

Why is the BSISO important?

The dominant mode of variability in the Asian summer monsoon.

It influences on the *summer monsoon onsets, active/break phases of the monsoon and interacts with a wide range of atmospheric circulation and associated weather.*

It is also a *possible source of seasonal climate predictability for precipitation* (Wang et al. 2009a; Lee et al. 2010) and *extratropical atmospheric circulation* (Ding and Wang 2005; Lee et al. 2011; Wang et al. 2012).

The wet and dry spells of the BSISO strongly influence *extreme hydro-meteorological events, major driving forces of natural disasters, and thus the socio-economic activities* in the World's most populous monsoon region (Lau and Waliser 2005).

Enhancing the practical usefulness of APCC's BSISO information

(July 24, 2018)

Hae-Jeong Kim* and Yoo-Rim Jung
APEC Climate Center

Better forecast? *practical use*



**Reliable
forecast**



**Reasonable
interpretation**



**Recognition
of the value**



**Actionable
information**

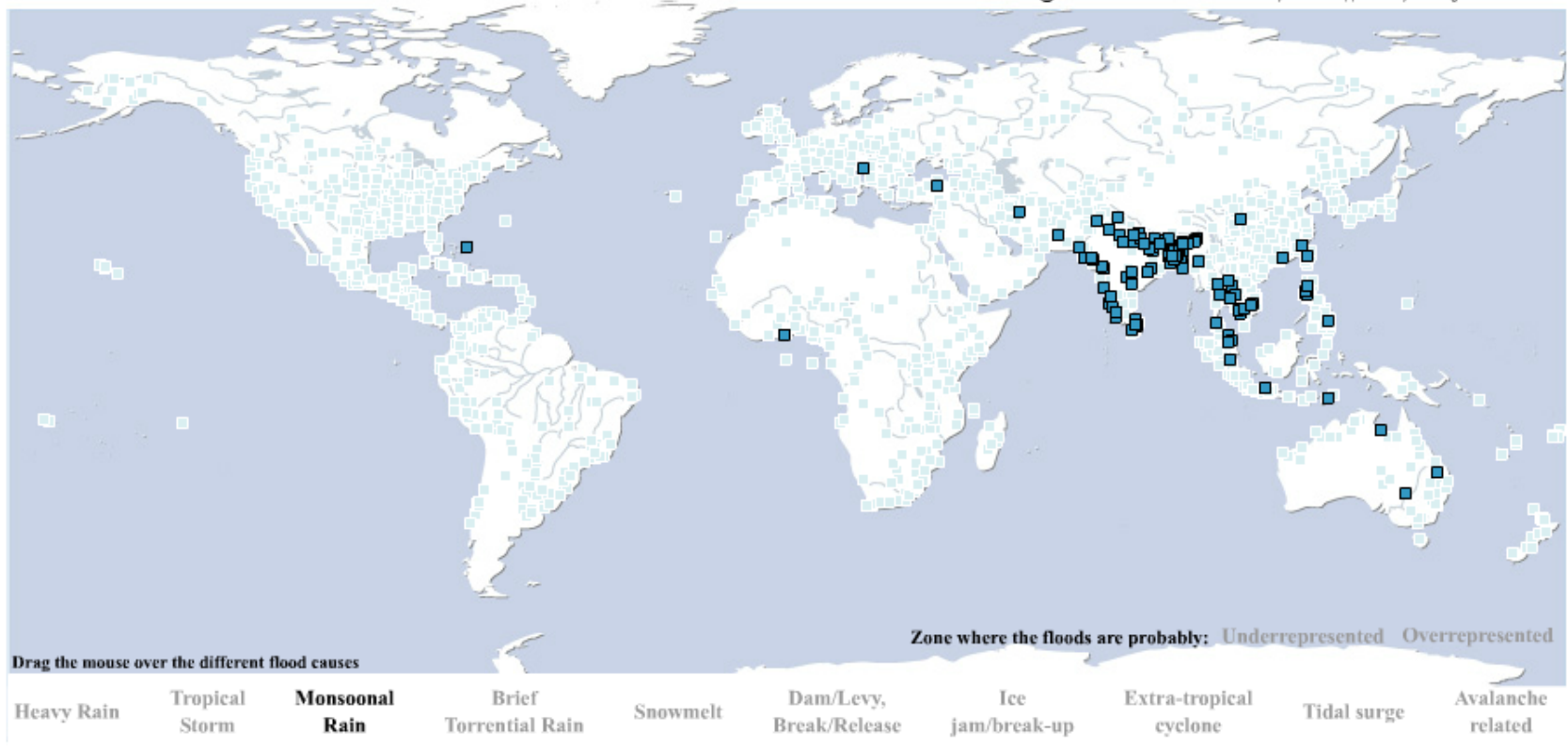
Better forecast? *practical use*



What is the actionable information for?

Flood causes listed since 1985

© 2003 - Dartmouth Flood Observatory - Work supported by NASA grant NAG5-9470



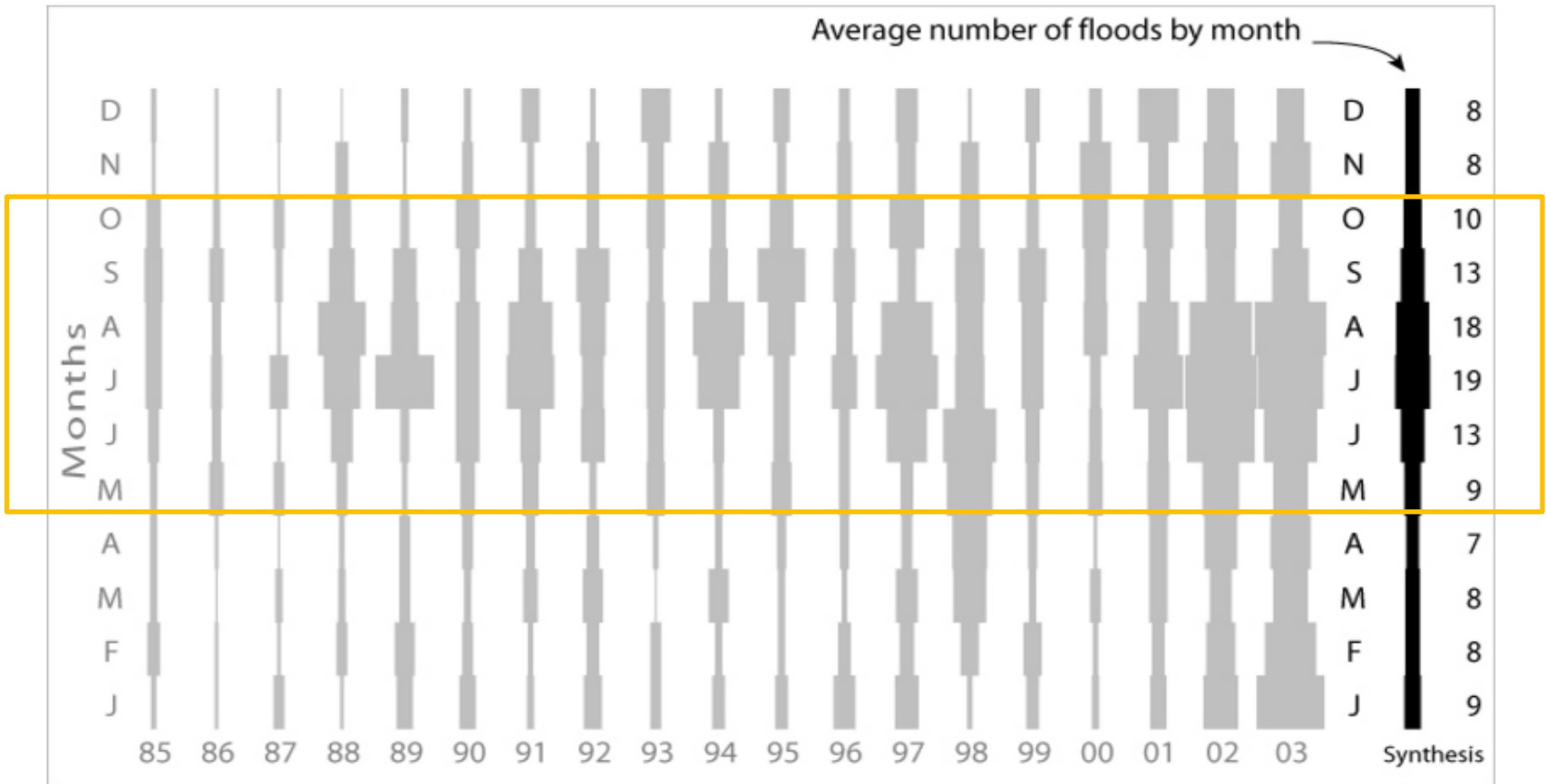
A lot of ***flooding*** is caused by heavy rain, tropical storm and monsoonal rain, which are ***considerably associated with the BSISO activity***.

Better forecast? *practical use*



What is the actionable information for?

When do the floods start?



May to Oct. matches with the period when BSISO is dominant.

Better forecast? *practical use*

Under operational perspective



#1. BSISO impact on heavy rainfall occurrence

#2. Guideline for the practical use and interpretation

of BSISO forecast information

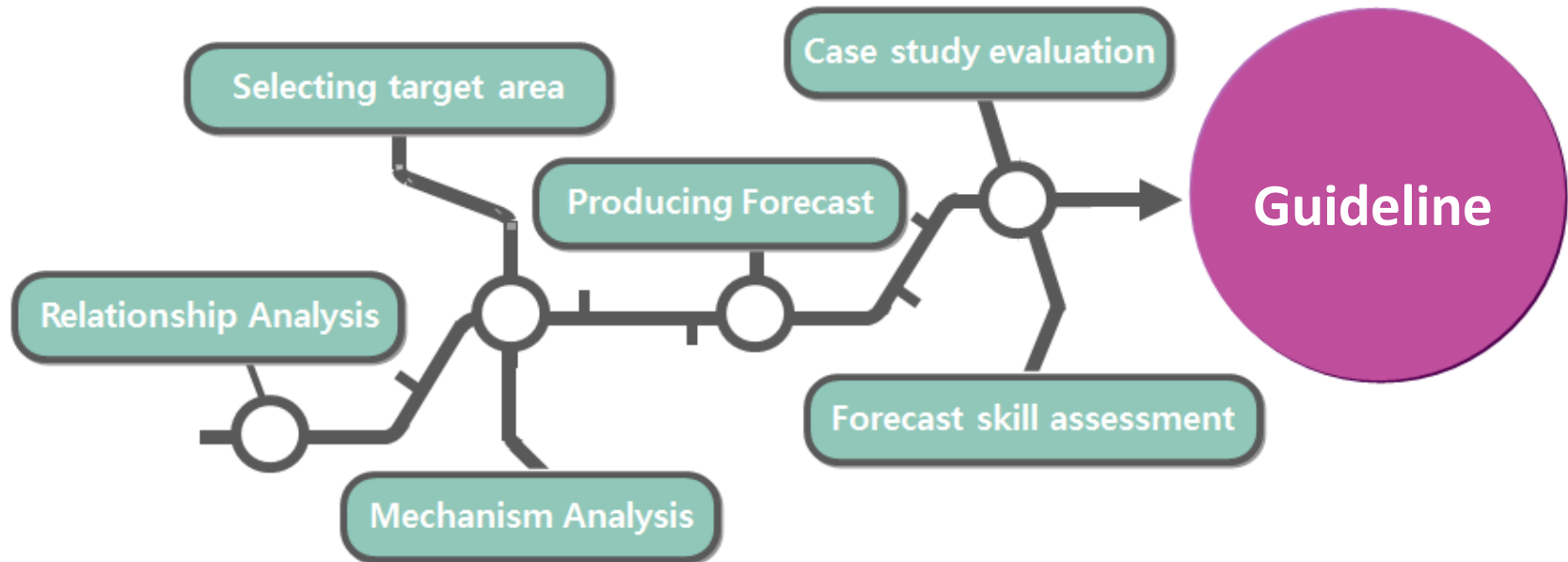
: Focused on the ***flood prone areas with large rivers over Southeast Asia***

Better forecast? *practical use*



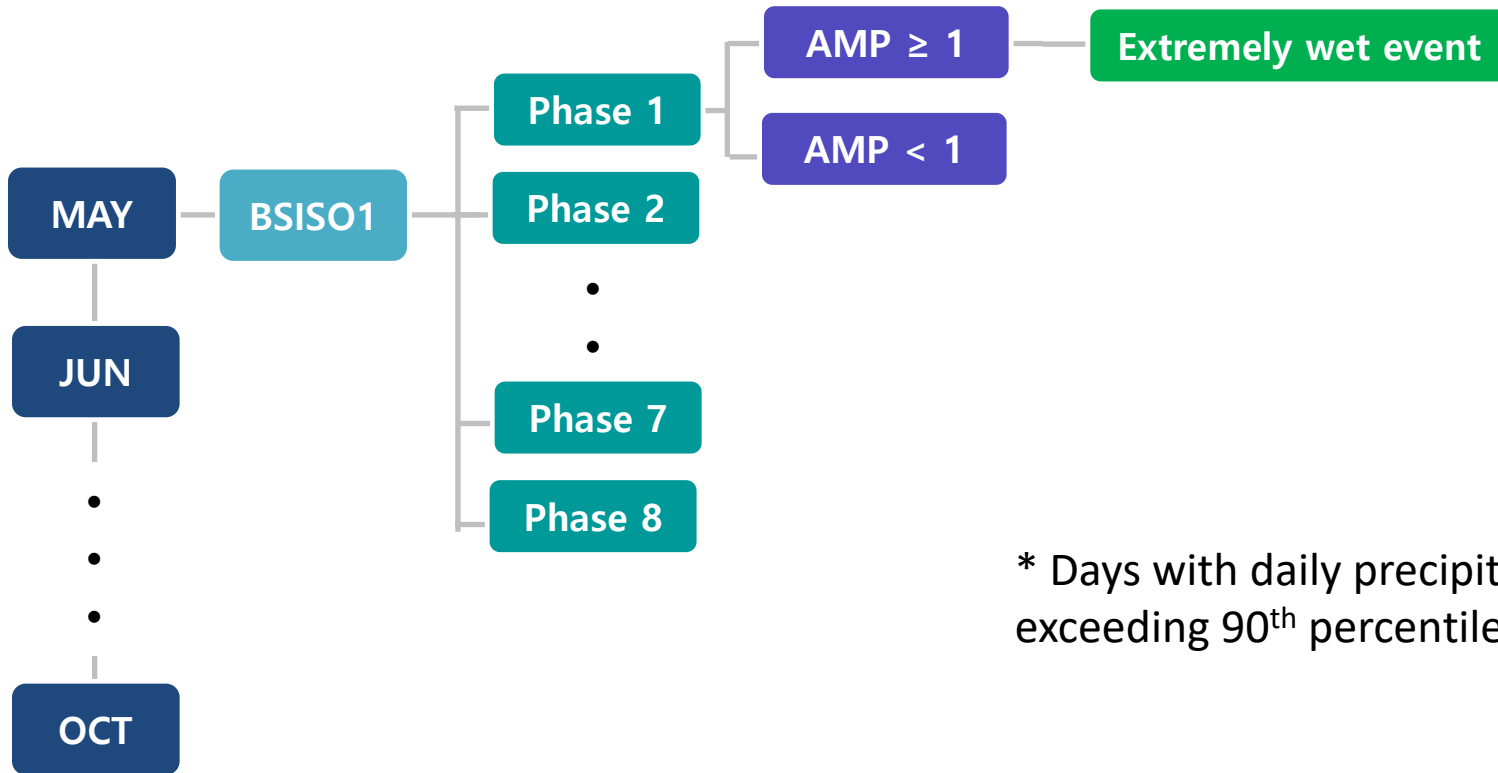
Procedure

'15 '16



Better forecast? *practical use*

 Relationship analysis (*Composite analysis : BSISO-Heavy rainfall probability*)



* Days with daily precipitation exceeding 90th percentile

Probability of heavy rainfall occurrence at a given BSISO phases & amplitude

$$= \frac{\text{number of days [BSISO1}_{AMP} \geq 1, \text{ BSISO1 phase1, daily PRCP} > 90\text{th percentile}]}{\text{number of days [BSISO1}_{AMP} \geq 1, \text{ BSISO1 phase1}]} \times 100$$

