應用中央氣象局模式資料監測預報北半球夏季季內震盪

BSISO Prediction at CWB

中央氣象局氣象科技研究中心

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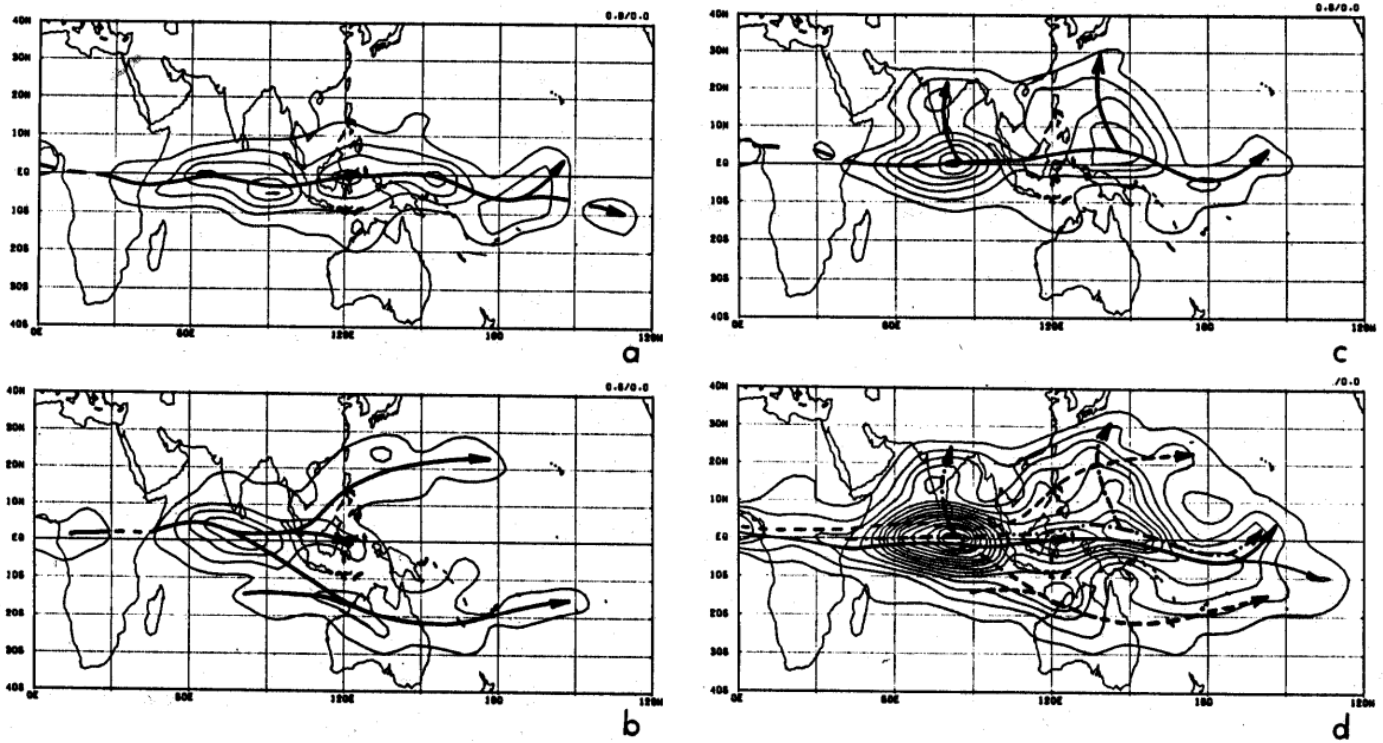
Introduction

- 季內至季節預報（Subseasonal to Seasonal Prediction，簡稱S2S Prediction）是現今預報技術發展的主要領域之一，對於熱帶季內震盪（Intraseasonal oscillation；ISO）現象的了解與掌握是提升S2S預報技術的關鍵。

- 許多研究（Madden1986, Wang and Rui1990; Salby and Hendon1994; Zhang and Dong2004; CLIVAR Madden-Julian Oscillation (MJO) working group2009; Kikuchi et al.2012）指出熱帶季內震盪有顯著的季節變化，也就是在不同的季節有不同的特性。

