The APCC's Seasonal and Subseasonal Forecasting Activity

(Mar. 20, 2018)

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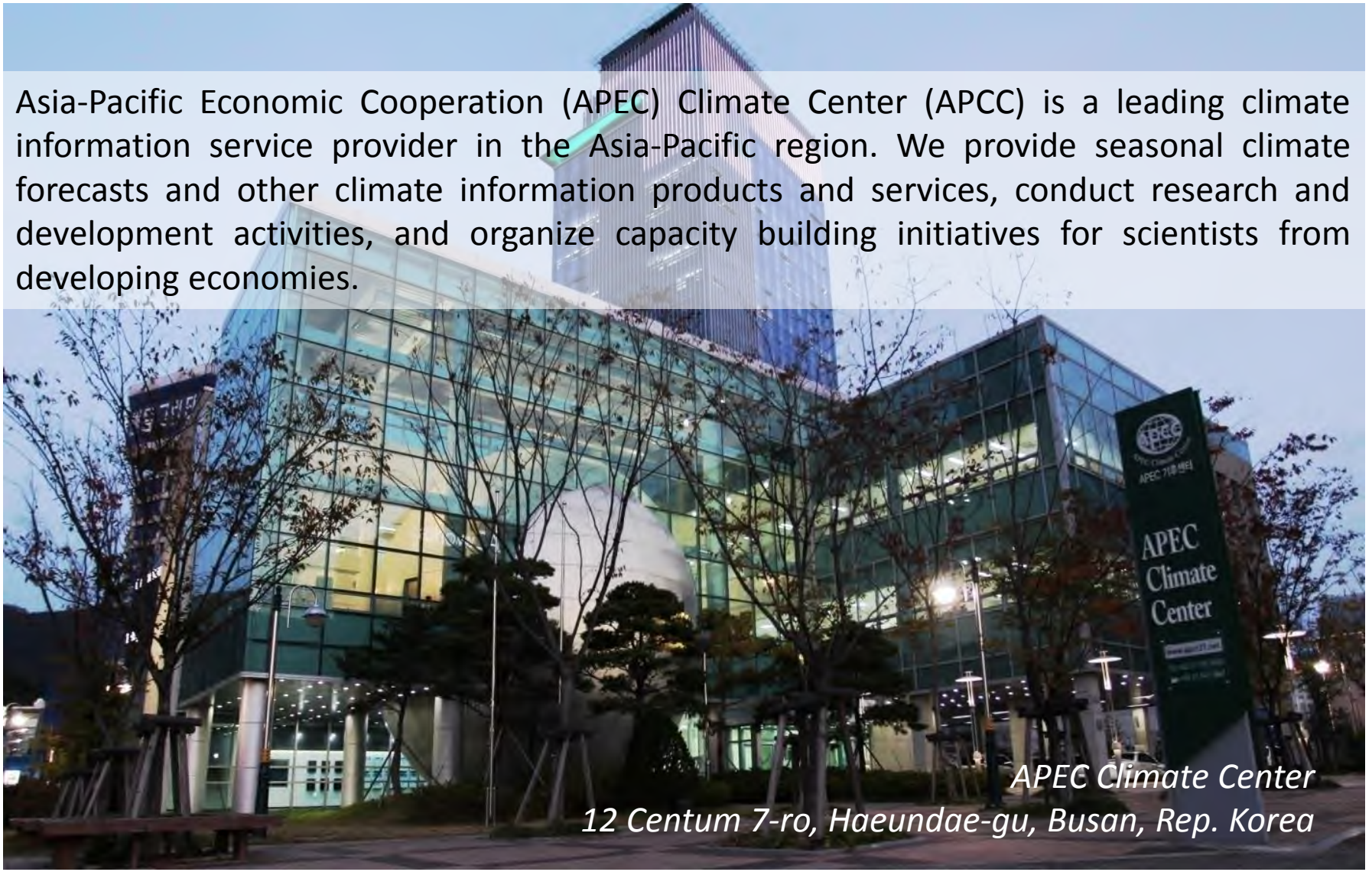
APEC Climate Center

Central Weather Bureau, Taiwan

Overview of the APEC Climate Center

Asia-Pacific Economic Cooperation (APEC) Climate Center (APCC) is a leading climate information service provider in the Asia-Pacific region. We provide seasonal climate forecasts and other climate information products and services, conduct research and development activities, and organize capacity building initiatives for scientists from developing economies.



APEC Climate Center
12 Centum 7-ro, Haeundae-gu, Busan, Rep. Korea

Mission of the APEC Climate Center

To enhance the socio-economic well-being of member economies by utilizing up-to-date scientific knowledge and applying innovative climate prediction techniques.

Climate Prediction

APCC produces value-added, reliable, and real-time climate prediction information and provides the APEC region with it.

Interdisciplinary Research

APCC leads in the development of interdisciplinary research and application techniques at the climate-environment-society nexus.

Climate Information Services

APCC strives to be a key climate database center to distribute climate data, information products, and related tools.

International Cooperation

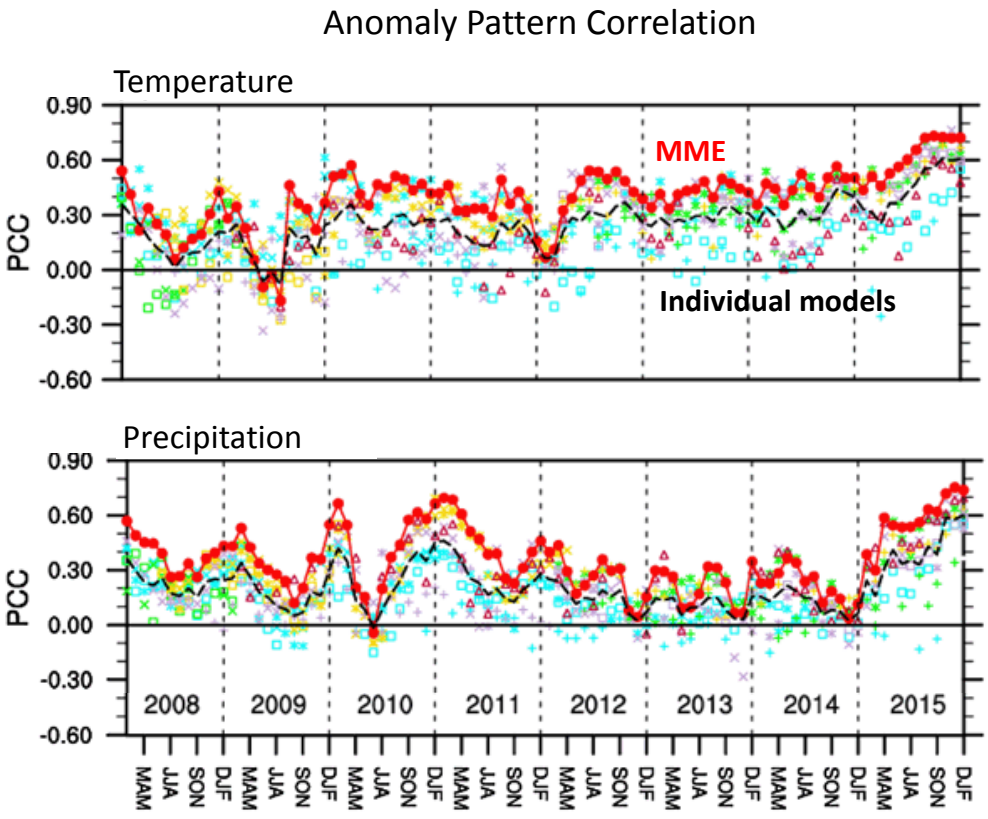
APCC guides developing countries from the APEC region toward building their own capacity to produce reliable climate prediction information.

