39th NOAA CDP Workshop

Prediction of Wet and Dry Season Precipitation over the Maritime Continent

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1 Importance of Maritime Continent

2 Variations of MC Precipitation

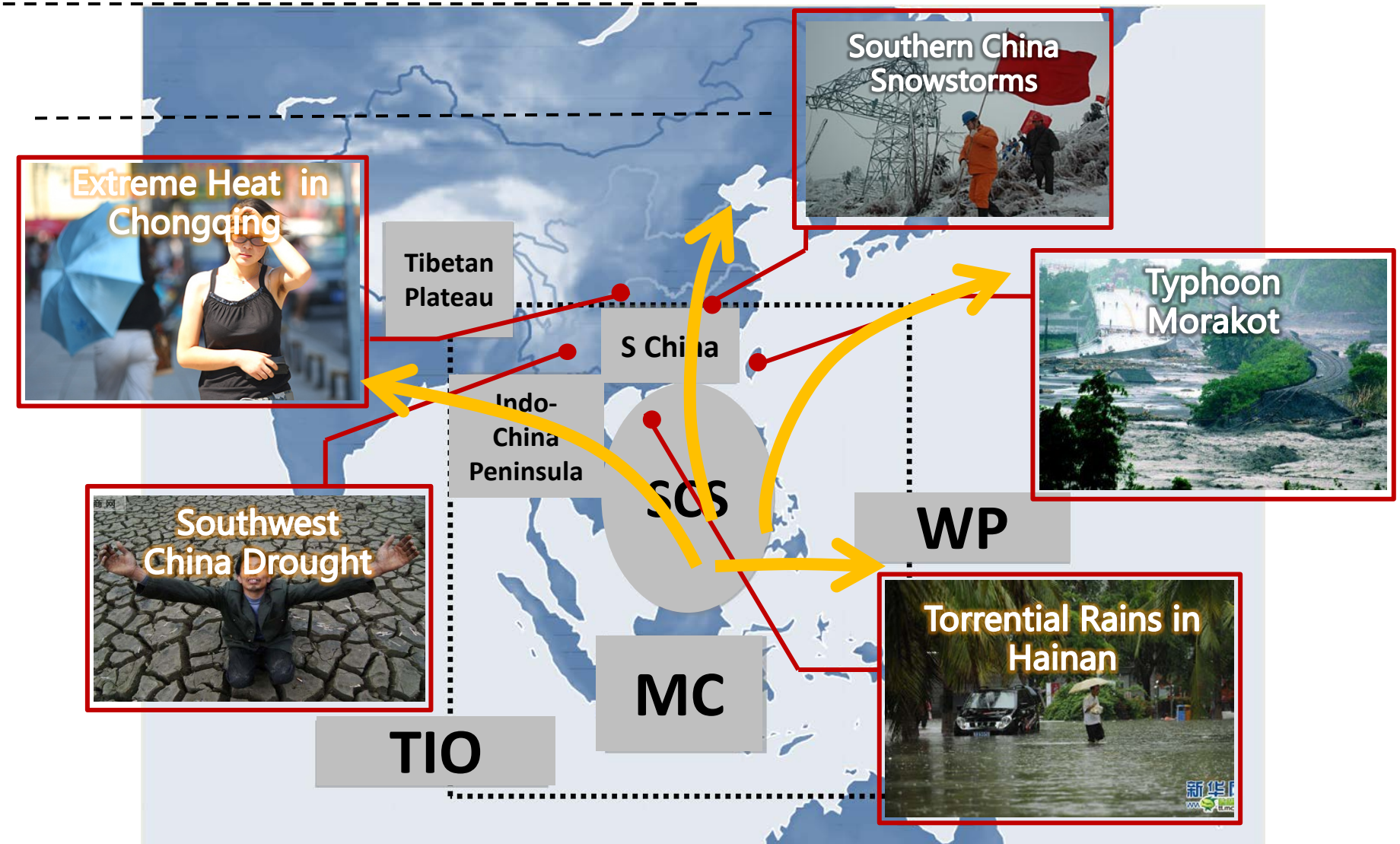
3 Prediction of MC Precipitation

4 On-going Work

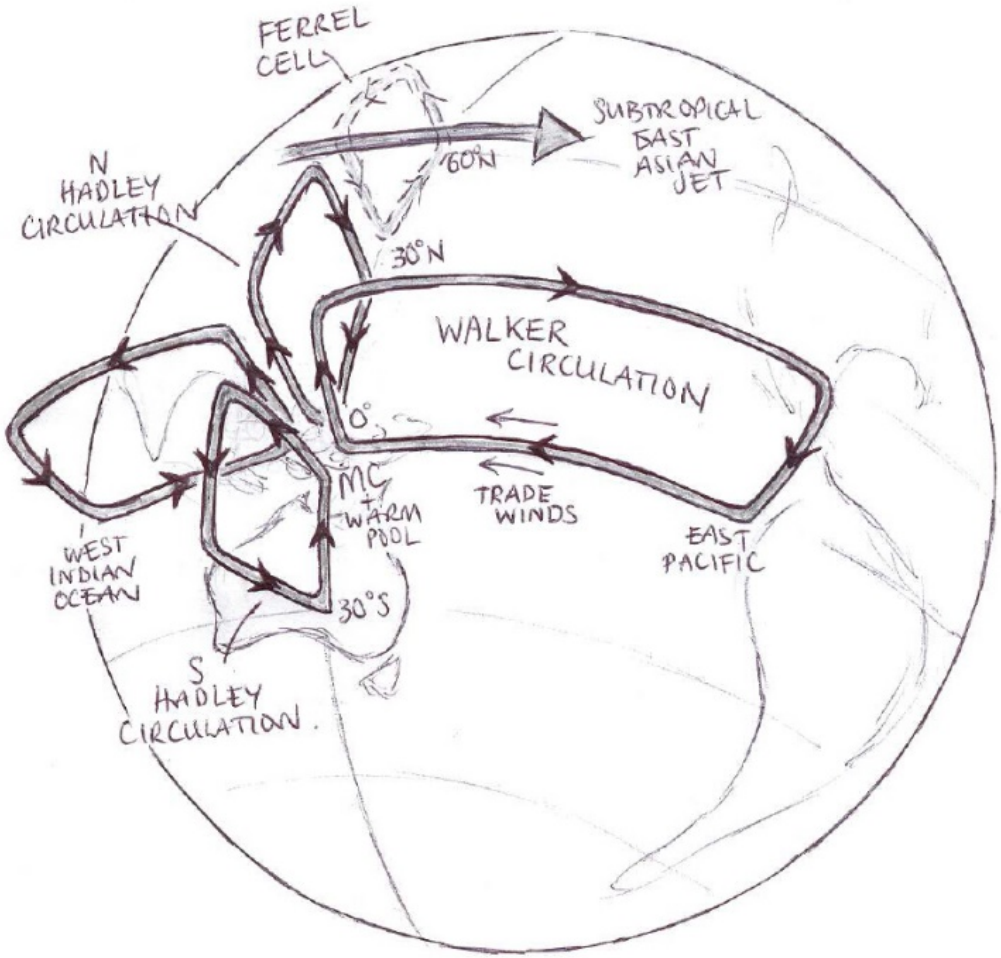
5 Summary

Domain and Importance

* Influence on Surrounding Regions

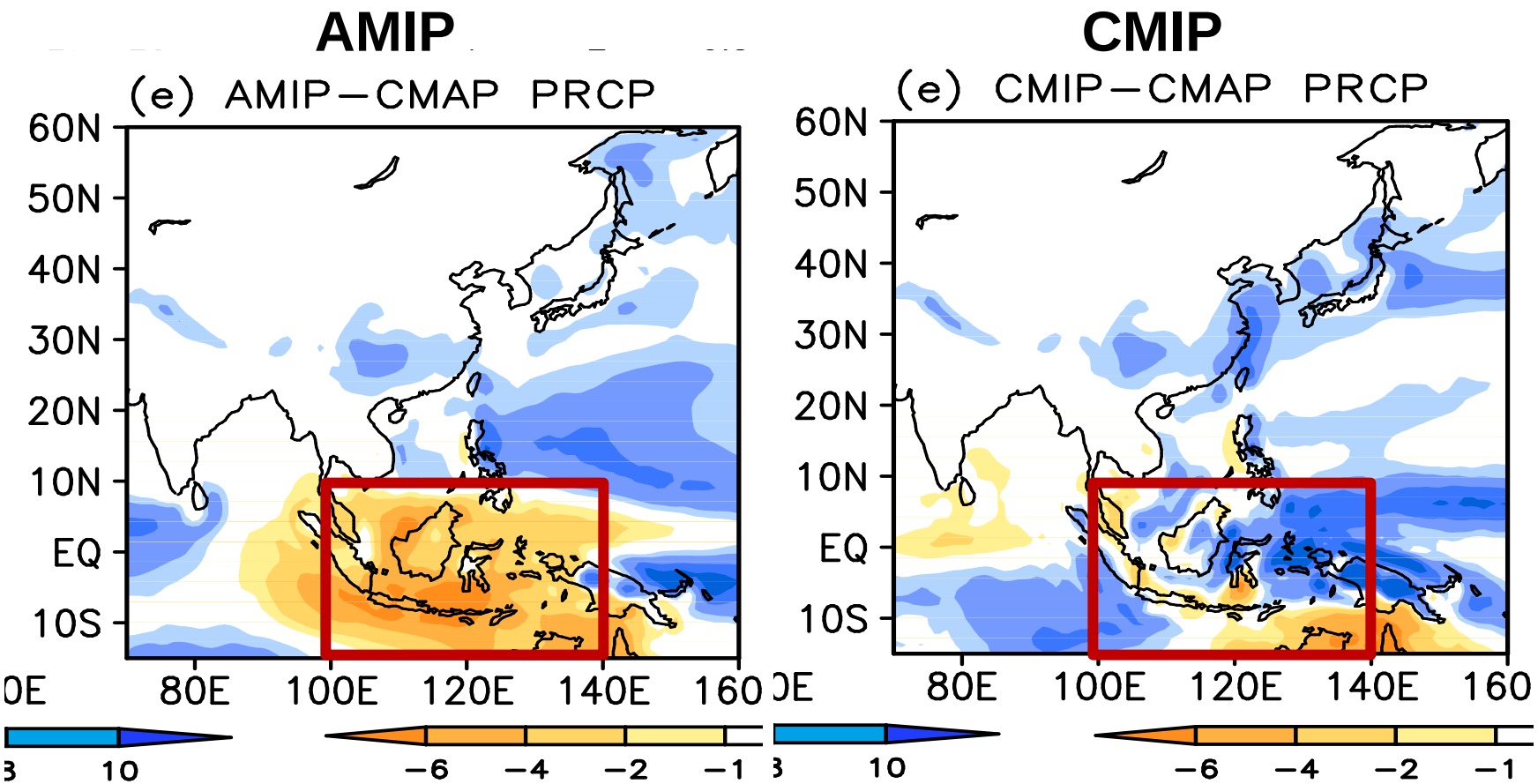


Domain and Importance



Strachan (2007)

Importance of MC for Winter Monsoon



Jiang, X., S. Yang*, and coauthors, 2013: Dynamical prediction of the East Asian winter monsoon by the NCEP Climate Forecast System. *J. Geophys. Res.,* **118,** 1312-1328.

