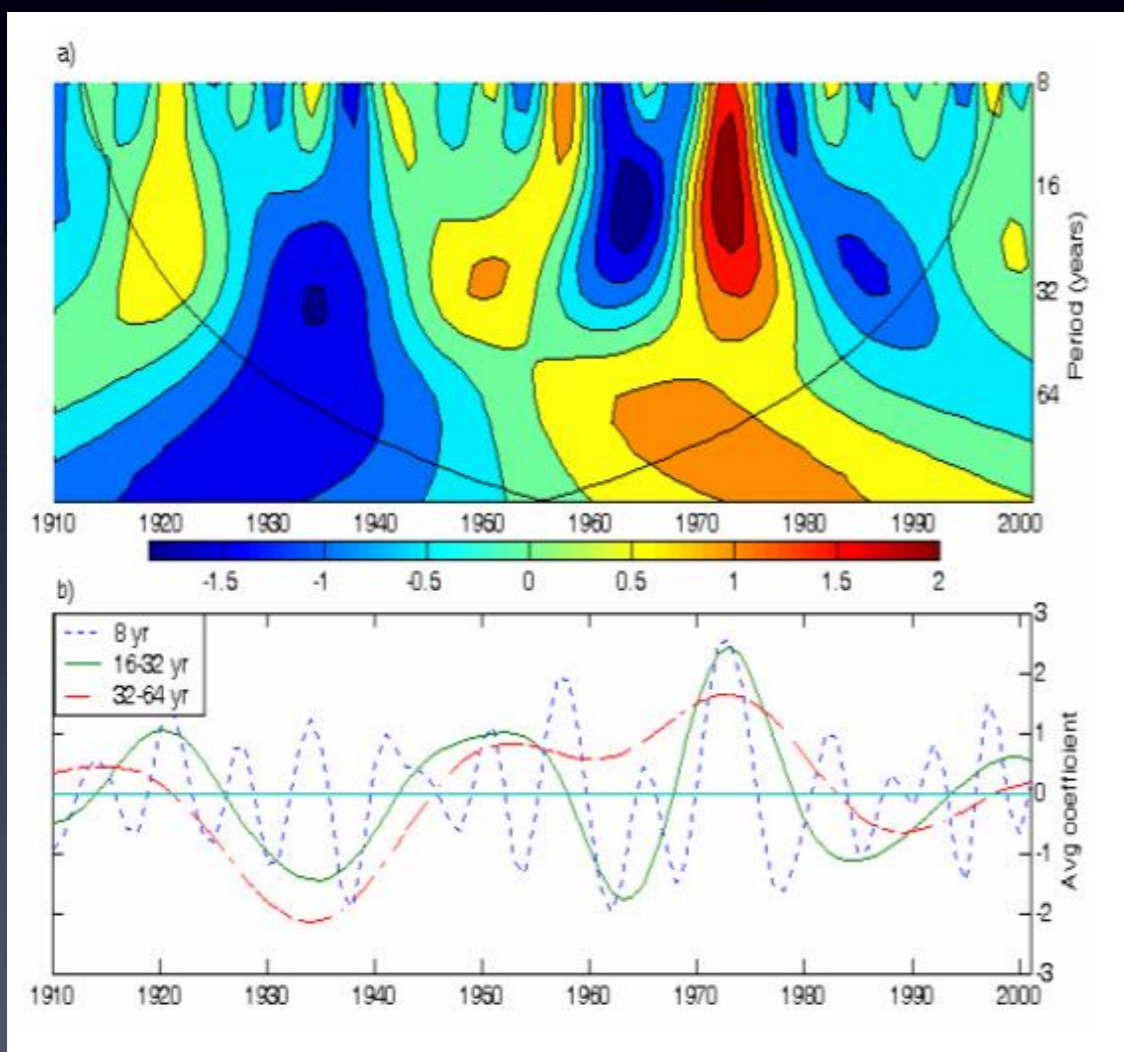
ISO

ENSO

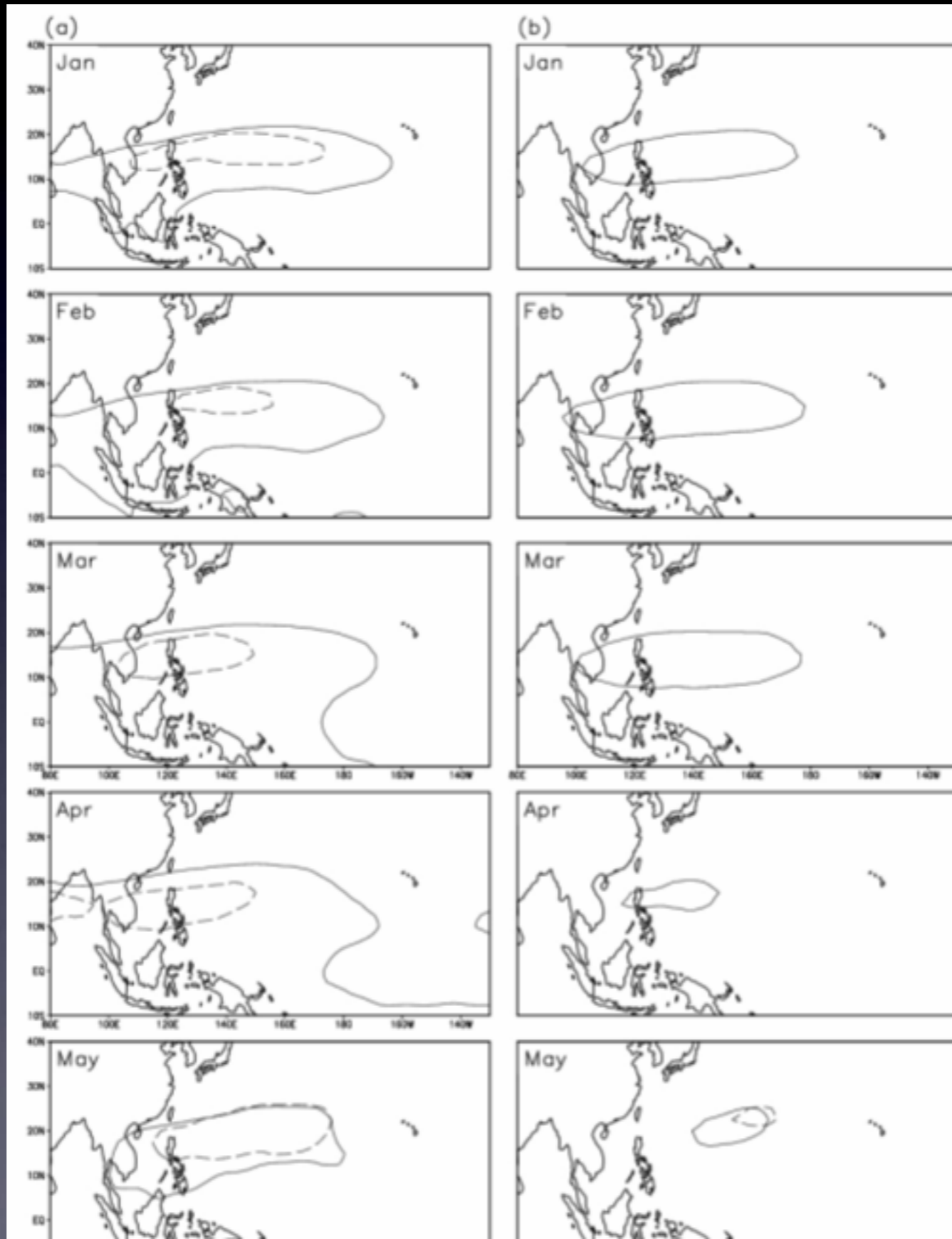


Interaction

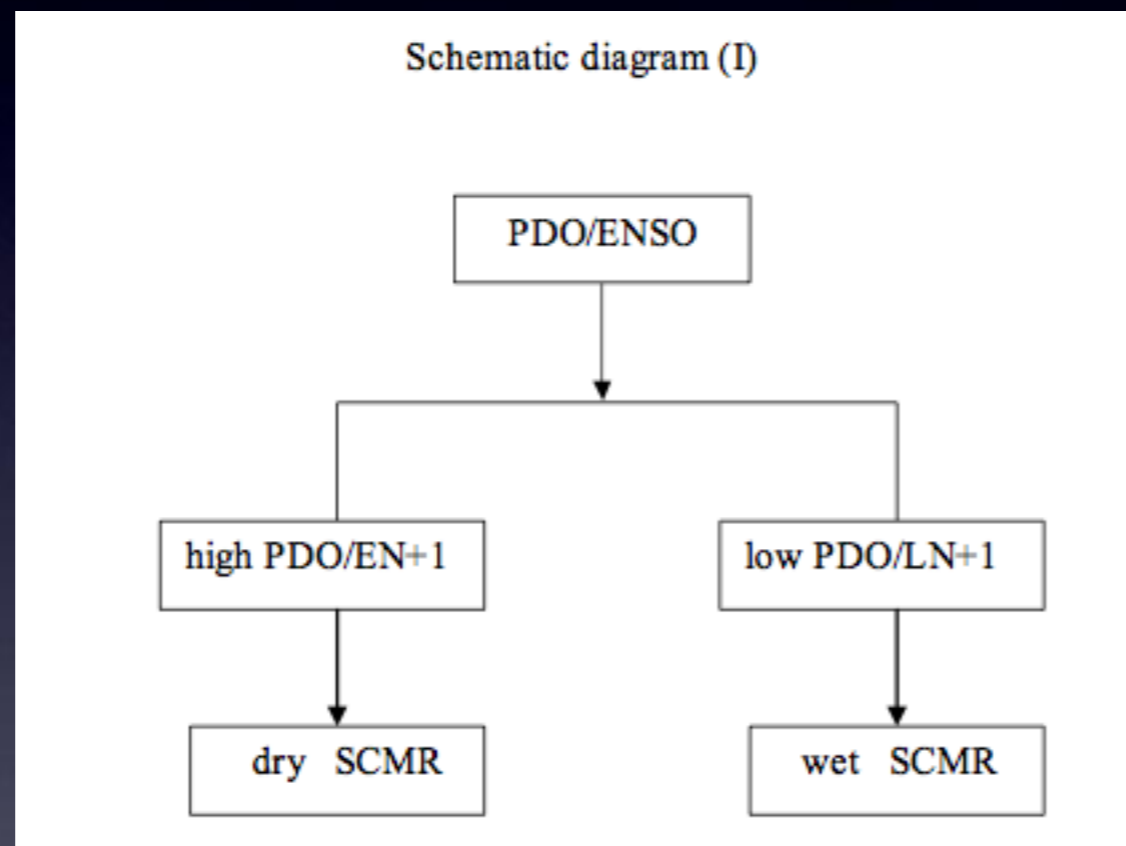
- advancing a PDO forcing to elucidate the long-term variations of SCSM rainfall
- revealing the interdecadal change of the structure of the ENSO-PDO phase and its impact on SCSM frequency and amplitude variation
- documenting detailed basin-wide thermocline adjustment during ENSO cycles
- Explaining how the ISO such as 10-20-day and 30-60-day modes can have a crucial impact on the SCSM life cycle
- proposing a possible mechanism of PDO, ENSO and ISO modifying SCSM variations



(a) EN+1/high PDO(solid) (b) EN+1/ low PDO(solid)
LN+1/high PDO(dashed) LN+1/ low PDO(dashed)