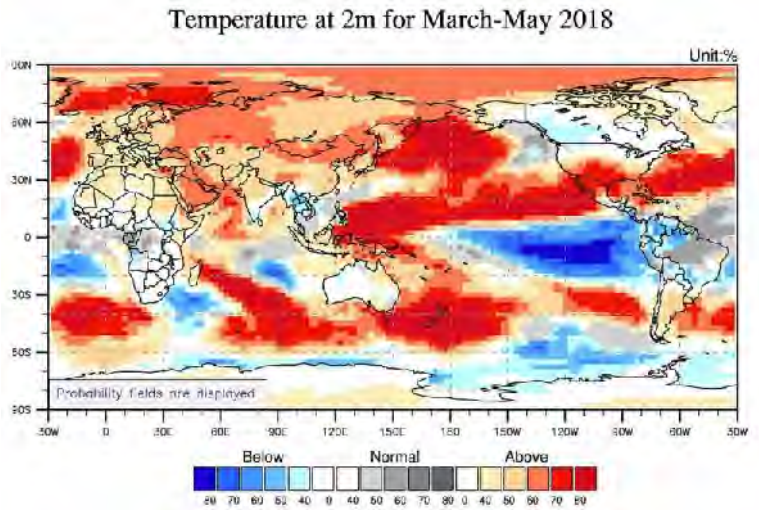
Climate Prediction & Information Service

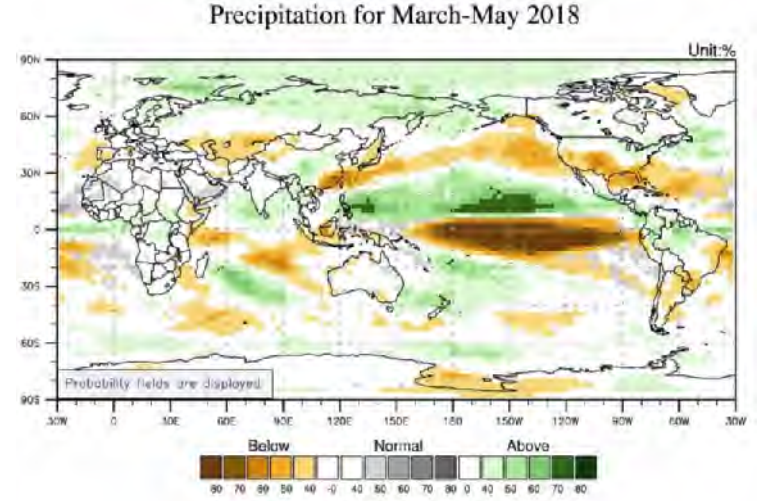
✓ ***http://www.apcc21.org***

Seasonal Forecast

- **Producing skillful real-time climate predictions and developing a value-added reliable climate prediction system based on a Multi-Model Ensemble (MME) technique.**







Min et al. (2017), Climate Dynamics

APCC MME Prediction System

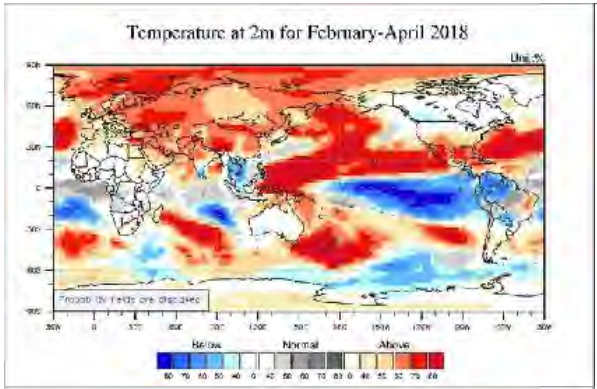
- **The world's largest MME system based on international cooperation to generate monthly rolling 3-month and 6-month MME climate outlooks.**

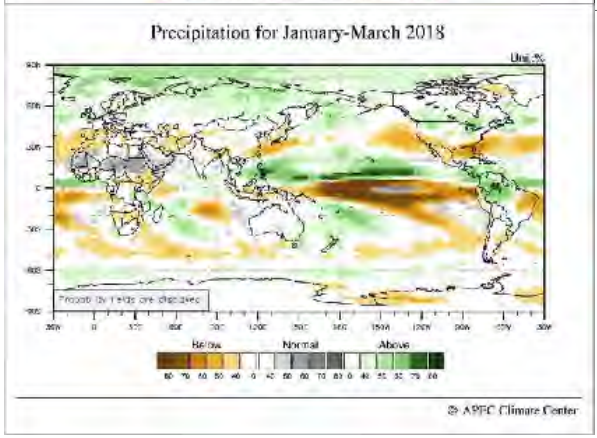
Multi-institutional Cooperation

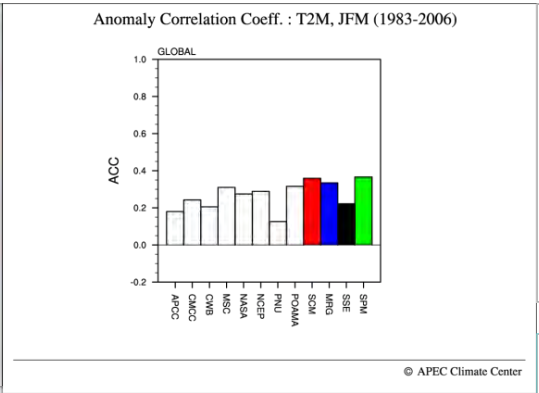
Economy	Organization/Institute
Australia	Bureau of Meteorology (BoM)
Canada	Meteorological Service of Canada (MSC)
China	Beijing Climate Center (BCC) Institute of Atmospheric Physics of China (IAP)
Chinese Taipei	Central Weather Bureau of Chinese Taipei (CWB)
Italy	Euro-Mediterranean Center on Climate Change (CMCC)
Japan	Japan Meteorological Agency (JMA)
Korea	Korea Meteorological Administration (KMA) Pusan National University (PNU)
Peru	Servicio Nacional de Meteorología e Hidrología (SENAMHI)
Russia	Hydrometeorological Centre of Russia (HMC) Main Geophysical Observatory of Russia (MGO)
UK	Met Office
USA	Center for Ocean-Land-Atmosphere Studies (COLA) International Research Institute for Climate and Society (IRI) National Aeronautics and Space Administration (NASA) National Center for Environmental Prediction (NCEP) / National Ocean and Atmospheric Administration (NOAA)

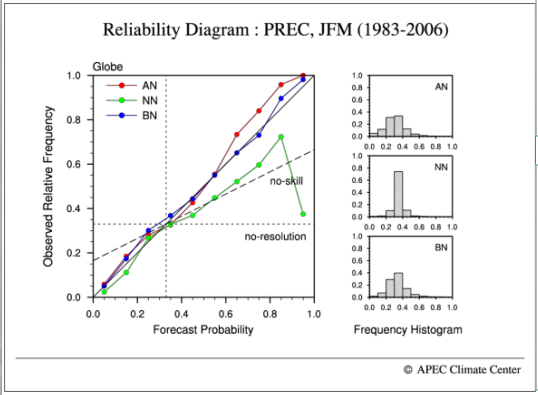
Seasonal Forecast Products

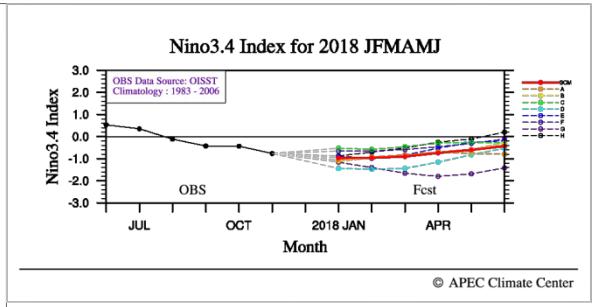
- **Monthly & Seasonal mean forecast of Tsfc, Prec, T850, Z500, SLP, SST, UV (deterministic & probabilistic)**
- **Verification results (hindcast, realtime forecast)**
- **ENSO Outlook**