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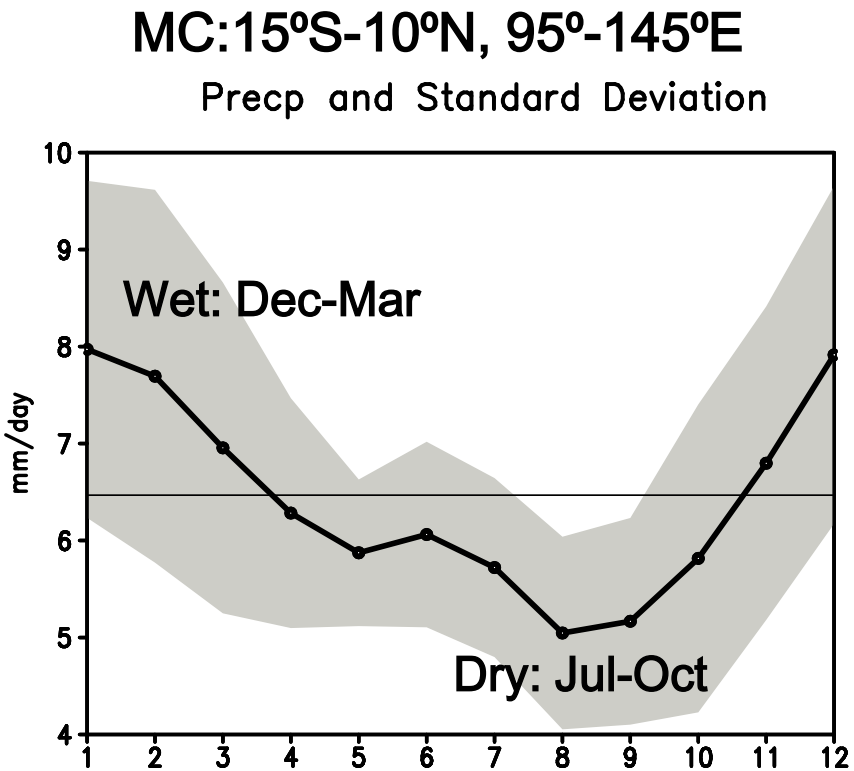
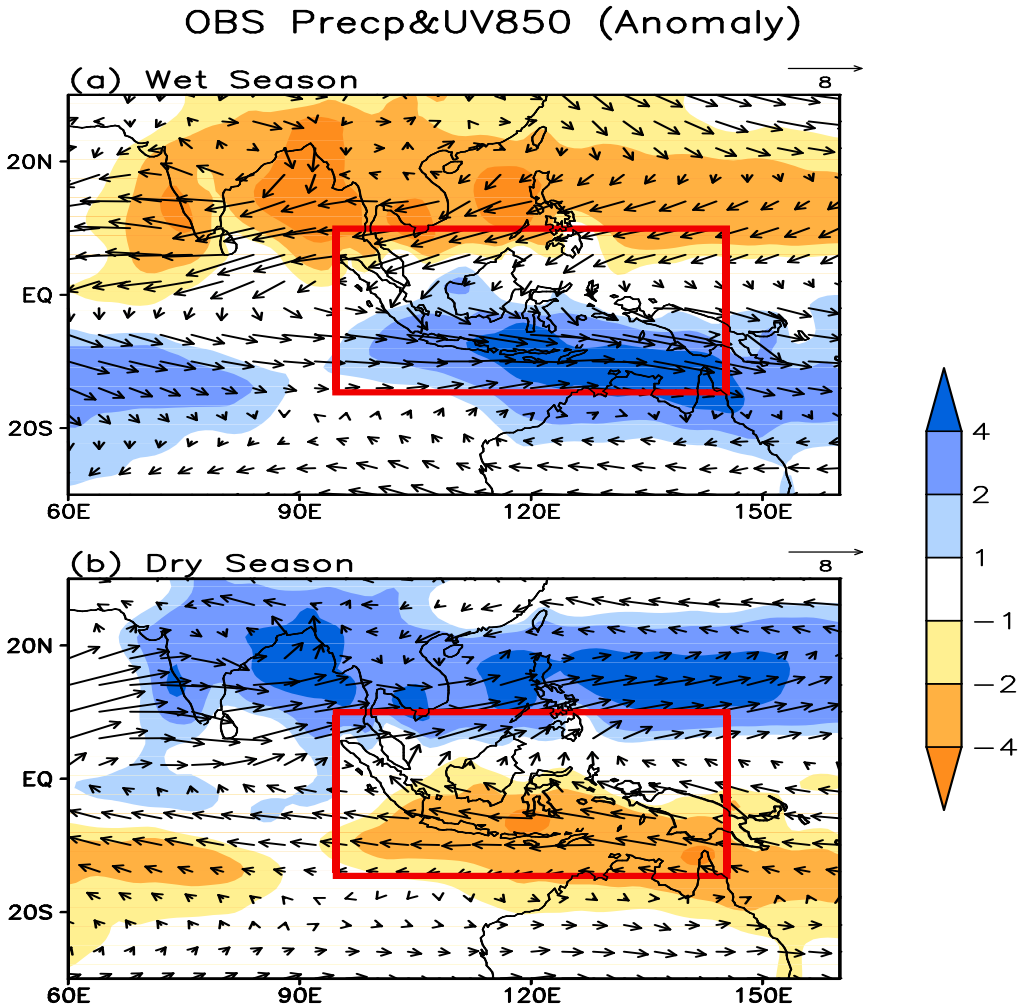
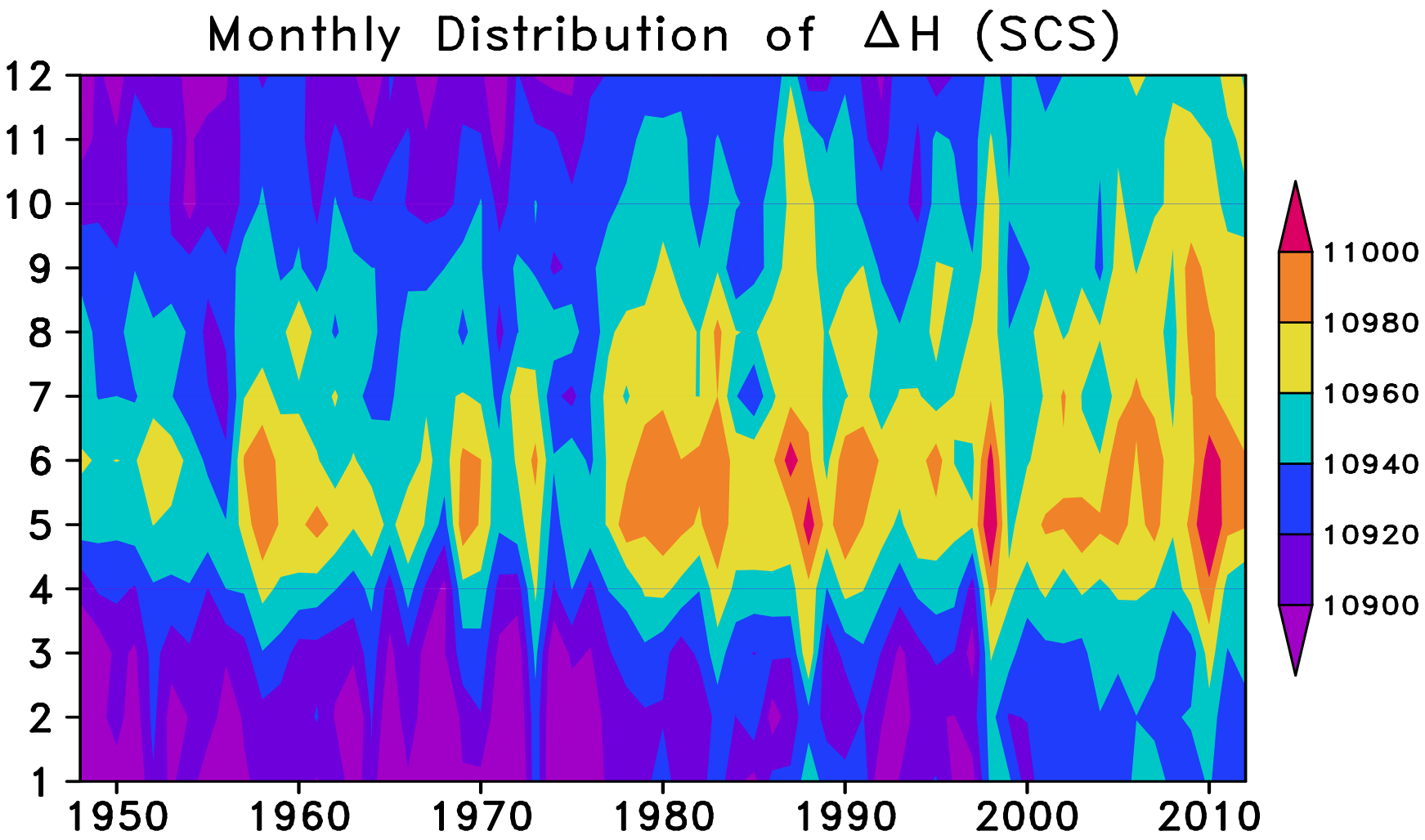
Wet and Dry Seasons: Climatology

