Prediction of Wet and Dry Season Precipitation over the Maritime Continent

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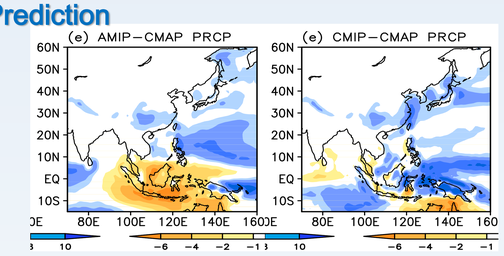
※ Introduction

The Maritime Continent (MC) is important for both local and global atmospheric circulation, but prediction of the MC precipitation is a big challenge due to the complex land-sea distribution, among others. In this study, the skills of MC precipitation prediction for wet and dry seasons are investigated

Importance of MC for Winter Monsoon Prediction



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.

※ Data and Methods

Observational Data:

Precipitation from CMAP, monthly, 1983-2010 (Xie and Arkin 1997)

SST from OI SST, monthly, 1983-2010 (Reynolds et al. 2007)

Winds from NCEP CFSR, monthly, 1983-2010 (Saha et al. 2010)

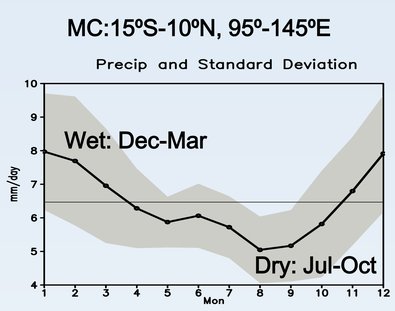
CFSv2 Output :

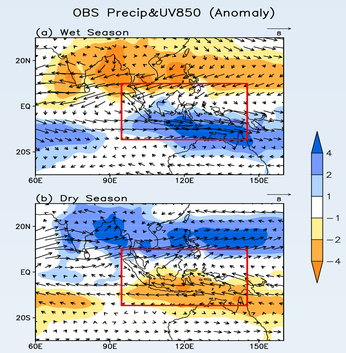
Monthly means, 1983-2010, 24 members (4x6), integrated for 9 months

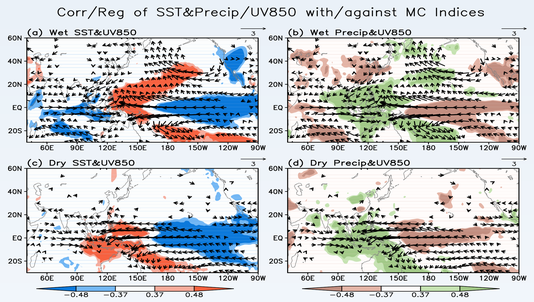
- The CFSv2 is a coupled atmosphere-ocean-land dynamical climate forecast system (Saha et al. 2010). Details about the initial time can be found at http://cfs.ncep.noaa.gov/cfsv2.info/.

Result 1. Variations of MC Precipitation

Wet and Dry Seasons: Climatology



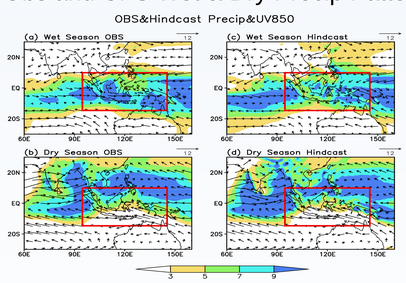




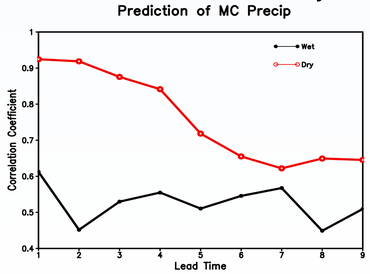
Patterns of correlation between SST/precipitation and MC precipitation indices and regression of 850-hPa winds against MC precipitation indices for observations in wet and dry seasons.

Result 2. Prediction of MC Precipitation

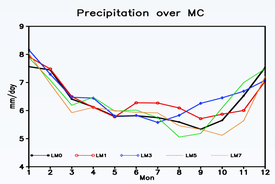
Obs and CFS Wet & Dry Precip Patterns



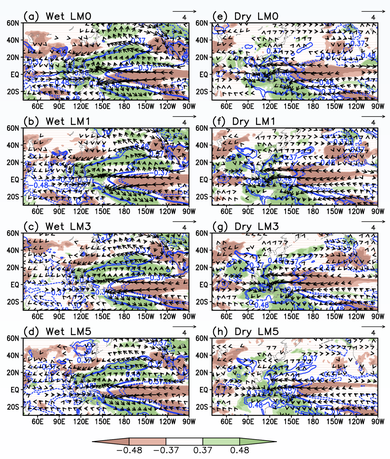
Prediction Skill for Wet & Dry Seasons



Prediction skill of the wet season MC precipitation is lower than that for the dry season. The skill decreases rapidly from LM0 to LM1 for wet season.



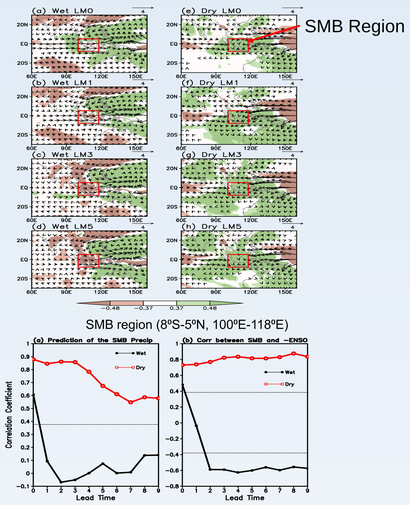
Monthly mean of MC precipitation for hindcast ensemble means of different lead months



The model captures the major features of patterns for all time leads. However, the relationships between the MC precipitation variation and the western MC climate anomalies are unrealistically predicted after LM0.

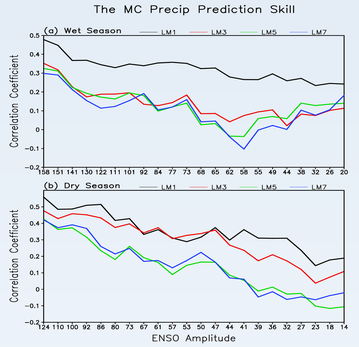
Result 3. ENSO Forcing

Correlation (regression) of precipitation (850-hPa winds) with (against) negative Niño-3.4 indices



The low prediction skill and unrealistic prediction relationship for the wet season can partly due to the unrealistic prediction relationship between the precipitation variation around the region of SMB and the ENSO variability for the wet season after LM0.

Prediction skill of precipitation over MC as a function of ENSO amplitude. Years are arranged in the descending order of ENSO amplitude. The ENSO amplitude and skill are 7-year moving averages from the largest ENSO amplitude year to the smallest.



Overall, the prediction skill increases with ENSO amplitude, suggesting that the source of skill of MC prediction comes mainly from ENSO. However, the prediction skills of the wet-season MC precipitation in LM3, LM5, and LM7 do not show an apparent decrease when the ENSO amplitude is less than 0.58.

※ Summary

- The variability of precipitation over MC is related to the phases of ENSO and the Asian-Australian monsoons, but features are different during wet and dry seasons.
- 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 relatively low prediction skill of the wet-season MC precipitation variation is contributed mainly by the low prediction skill of the precipitation over Sumatra, Malay, and Borneo (SMB), which can be partly attributed to the unrealistically predicted relationship between the variations of SMB precipitation and ENSO in the wet season.

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