The linkage between SCMR/PDO/ENSO



Chan J. C.L. and Zhou W. (2005): PDO, ENSO and the summer monsoon rainfall over South China. *Geophys. Res. Lett.* 32, L08810.

Zhou W., Li C. Y. and Chan J C L (2006): The interdecadal variations of the summer monsoon rainfall over South China. *Meteorol Atmos. Phys.*, DOI 10.1007/S00703-006-018-9.

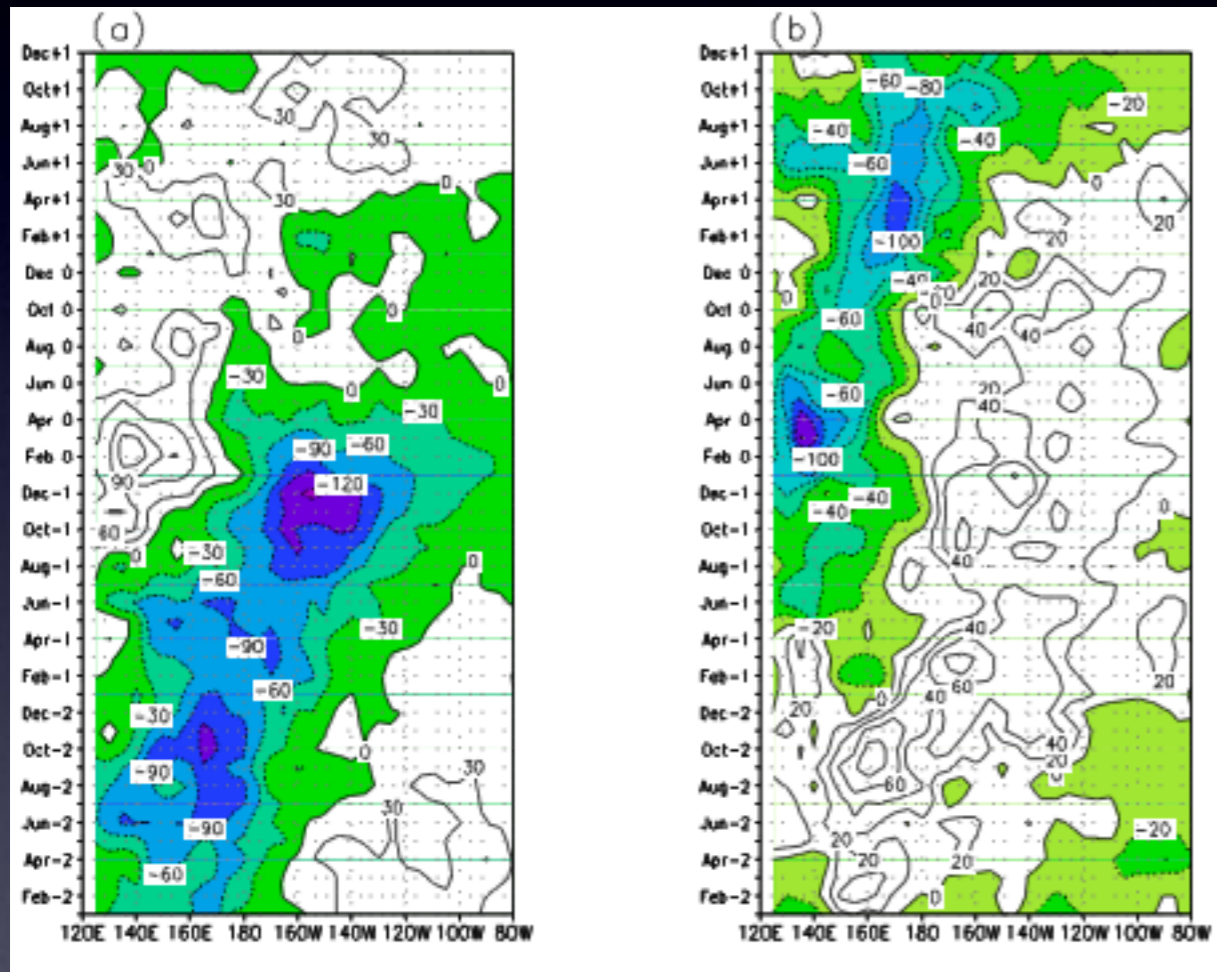
ENSO-SCSSM

- The **El Niño / La Niña** indeed plays an important role in the SCSSM.
- Associated with an **El Niño** event, the high pressure system in subtropical region **strengthens**, and hence a **late** SCS summer monsoon onset.
- Associated with a **La Niña** event, the high pressure system in subtropical region **weakens**, and hence an **early** SCS summer monsoon onset