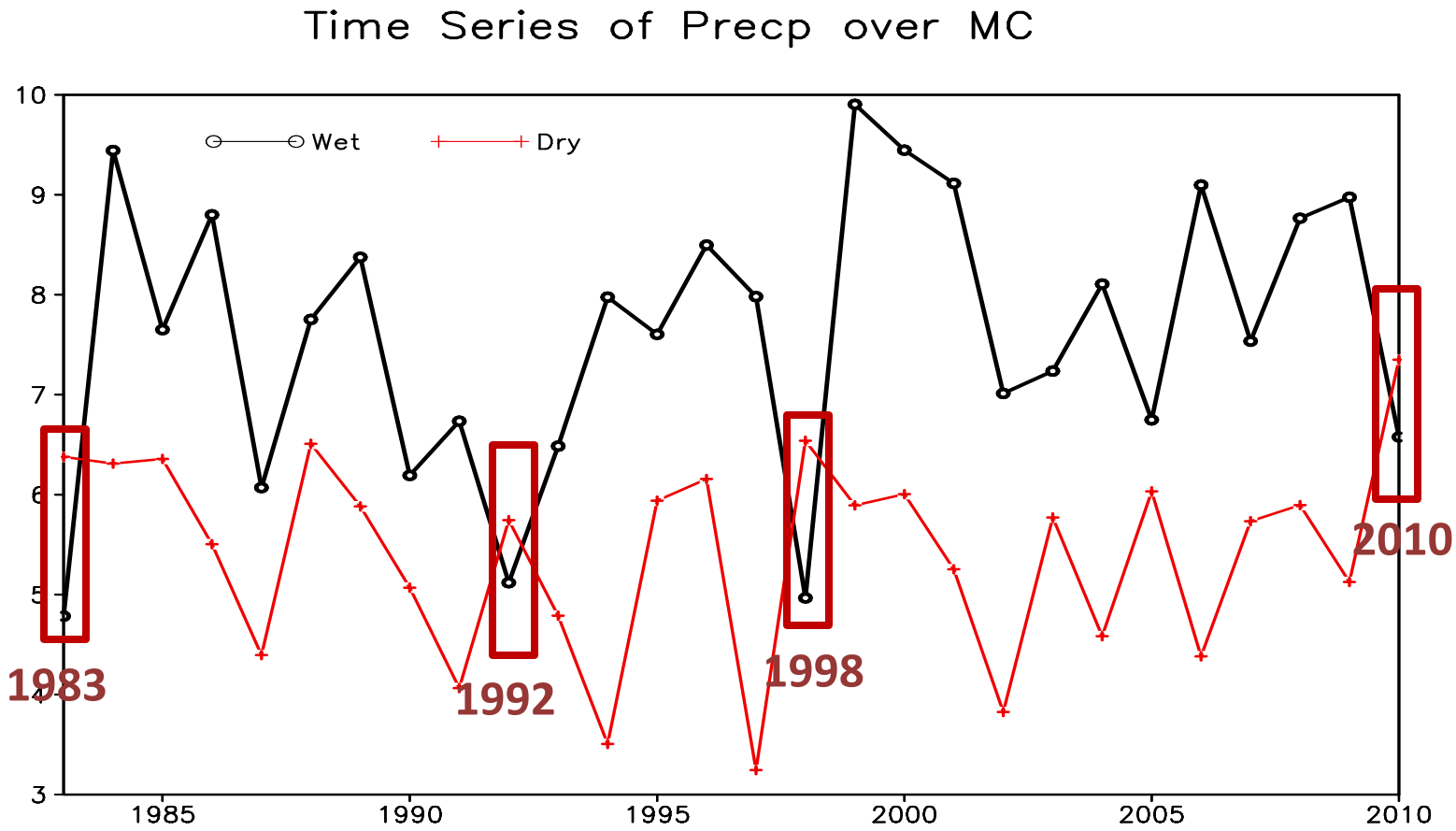




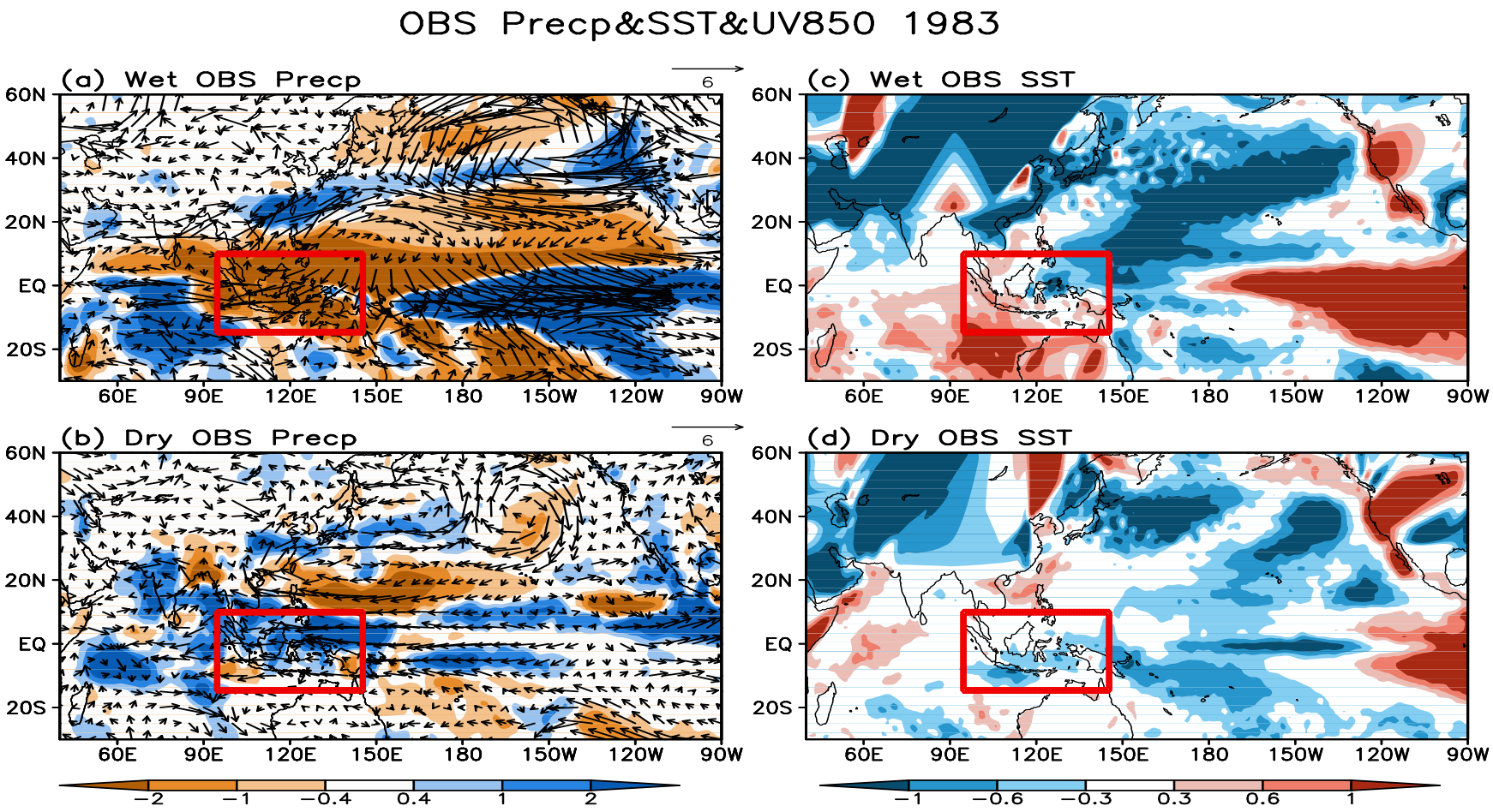
(H200-H850) over the South China Sea and Surrounding Regions