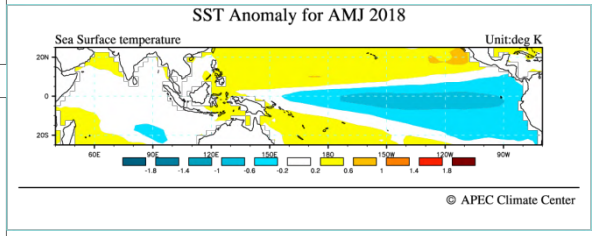


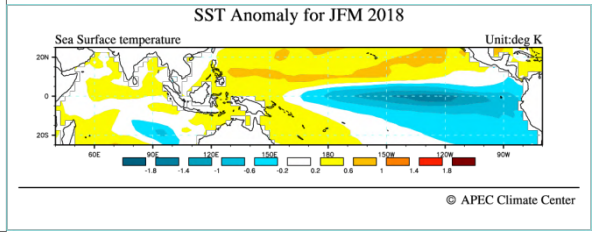












Climate Prediction & Information Service

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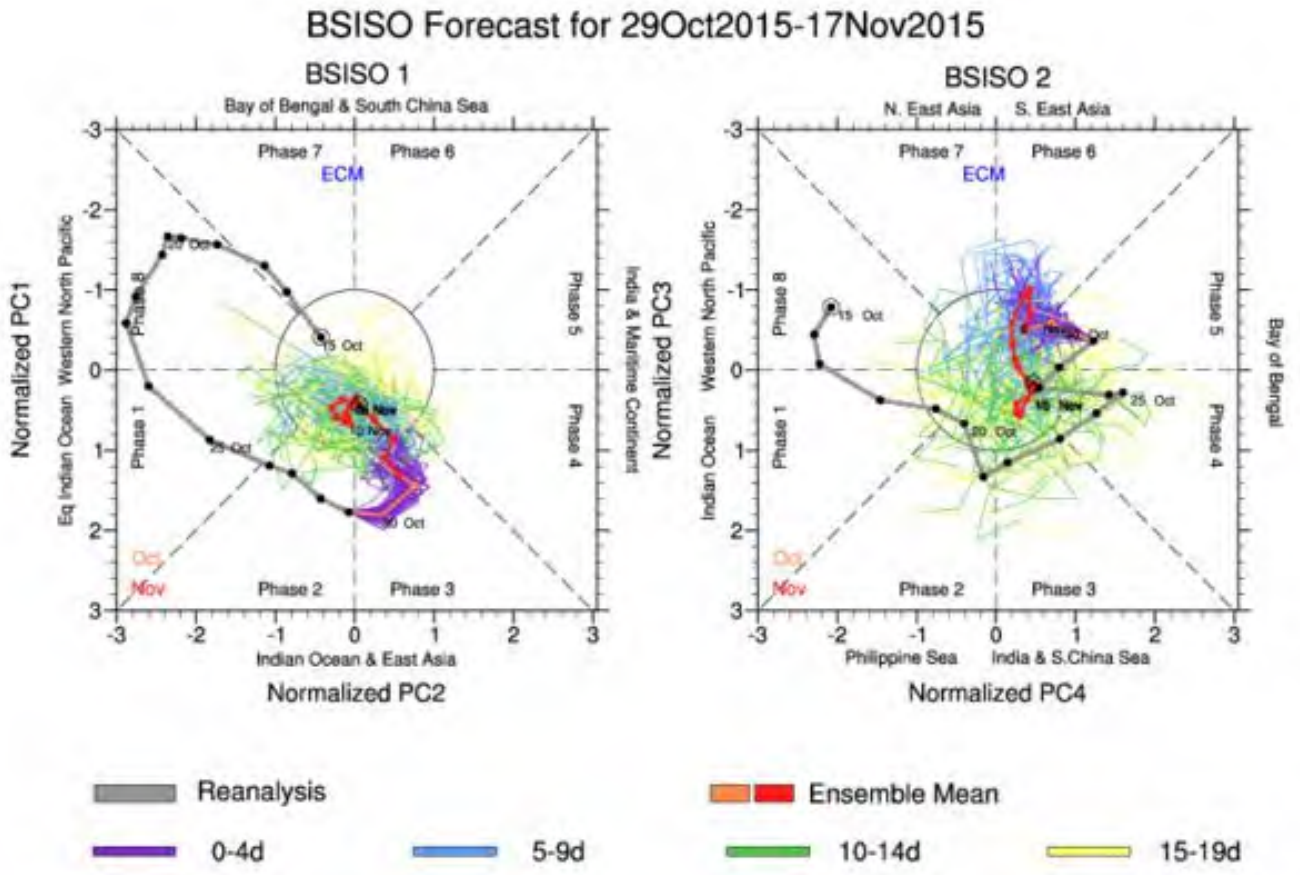
Expansion into subseasonal forecast
by providing BSISO real-time forecasts

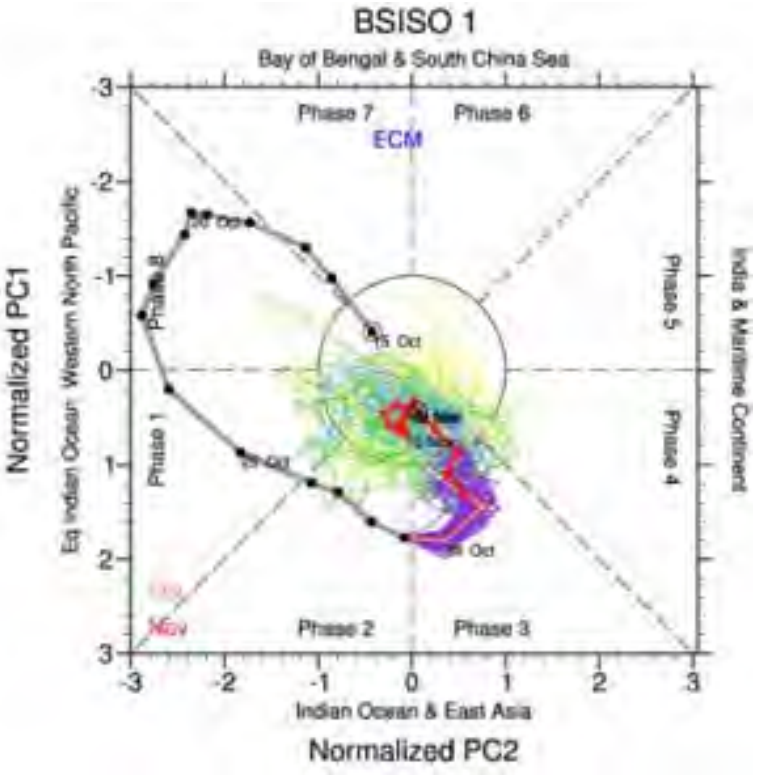
BSISO(Boreal Summer Intraseasonal Oscillation) Prediction

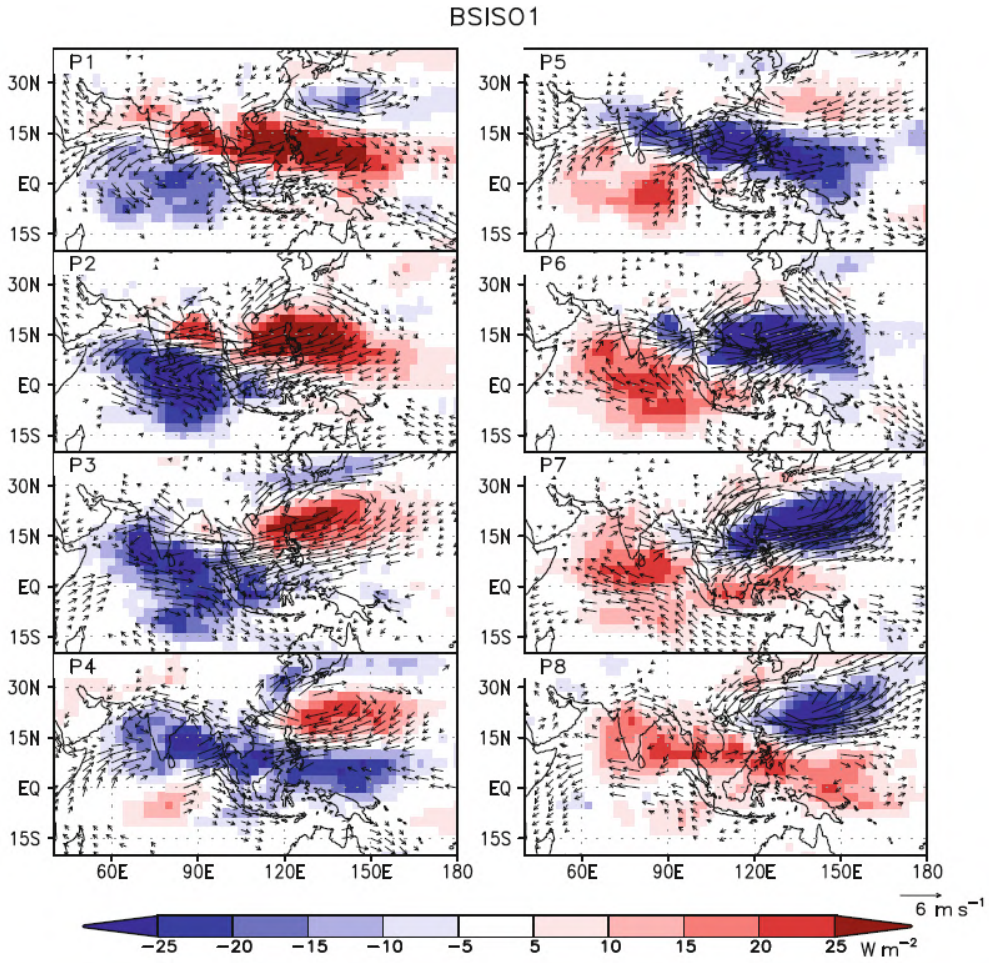
- **Since 2013, APCC has expanded climate service from seasonal to subseasonal timescale by providing BSISO real-time forecasts for upcoming 20 days. It is available from May to October at APCC webpage.**
- **For the real-time forecast, the Lee et al. (2013) BSISO index is applied.**