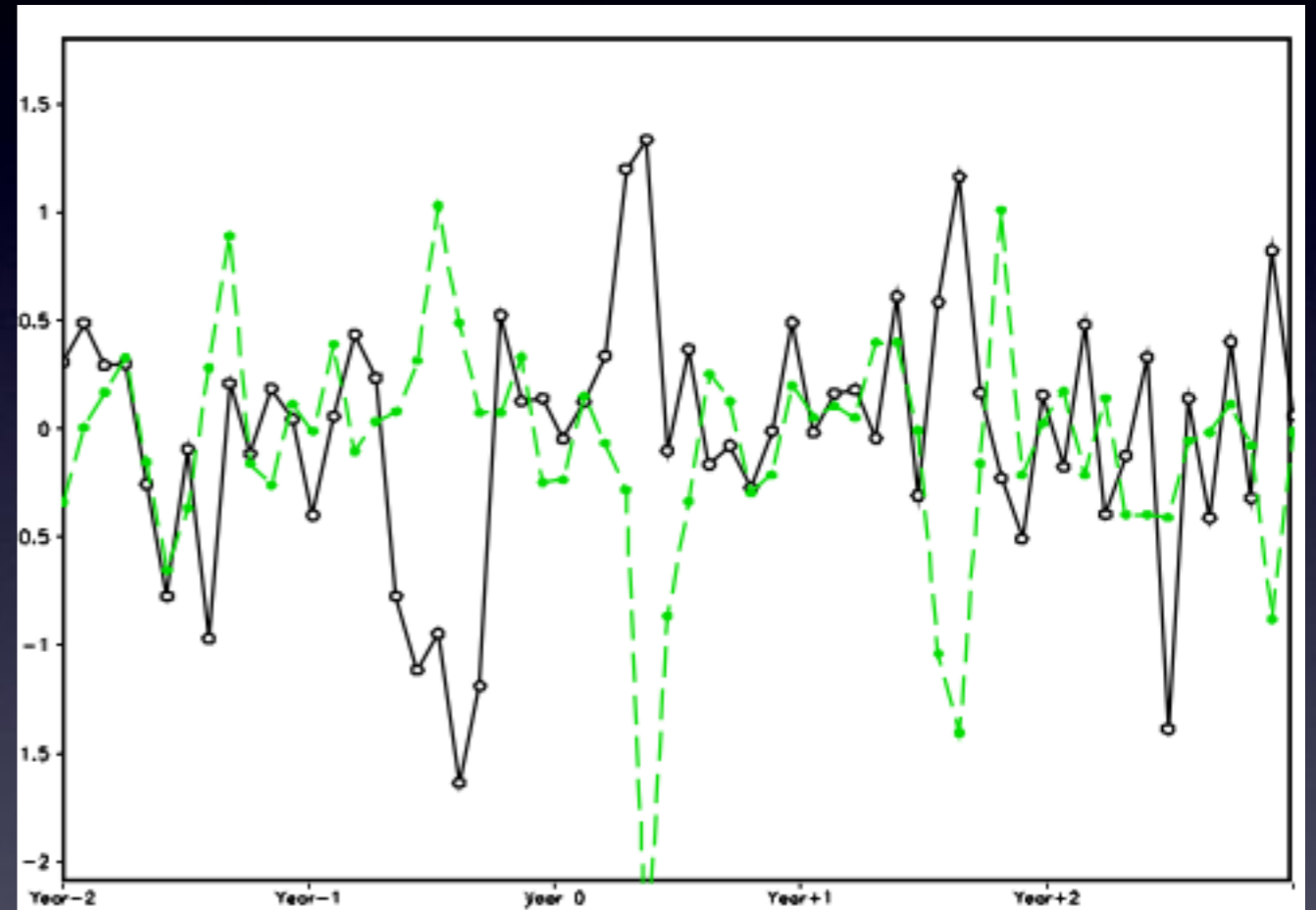
Definition of the SCSSM onset

- **Two criteria:**
 - (a) the first pentad, westerly winds prevail over SCS;
 - (b) in the subsequent 2 pentads, westerly winds prevail as well.
- Early (<P27, Normal (P27-P29), Late (>P29)