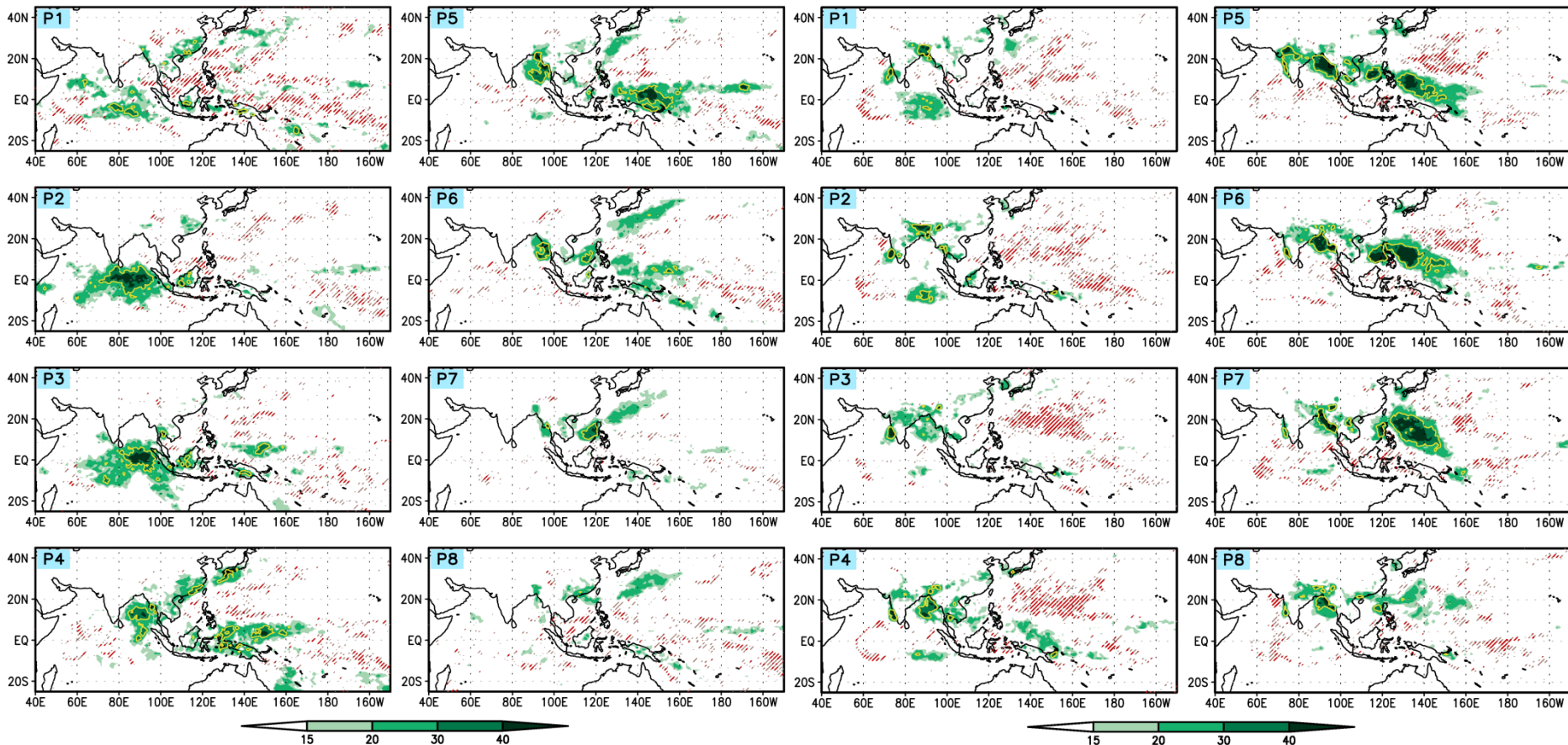
Better forecast? *practical use*

 Relationship analysis (Composite analysis : BSISO-Heavy rainfall probability)

Probability of extreme rainfall occurrence based on BSISO phases

[e.g.MAY, BSISO1 \geq 1.0]

[e.g.JUL, BSISO2 \geq 1.0]

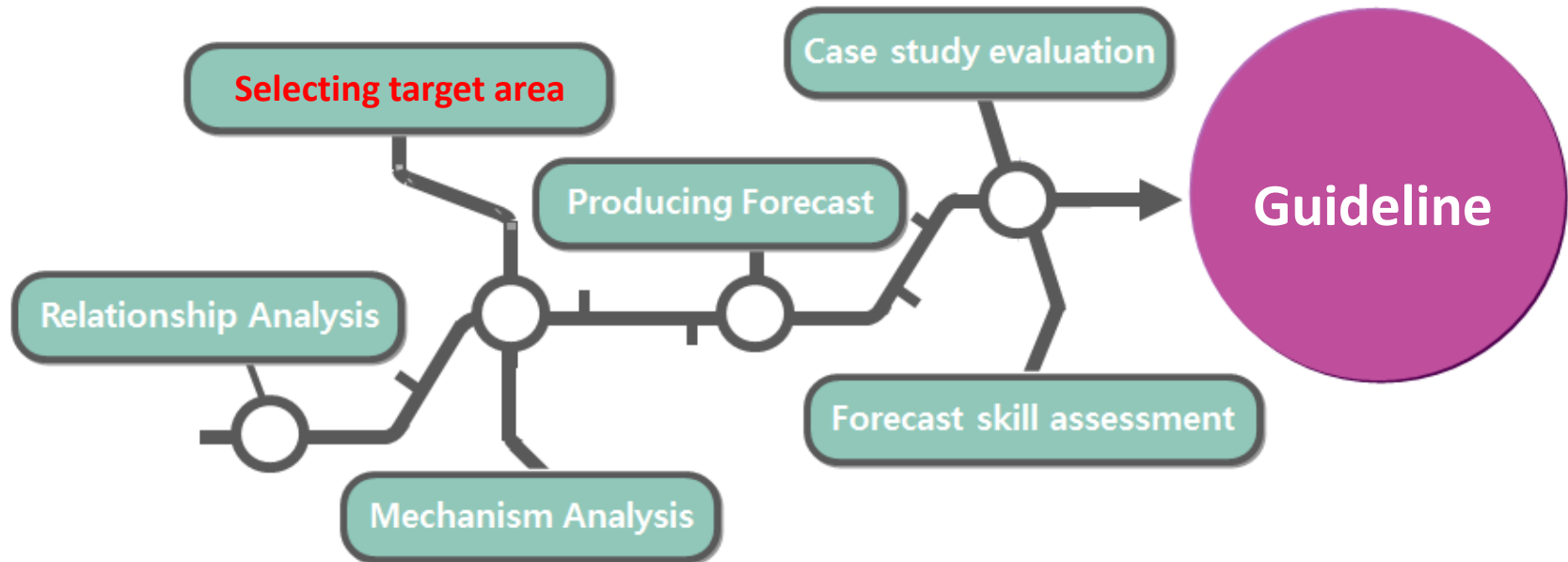


Better forecast? *practical use*



Procedure

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Better forecast? *practical use*



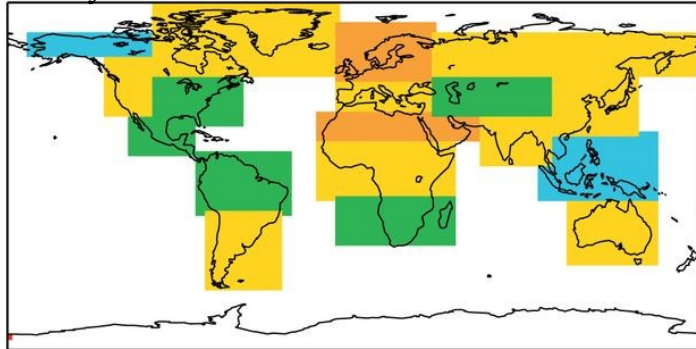
Selecting target area

#R1. *Developing countries in the APEC region*

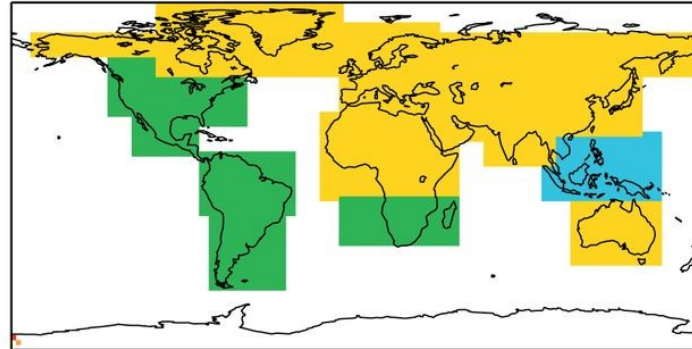
#R2. *Predictable region from the view of meteorologist*

Reliability categorization of precipitation forecasts

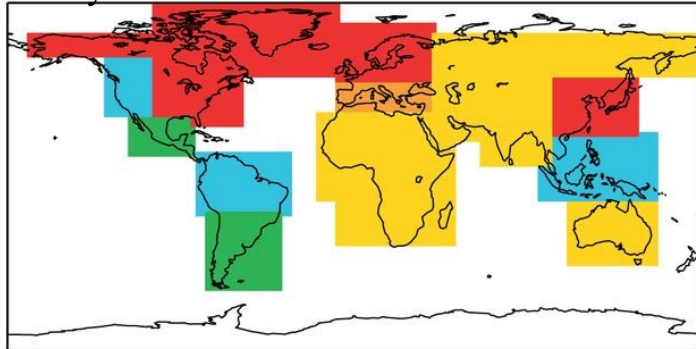
(a) Dry DJF



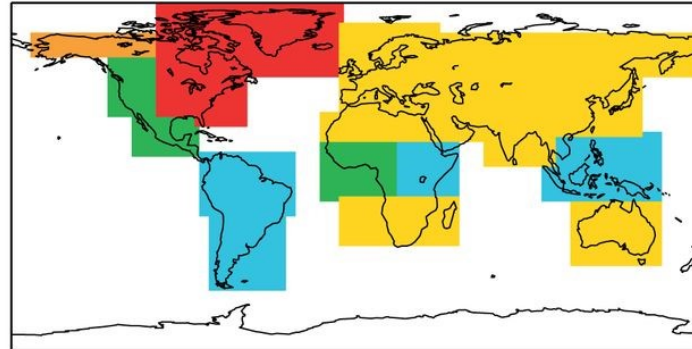
(b) Wet DJF



(c) Dry JJA



(d) Wet JJA



5 perfect 4 still useful 3 marginally useful 2 not useful 1 dangerous

The skill over *Southeast Asia* is useful. It is consistent among the events and seasons.

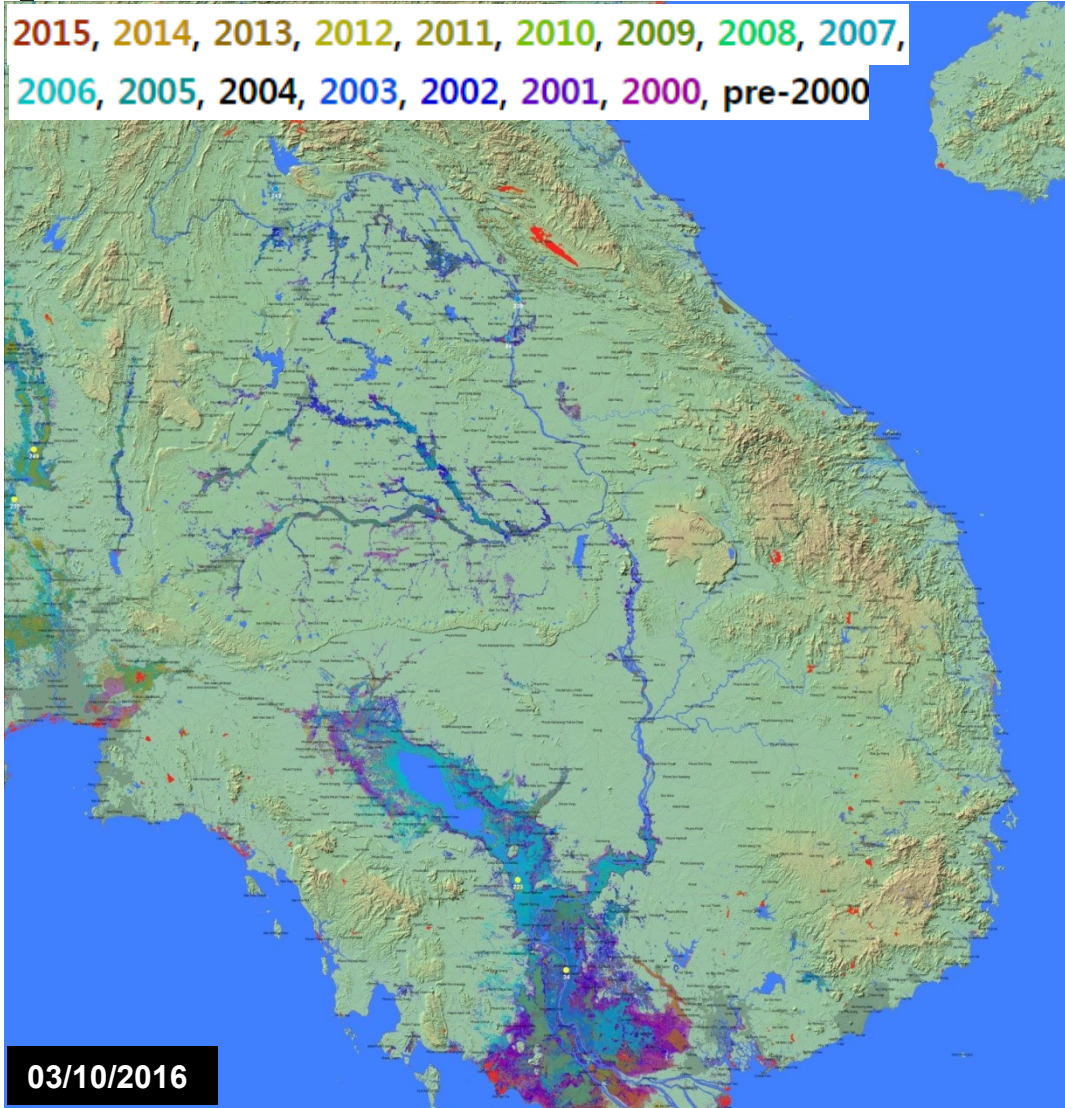
A. Weisheimer, and T. N. Palmer, J. R. Soc. Interface 2014;11:20131162

Better forecast? *practical use*



Selecting target area

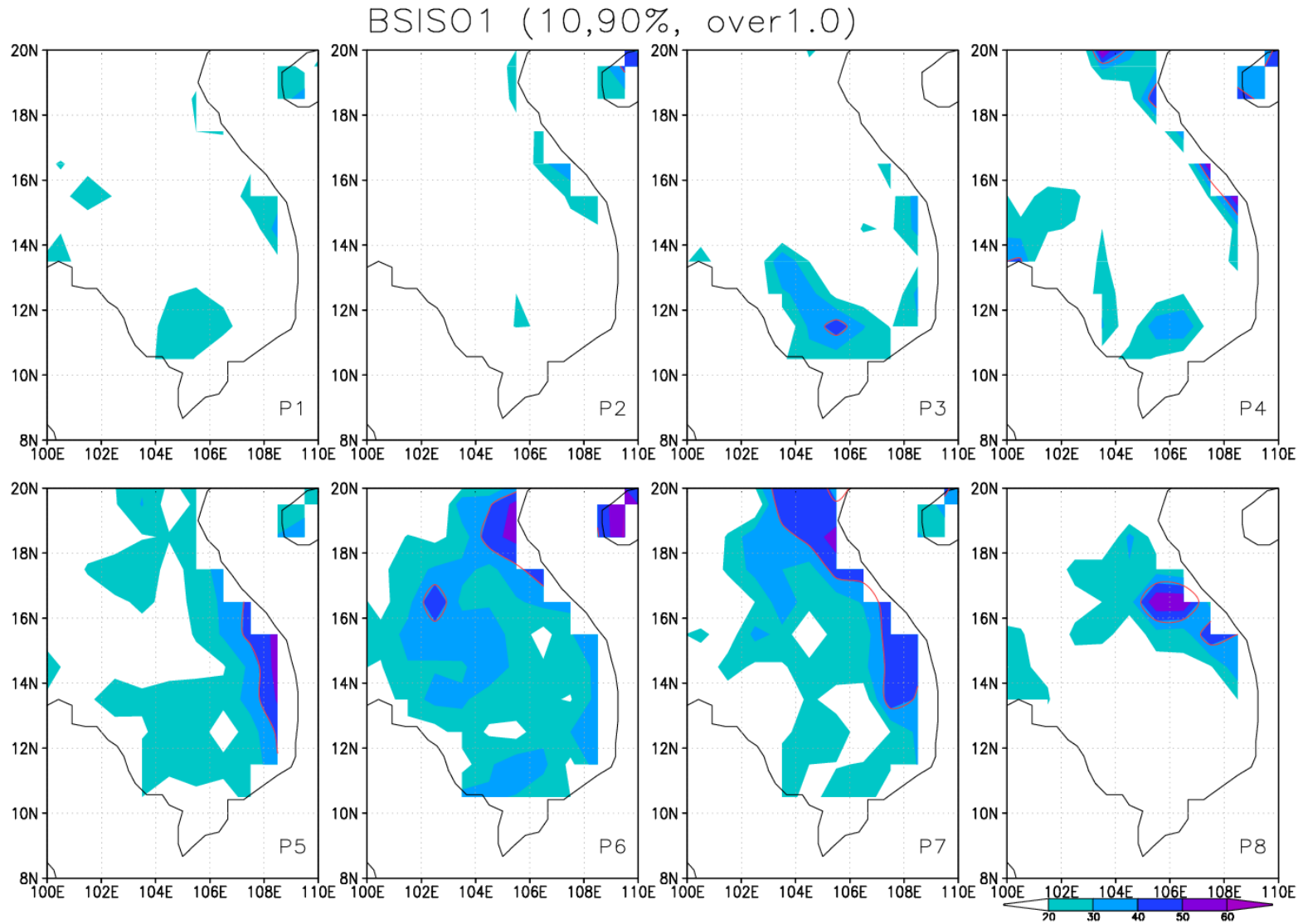
2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007,
2006, 2005, 2004, 2003, 2002, 2001, 2000, pre-2000