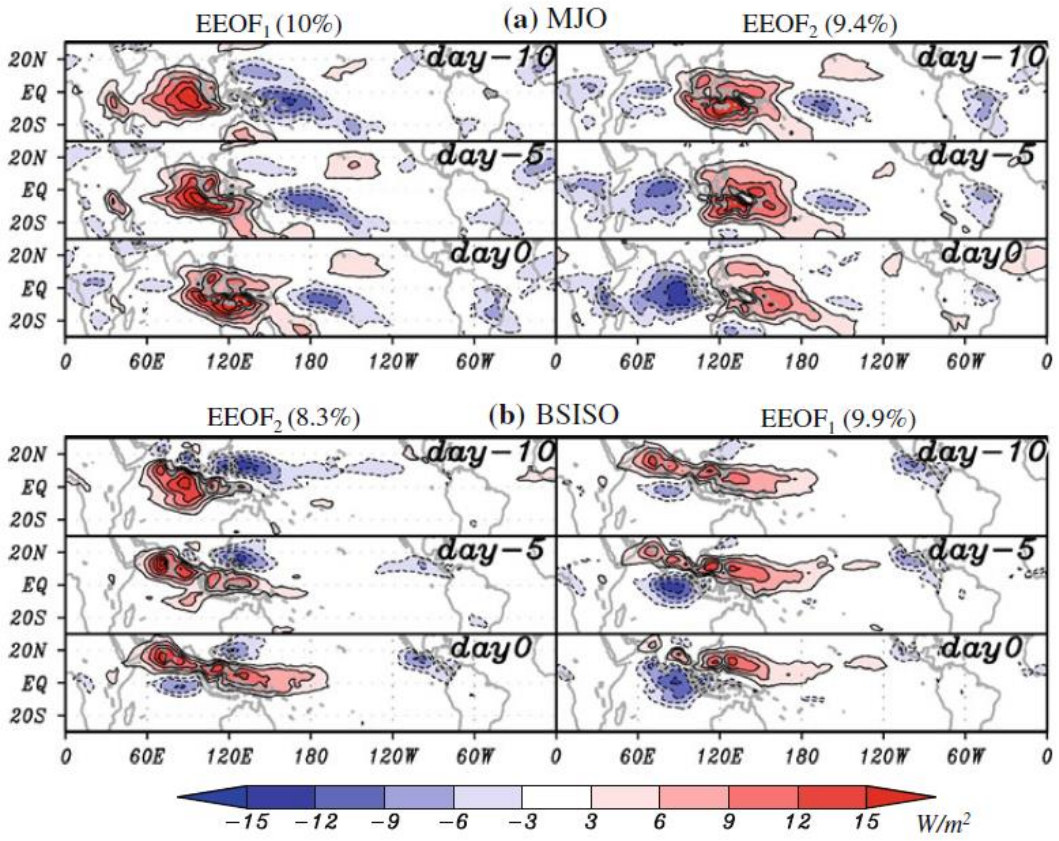
Introduction

- Wang and Rui(1990)從1975-1985年間10年5天平均的長波外逸輻射資料(OLR)中判定出122個季內震盪事件，並將其分類為3種類型：向東傳(77個事件)、獨立北傳(27個事件)、向西傳(18個事件)，其中東傳的季內震盪在北半球冬季較夏季為活躍，獨立北傳的季內震盪則主要發生在北半球，時間為5-10月期間。



Introduction

- Kikuchi et al.（2011）將熱帶季內震盪依季節分為兩個模態，一為冬季的MJO（Madden-Julian Oscillation）模態，一為夏季的BSISO（Boreal Summer Intra-seasonal Oscillation）模態，指出這是兩種不同的變化。



Introduction

- BSISO 主要活躍在夏季，特徵是在印度洋-西北太平洋區域有向北傳遞的波動並具有10-90天的週期變化，為東亞與西北太平洋夏季季風系統在季內尺度的熱帶對流重要變化模態，可影響臺灣的颱風、豪大雨、高溫等易致災天氣的發生時機，因此對於BSISO的變化需要即時監測以及預報的資訊提供參考。