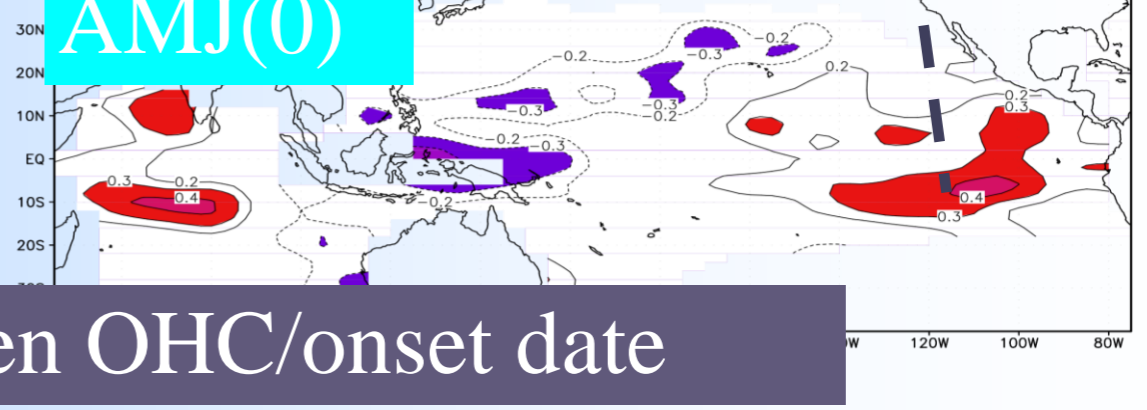
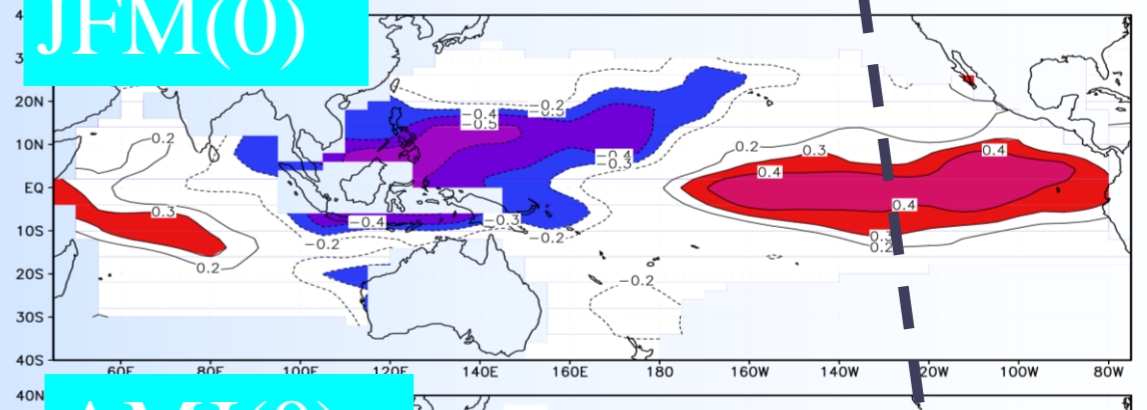
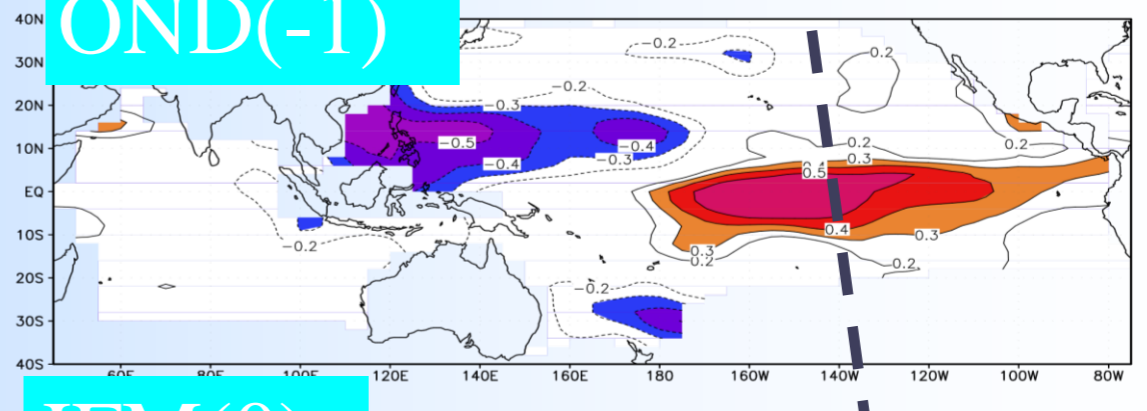
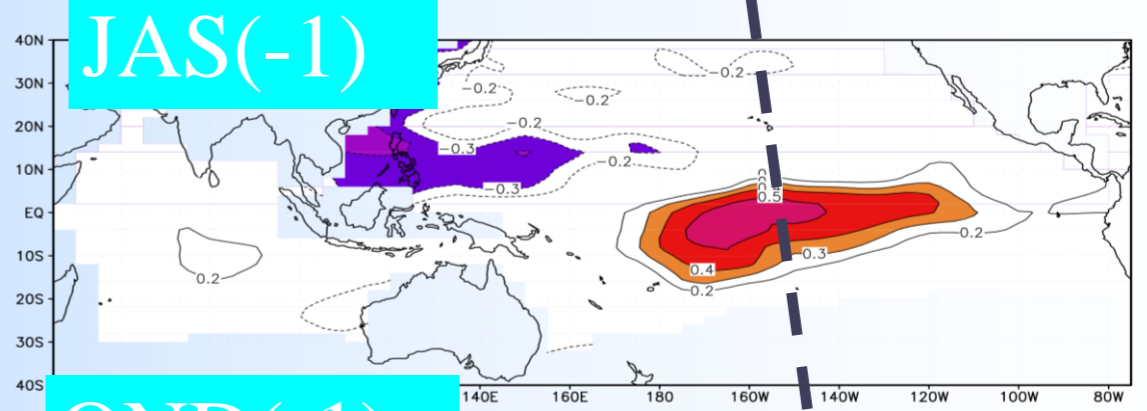
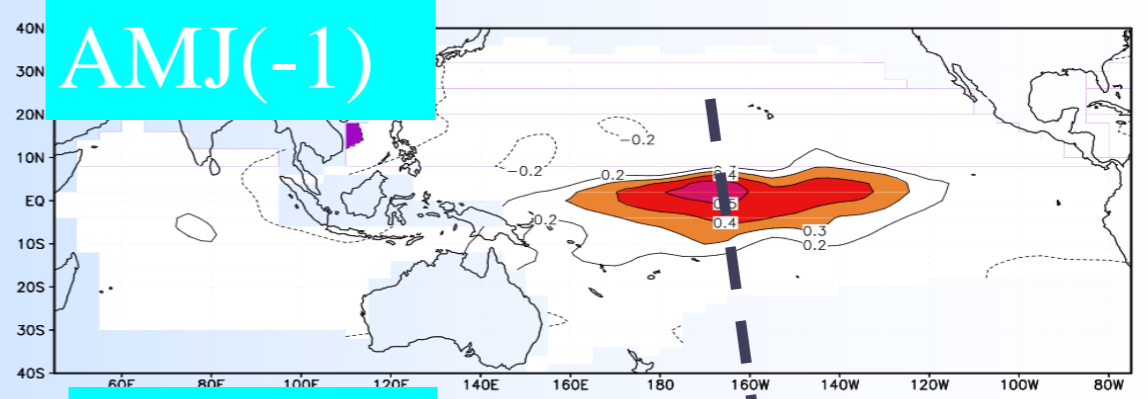