BSISO(Boreal Summer Intraseasonal Oscillation) Prediction

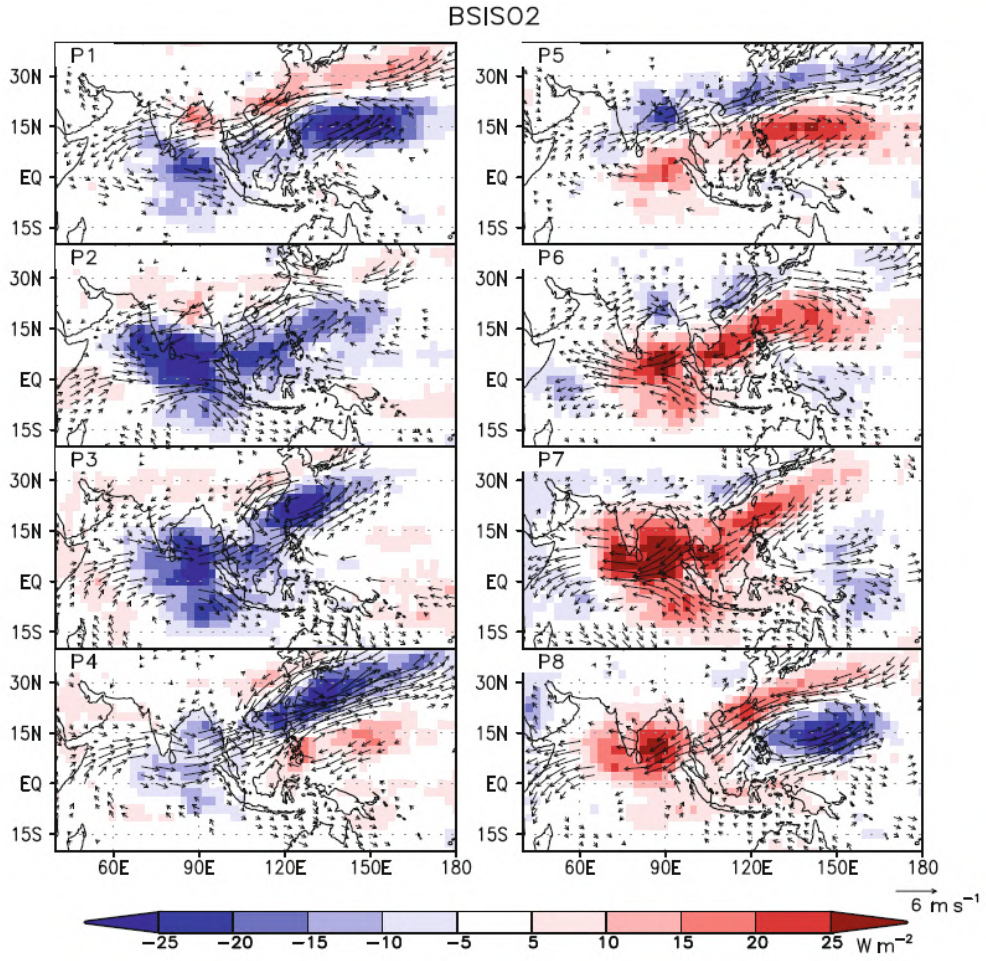
- **BSISO1 : canonical northward propagating BSISO over ASM region with 30-60 days quasi-oscillating period**

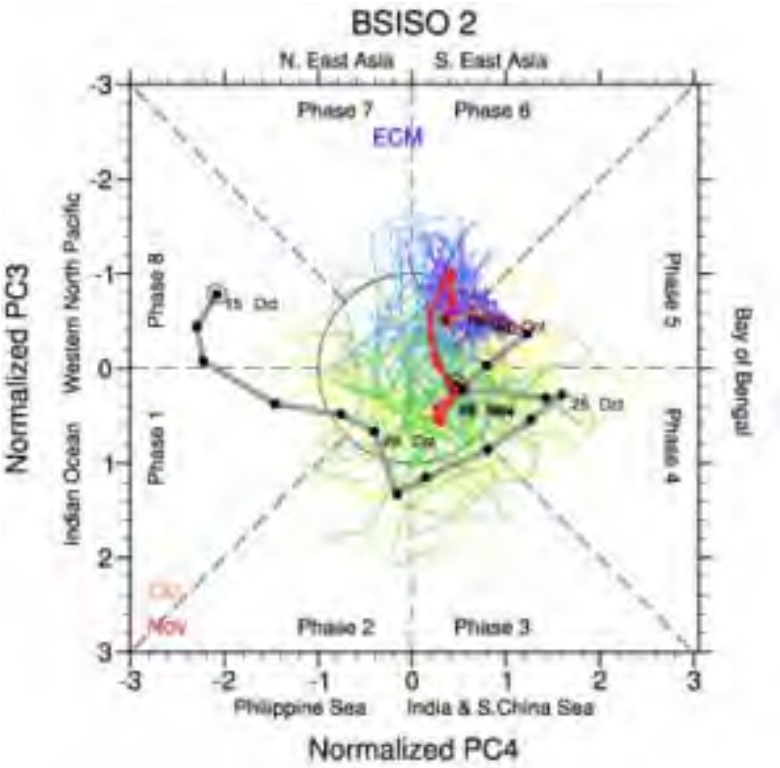




BSISO(Boreal Summer Intraseasonal Oscillation) Prediction

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





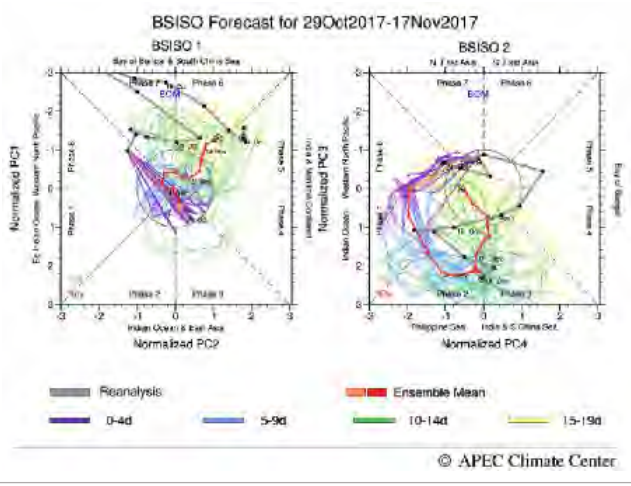
APCC BSISO Prediction System

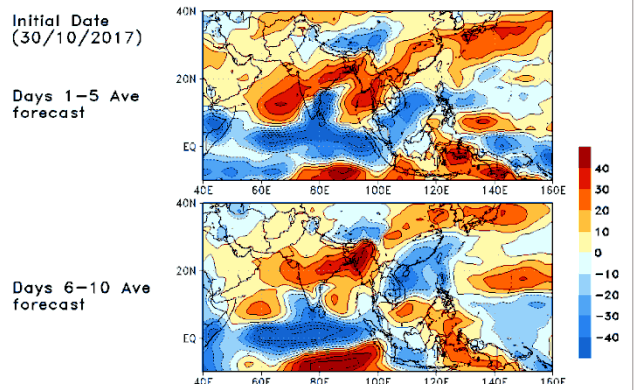
- In corporation with MJO Task Force, Multi-Institutional Cooperation