*#R3. Flood prone areas
with large rivers
from the view of hydrologist*

Better forecast? *practical use*

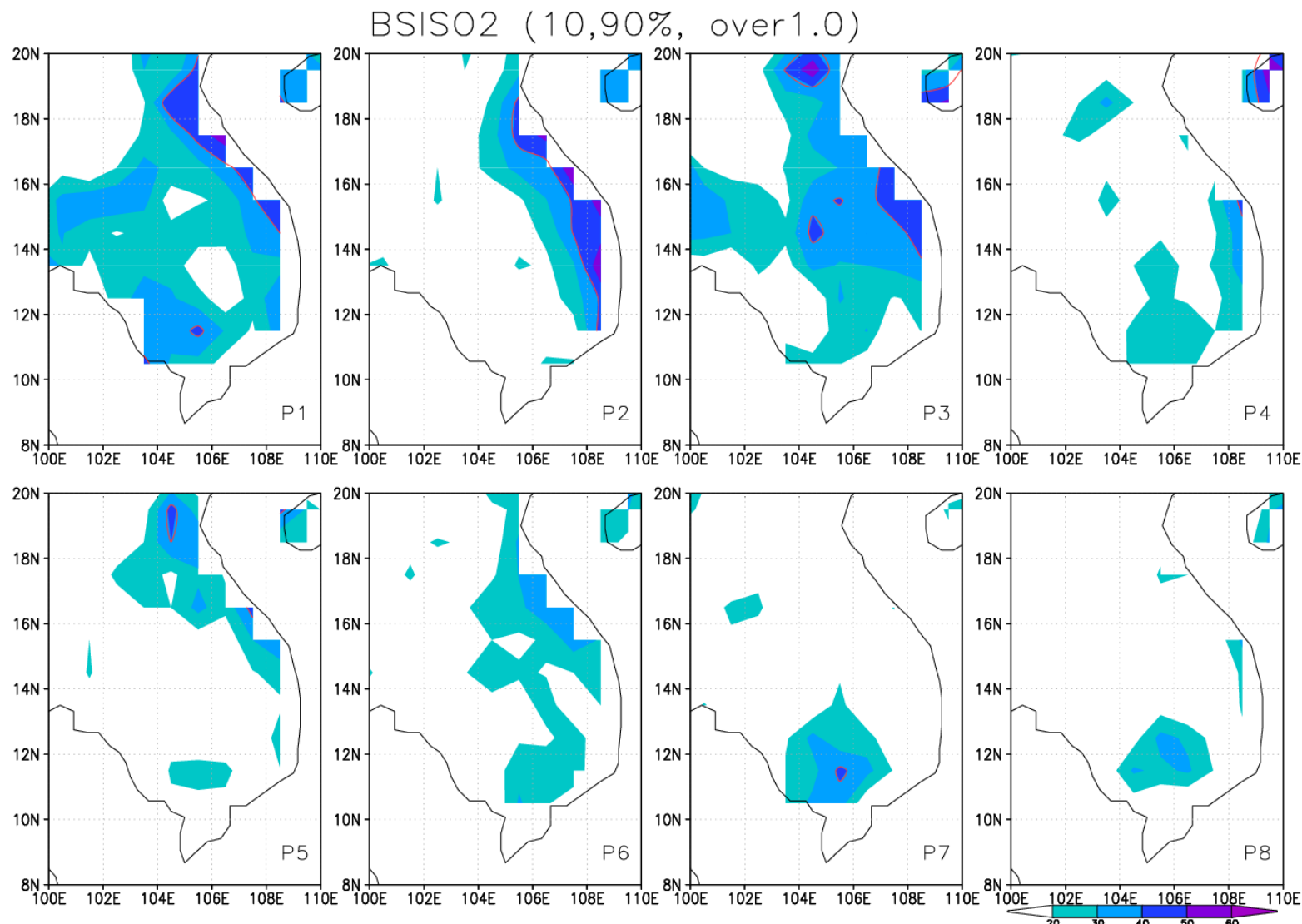
 Relationship analysis (Composite analysis : BSISO-Heavy rainfall probability)



Better forecast? *practical use*



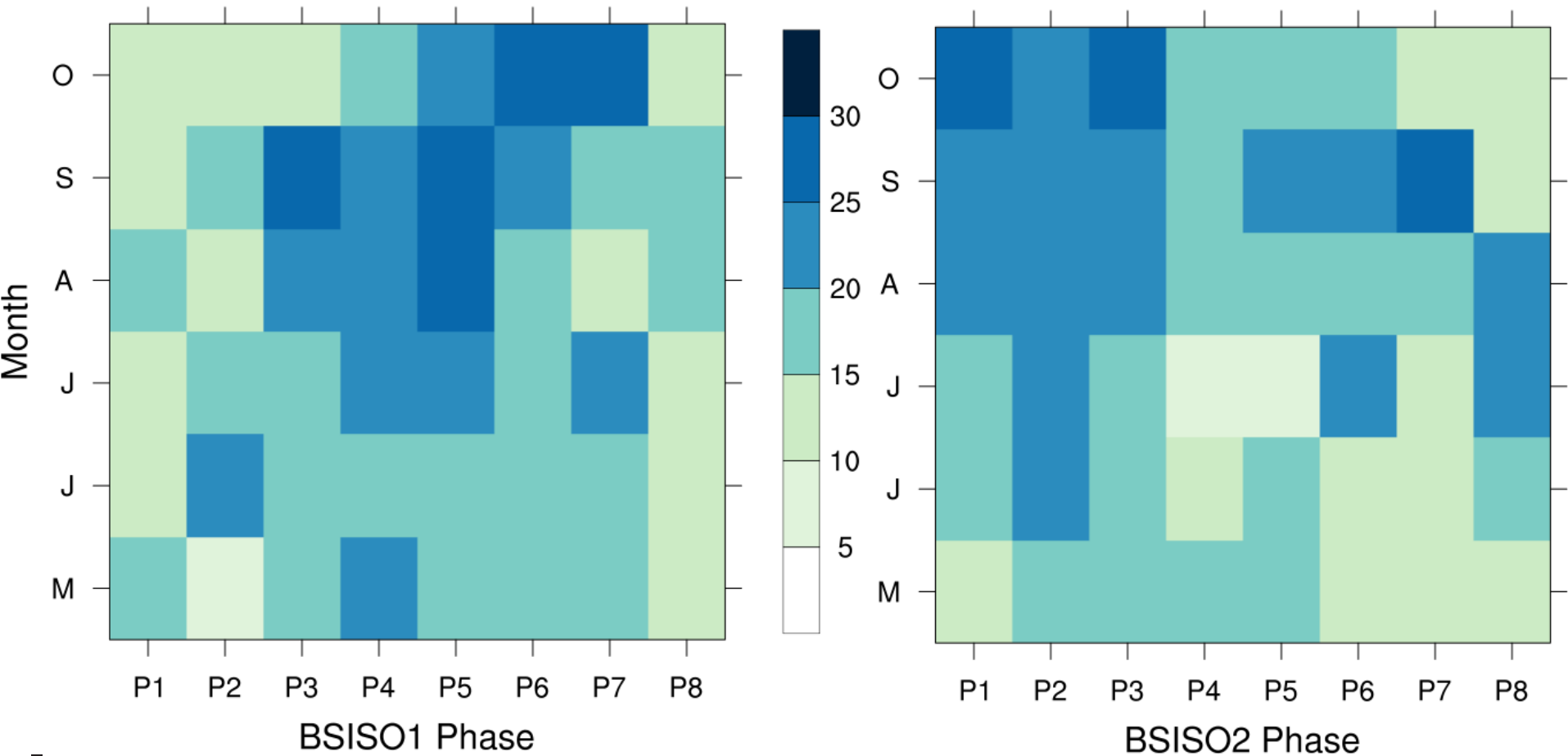
Relationship analysis (*Composite analysis : BSISO-Heavy rainfall probability*)



Better forecast? *practical use*

 Relationship analysis (*Composite analysis : BSISO-Heavy rainfall probability*)

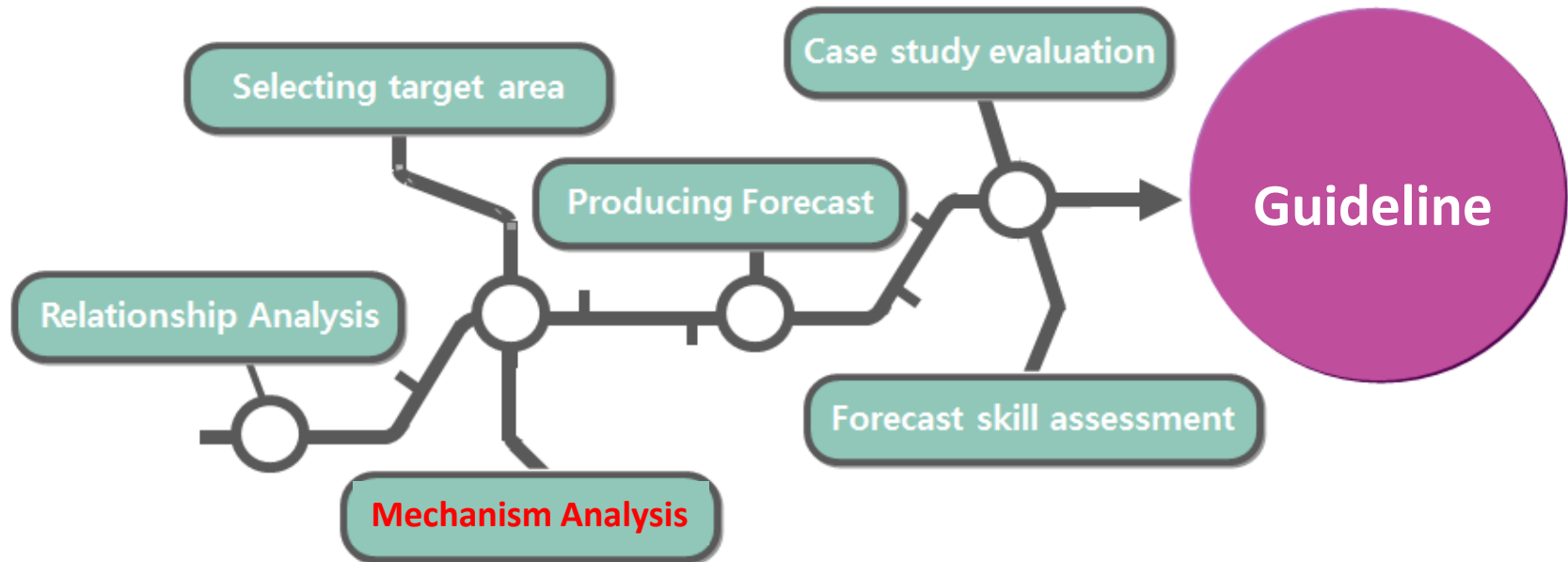
Probability of Heavy Rainfall occurrence [Mekong River]



Better forecast? *practical use*



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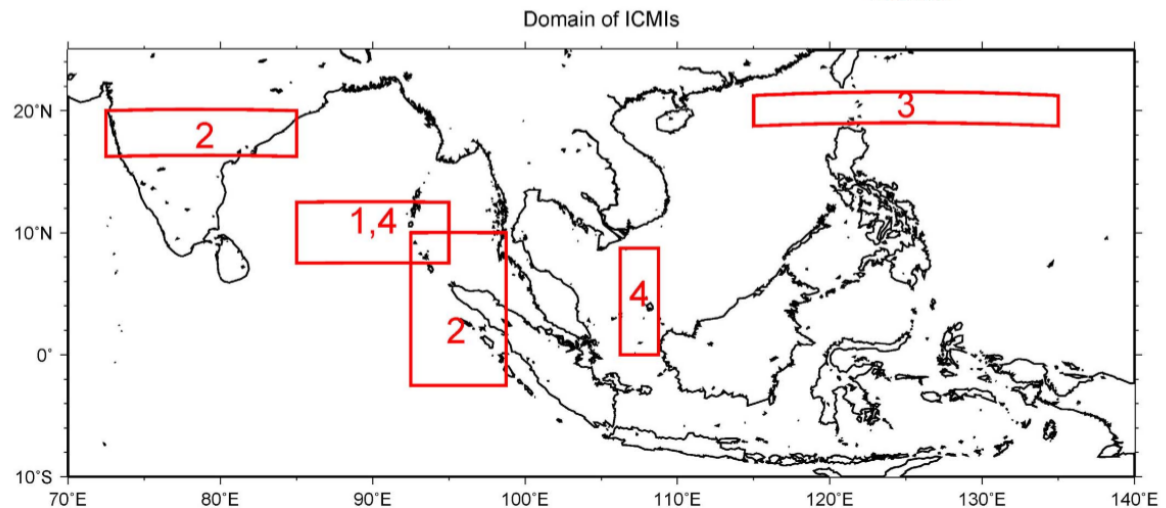
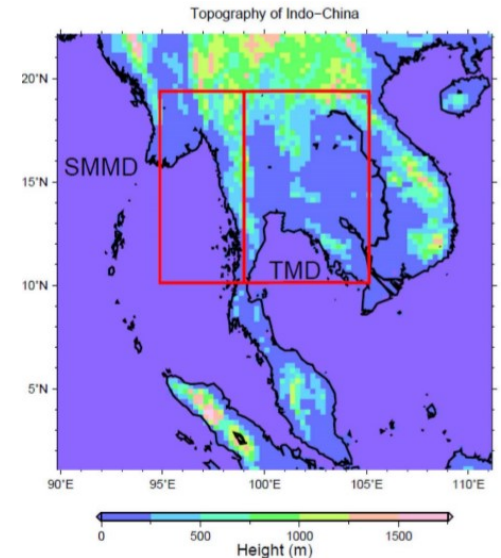


Better forecast? *practical use*



Mechanism Analysis (BSISO-Extreme rainfall probability)

Because the precipitation in Thailand is *influenced by local monsoon winds* rather than Indian monsoon or WNP monsoon, a new set of indices incorporating these winds was explored and these four indices are named the *Indo-China Monsoon Indices (ICMIs)*. These ICMIs *better explain the rainfall* over Thailand monsoon domain.



Tsai, C., Behera, S.K. & Waseda, T. (2015). Indo-China Monsoon Indices. *Sci. Rep.* 5, 8107; DOI:10.1038/srep08107

Figure 8 | Domain of ICMIs. The boxes represent the domains of ICMIs and the numbers represent the type of ICMIs.

Better forecast? *practical use*



Mechanism Analysis (*BSISO-Extreme rainfall probability*)

[MAM] TMD are influenced by the developing phase of the Southeastern Asian Summer Monsoon. This monsoon early signal can be detected ***from the changing zonal wind east of Sri Lanka.***

[JJA] The strengthening of ***the easterlies east of Hainan Island*** brings extra precipitation to TMD.

[SON] Normal/slow decaying Southeastern Asian Summer Monsoon and ***southerlies in south of Vietnam*** are necessary to bring extra precipitation to TMD.