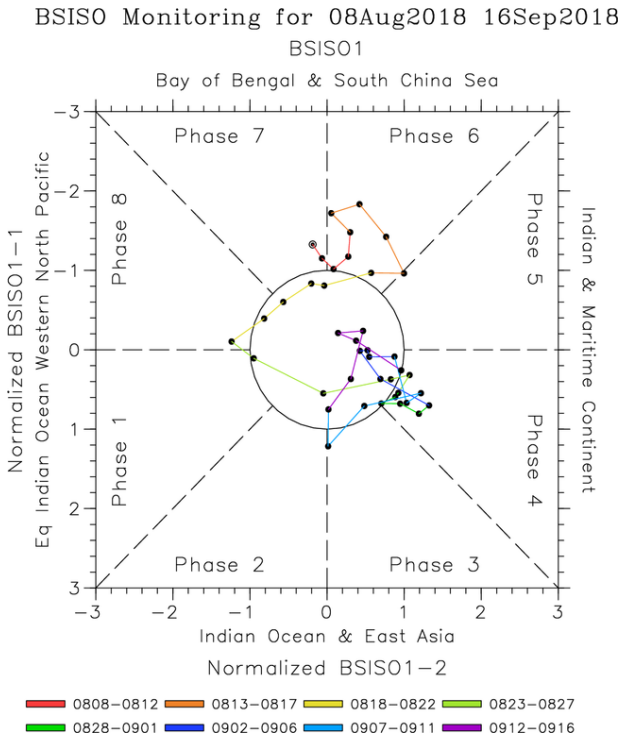
報告大綱

OUTLINE

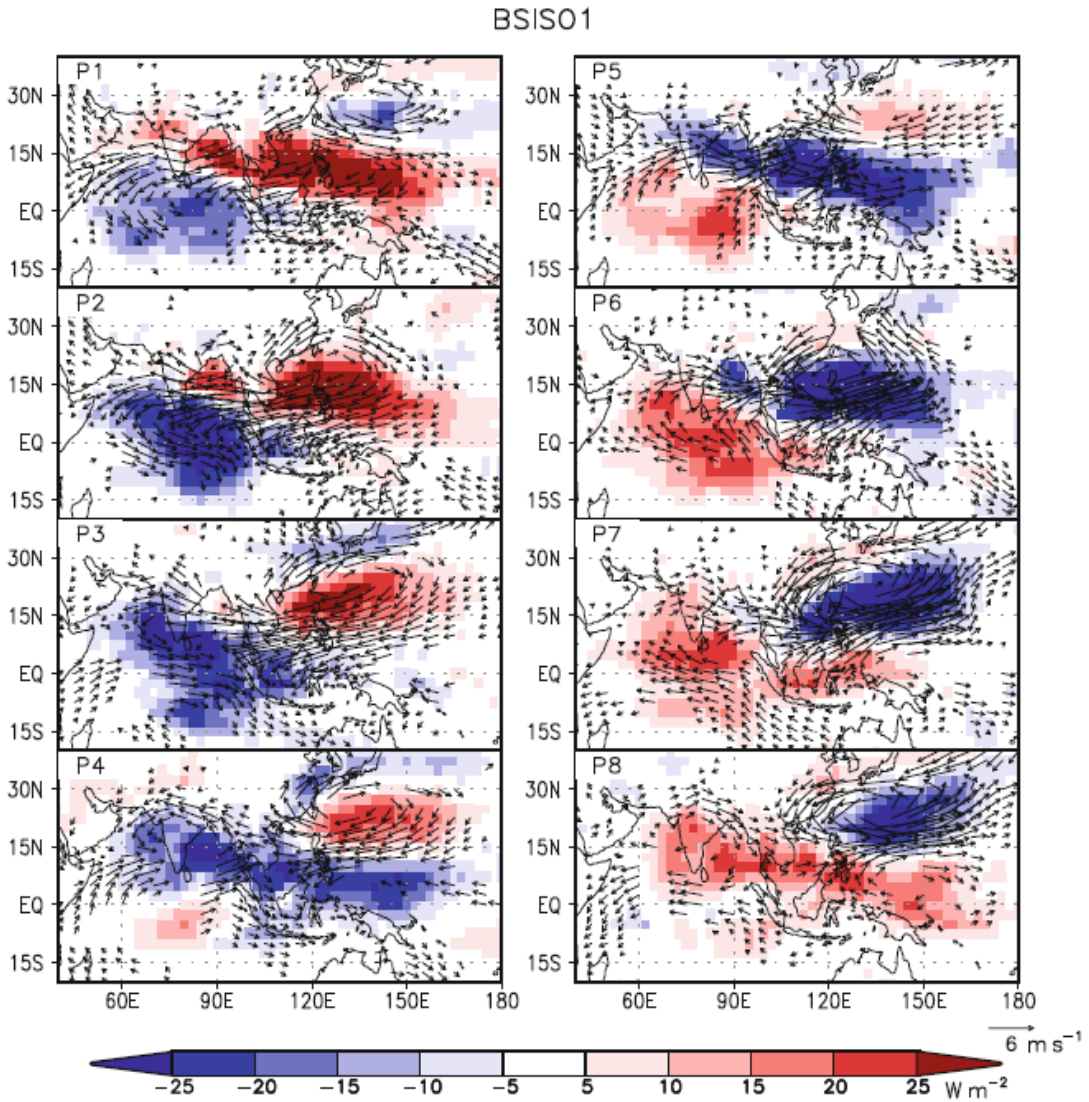
1. Introduction
2. Data and Method -BSISO
3. APCC BSISO Forecast Project
4. BSISO Prediction at CWB
5. Ongoing and Future work

BSISO(Boreal Summer Intraseasonal Oscillation)Prediction

- **BSISO1 : canonical northward propagating BSISO over ASM region with 30-60 days quasi-oscillating period**

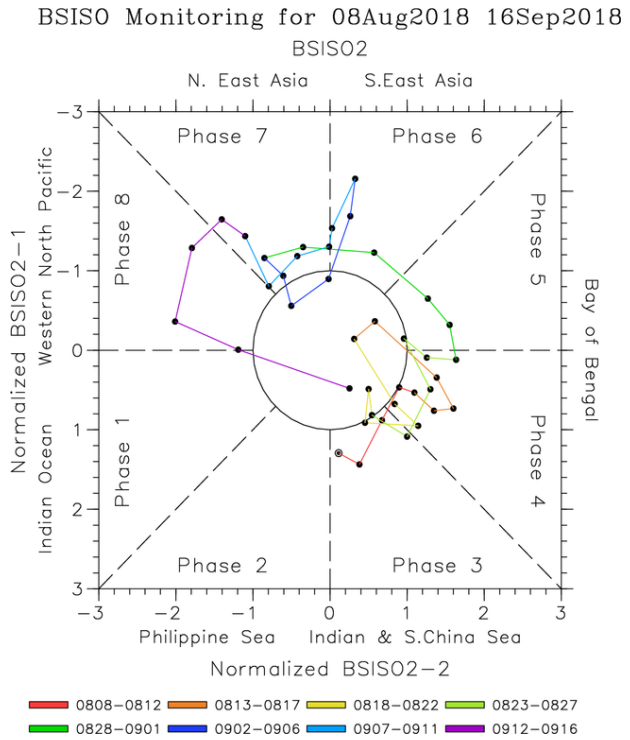


BSISO index(Lee et al,2013)