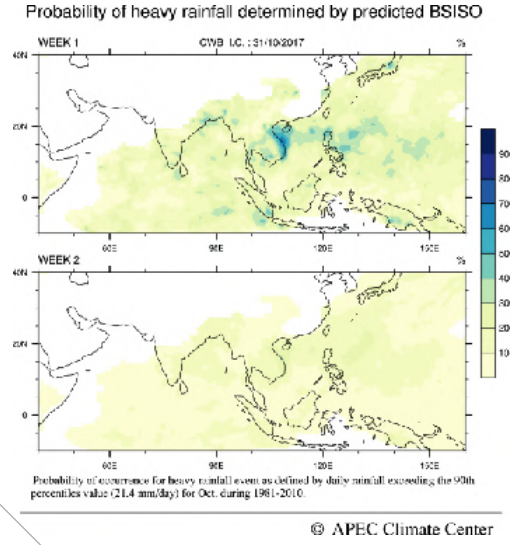
Institute	Model	Ensemble Size	Forecast Period	Update frequency	Resolution
NCEP	Climate Forecast System	4	40 days	Once a day	T126 L64
	Global Forecast System	1	16 days	Once a day	T574, T190 L64
Australia	POAMA 2.4 multi-week model	33	40 days	Twice per week	T47 L17
ECMWF	ECMWF Ensemble Prediction System	51	32 days	Twice per week	T639, T319 L62
UK Met Office	MOGREPS-15	24	15 days	Once a day	60km L70
Taiwan CWB	CWB EPS T119	6	40 days	Every 5 days	T119 L30

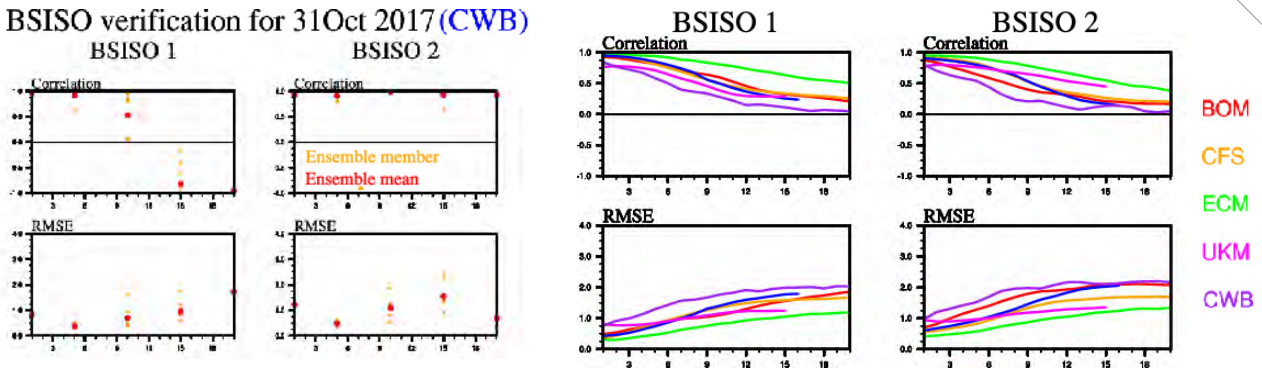
BSISO Forecast Products

- Daily forecast of BSISO index
- 5-day mean OLR anomaly
- Probability of heavy rainfall for week1&2 predicted by BSISO index
- Verification results (hindcast, realtime forecast)