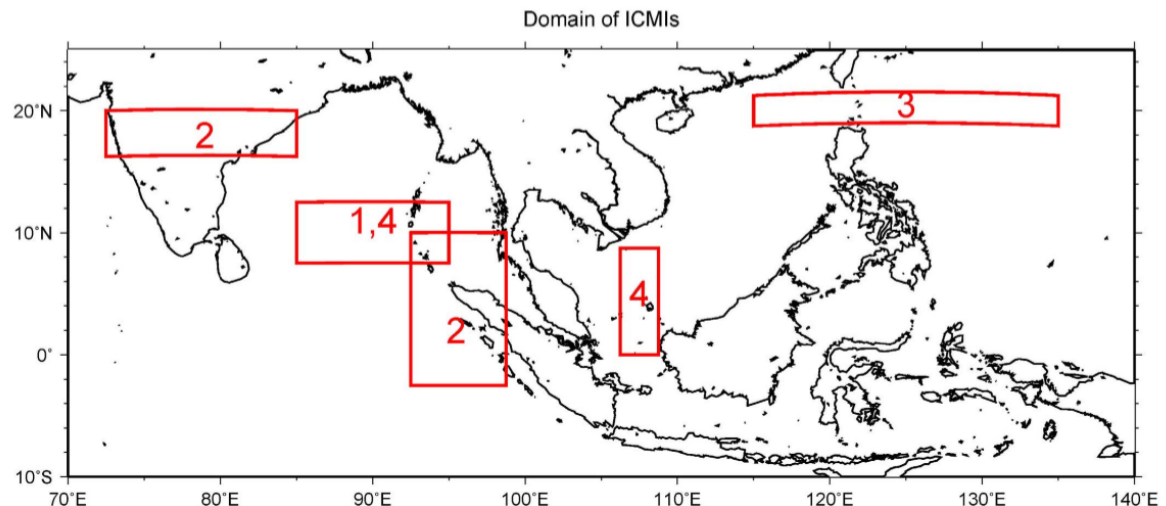
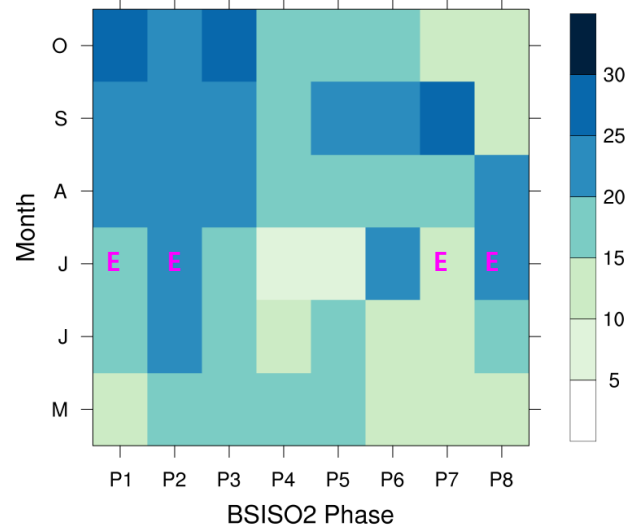
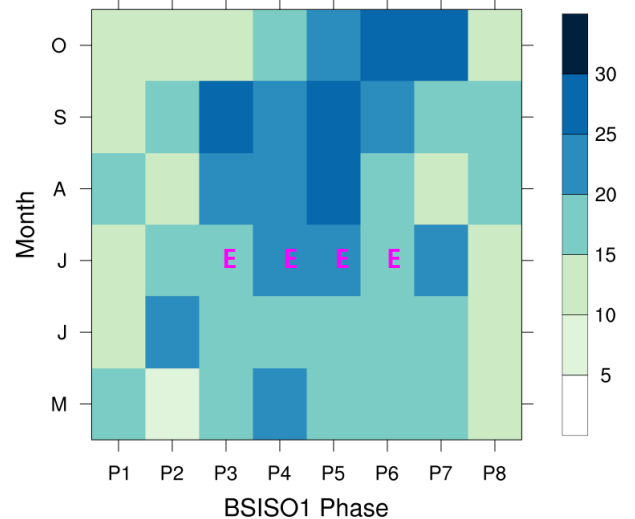
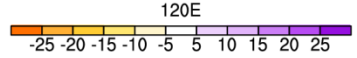
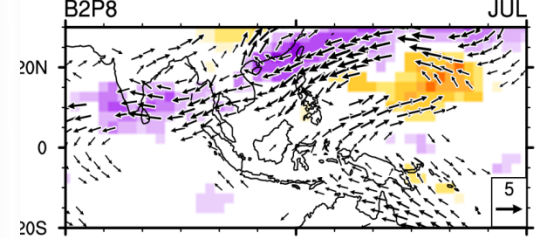
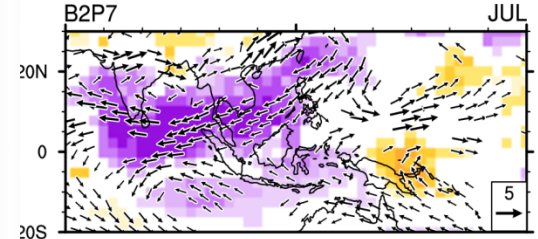
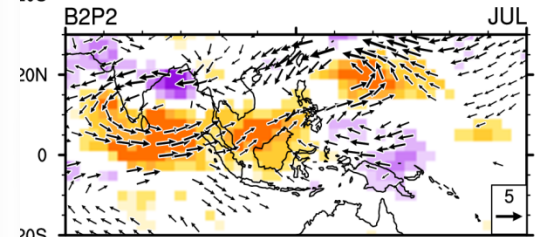
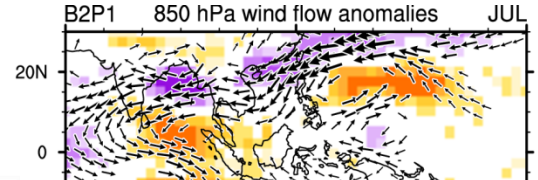
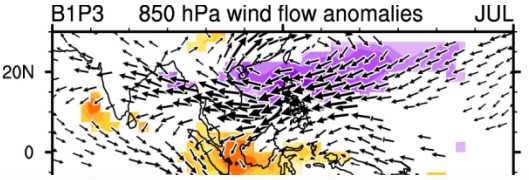
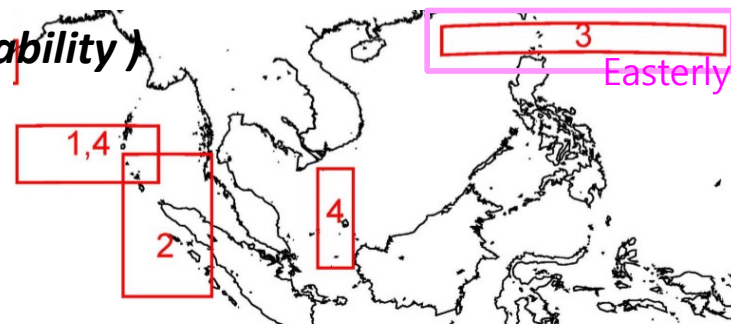


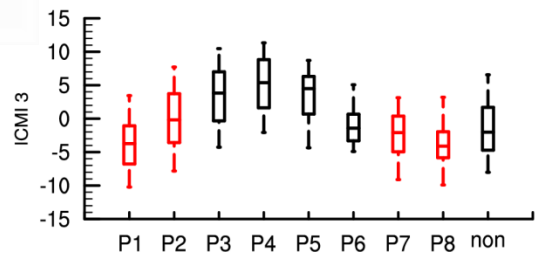
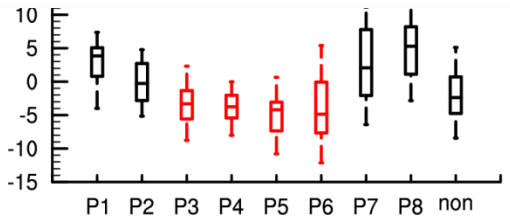
Figure 8 | Domain of ICMI. The boxes represent the domains of ICMI and the numbers represent the type of ICMI.



Mechanism Analysis (BSISO-Extreme rainfall probability)



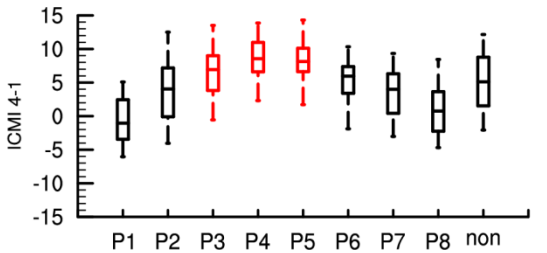
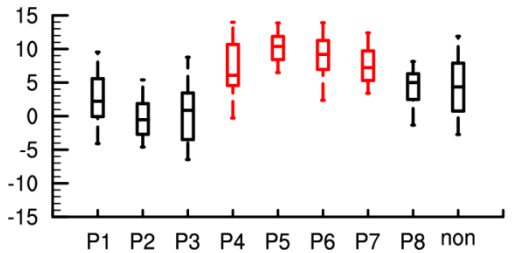
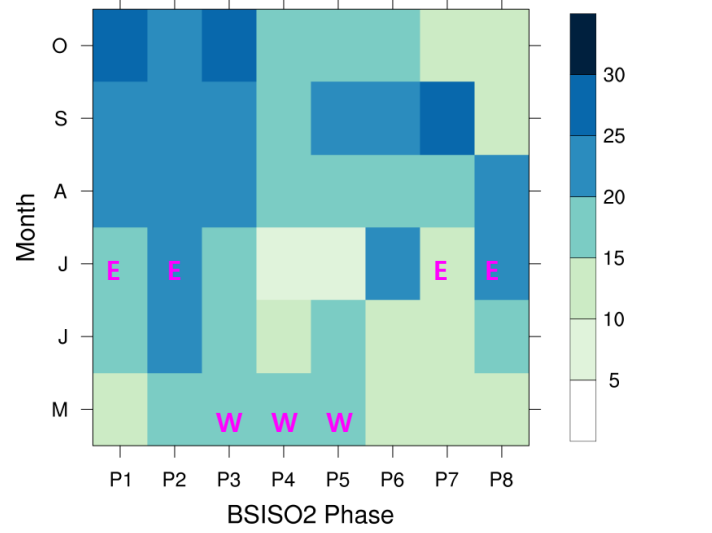
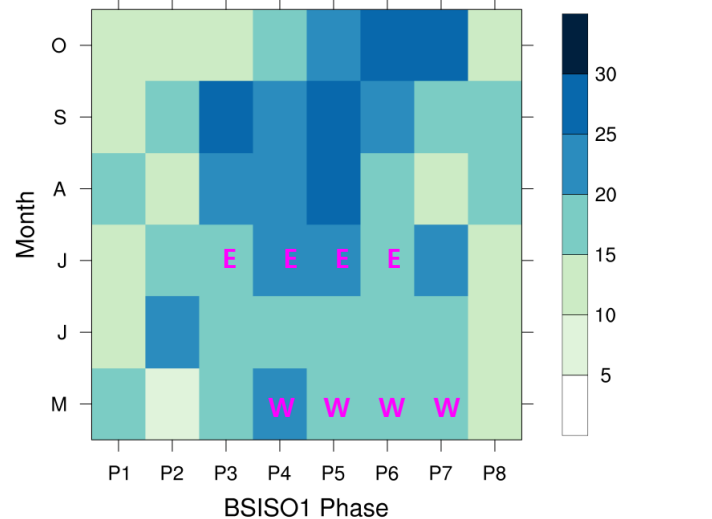
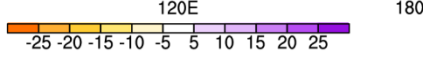
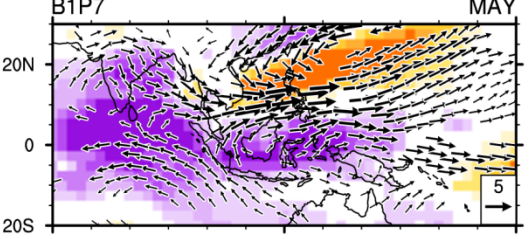
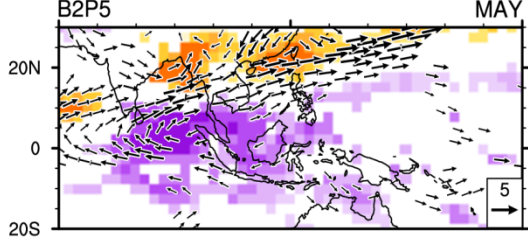
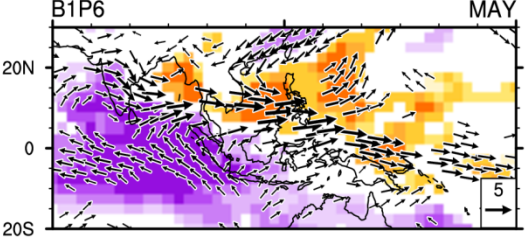
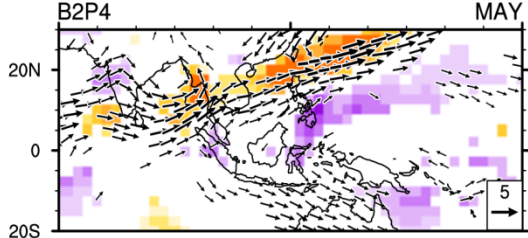
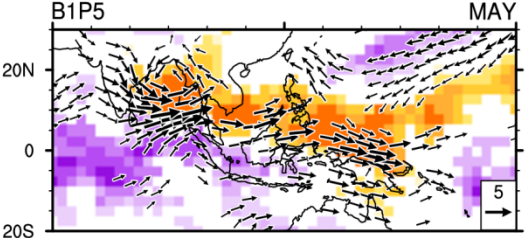
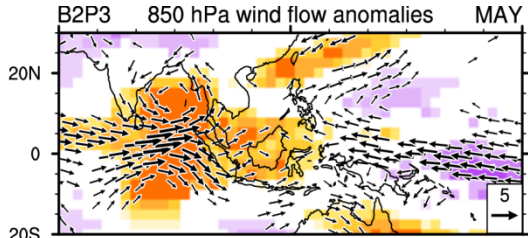
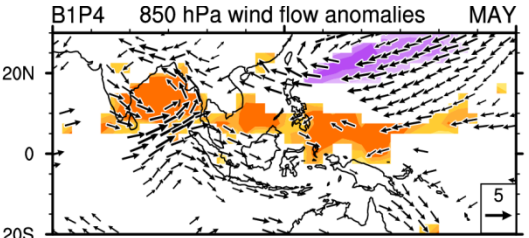
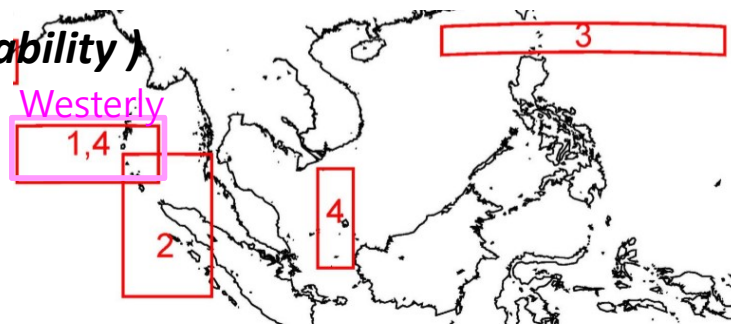
BSISO can contribute to the favorable condition in making strong Indo-China monsoon and bringing extra precipitation to TMD.





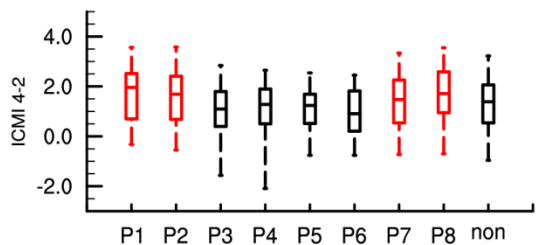
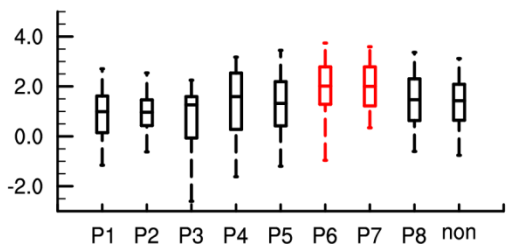
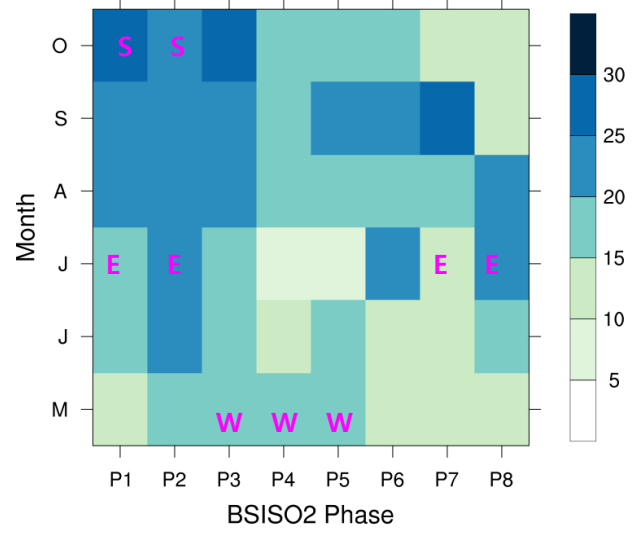
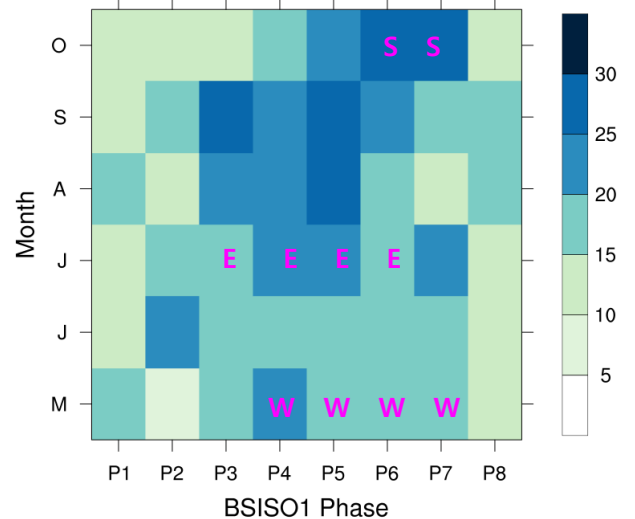
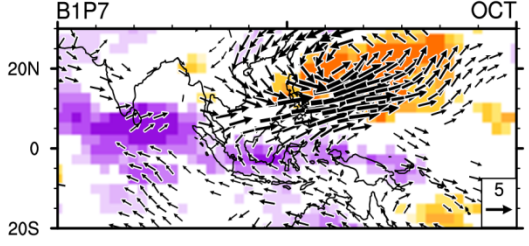
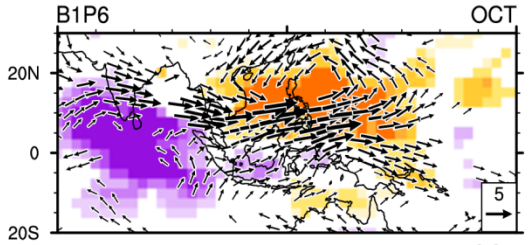
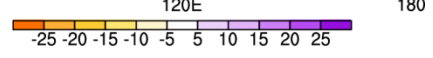
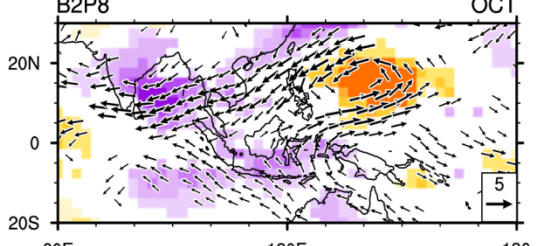
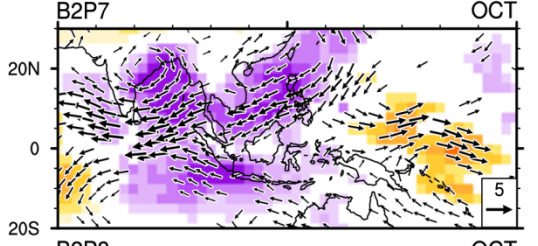
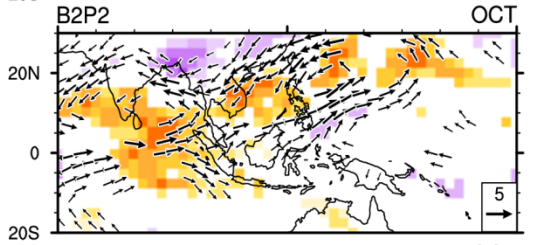
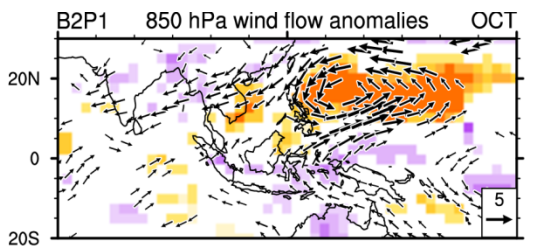
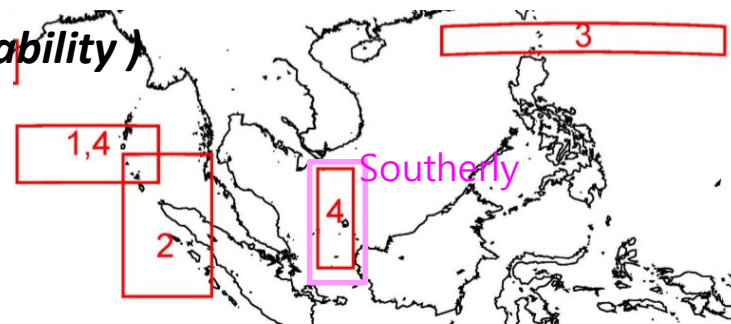
Mechanism Analysis