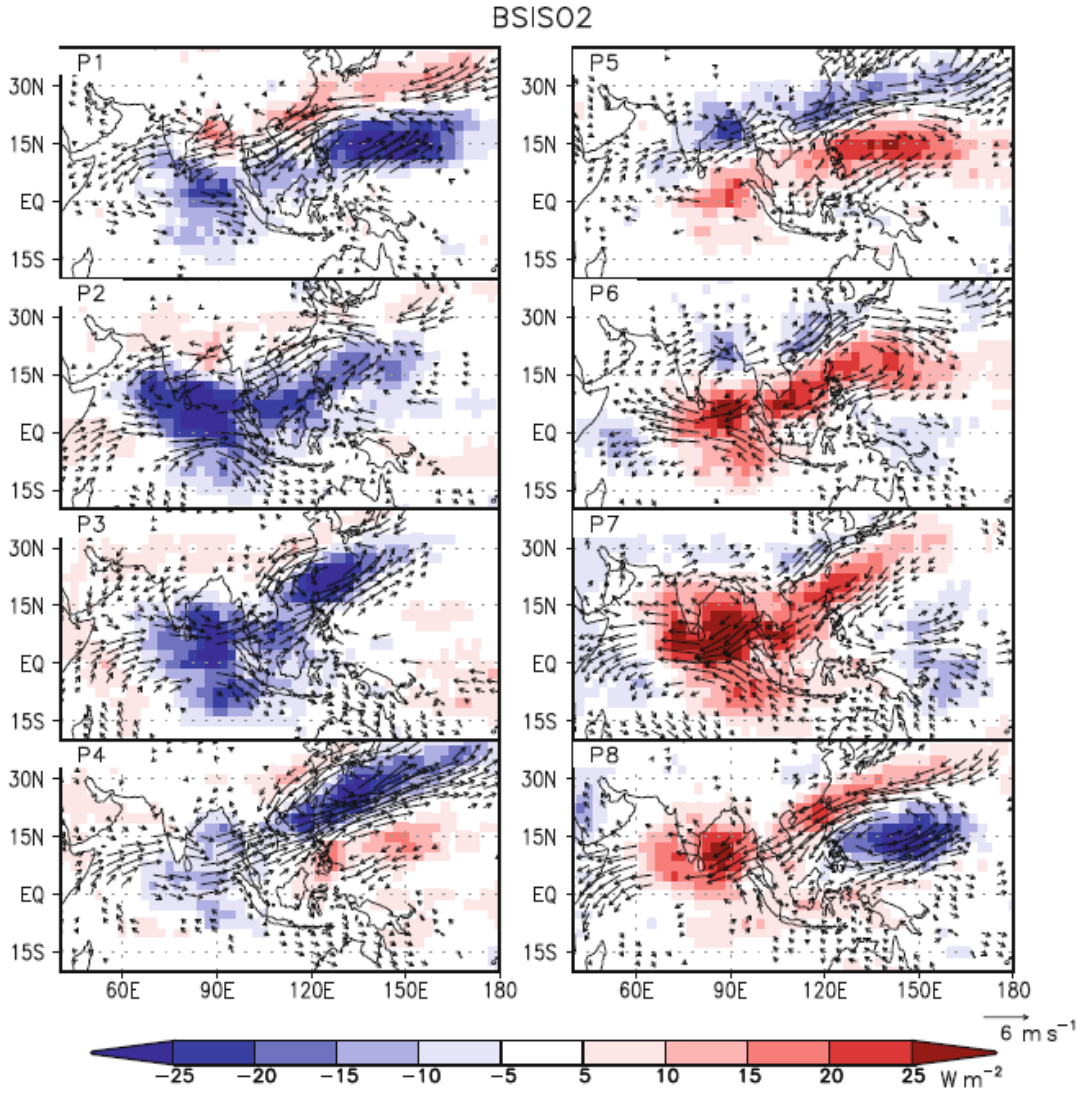


BSISO(Boreal Summer Intraseasonal Oscillation)Prediction

- **BSISO2 : pre-monsoon and onset mode with periods of both around 30 days and 10-20 days**



BSISO index(Lee et al,2013)

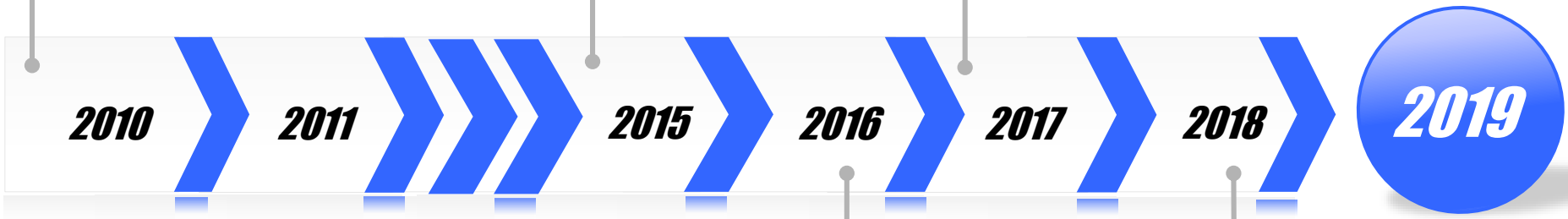


CWB participate in BSISO Forecast project

GFS v2015
T119 (1°x1°)
vertical levels: 40 levels
archived forecast
since Feb 2010, twice daily

CWB joins APCC BISISO Forecast Project

GFS v2015 retired in Dec, 2017



GEPS
(Global Ensemble Prediction System)
control run and 20 members
T319 (0.5°x0.5°)/40 levels
archived forecast since Mar, 2016 ,
Four times daily

CWB submit GEPS product to APCC BSISO

GEPS (Global Ensemble Prediction System)