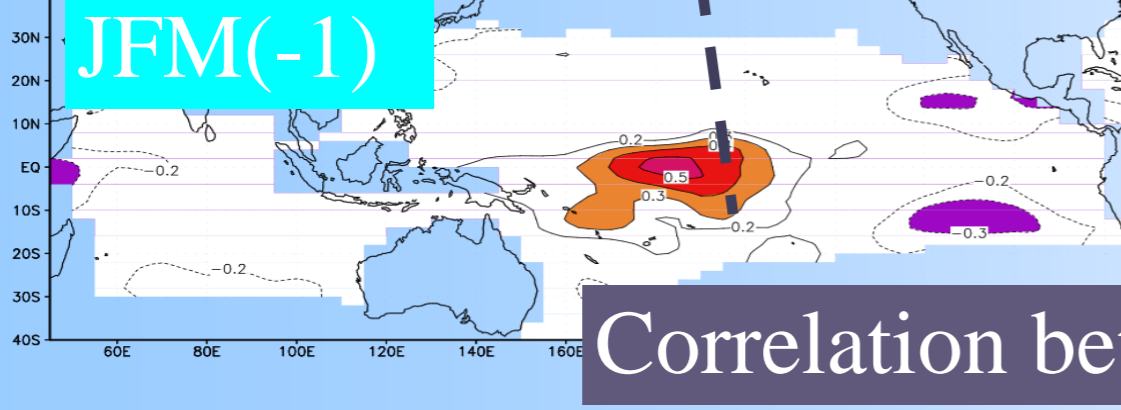
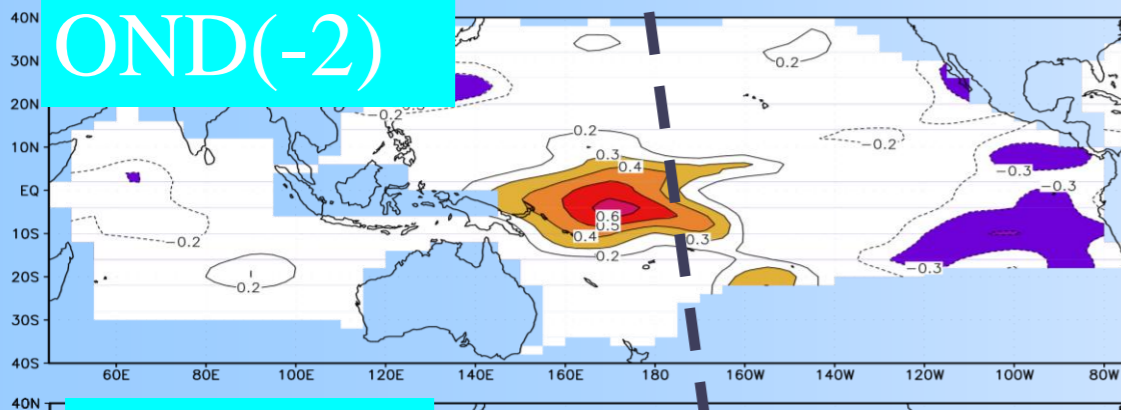
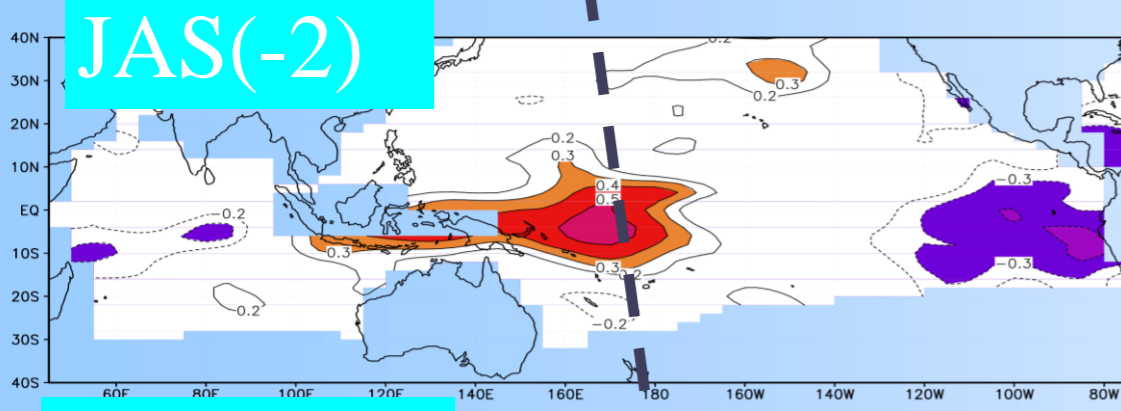
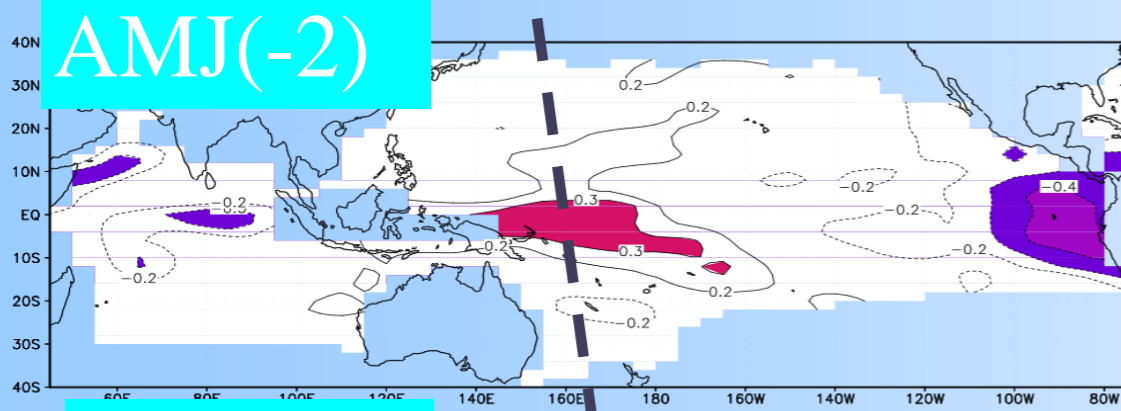
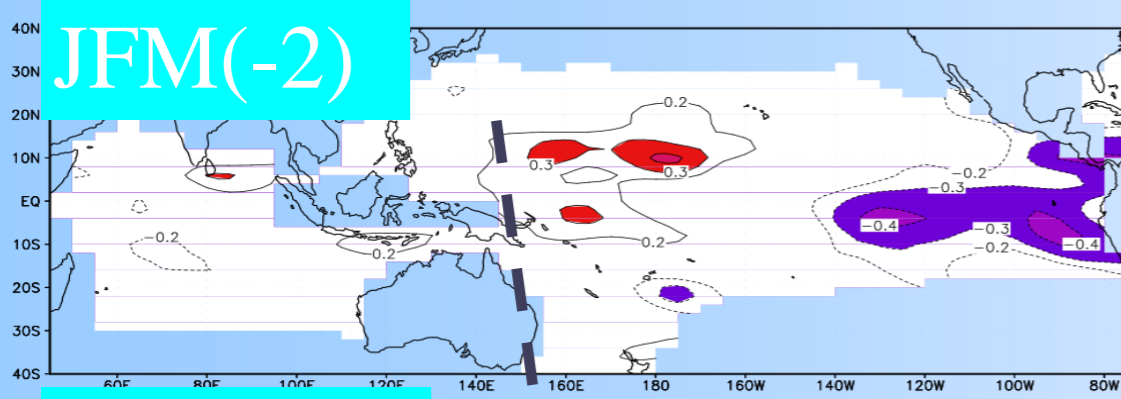
ENSO and the SCSSM onset