(BSISO-Extreme rainfall probability)





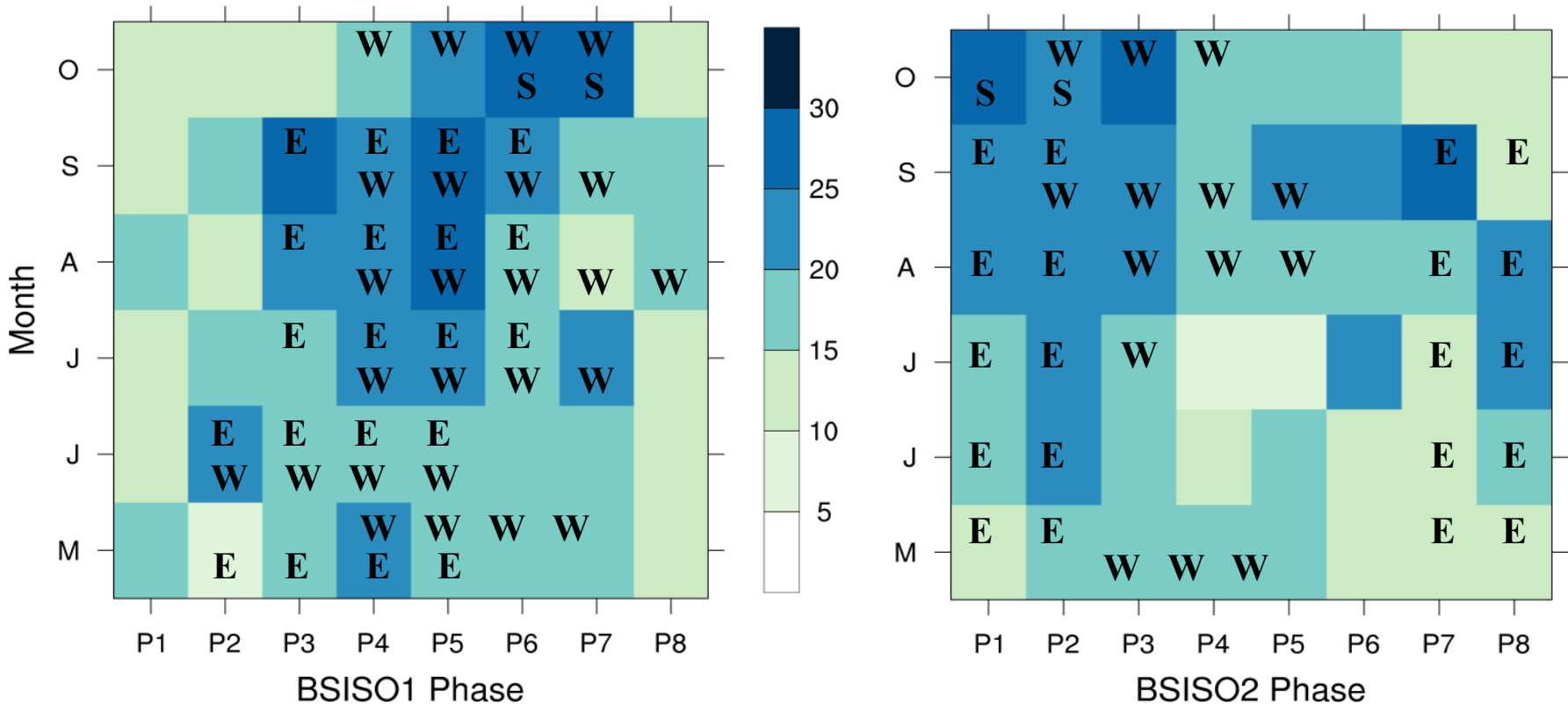
Mechanism Analysis (BSISO-Extreme rainfall probability)



Better forecast? *practical use*



Mechanism Analysis (BSISO-Extreme rainfall probability)

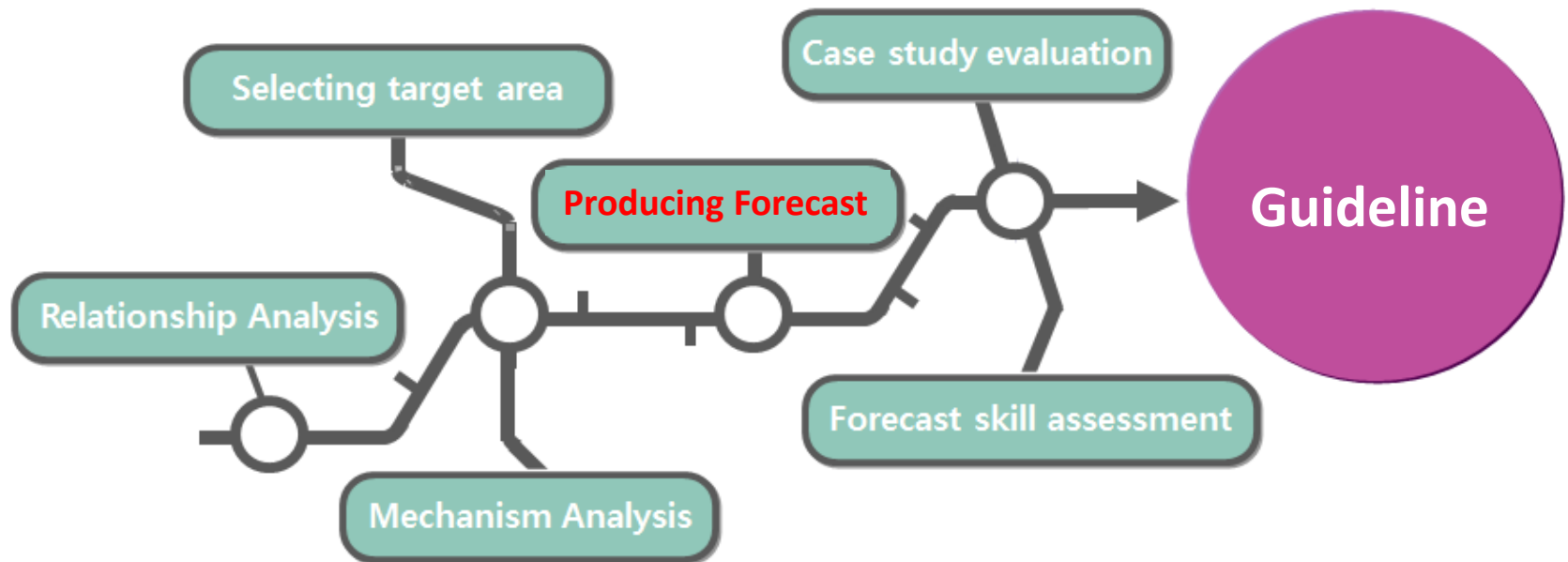


Probability table marked with favorable wind condition which can contribute strong Indo-China monsoon and bring heavy rainfall.

Better forecast? *practical use*



'15 '16



Better forecast? *practical use*

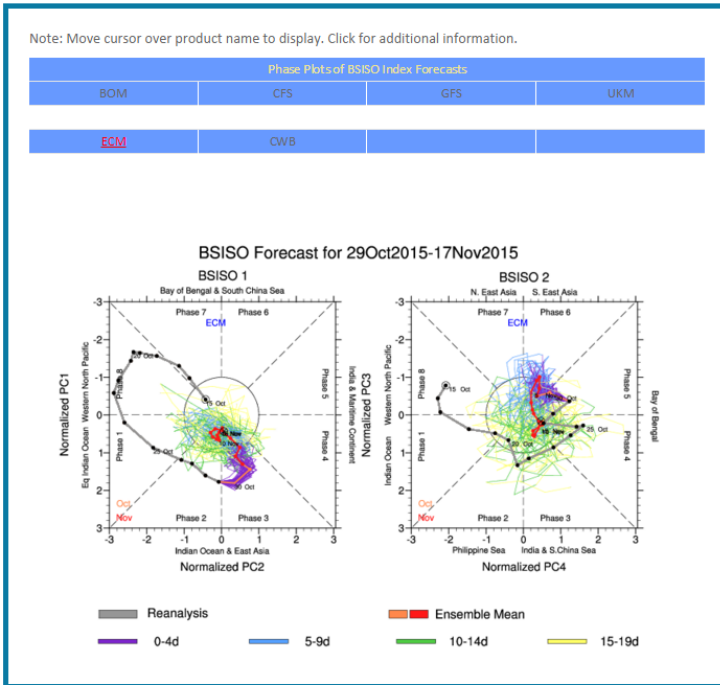


Producing Forecasts estimated by BSISO indices

BSISO real-time forecast

Note: Move cursor over product name to display. Click for additional information.

Phase Pkts of BSISO Index Forecasts			
BOM	CFS	GFS	UKM
ECM	CWB		



YEAR	DAY	BSISO1	BSISO2	B1phs	B2phs
2015	262	0.395	0.734	P3	P6
2015	263	0.154	0.753	P3	P6
2015	264	0.190	0.223	P3	P6
2015	265	0.600	0.833	P3	P6

BSISO forecast index = $f(\text{Amplitude, Phase})$

Better forecast? *practical use*



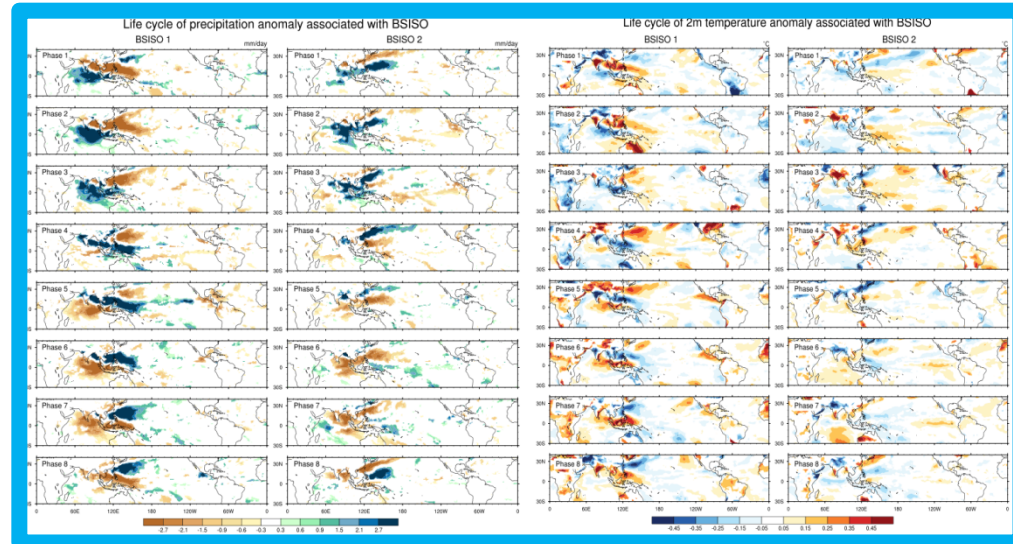
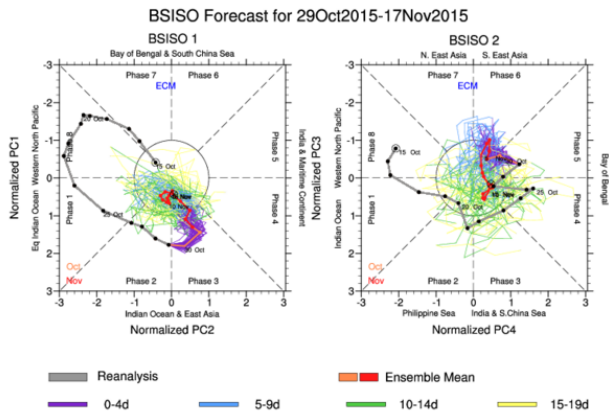
Producing Forecasts estimated by BSISO indices

Observational relationship

BSISO real-time forecast

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Phase Pkts of BSISO Index Forecasts			
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Composite Anomalies associated with the BSISO
[Mon, BSISO > 1.0]

YEAR	DAY	BSISO1	BSISO2	B1phs	B2phs
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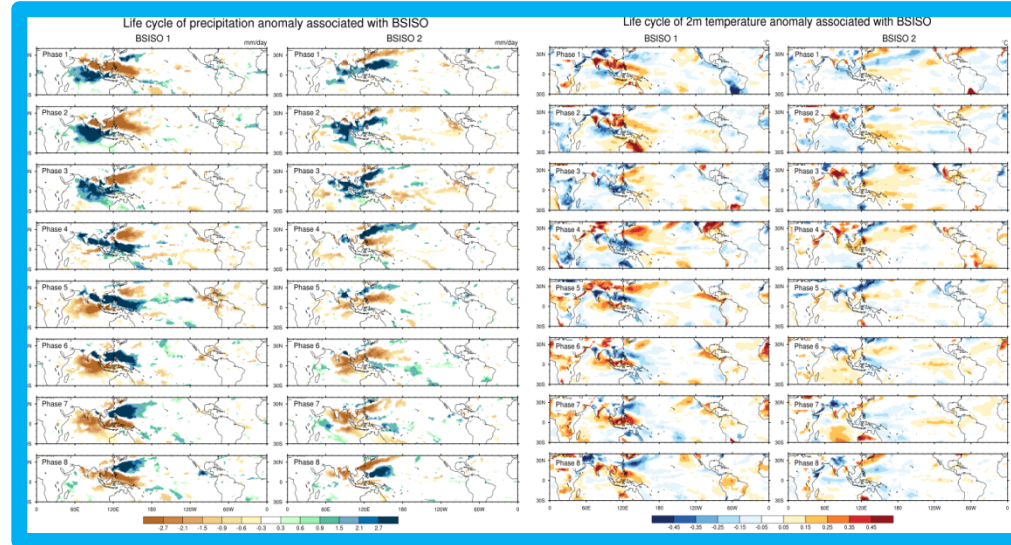
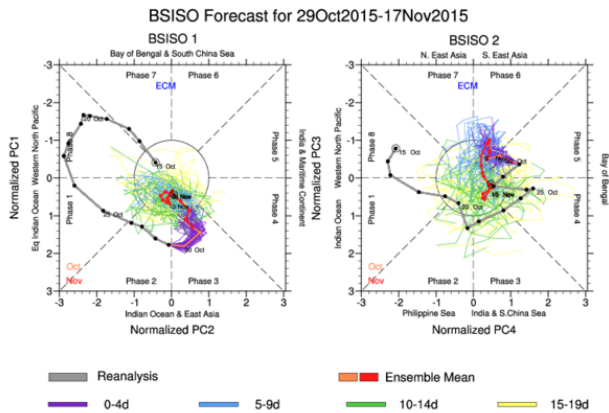
Producing Forecasts estimated by BSISO indices

Observational relationship

BSISO real-time forecast

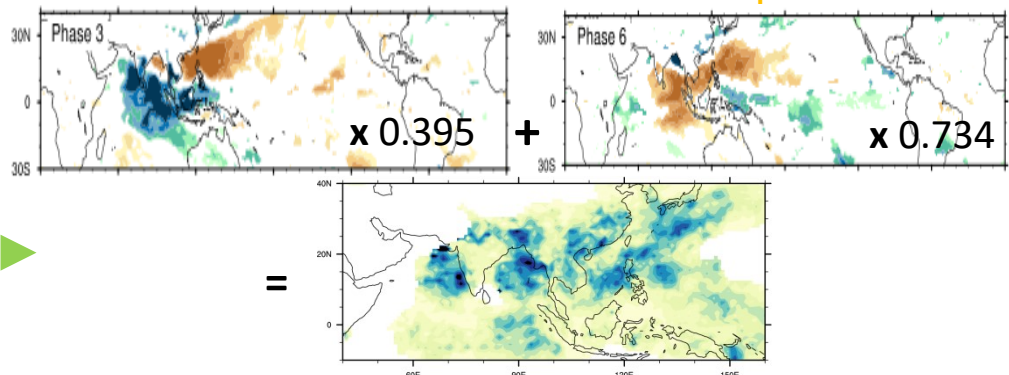
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Phase Pkts of BSISO Index Forecasts			
BOM	CFS	GFS	UKM
ECM	CWB		