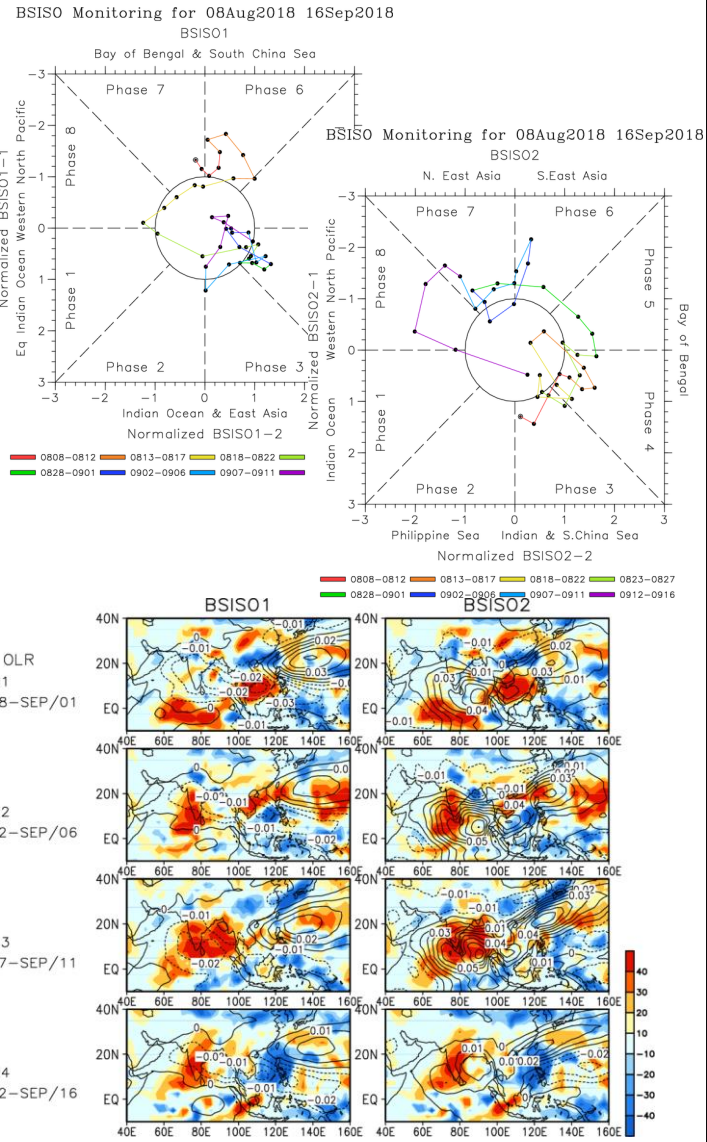
*GEPS based on CWB global model-GFS
*Using different initial singular vectors perturbations to produce 20 members data.

Resolution：T319L60
Horizontal：0.375 degree(Gaussian)
Vertical：60 layers
Run time：00Z, 12Z (twice a day)
Member：00Z- control run and 20 members
12Z- control run
Forecast hours：0000~1080(45 days)

BSISO Prediction at CWB

BSISO Forecast Products

1. Daily monitoring of BSISO index
2. 5-day mean OLR anomaly
3. 5-day mean BSISO projection
4. Daily forecast of BSISO index
5. 5-day mean OLR anomaly
6. 5-day mean BSISO projection
7. verification



Derive BSISO Index using forecast data

Variables :
daily **OLR and U850**

Forecast data

Subtract the slow annual cycle

Removal of the first 3 harmonics in climatological annual cycle

Subtract the mean of 120 days

Subtract the mean of the most recent 120 days of anomaly analysis/forecast data. For the 'day 1' forecasts this will be the *mean of the last 119 days of analysis, plus the 1st day of the forecast* (which already have had the climatological seasonal cycle removed).