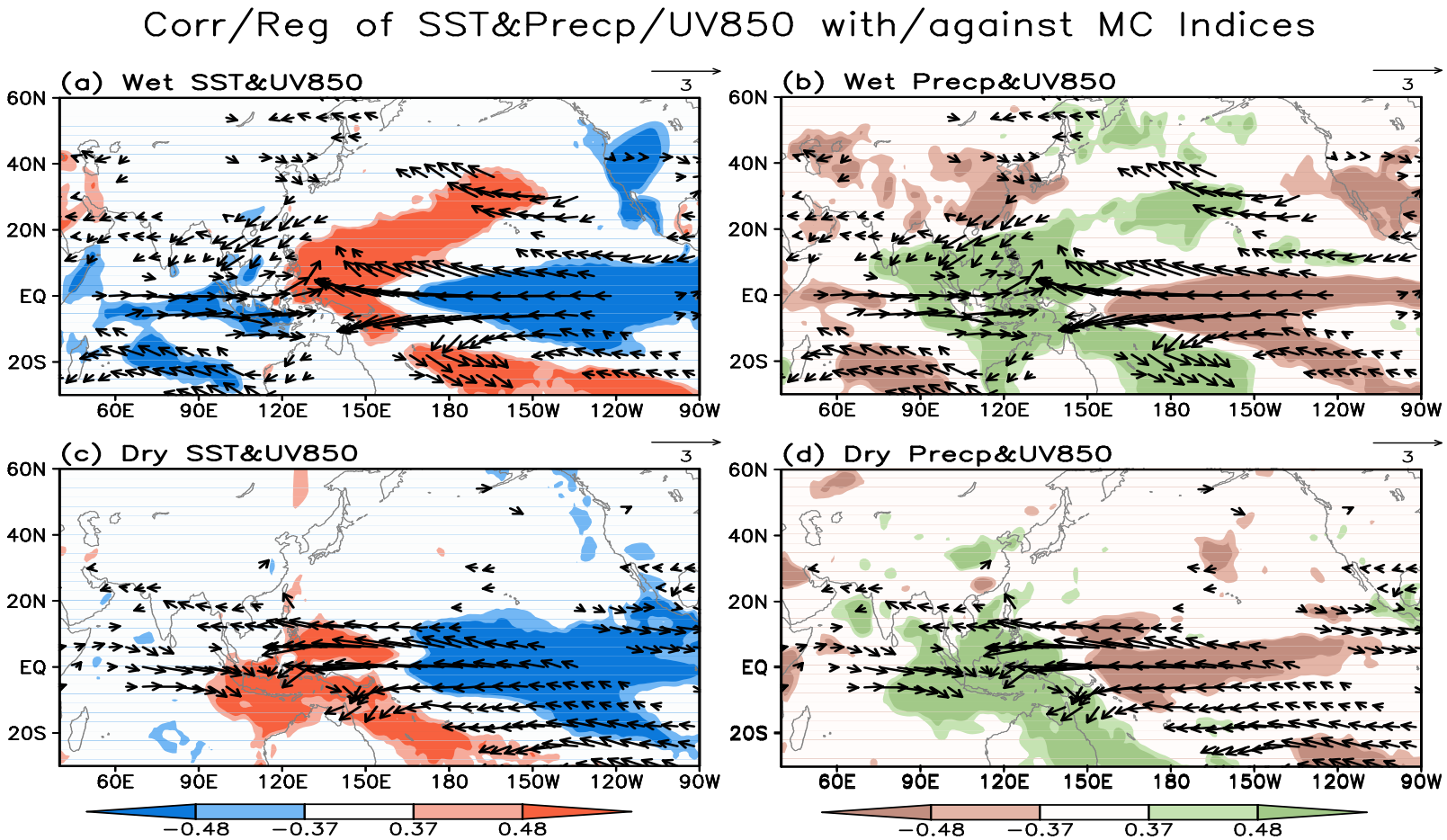
Wet and Dry Seasons: Interannual



Case Analysis for 1983

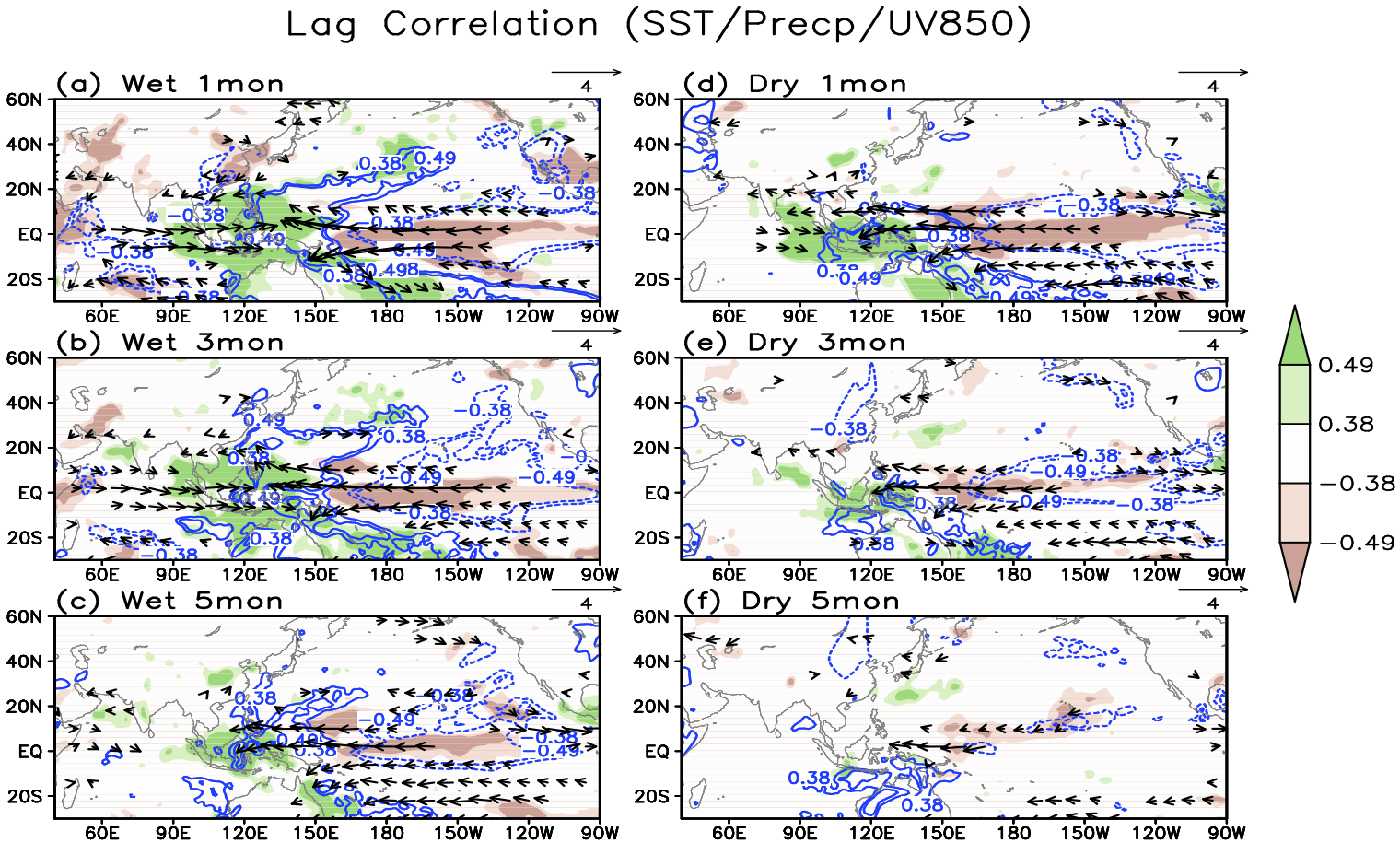


Cor/Reg (SST, P & Winds): Wet & Dry



Patterns of correlation between SST/precipitation and MC precipitation indices and regression of 850-hPa winds against MC precipitation indices for observations in wet and dry seasons.

Lag Relationships for Wet & Dry Seasons



Patterns of correlation between SST (contours)/precipitation (shading) and MC precipitation indices and regression of 850-hPa winds against MC precipitation indices for wet and dry seasons.

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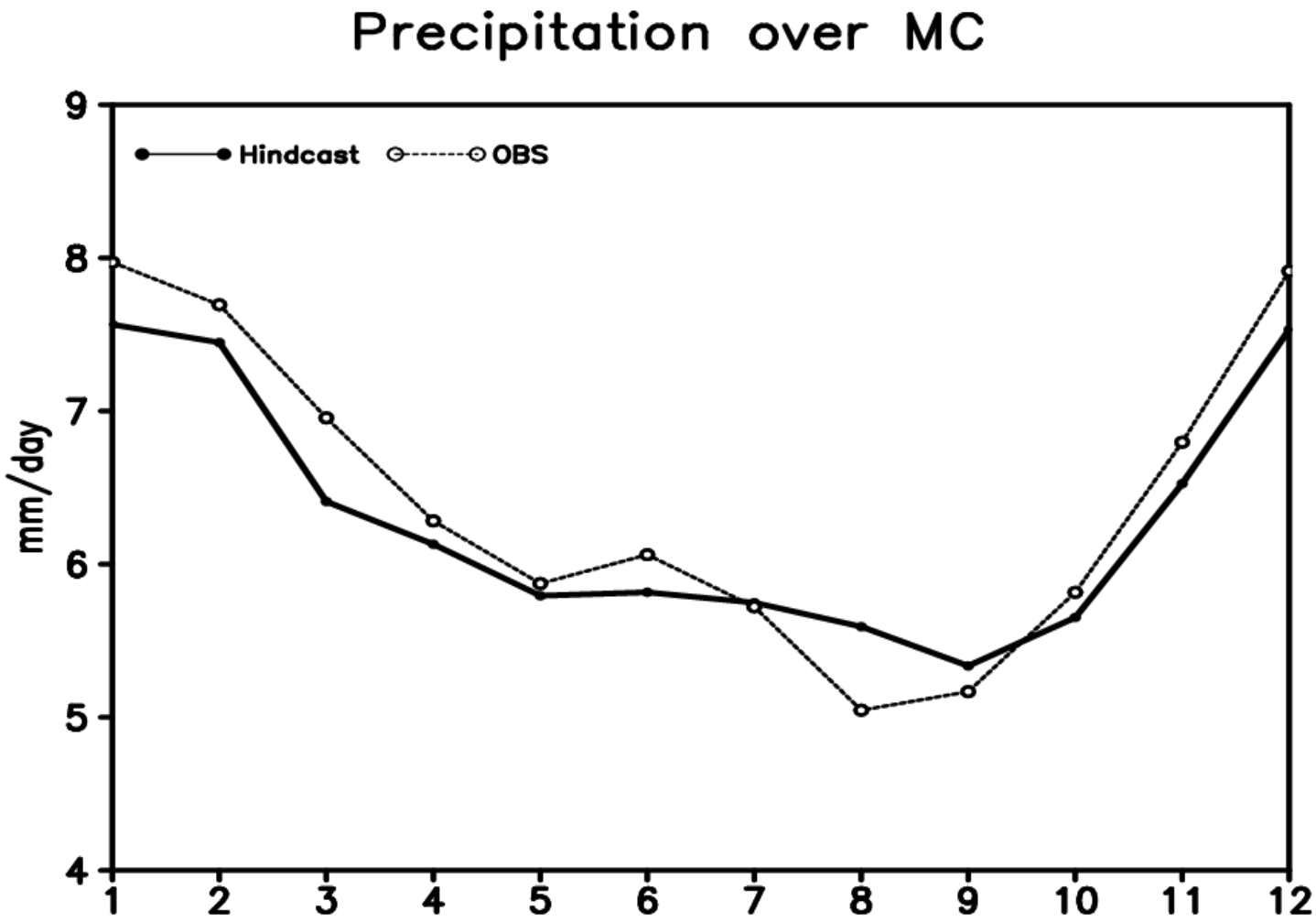
CFSv2 Output

Hindcast Products:

(a) Monthly means, 1983-2010
24 members (4x6), integrated for 9 months

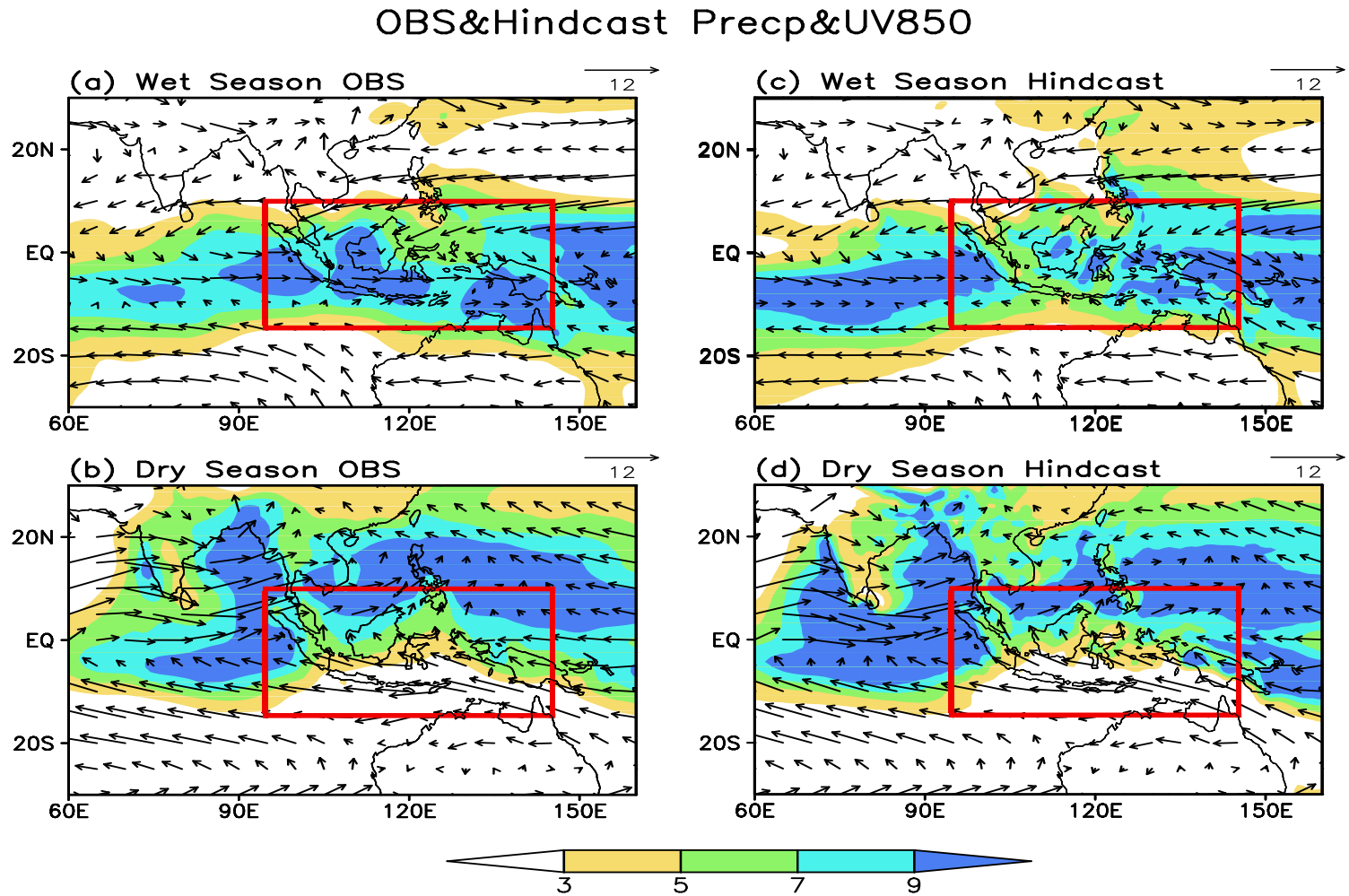
(b) Daily data, 1999-2010
4 members every day, integrated for 45 days