Composite Anomalies associated with the BSISO [Mon, BSISO > 1.0]

Prediction of anomalies associated with the BSISO $B1P3 \times \text{Amp}_{BSISO1} + B2P6 \times \text{Amp}_{BSISO2}$



YEAR	DAY	BSISO1	BSISO2	B1phs	B2phs
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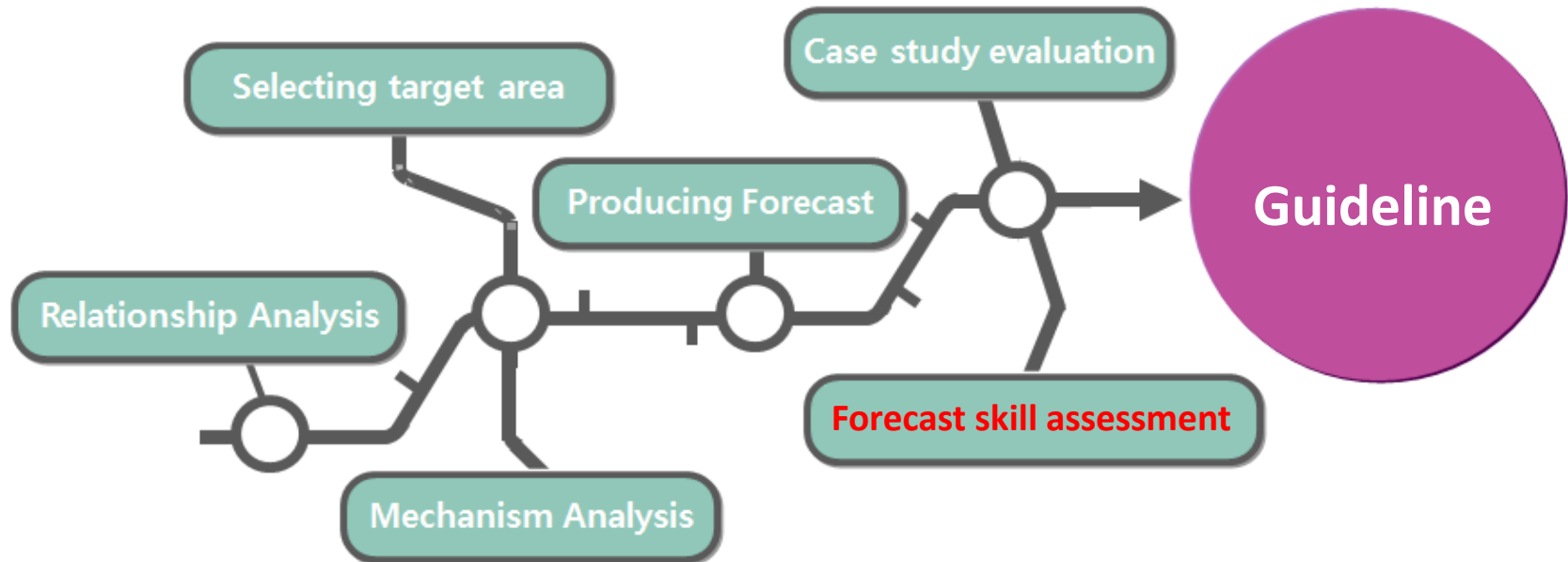
BSISO forecast index = $f(\text{Amplitude, Phase})$

Better forecast? *practical use*



Strategy

'15 '16



Better forecast? *practical use*



Forecast skill assessment : *Data and Verification metrics*

Period : 2013 ~ 2015
Season : MJJASO
Lead : WEEK1, WEEK2

	ECM	BOM	CFS	GFS	CWB
# of sample	104	80	285	300	29

Multi-category forecasts : **Brier Skill Score**

Contingency Table for multi-category forecasts

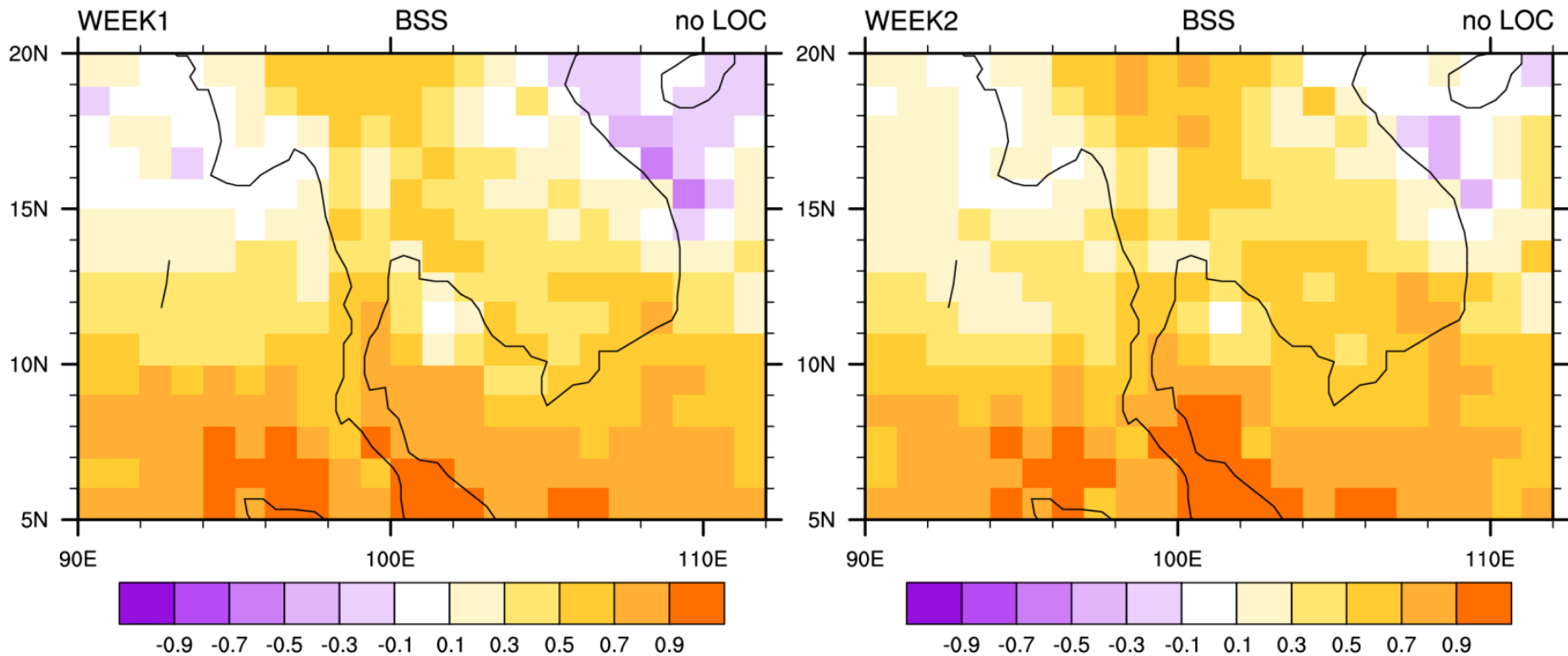
		Observed			Total
		1 PoHR <= 0.3 mm	2 0.3 < PoHR < THR	3 THR <= PoHR	
Forecast	1	n(F1,O1)	n(F1,O2)	n(F1,O3)	N(F1)
	2	n(F2,O1)	n(F2,O2)	n(F2,O3)	N(F2)
	3	n(F3,O1)	n(F3,O2)	n(F3,O3)	N(F3)
Total		N(O1)	N(O2)	N(O3)	N

Better forecast? *practical use*



Forecast skill assessment

ECM Forecast Skill



Probability forecasts of heavy rainfall in Mekong river basin show *improvements over 30-50%* relative to climatological forecast at the lead time of WEEK2.

Better forecast? *practical use*

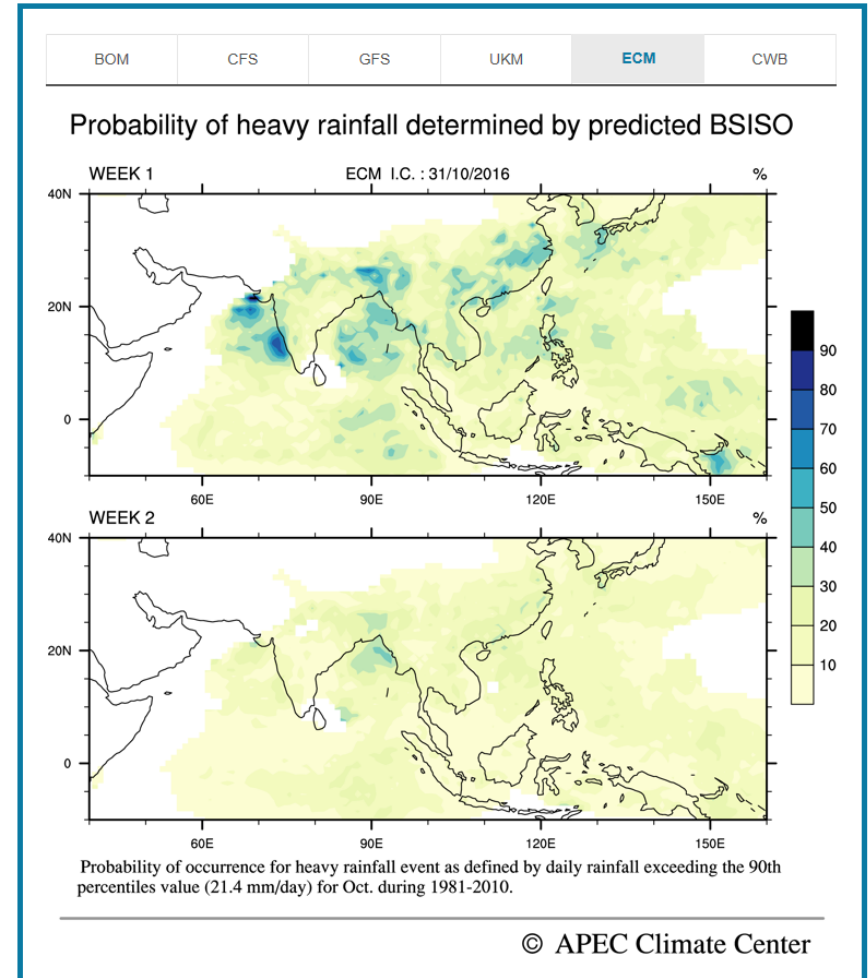


Delivery of user friendly forecast information

*On the APCC webpage
For upcoming week1 and week2
Everyday updated*

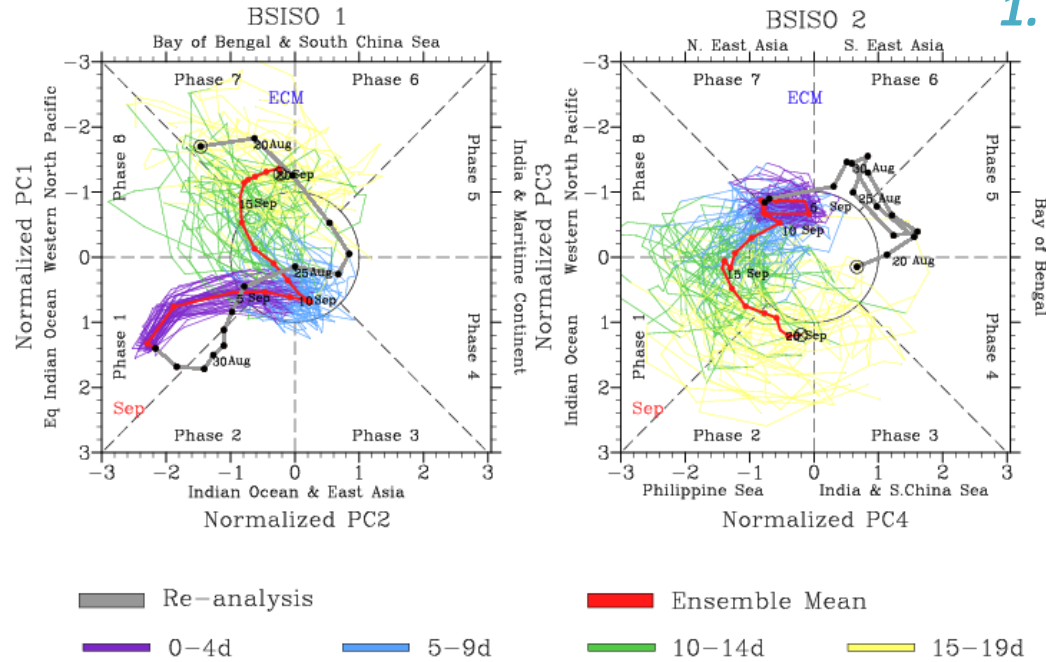
BSISO phase diagram may be difficult information for ordinary people.

So it is meaningful that simple index can be transformed into **user friendly information** such as rainfall.



Guideline

BSISO Forecast for **2Sep** 2013–21Sep2013



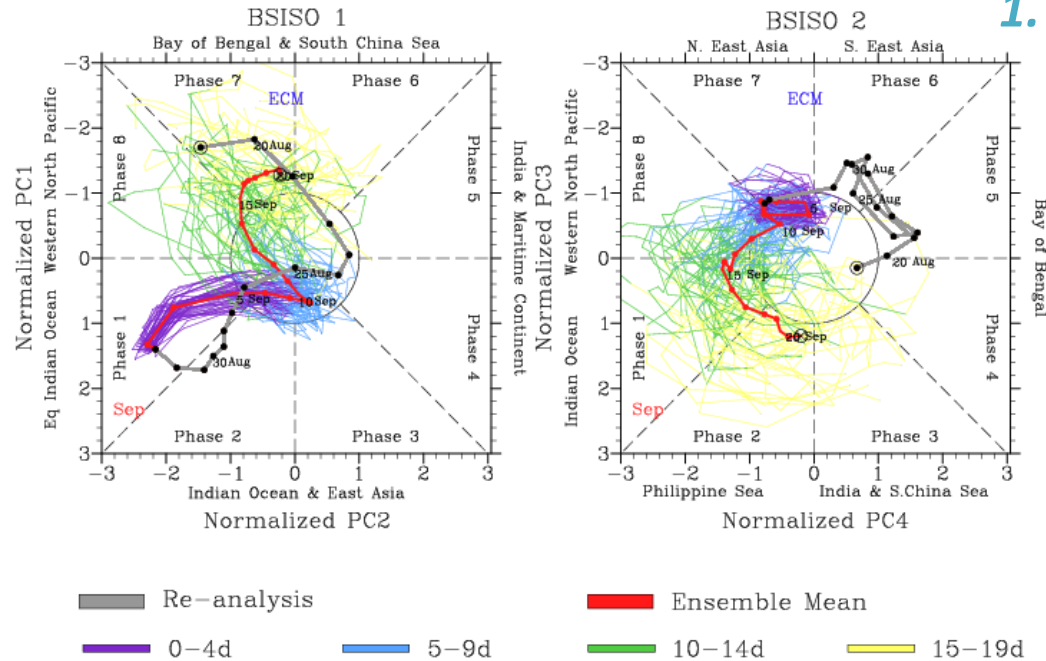
1. **Confirm the forecast of BSISO phase and amplitude for next two weeks**