Normalization

Divide each field by its area-averaged normalization factor

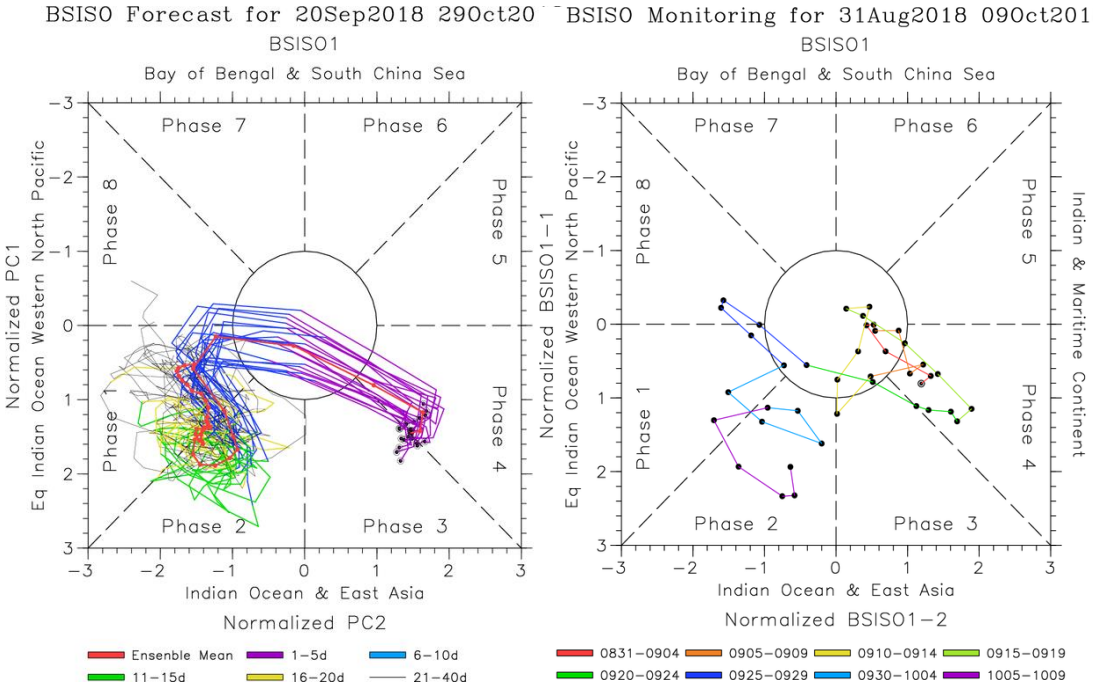
project

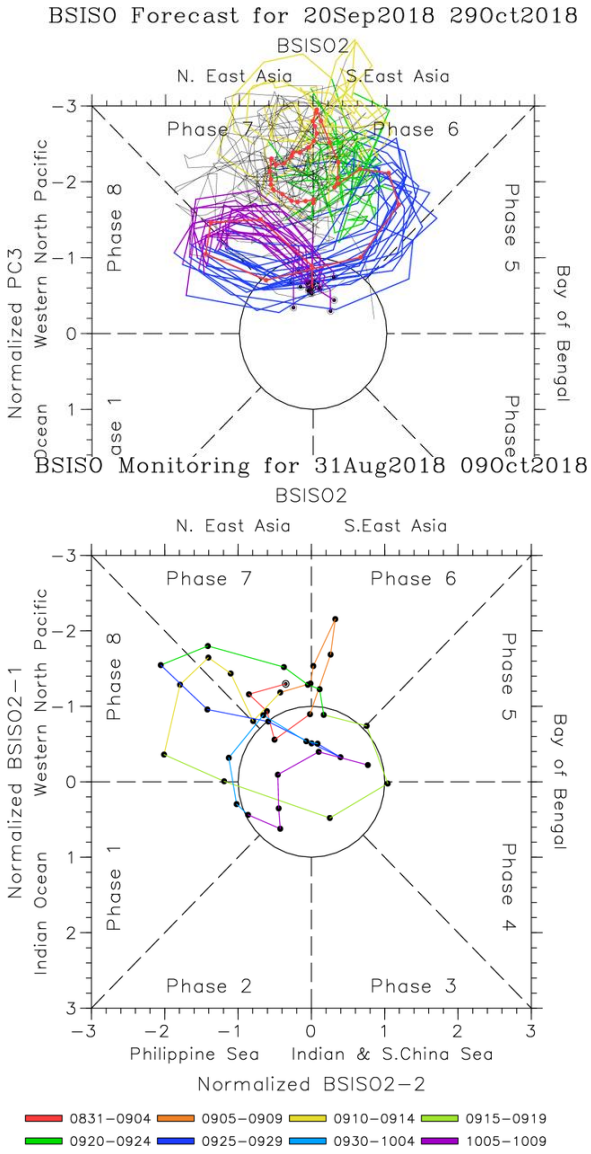
Project data onto the BSISO EOFs of obs to get PCs

BSISO INDEX

BSISO Prediction at CWB

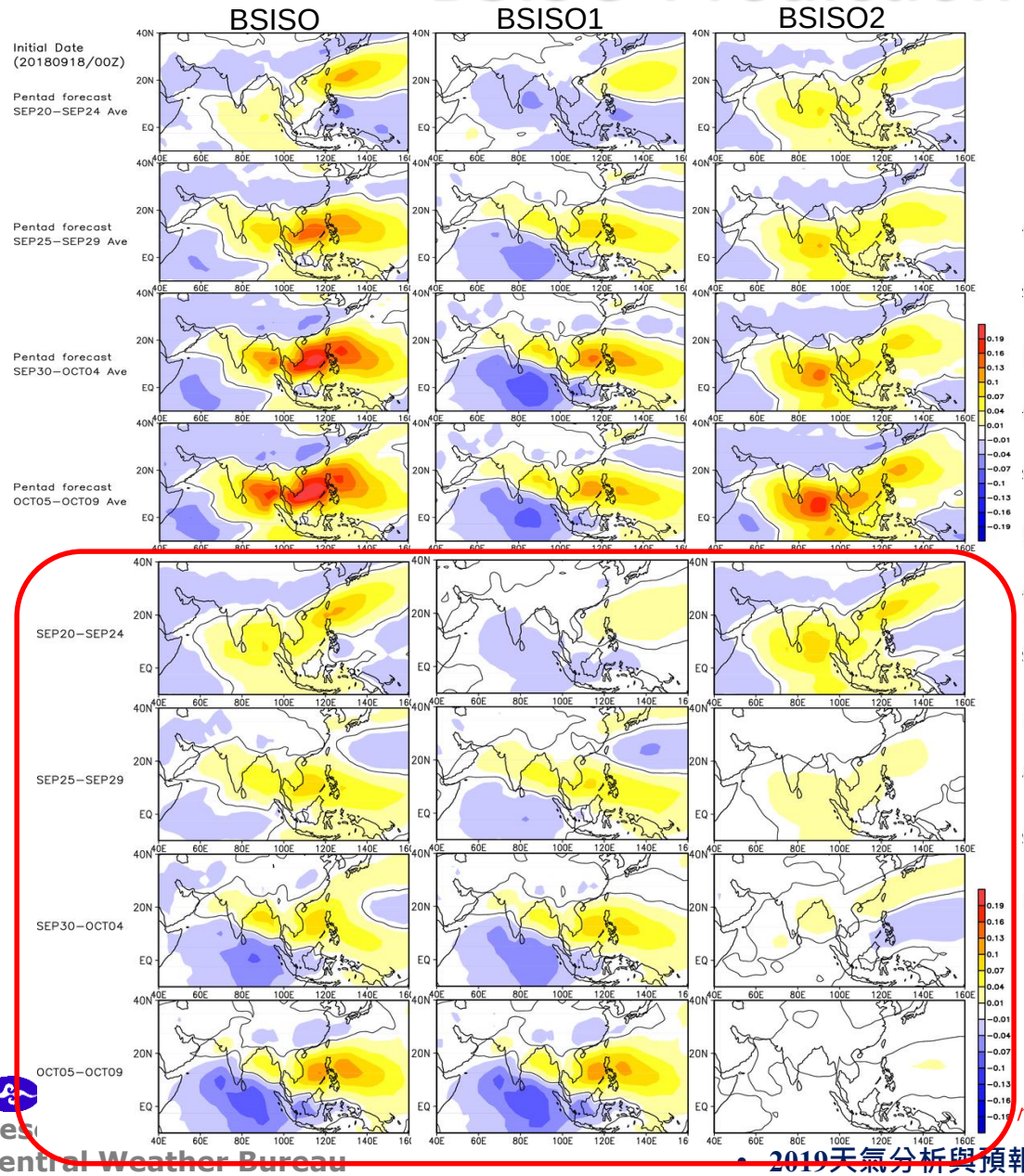
BSISO Forecast
Initial time: 20180918 00Z ;Forecast length: 40 days
Total members: 20