Longitude-time section of OHC anomalies composites (unit: 108 J m^{-2}) averaged over 4So-4No for (a) Early onset years and (b) Late onset years

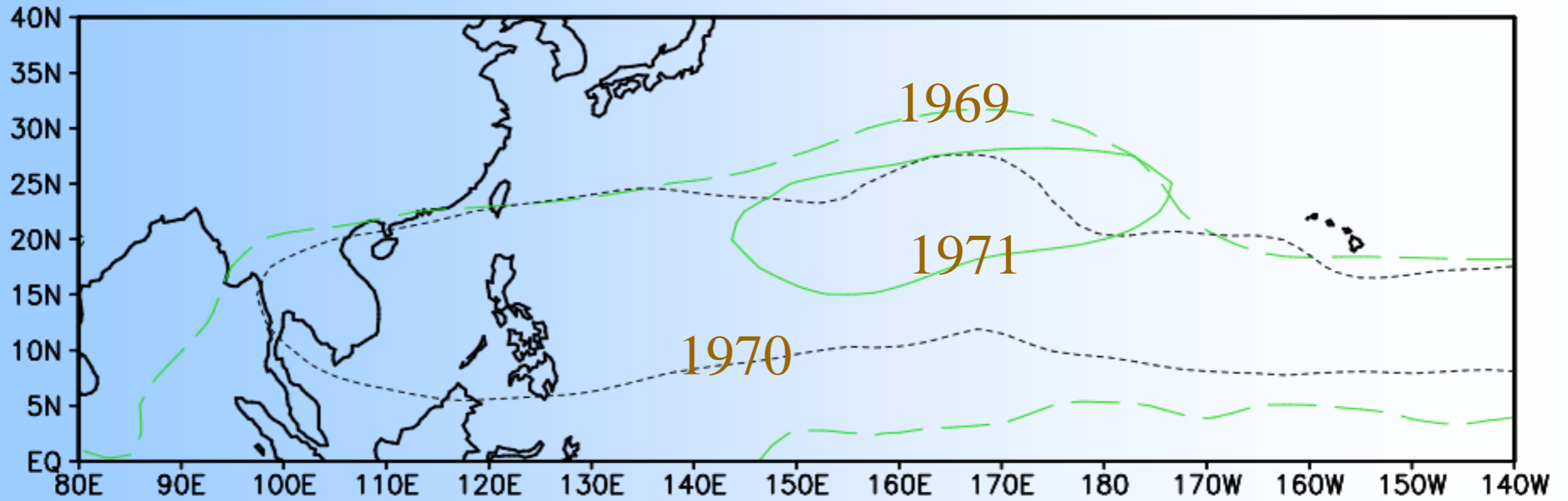


The biennial variation of 850-hPa zonal wind anomalies over SCS (110-120oE, 5-15oN) for Early onset years (solid line) and Late onset years (dash line)