Obs and CFS Time Series



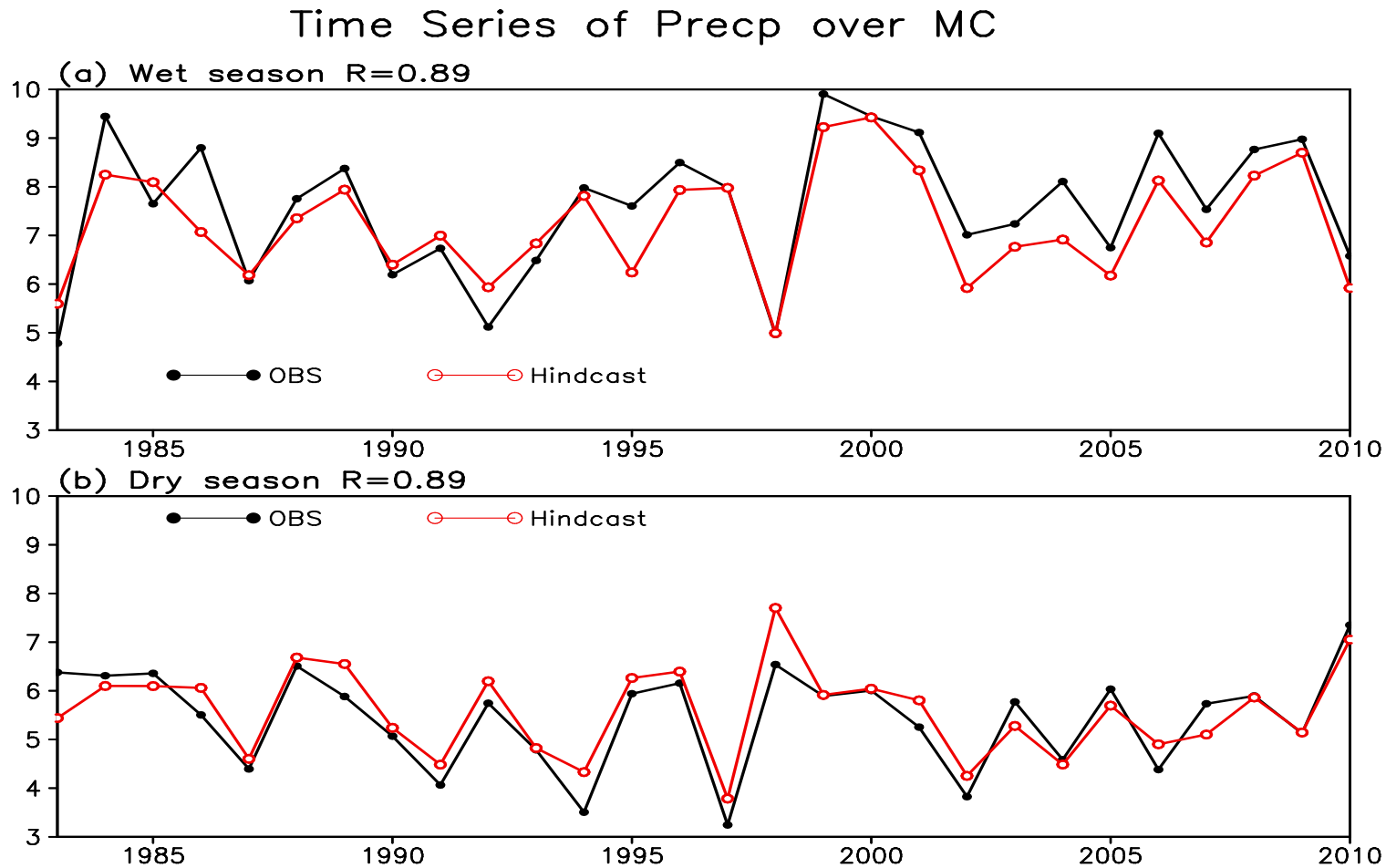
Monthly climatological mean of MC precipitation for observation and hindcast ensemble mean of 0-month lead

Obs and CFS Wet & Dry Precip Patterns



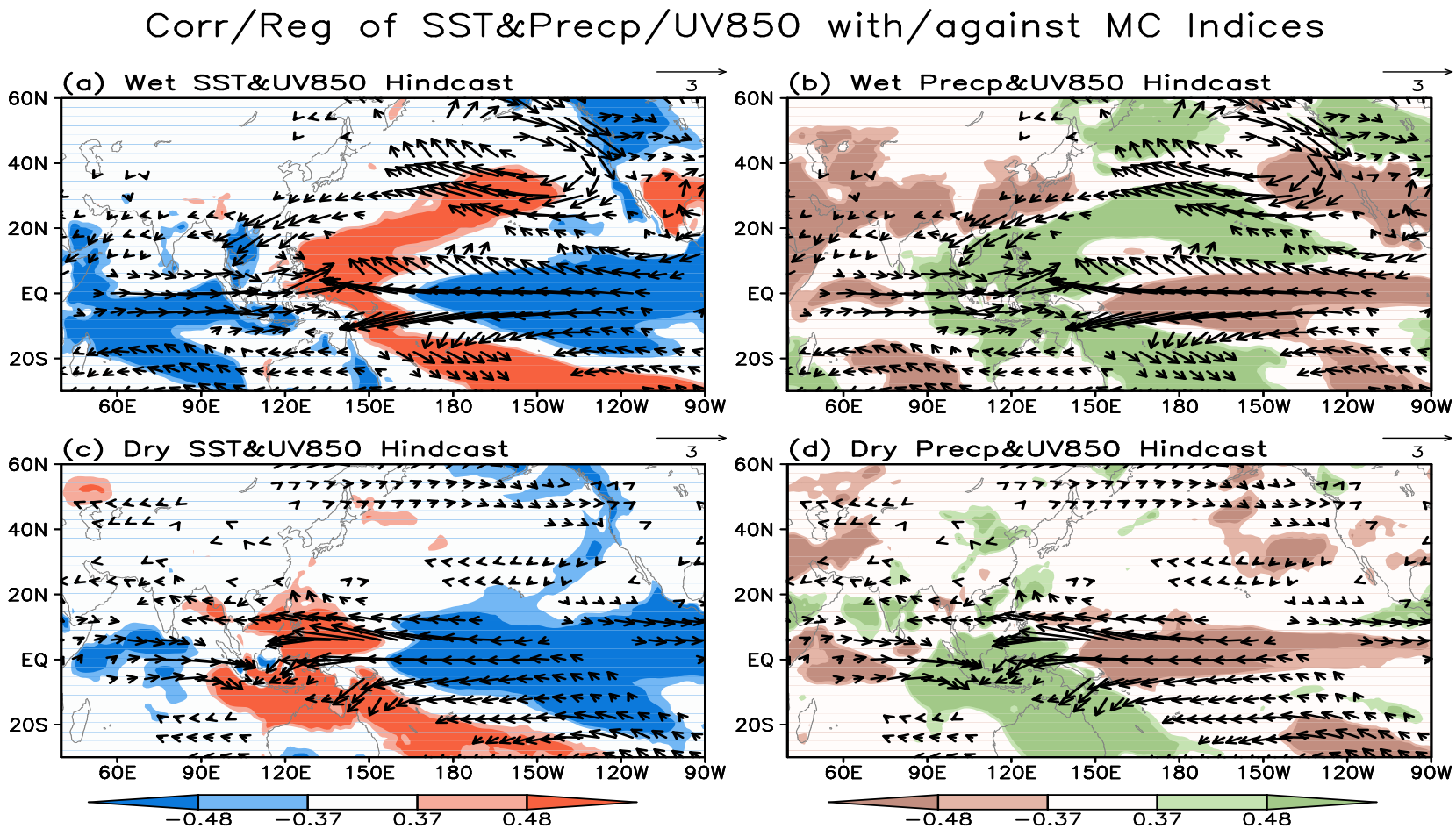
Climatology of precipitation and 850-hPa winds in wet and dry seasons