→ **15-20Sep2013**

B1P7-8, B2P1-2

Guideline

BSISO Forecast for **2Sep** 2013–21Sep2013



1. Confirm the forecast of **BSISO phase and amplitude** for next two weeks

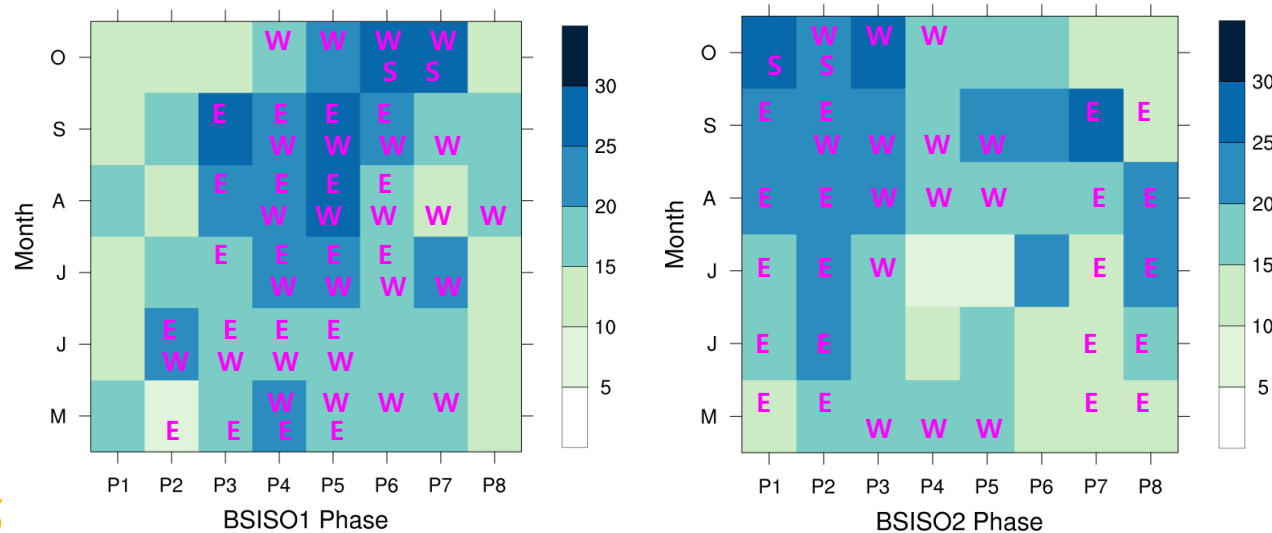
→ 15-20Sep2013

B1P8-7, B2P1-2

2. Find the relationship btw BSISO phase and heavy rainfall probability in the user guide.

→ B1P8-7 (Sep) W ~20%

B2P1-2 (Sep) E,W ~25%

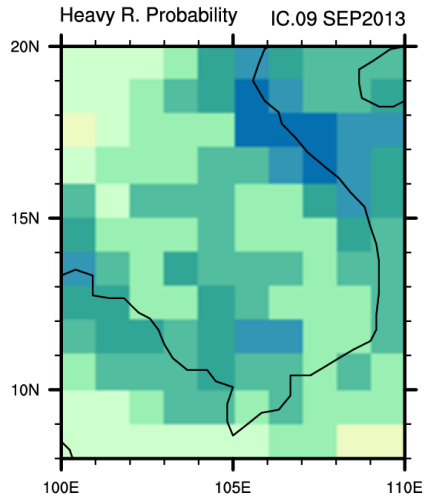


Guideline

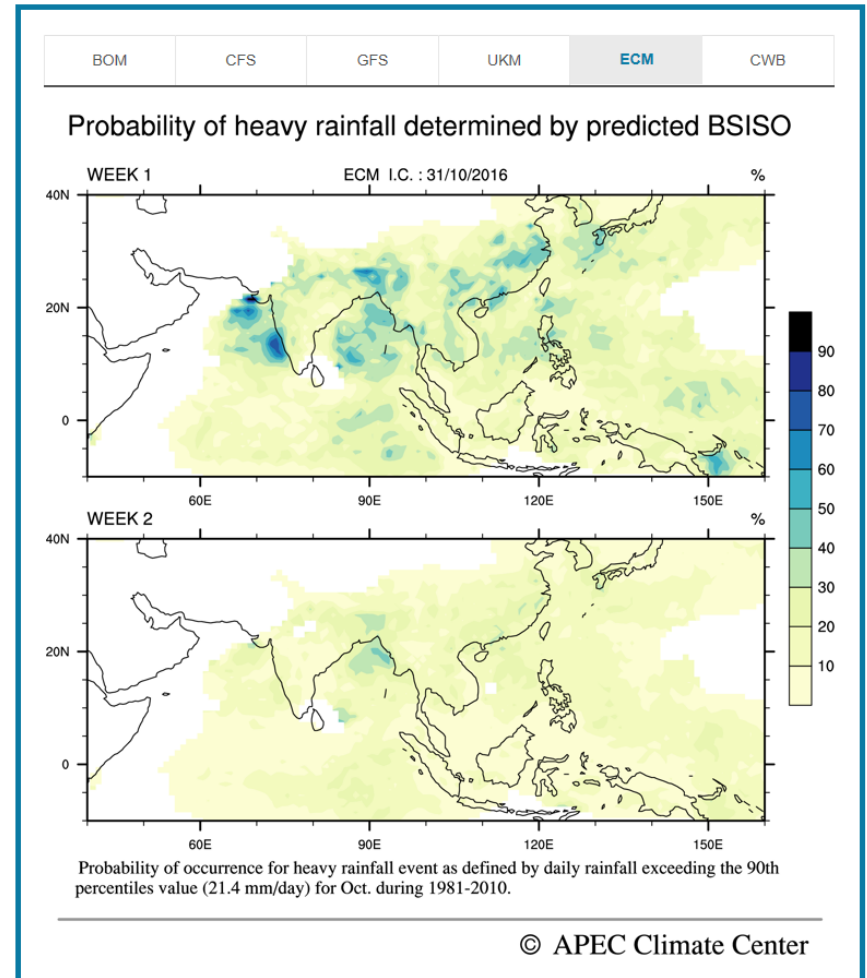
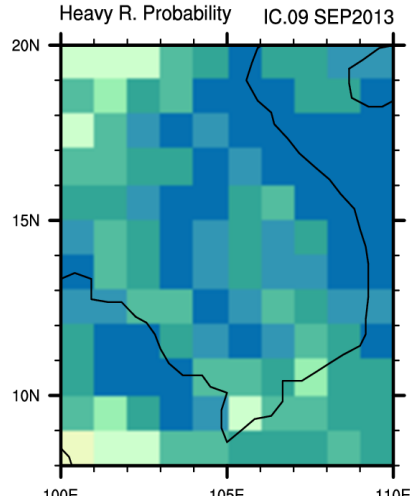
3. For easier viewing, you can go to [heavy rainfall probability forecast map in the APCC website](#).

ECM Forecast

WEEK1



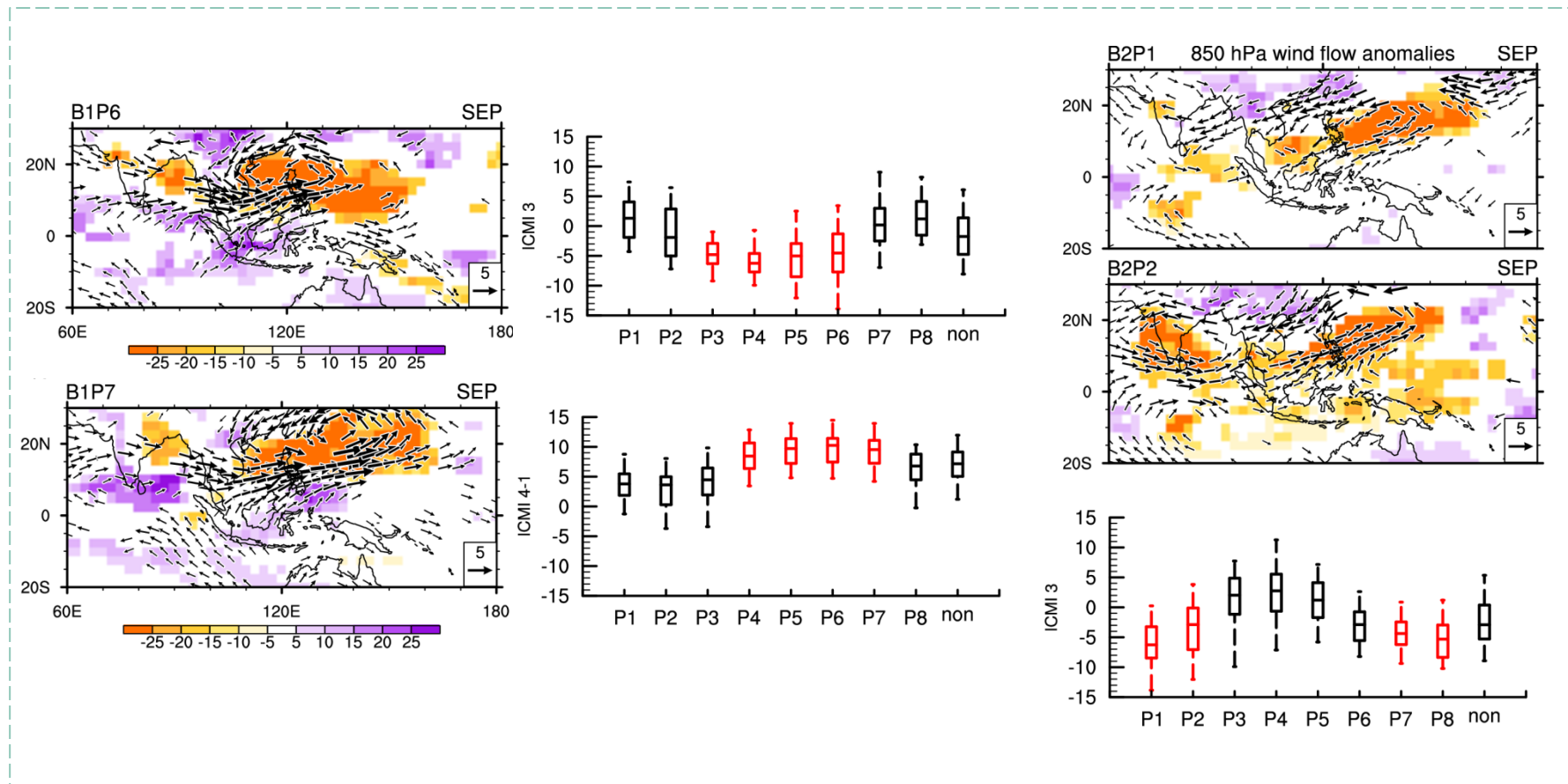
WEEK2



Guideline

4. If you want to know the cause of easterlies and circulation pattern ..
Look up it in the **mechanism chapter** or **Appendix**.

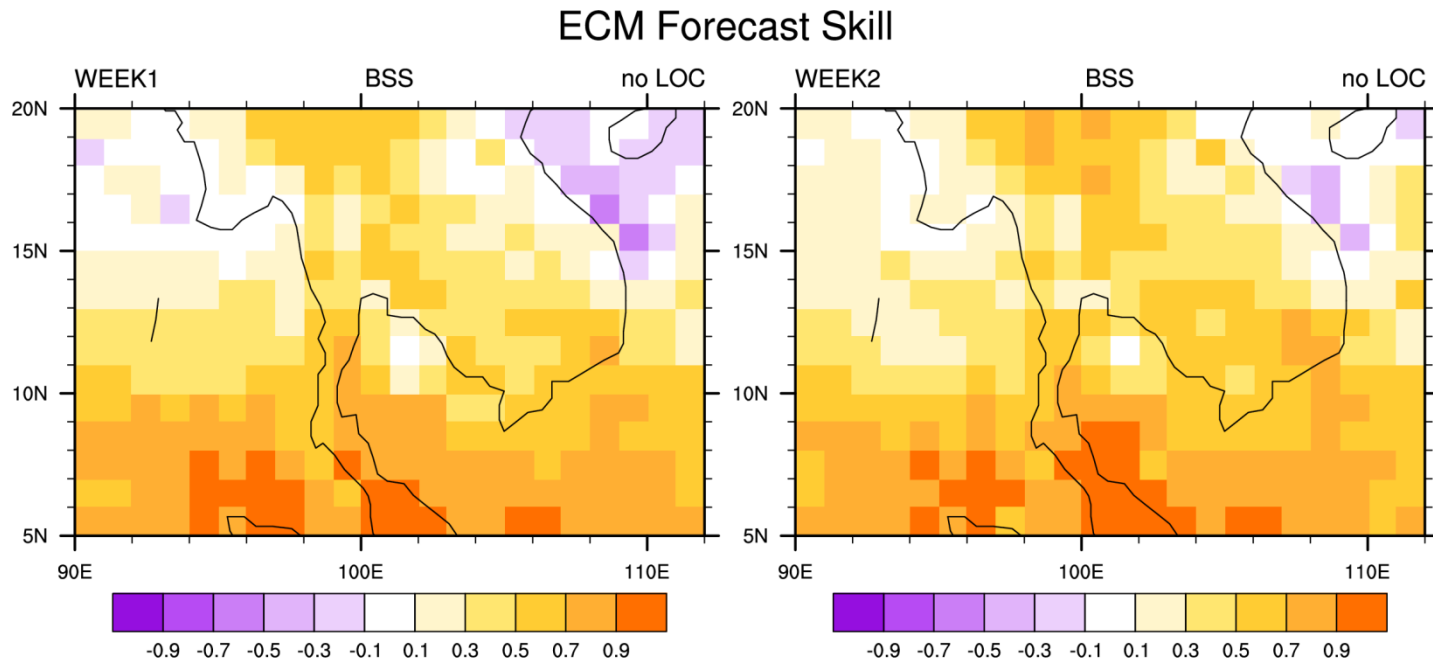
→ **Indo-china peninsular has favorable condition for having easterly (westerly) wind due to a strong convective cell (anticyclonic cir.) located on the Philippine sea and the northwest Pacific (the Indian Ocean).**



Guideline

5. There are some points to be duly considered.

→ Probability forecasts of heavy rainfall at 1-week and 2-week lead show improvements of 30% - 50% relative to climatological forecasts over the Mekong river.



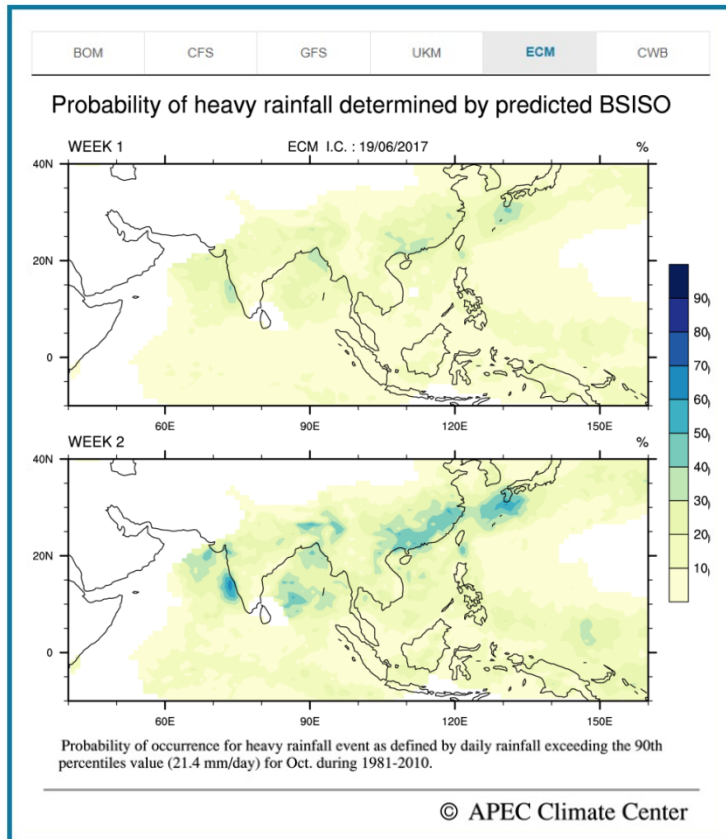


Better forecast from better recognition of the value

 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

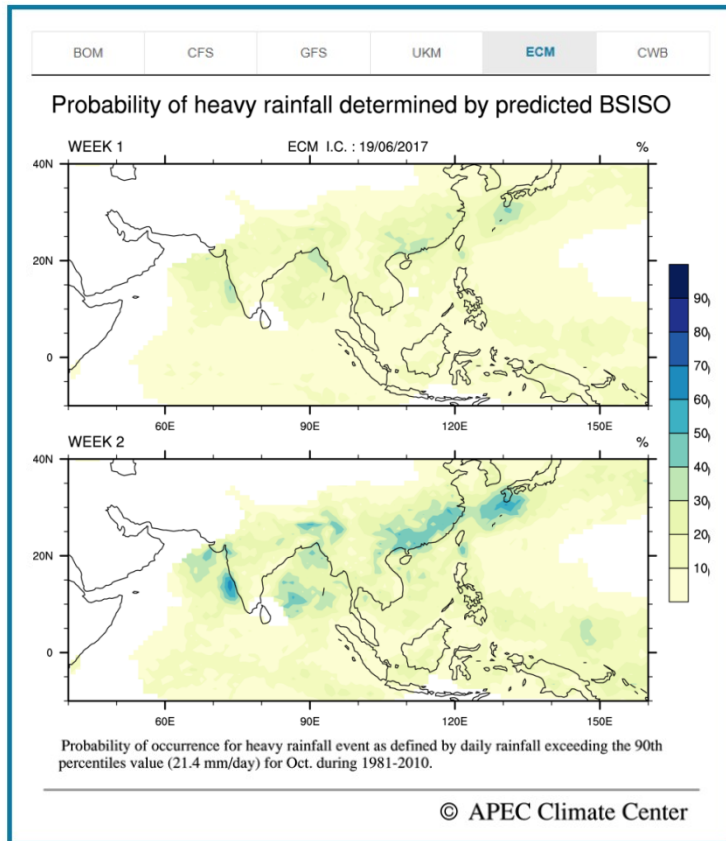




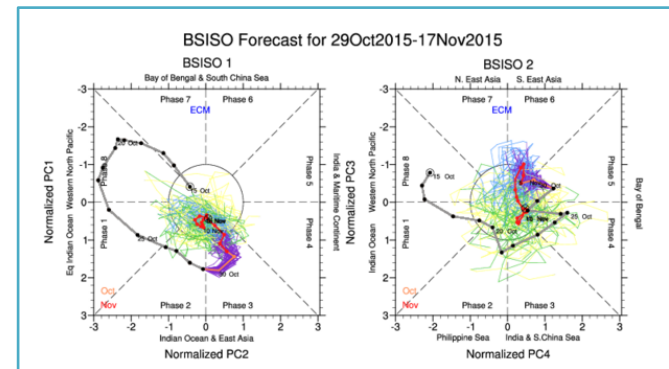
Better forecast by actionable information

Heavy rainfall forecast based on BSISO index forecast [ECMWF]