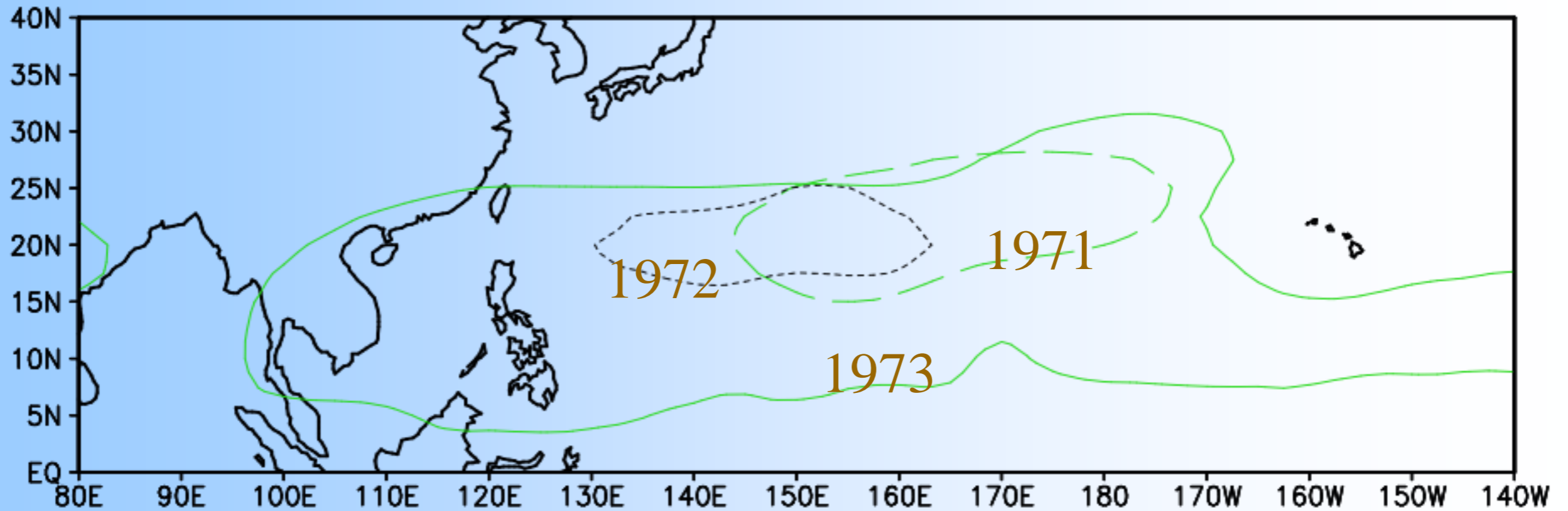
Correlation between OHC/onset date

(a) EN---LN

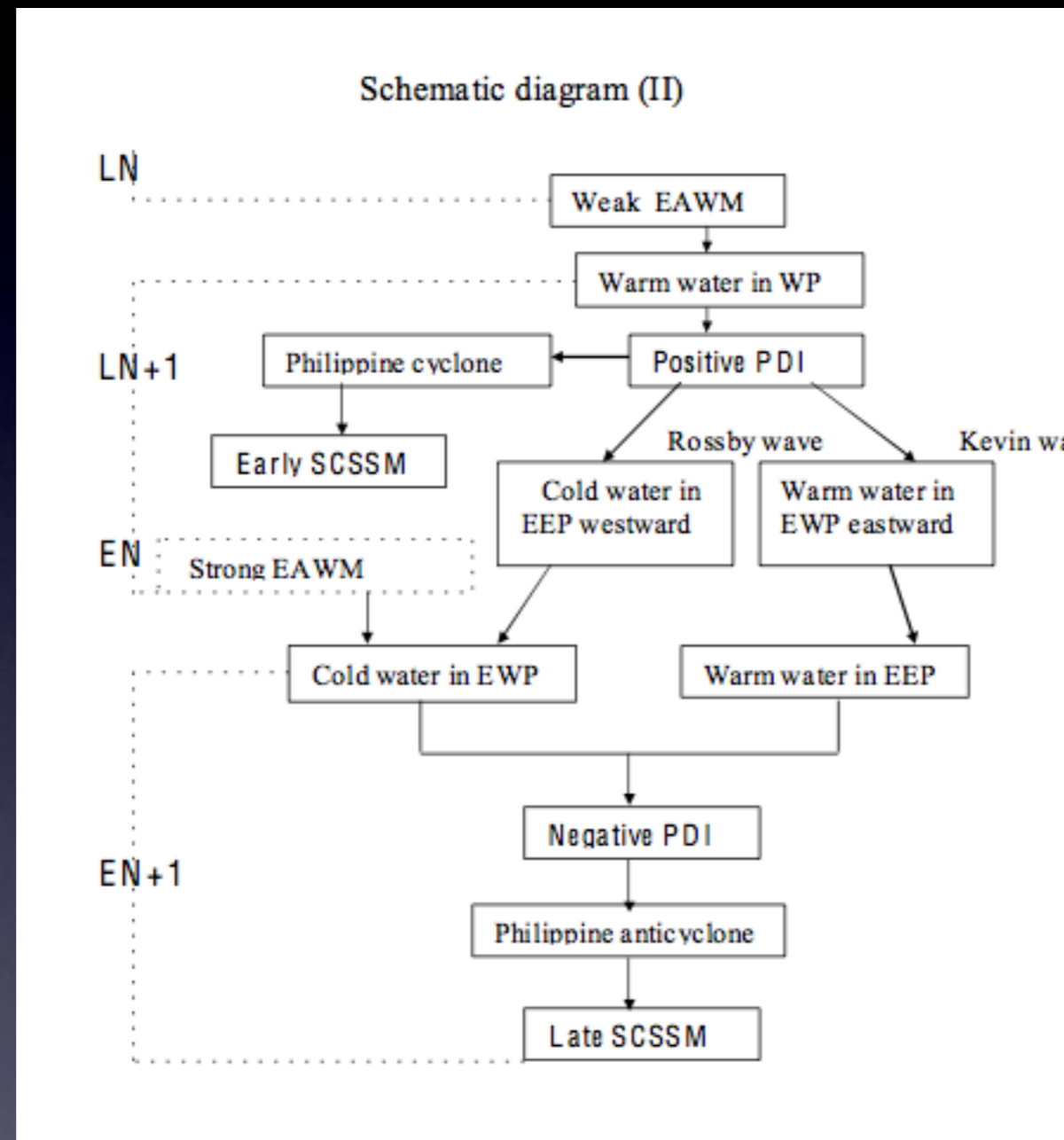


Western Pacific Subtropical High

(b) LN---EN



The linkage between SCSSM onset to ENSO



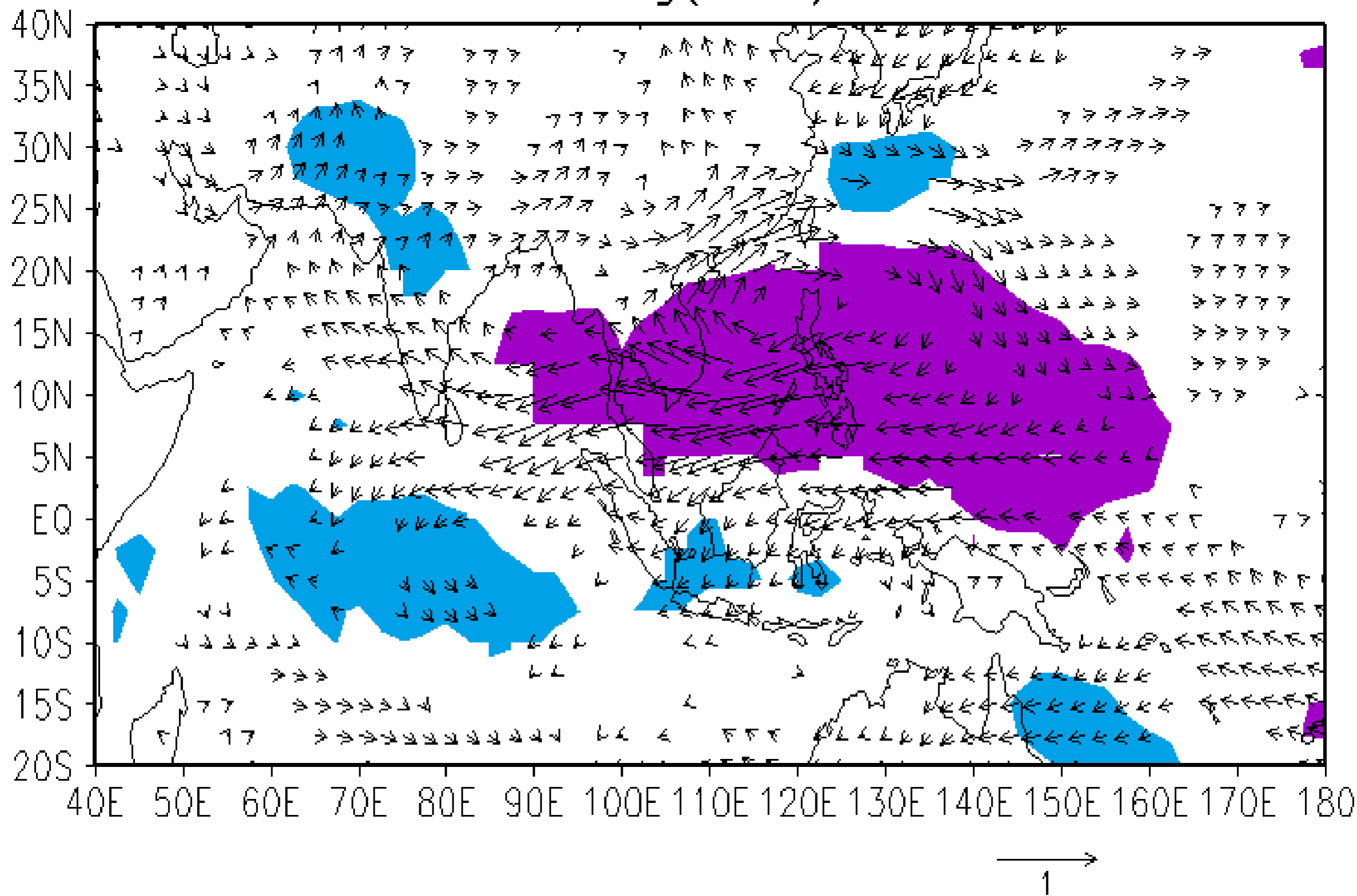
Zhou W., and Chan J. C. L. (2007): ENSO and South China Sea summer monsoon onset. *International Journal of Climatology*, 27, 157-167.

ISO-SCSSM

- **ISO-----a leading role in the onset and development of the SCSSM.**
- **10-20-day mode exhibits a northwestward propagating associated with the retreat of the western Pacific subtropical high.**
- **30-60-day mode originates from convection over equatorial Indian Ocean, exhibits eastward propagations.**

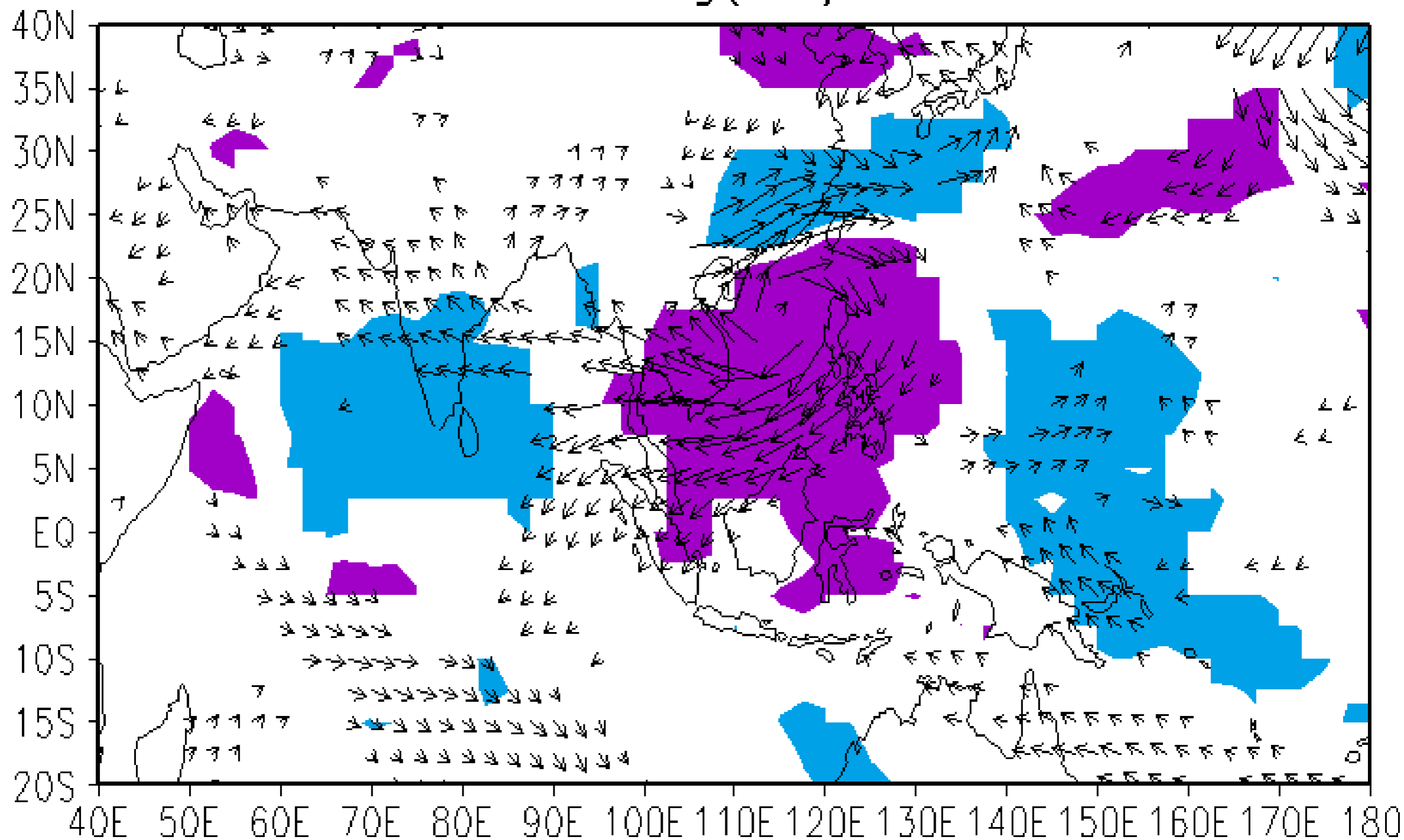
30-60-day mode

Lag(-24)