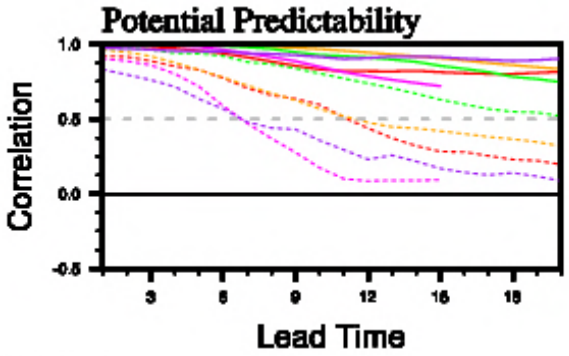




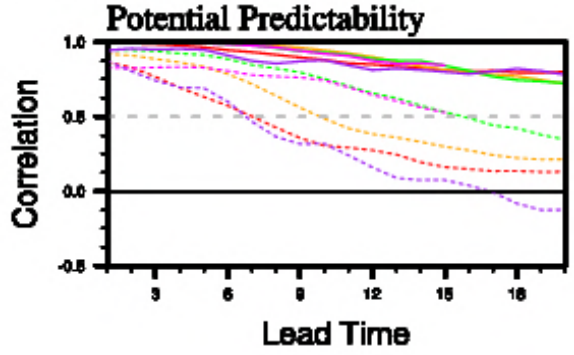


Performance of APCC BSISO

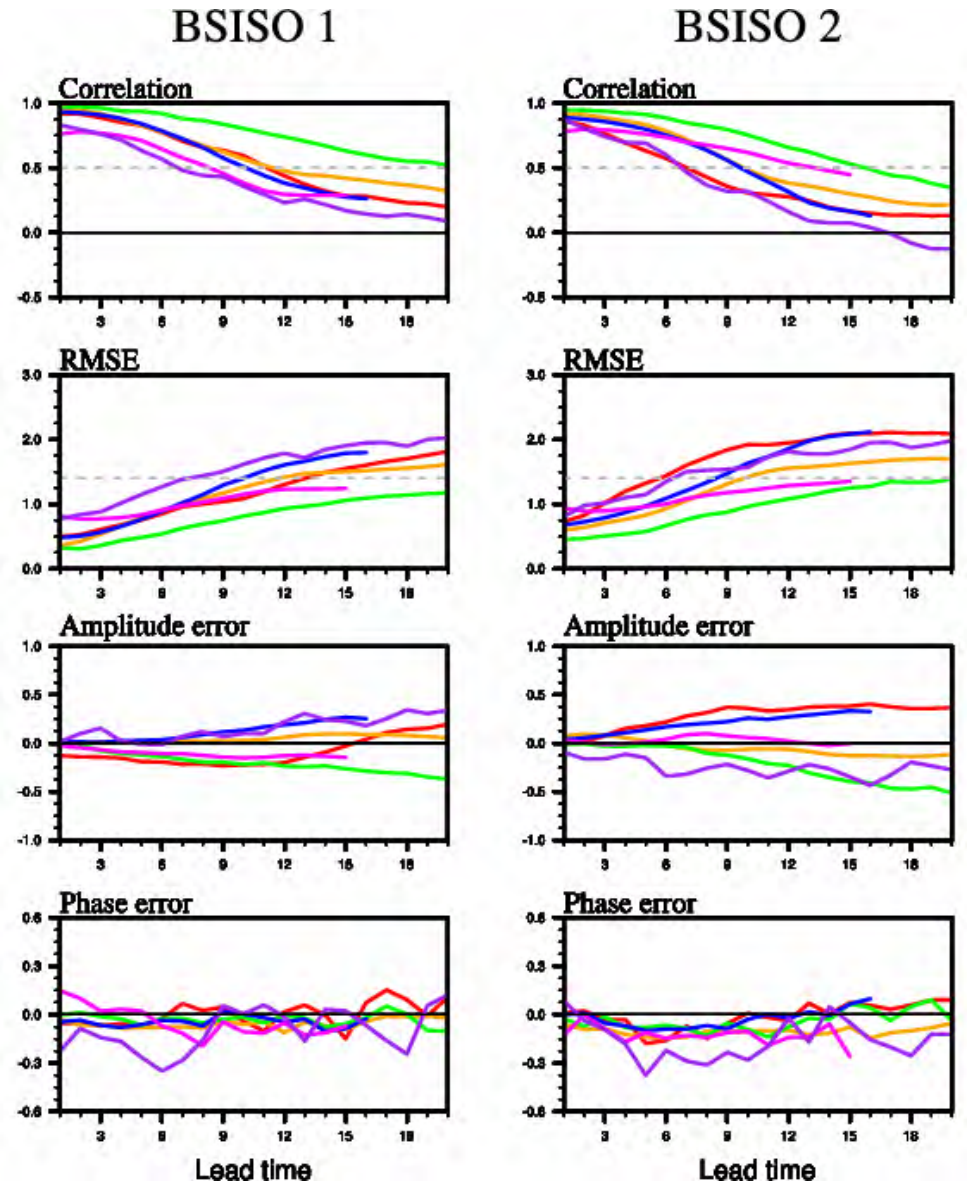
BSISO 1



BSISO 2



BOM CFS ECM UKM CWB



Better forecast? *practical use*

Reliable forecast

Reasonable interpretation

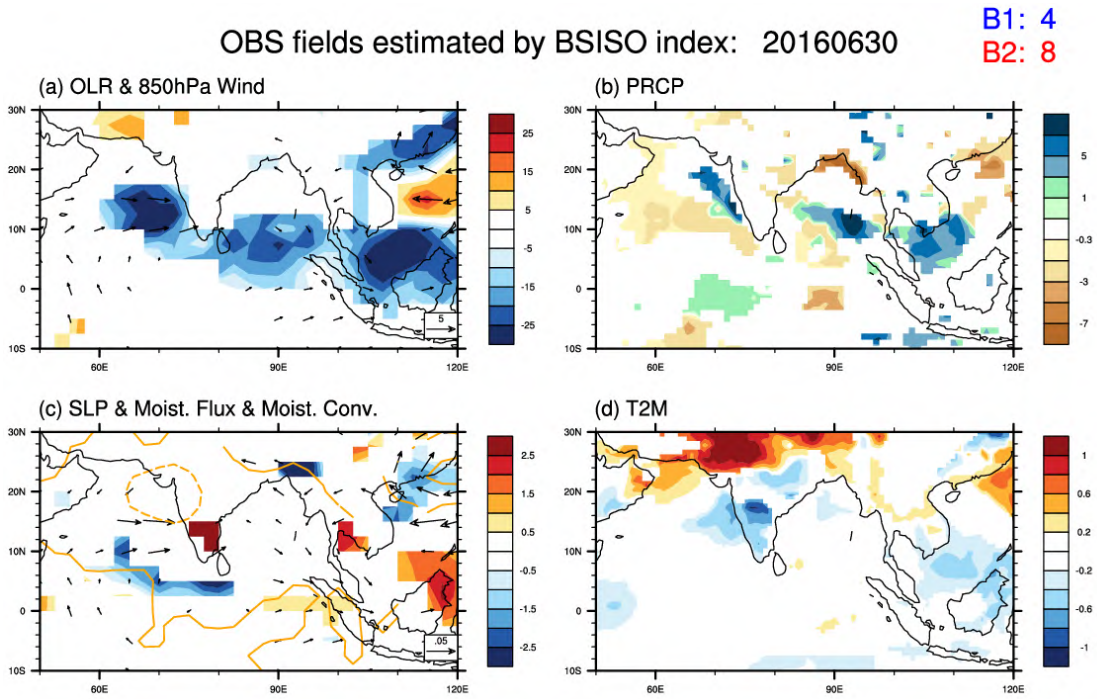
Recognition of the value

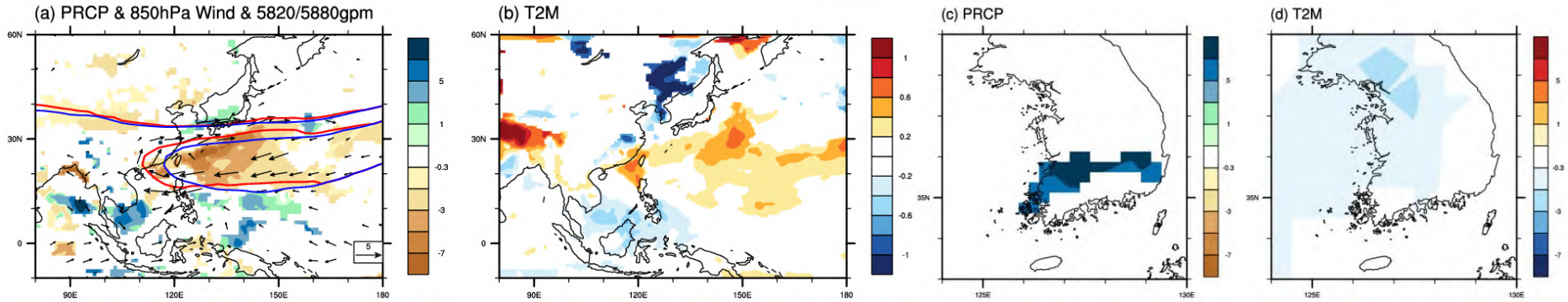
Actionable information

BSISO Forecast

Better forecast from better understanding on BSISO

Extended forecast over Asia-monsoon region estimated by BSISO forecasts





Monitoring, Forecast, Verification

- **Asia monsoon region**
  : General circulation pattern, Tropical cyclone, Heavy rainfall
- **India**
  : Monsoon onset, Heat wave
- **East Asia including S.Korea**
  : Meiyu, Changma, Extreme heat

BSISO Forecast

Better forecast from better understanding on BSISO

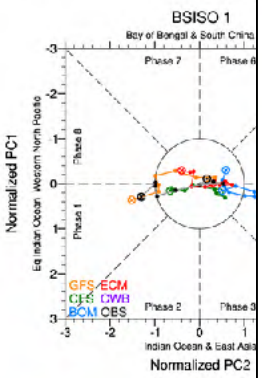
Extended forecast over Asia-monsoon region estimated by BSISO forecasts

Forming into the BSISO Weekly Bulletin (at the pilot stage for regular operation)

- **Updated every Monday from May to Oct.**

BSI

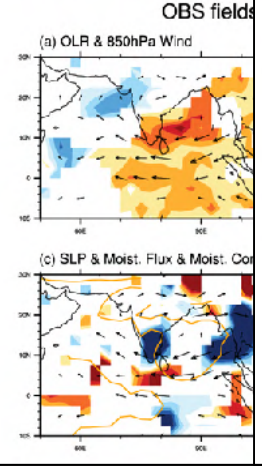
Verification



- Period : 08 June ~ 16 June
- BSISO 1 : nonactive 한 상태로 지
  모델들이 nonactive 한
- BSISO 2 : 익하게 유지되다가 P5-
  모델들의 관측의 경향

Monitoring

2. Indian monsoon area
   -현재 +IOD
   -BSISO와 관련된 대기 순환상도
   -BSISO 로 인해 Anomalous 동풍
   Indo monsoon 이 악화되기니 북

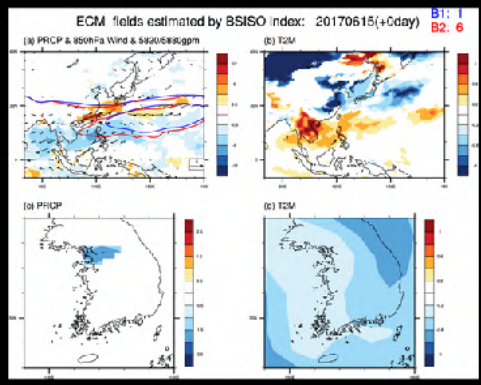


Forecast

1. ECMWF (I.C. 15Jun)
   : BSISO1 : P18→nonactive→P34
   : BSISO2 : P4→nonactive

S.Korea

- L15~20 : 장마 전선 남부(심지어 중부) 상륙 (30일)
- 장미비는 평년 or 평년 보다 적을 것으로
- 북태평양 고기압 (5880gpm) 서쪽으로 확장
- L0~5 : 동해안 cool
- L6~14 : 남한(한반도) cool
- L15~20 : 북서부(북한) cool
- 기온 ano 이 중국-한국 동시 내비