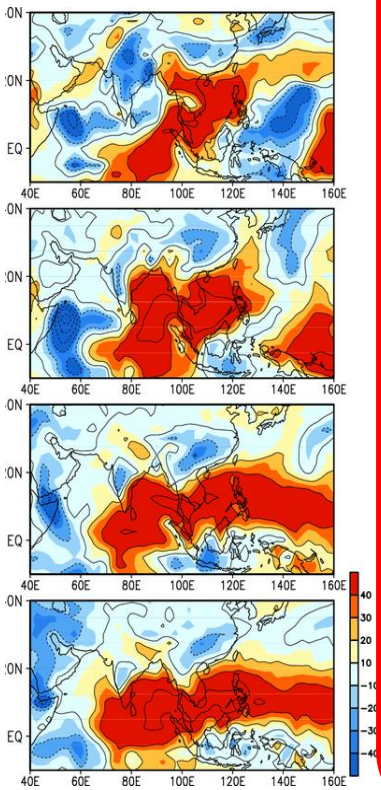


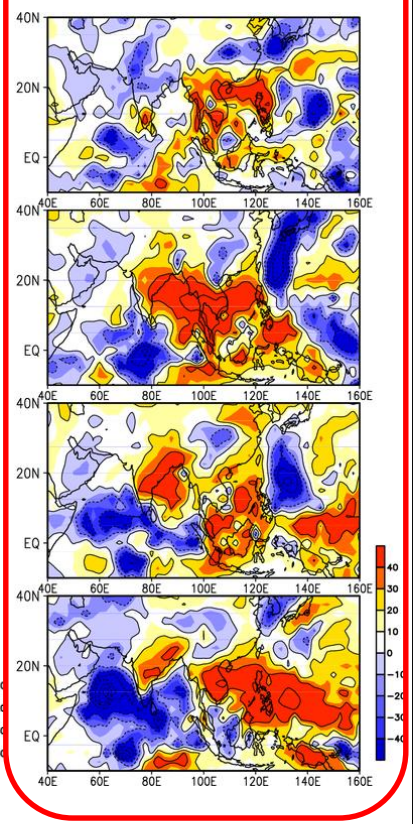


BSISO Prediction at CWB

OLR anomaly and BSISO projection

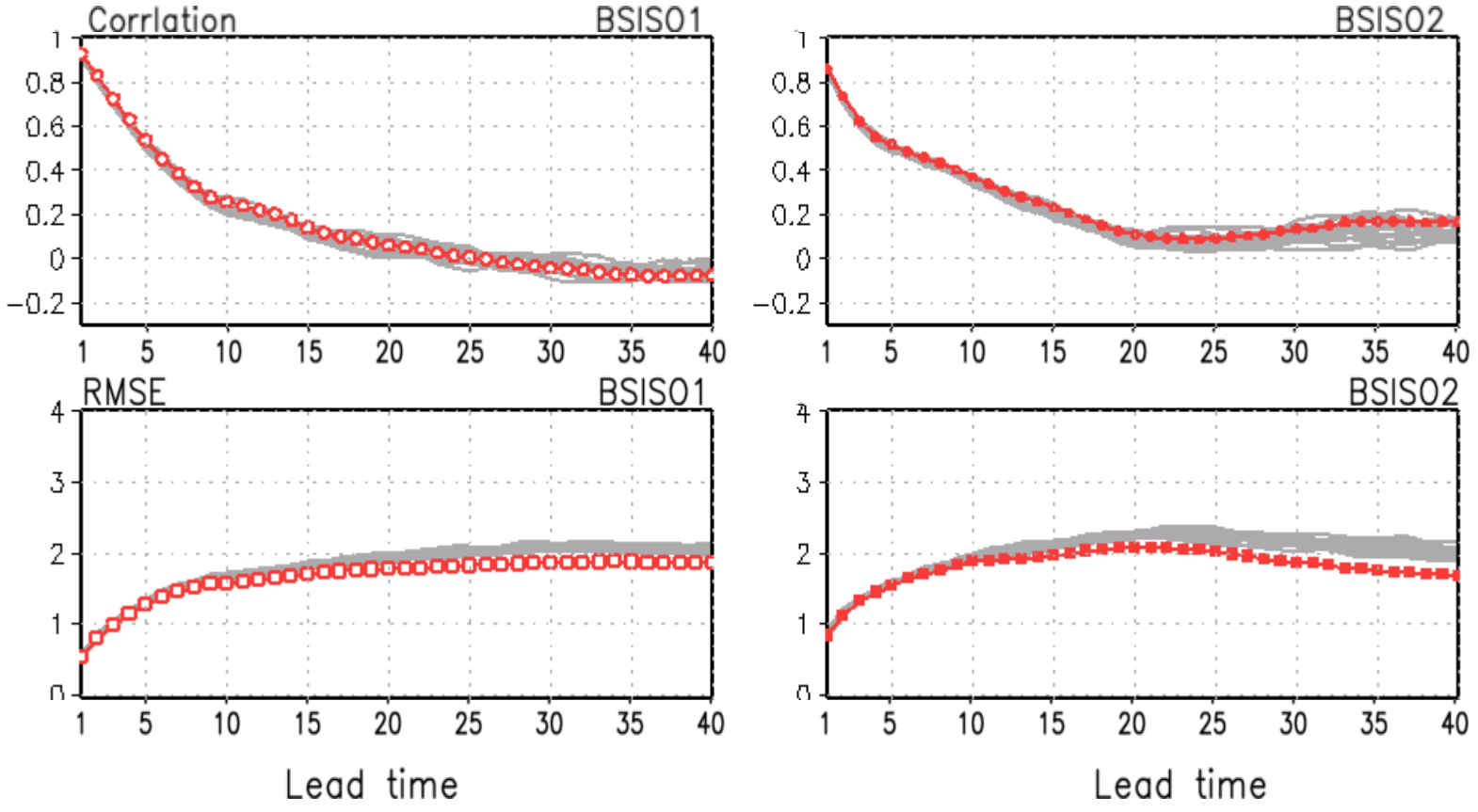






"anomaly" = model forecast .minus. observation climatology

BSISO verification –GEPS 2018



Ongoing and Future work –
BSISO Forecast Products

1. Daily forecast of BSISO index
2. 5-day mean OLR anomaly
3. 5-day mean BSISO projection
4. verification