Obs and CFS Time Series for Wet & Dry Seasons



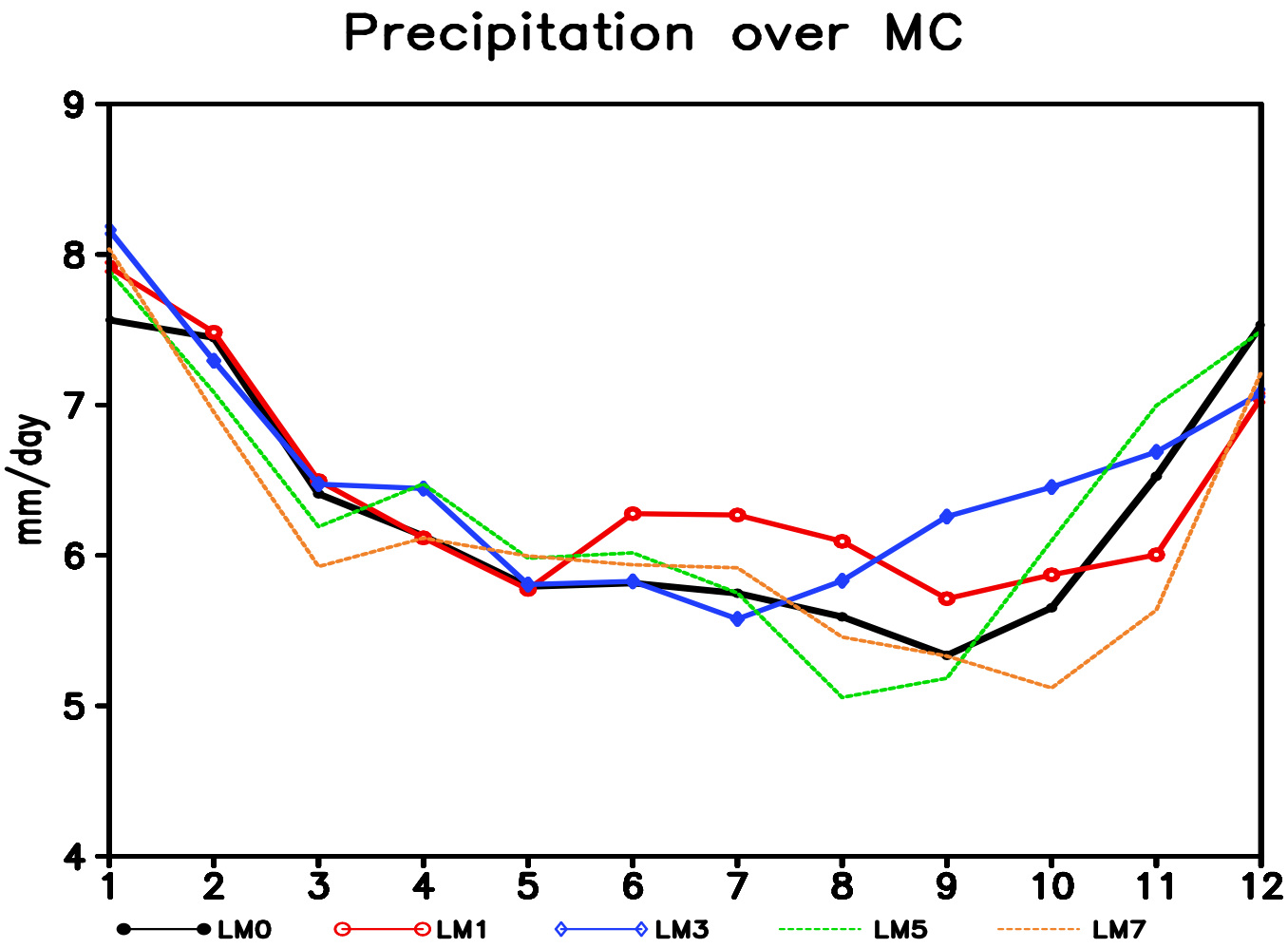
Time series of MC precipitation indices in (a) wet season and (b) dry season, for observations and hindcast ensemble mean of 0-month lead

Cor/Reg (SST, P & Winds): Wet & Dry



Correlation and regression patterns for hindcast ensemble mean of 0-month lead

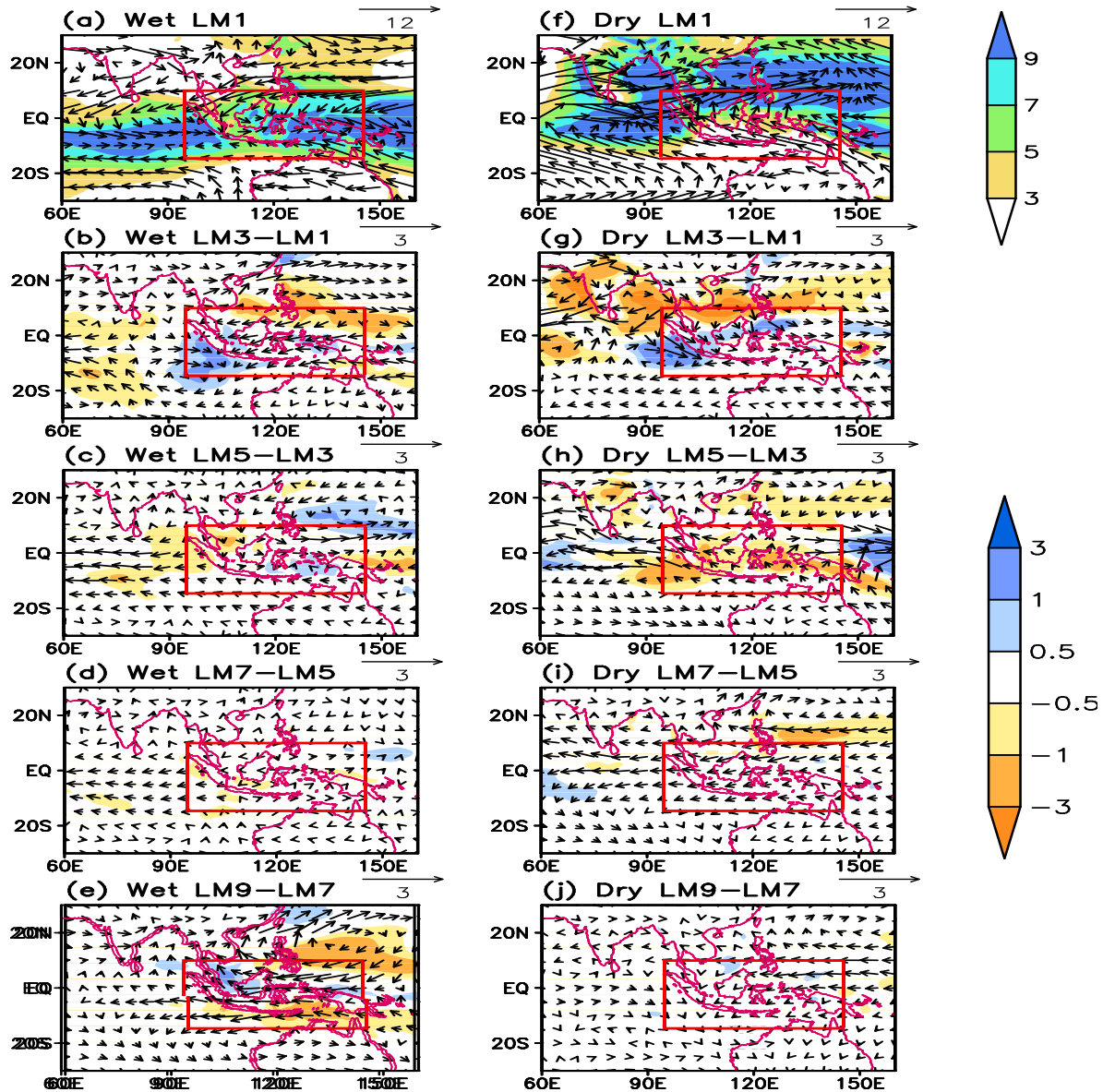
Prediction Skill as Functions of Lead Time and Initial Months



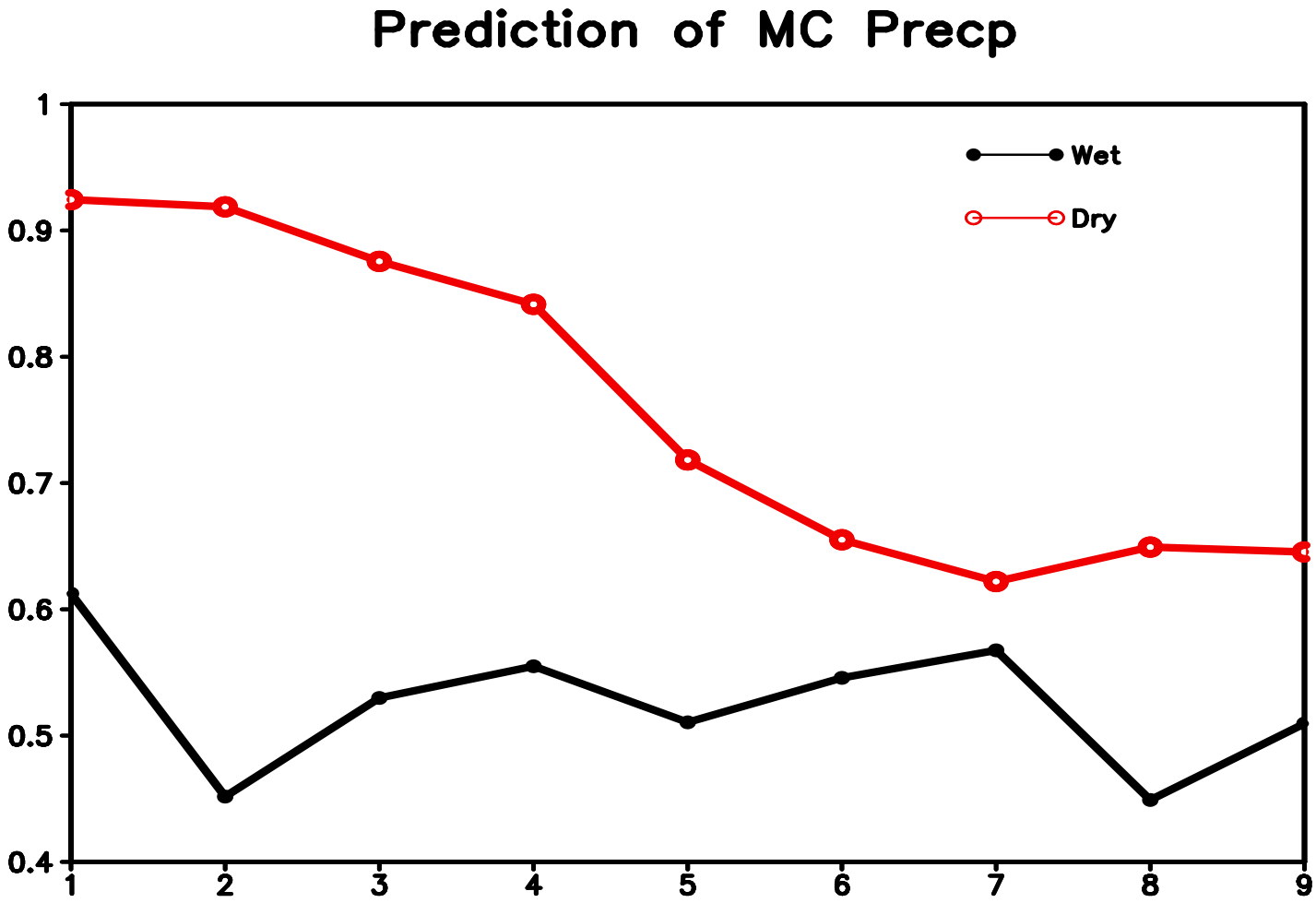
Monthly mean of MC precipitation for hindcast ensemble means of different lead months

P/Winds in LM1 and Diff btw Various Leads for Wet & Dry Seasons

Climatology of precipitation and 850-hPa winds for hindcast ensemble mean of 1-month lead (a and f). Changes in hindcast precipitation and 850-hPa winds for different lead months: differences between 3-month and 1-month, and so on.