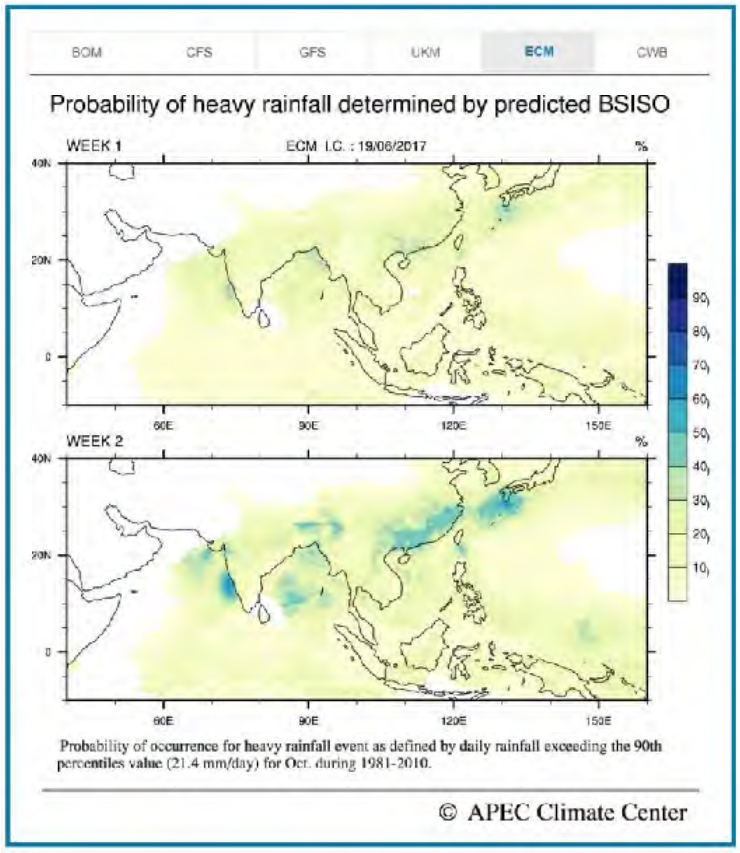
BSISO Forecast

Better forecast from better recognition of the value

Development of a guideline to increase practical use of BSISO forecast

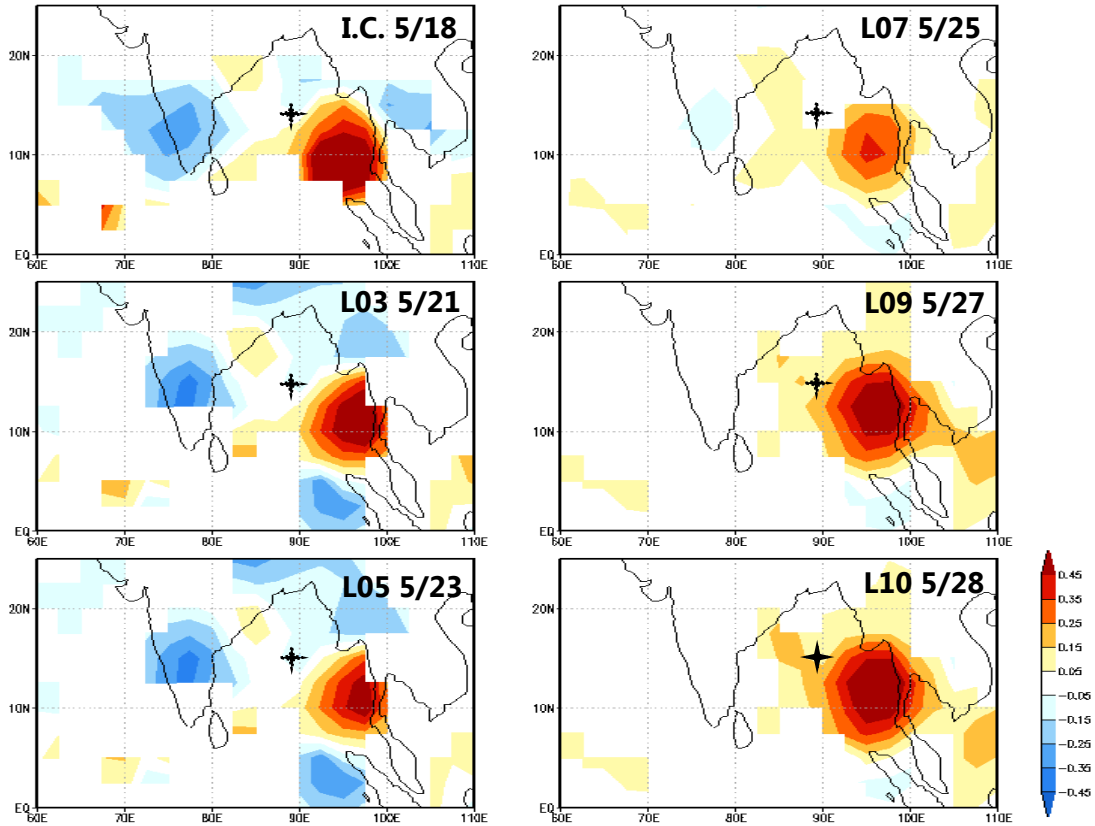
Heavy rainfall forecast based on BSISO index forecast [ECMWF]

❖ Ex> Japan flood, 398mm/4hr, July 6, 2017



ISGPI forecast estimated by BSISO index forecast [ECMWF]

❖ Ex> Tropical Cyclone Mora-17, May 28, 2017



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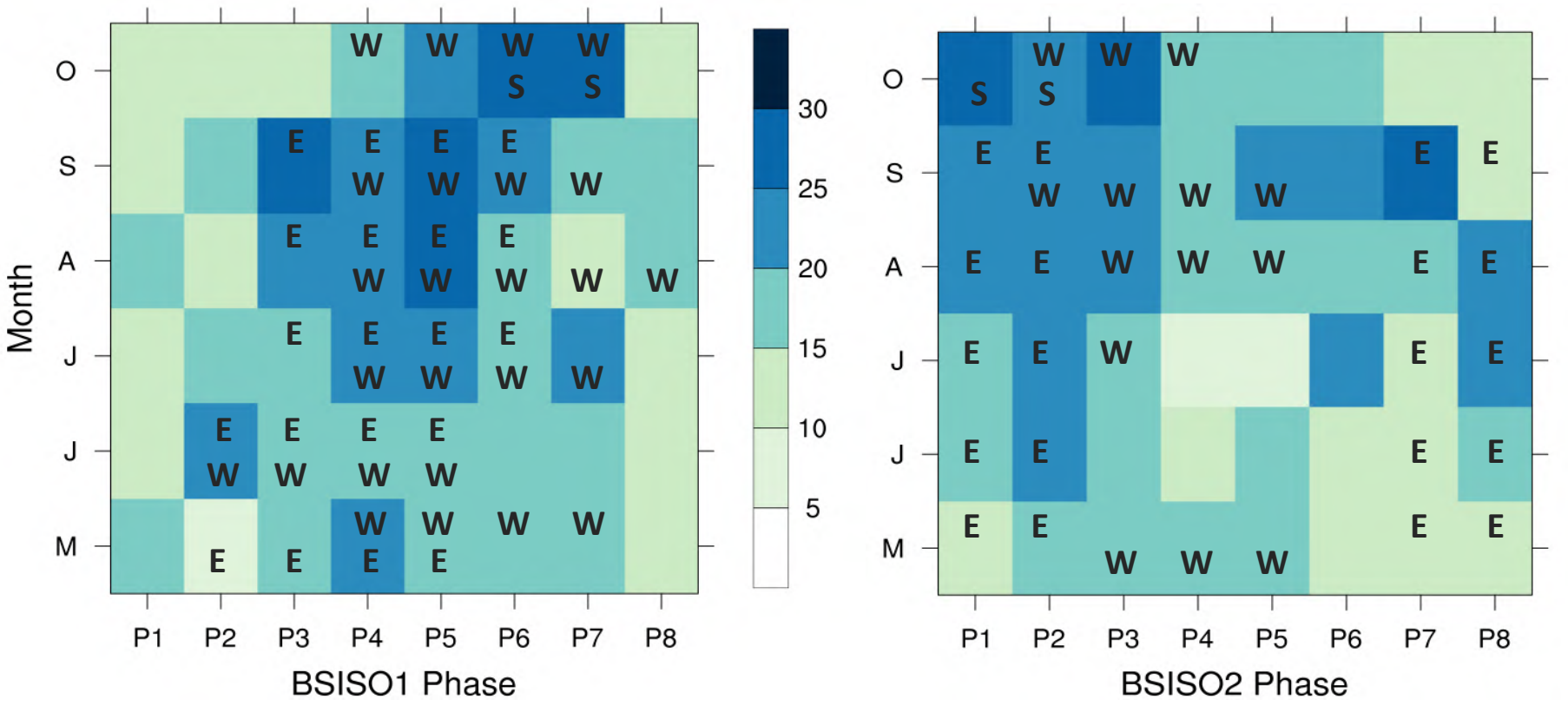
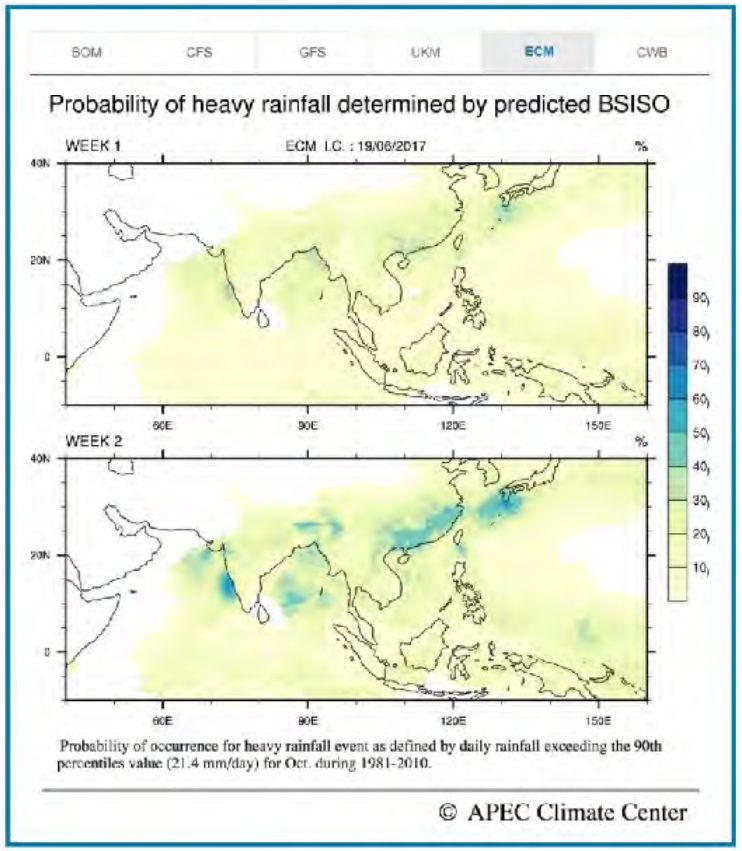