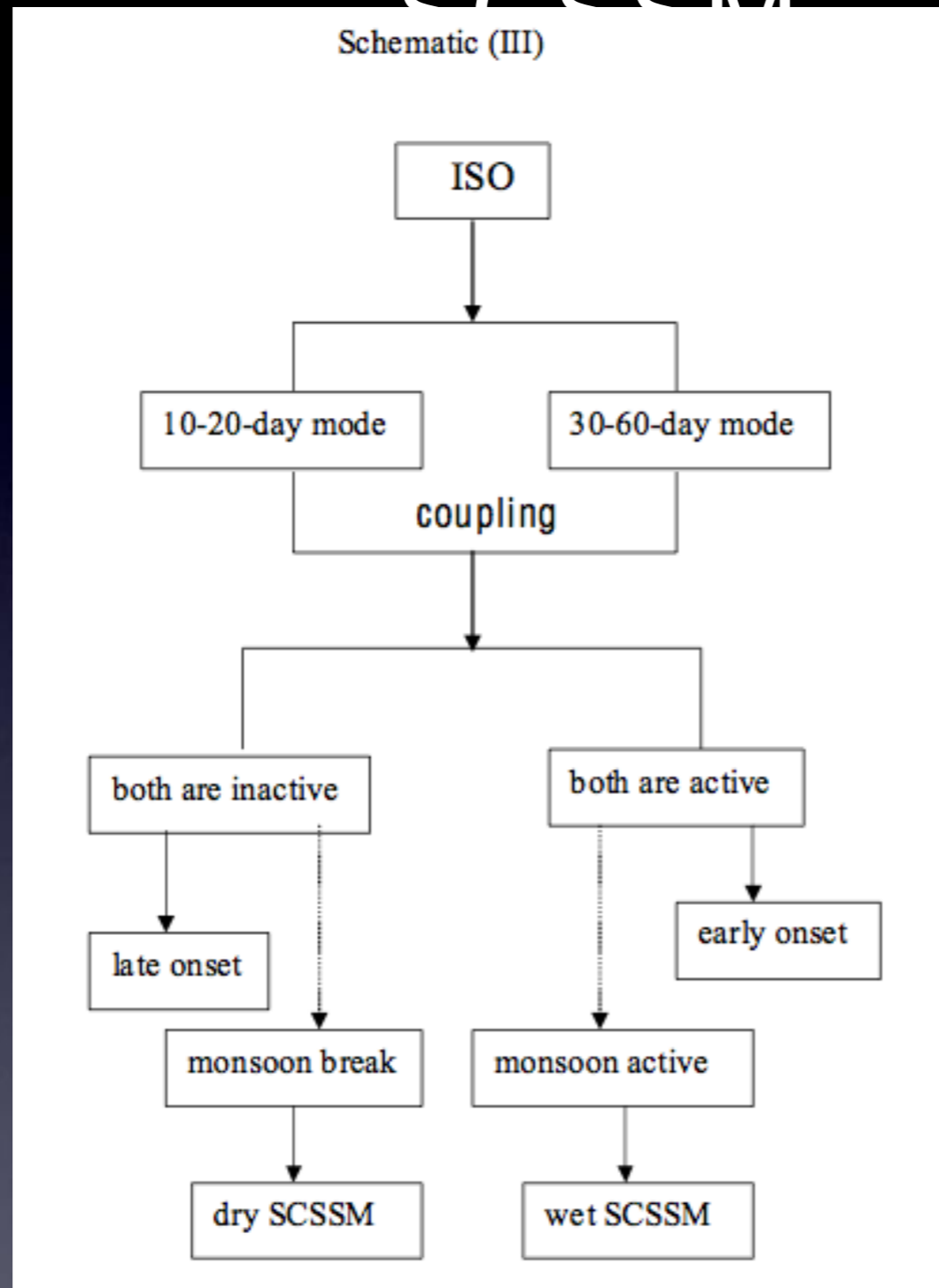


10-20-day mode

Lag(-8)

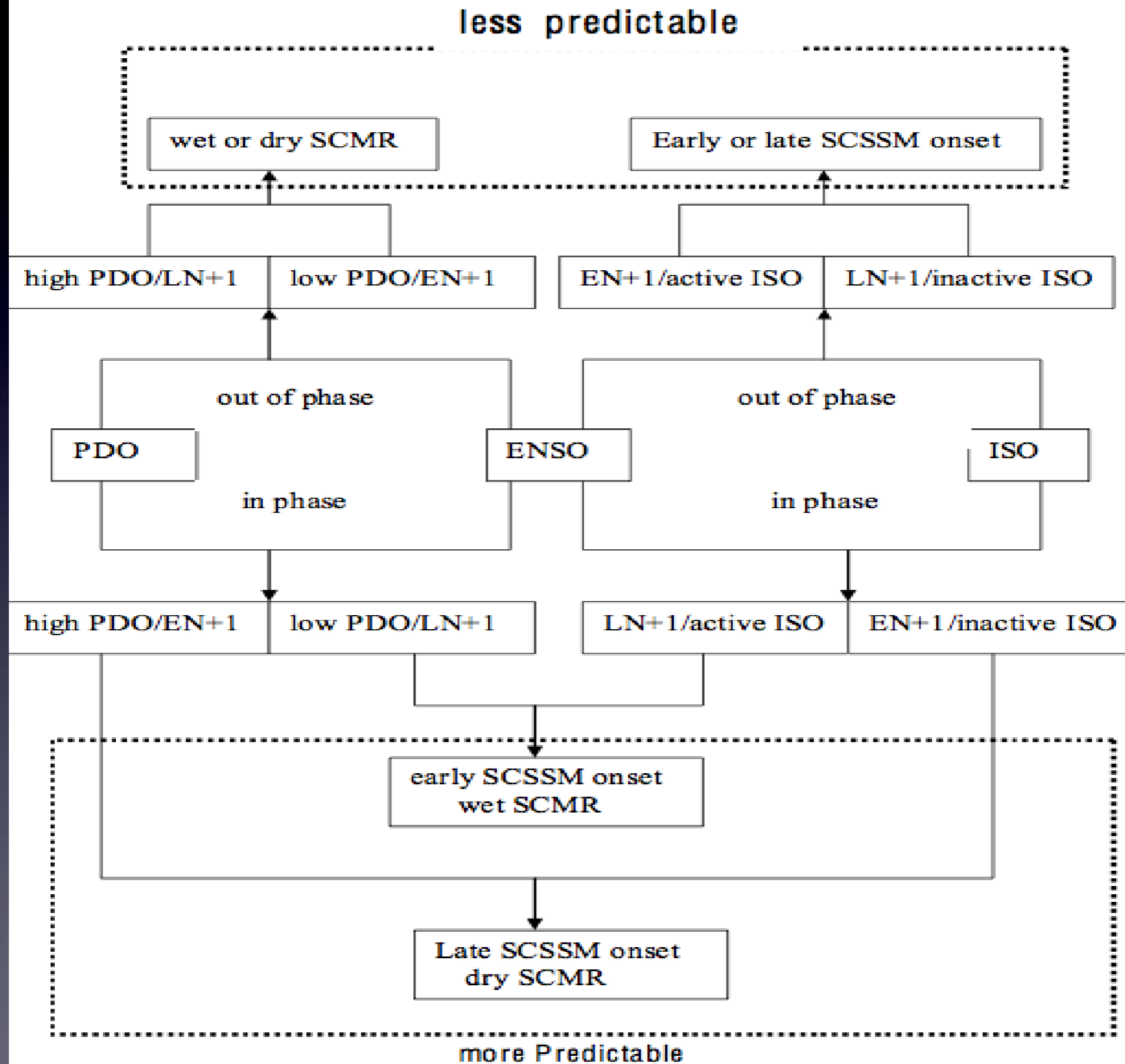


The Contribution of ISO to the SCSSM



Zhou W. and Chan J. C. L. (2005): Intraseasonal oscillations and the South China Sea summer monsoon onset. *International Journal of Climatology*, 25, 1585-1609.

Schematic (IV)





Summary

- **Whether the SCSSM is predictable or not makes climate research both interesting and challenging**
- **The evolution of the SCSSM actually results from a combination of oscillation at different timescales.**

END