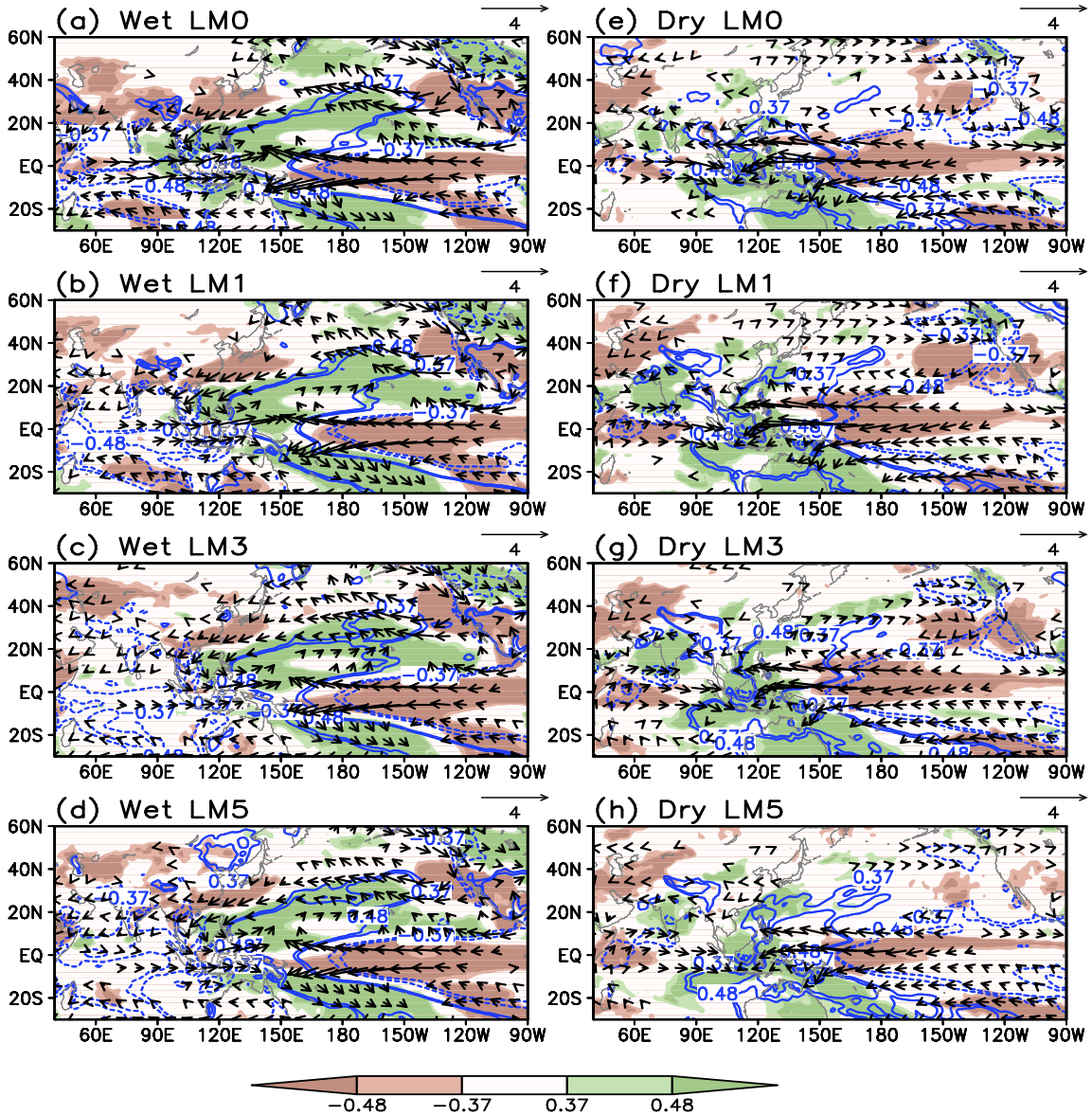
Prediction Skill for Wet & Dry Seasons



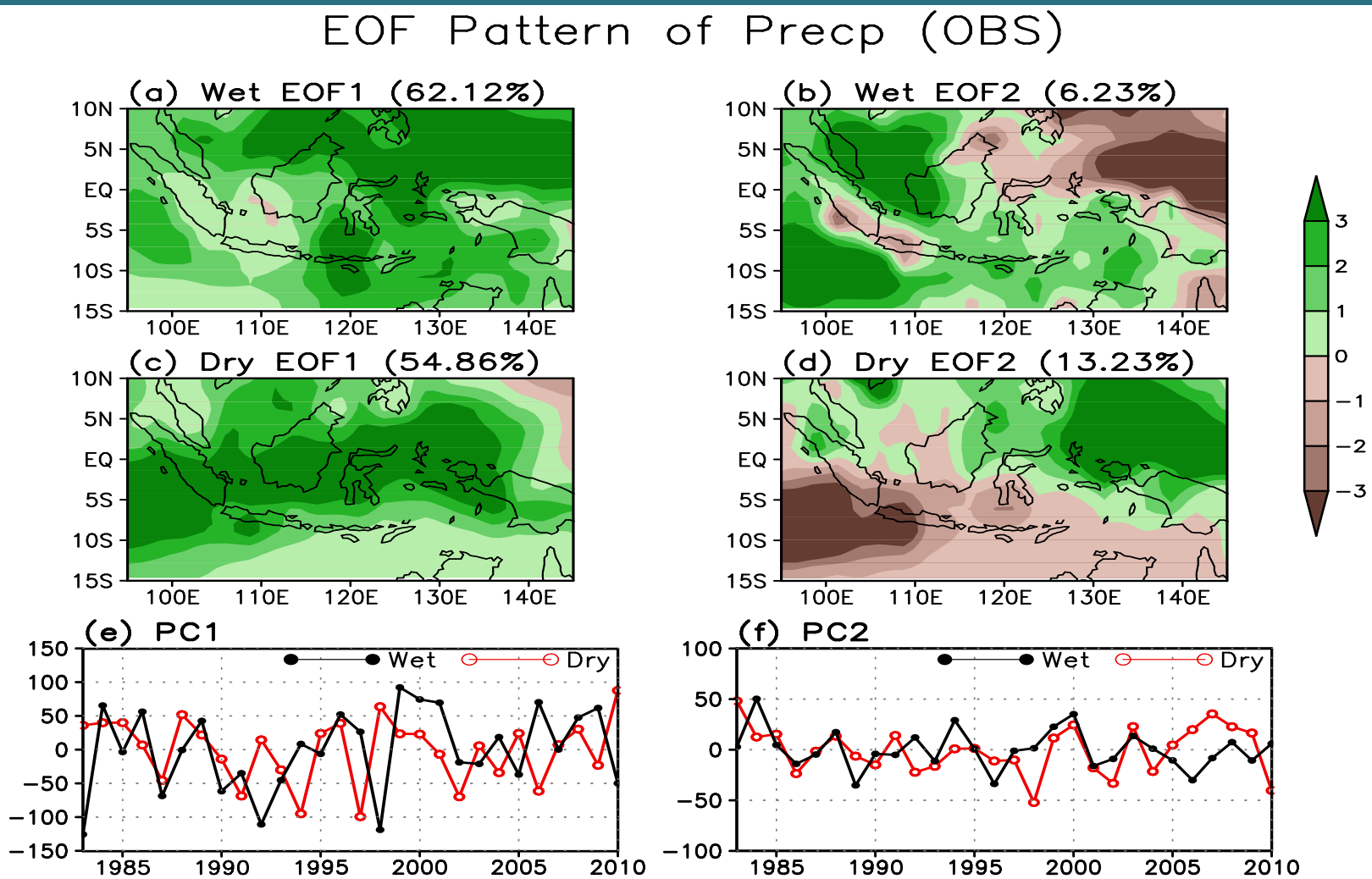
Coefficients of correlation between the CFS predicted MC precipitation of different leads and observed MC precipitation in wet season and dry season

Predicted SST/P/Winds and Obs MC Precip Time Series for Wet & Dry Seasons

Correlation (regression) of SST/precipitation (850-hPa winds) from hindcast ensemble mean for different lead months with (against) observed MC precipitation indices in wet and dry seasons.