Probability table marked with favorable wind condition which can contribute strong Indo-China monsoon and bring heavy rainfall.

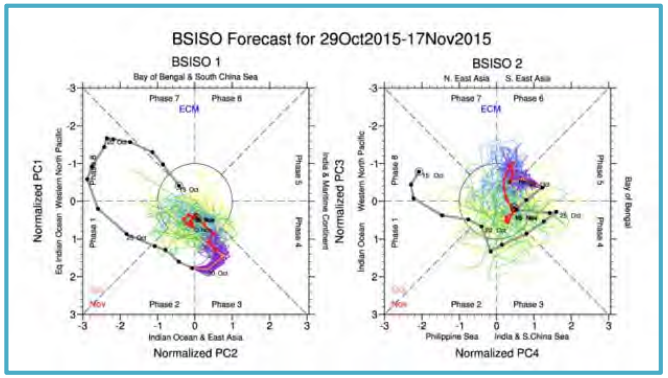
BSISO Forecast

Better forecast by actionable information

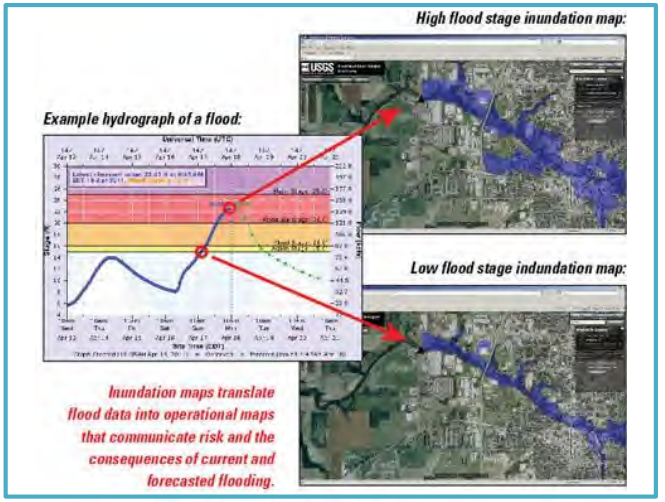
Heavy rainfall forecast



BSISO forecasts



Flood Inundation Mapping



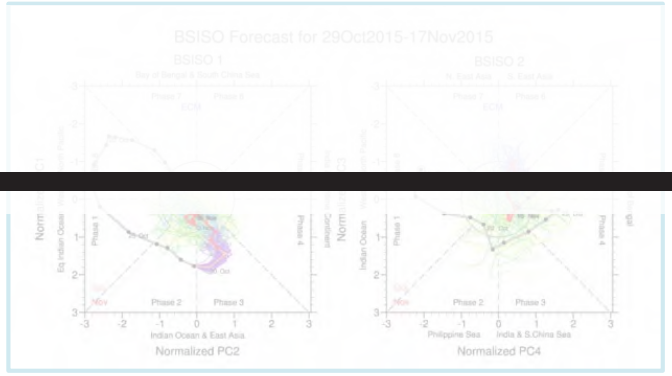
APCC Activities

BSISO Forecast

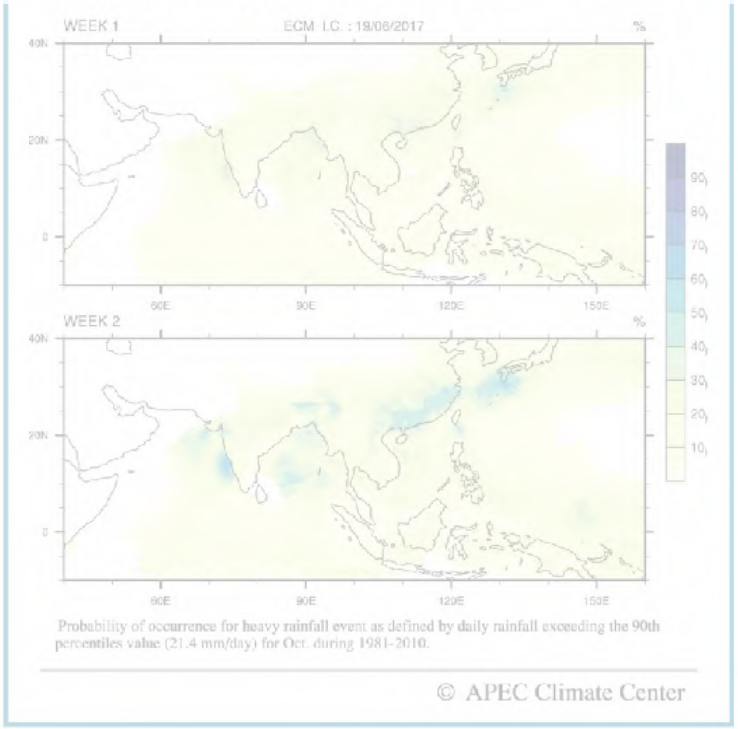
Better forecast by actionable information

Interdisciplinary Research

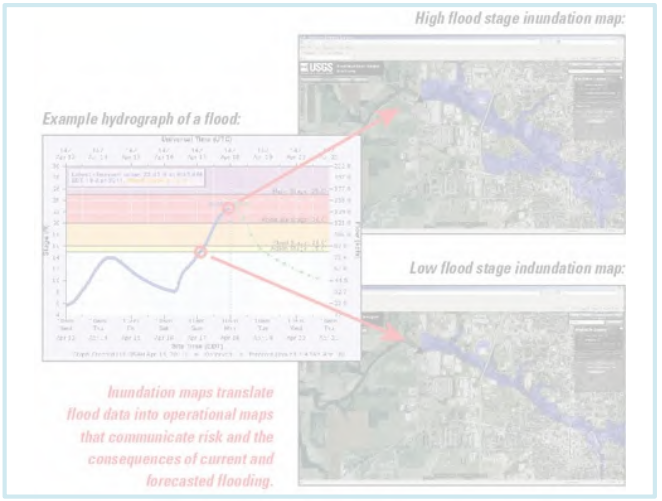
BSISO forecasts



Heavy rainfall forecast



Flood Inundation Mapping



International Cooperation

BSISO Forecast

✓ **APCC's S2S Training Program (1-week)**

- Every 2 years, APCC has trained about 20 participants from developing countries
- 2014 : S2S to cope with high impact weather
- 2016 : S2S to cope with extreme hydrological events
- 2018 : S2S prediction and APCC

Summary

- APEC Climate Center (APCC) is a leading operational center providing seasonal forecast based on the **Multi-Model Ensemble** (MME) prediction system.
- MME seasonal prediction is one of the **most reliable** seasonal forecast information at present.
- APCC has produced **real-time BSISO forecast** using multi-models based on the international cooperation.
- The goal of APCC's BSISO forecasting activity is to produce better forecast by promoting **practical use** of real-time BSISO information.

Summary

- Along with pursuing **more reliable forecast**, we've made an effort to **improve our understanding** on BSISO forecast and created **user friendly information**.

- In order **to arouse the people to the value of BSISO** forecast, the possibility of BSISO application is estimated and which would be the cornerstone for making **actionable information**.

- APCC's BSISO forecasting activity has become the origin of **APCC's S2S Training program** that takes places every two years.

THANK YOU

(http://www.apcc21.org)