5. **Probability of heavy rainfall for week1&2 predicted by BSISO index**
6. **Probability of extreme high-temp. for week1&2 predicted by BSISO index**

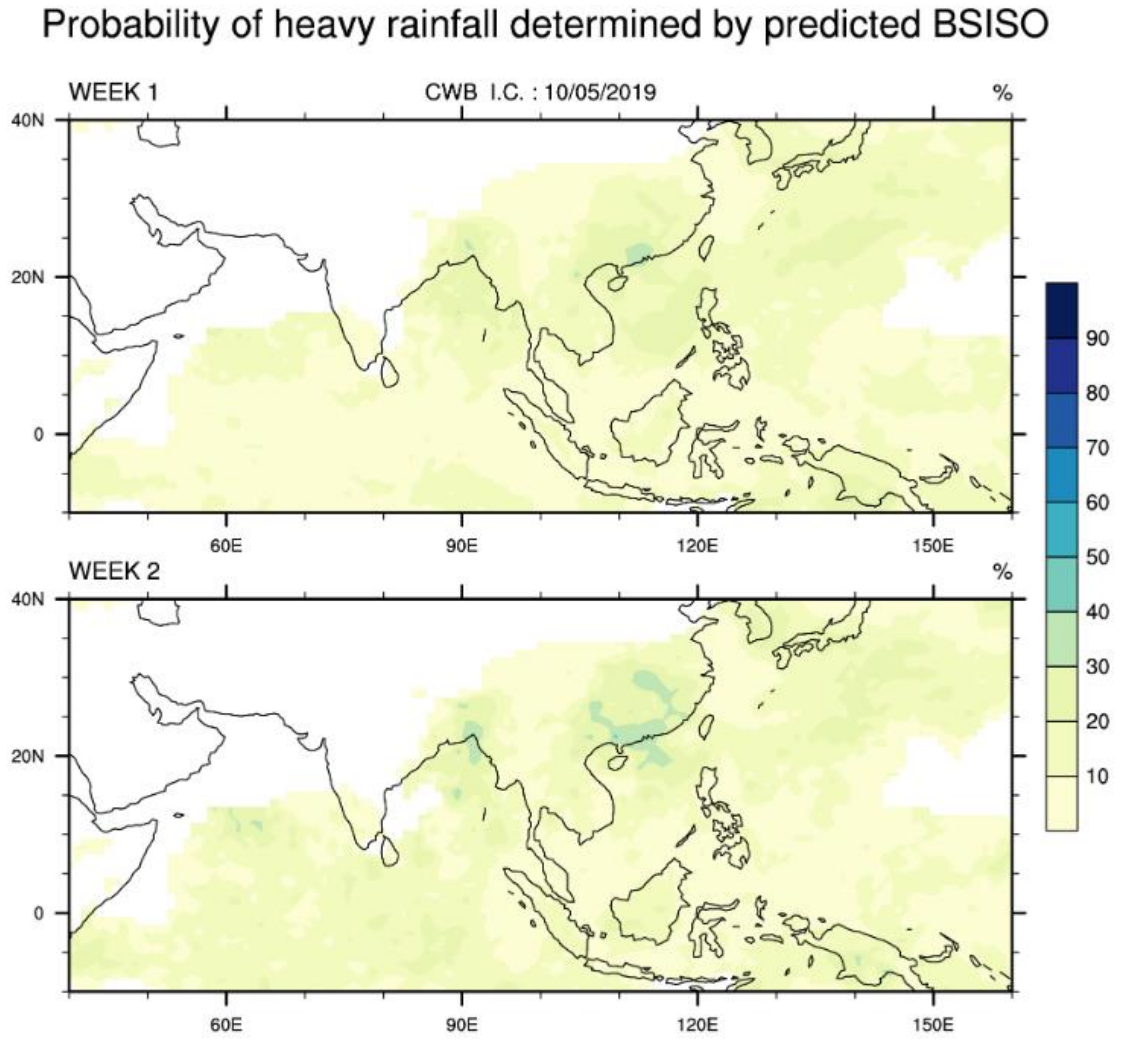
Ongoing and Future work –

Probability of heavy rainfall for week1&2 predicted by BSISO index

BSISO real-time forecast

Observational relationship
Composite Anomalies associated with the BSISO

Prediction of anomalies associated with the BSISO



謝謝聆聽 敬請指教

Thank you for your listening.