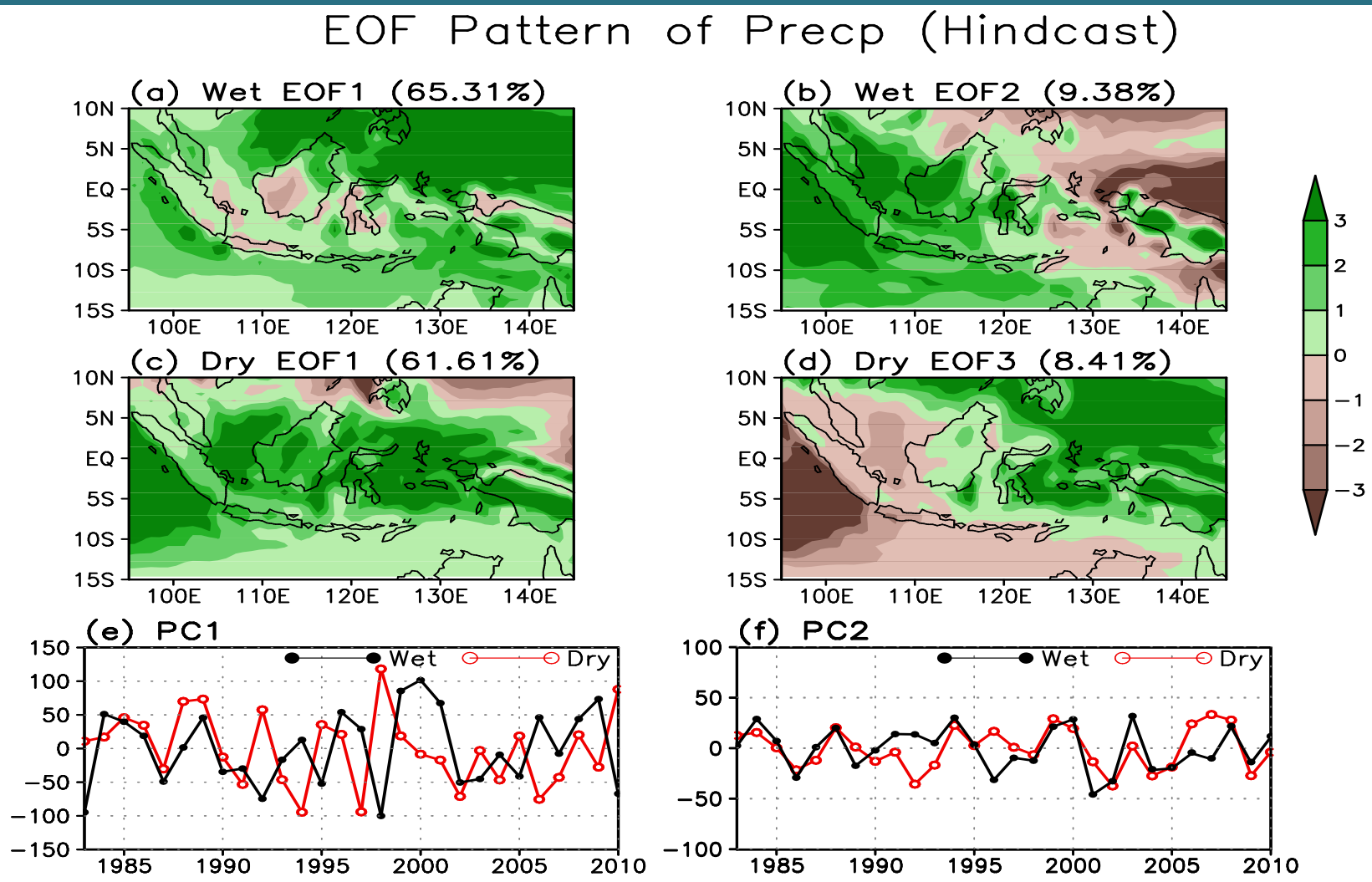


First Two EOF Modes: Obs



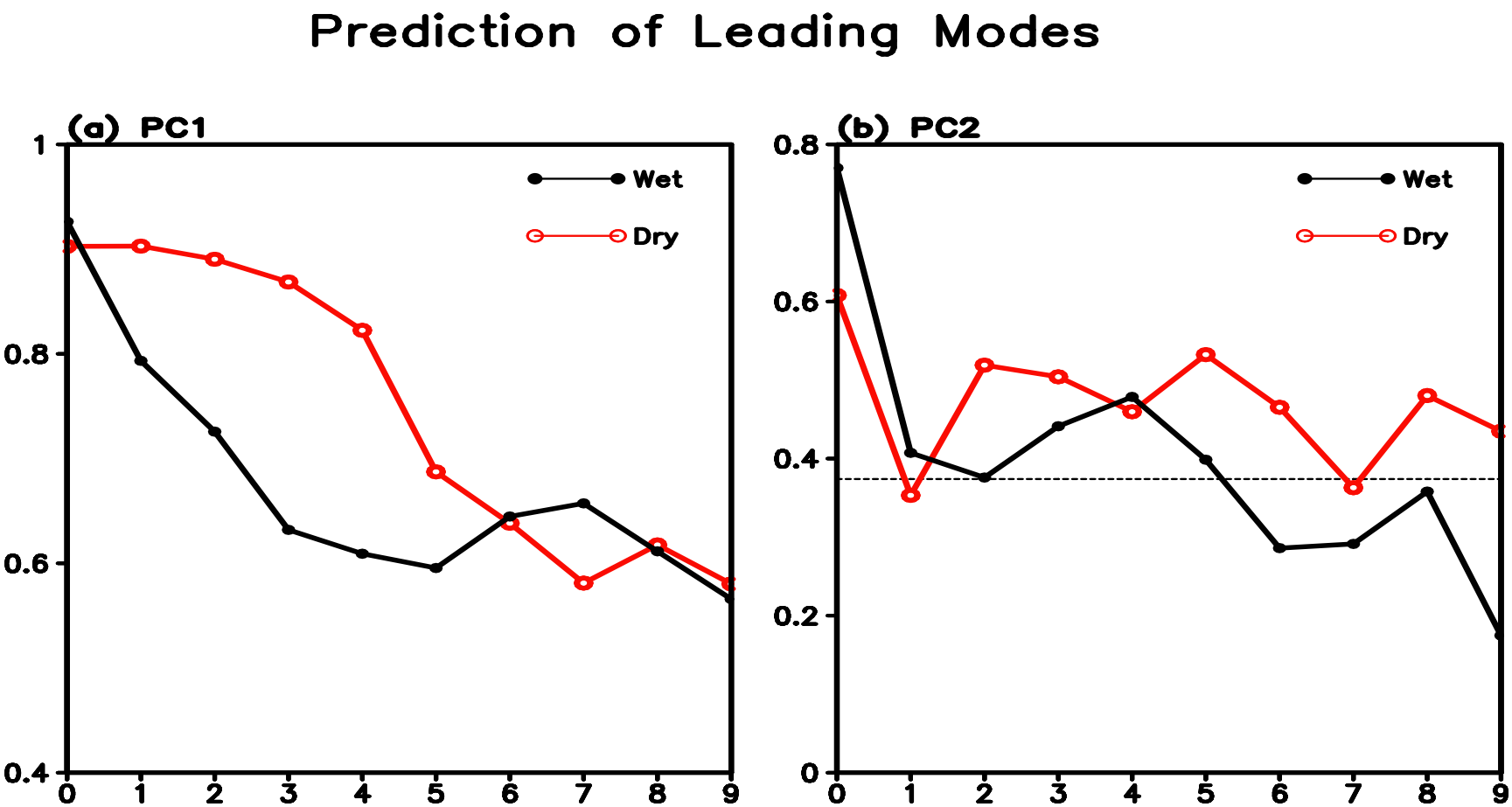
First and second EOF modes of observed precipitation and associated principal components in wet and dry seasons

First Two EOF Modes: CFS LM0



First and second EOF modes of precipitation for LM0 and associated principal components in wet and dry seasons

Prediction of First Two Modes for Wet & Dry



Coefficients of correlation between observed and CFS predicted PCs for different lead months in wet and dry season

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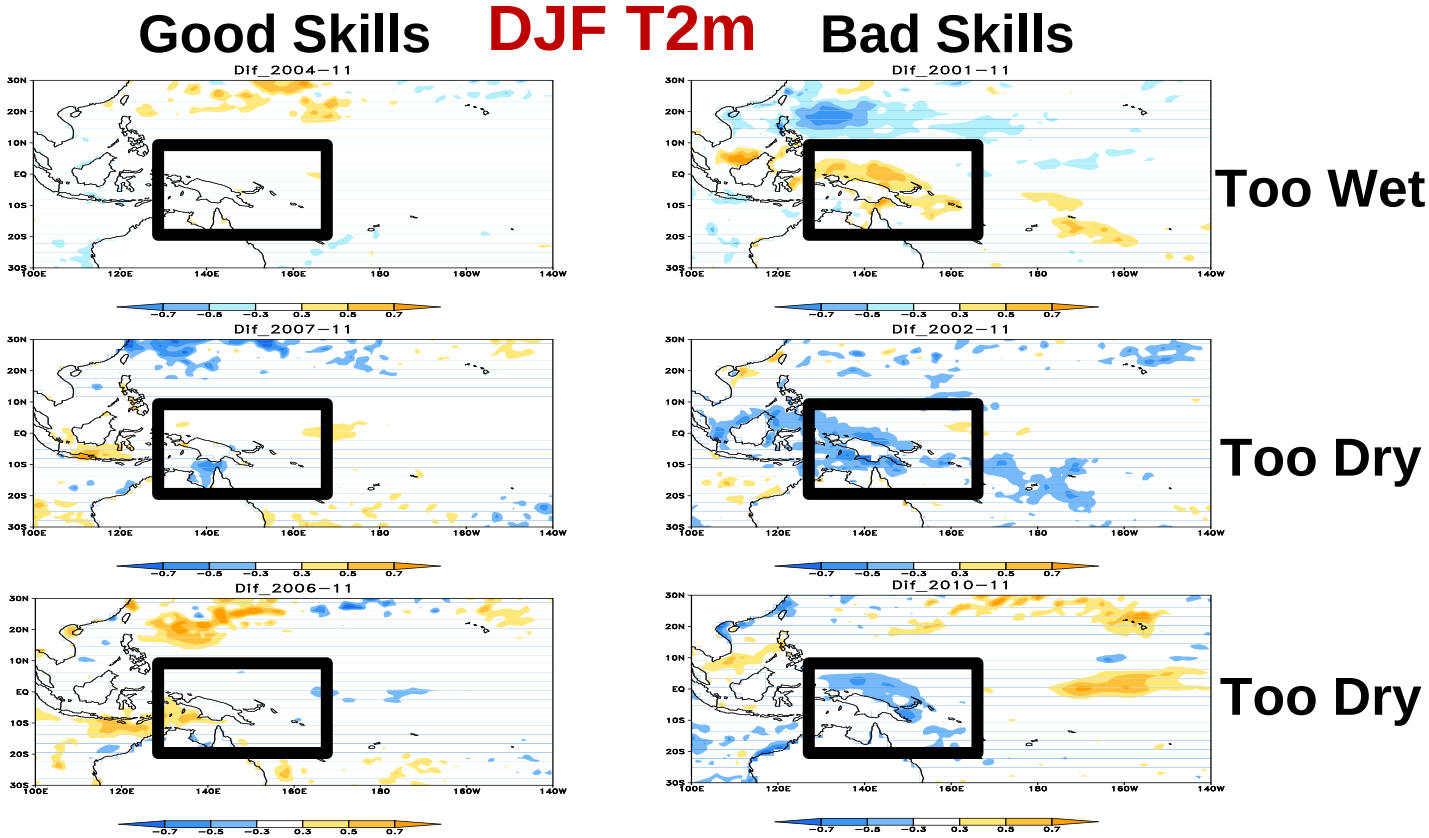
Research into following issues

- Sub-seasonal prediction of wet and dry season precipitation over the Maritime Continent

- Yearly prediction of MC precipitation

- MC as a key region for improving climate prediction for other (East) Asian regions?

Importance of Tropical W Pacific SST for Early-season Rainfall over Southern China



Zhao, S., and S. Yang, 2014: Dynamical prediction of the early-season rainfall over southern China by the NCEP Climate Forecast System. *Wea. Forecasting,* in press.

Zhao, S., S. Yang, Y. Deng, and Q. Li, 2014: Skills of yearly prediction of the early-season rainfall over southern China by the NCEP Climate Forecast System. *Theor. & Appl. Climatol.,* submitted.

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Summary

- The variability of precipitation over the Maritime Continent during both wet and dry seasons is related to the phases of ENSO and the Asian-Australian monsoons, but differently.

- The NCEP CFSv2 has a high skill in predicting the main features of MC precipitation variations and their relationships with larger-scale oceanic and atmospheric anomalies, especially for the dry season.

- The CFSv2 well predicts the dominant modes of MC precipitation, and the skill is higher in dry season than in wet season. When lead time is longer than 1 month, the skill drops remarkably in the wet season.