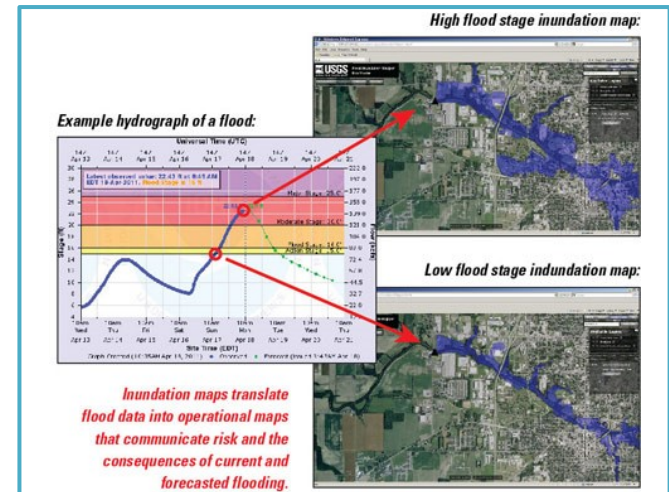
❖ Ex> Japan flood, 398mm/4hr, July 6, 2017



BSISO forecasts



Flood Inundation Mapping



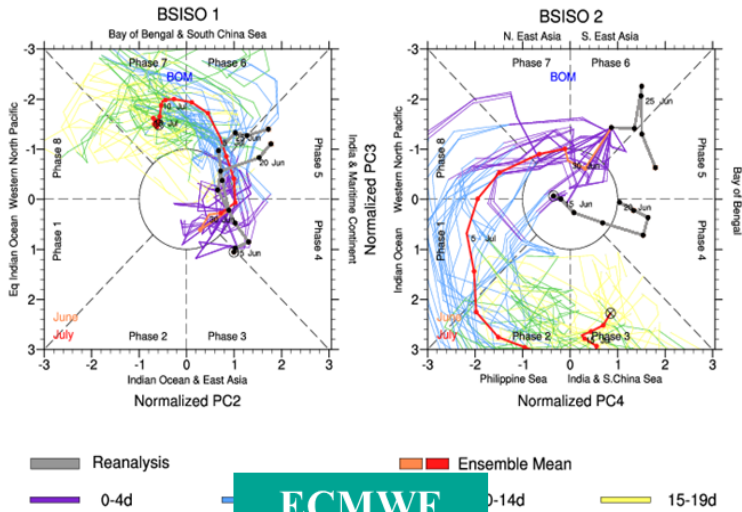
Application Possibility : Typhoon



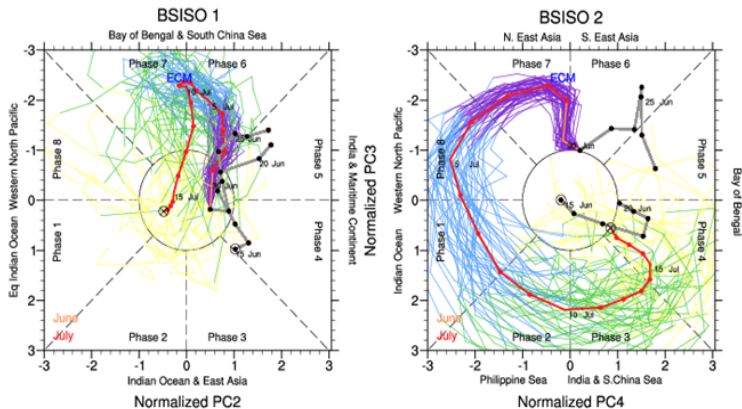
BSISO activity in 2015

BOM

BSISO Forecast for 28June2015-17July2015



BSISO Forecast for 29June2015-18July2015



❖ BSISO1, 2에 대한 Phase 변화

BOM	날짜	BSISO1	BSISO2	ECM	날짜	BSISO1	BSISO2
1	6/28	3	6	1	6/29	5	7
2	6/29	4	7	2	6/30	6	7
3	6/30	4	7	3	7/1	6	7
4	7/1	4	7	4	7/2	6	7
5	7/2	5	8	5	7/3	6	8
6	7/3	6	8	6	7/4	6	8
7	7/4	6	1	7	7/5	6	8
8	7/5	6	1	8	7/6	6	1
9	7/6	6	2	9	7/7	7	1
10	7/7	7	2	10	7/8	7	2
11	7/8	7	2	11	7/9	6	2
12	7/9	7	2	12	7/10	6	3
13	7/10	7	3	13	7/11	6	3
14	7/11	7	3	14	7/12	7	3
15	7/12	7	3	15	7/13	7	4
16	7/13	7	3	16	7/14	8	4
17	7/14	7	3	17	7/15	1	4
18	7/15	7	3	18	7/16	1	4
19	7/16	7	3	19	7/17	1	4
20	7/17	7	3	20	7/18	1	4

normalized amplitude가 1이상 인 경우

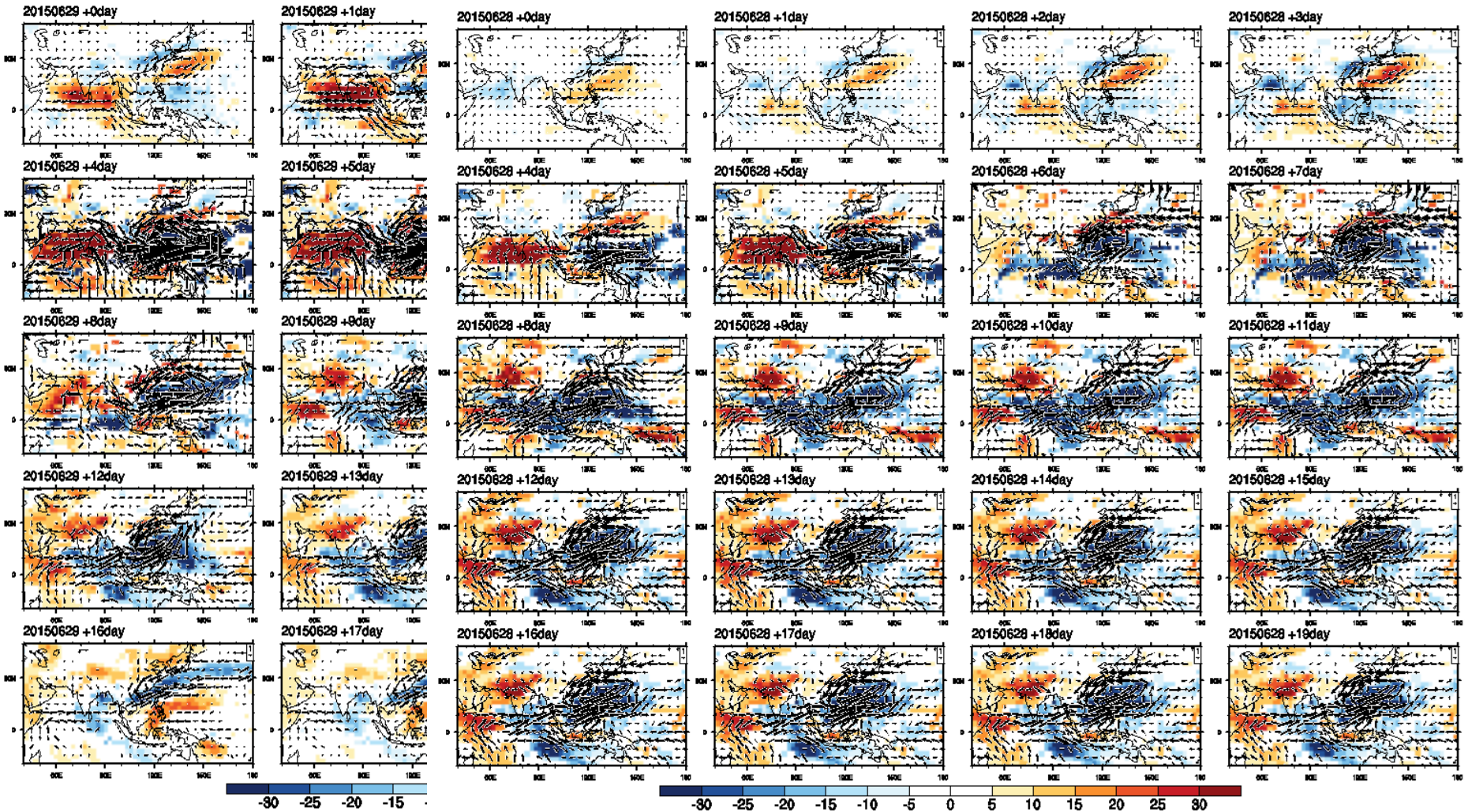
Application Possibility : Typhoon



BSISO activity in 2015

BSISO1+BSISO2 C

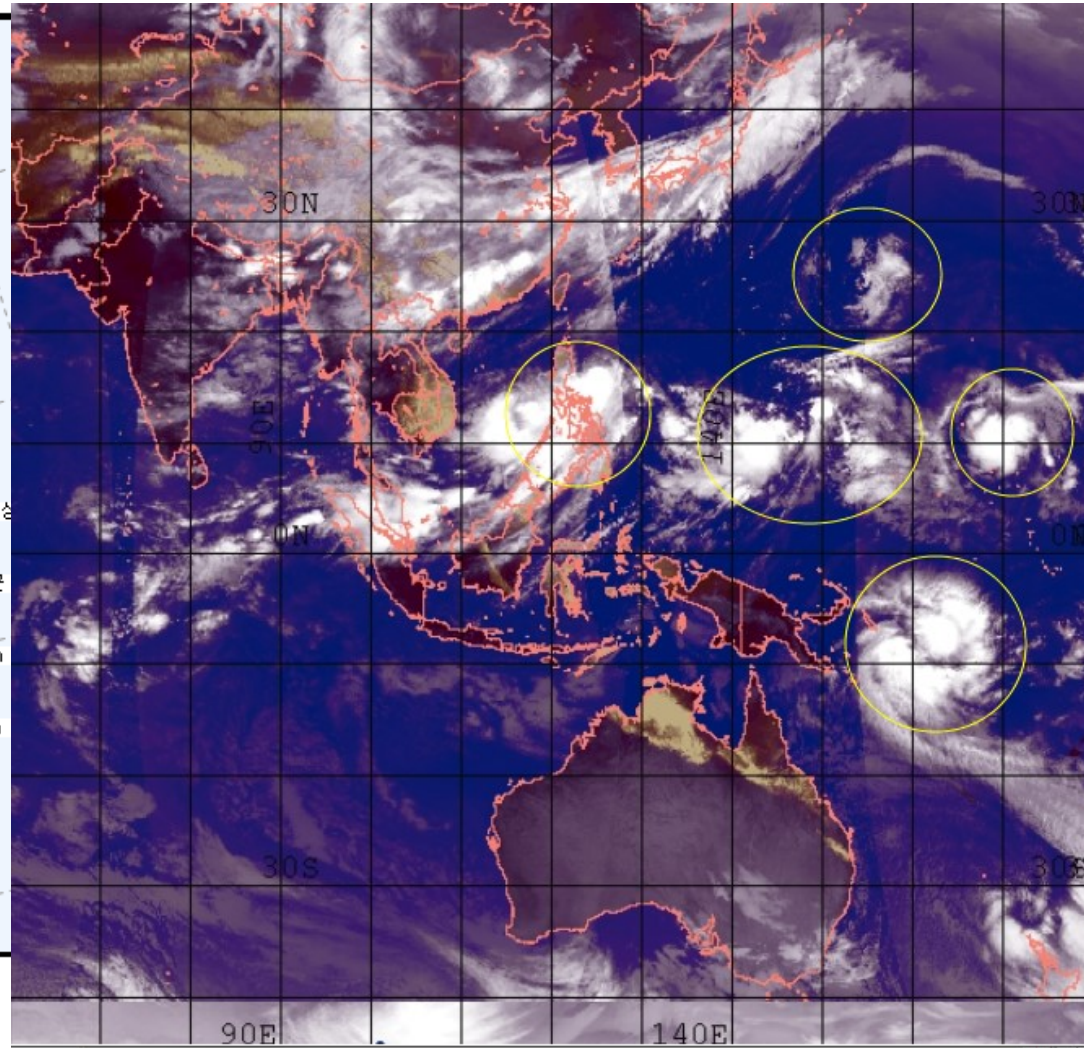
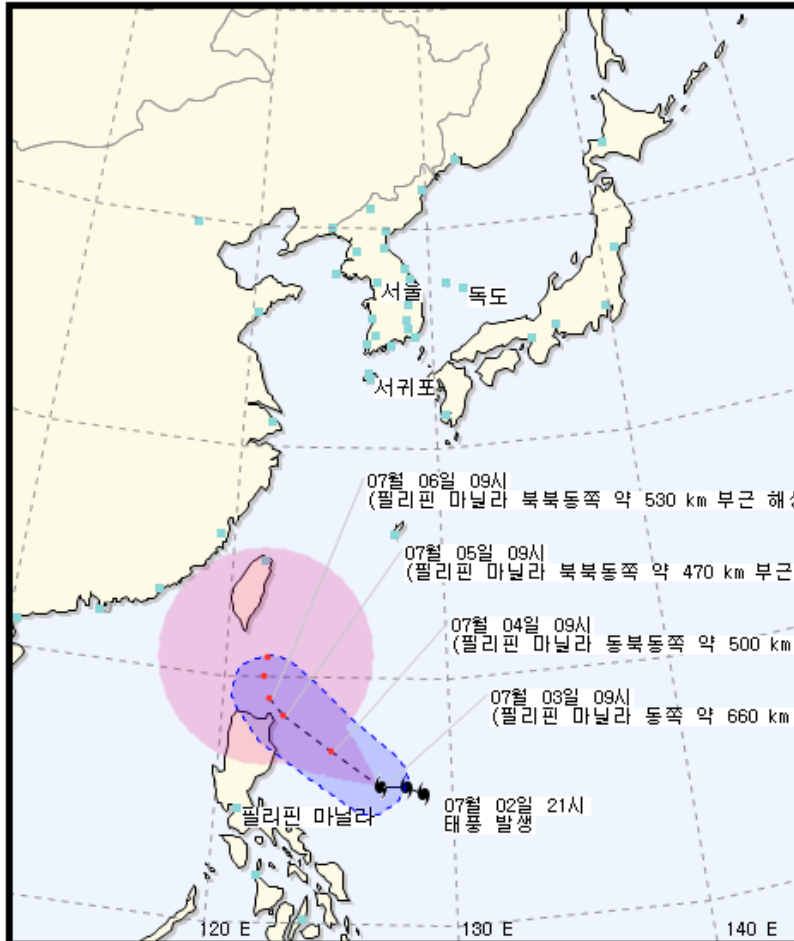
BSISO1+BSISO2 OLR&850hPa Wind anomaly (BOM)



Application Possibility : Typhoon



TC activity in 2015



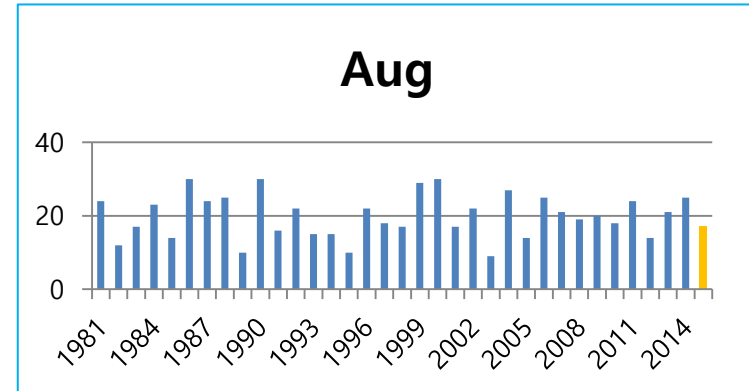
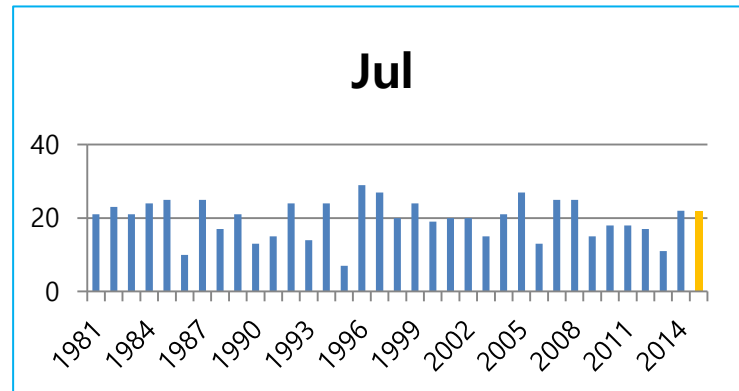
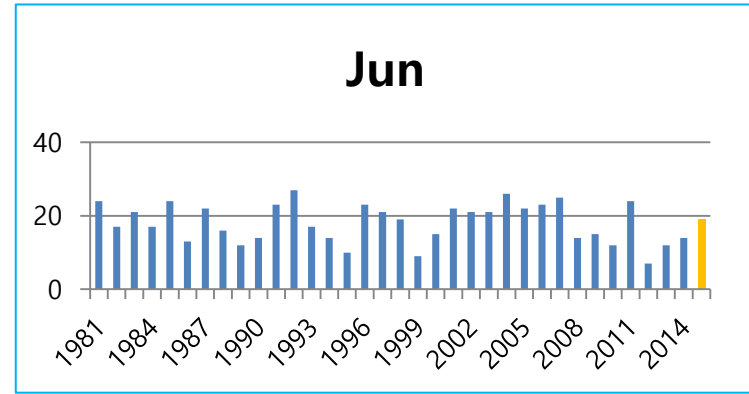
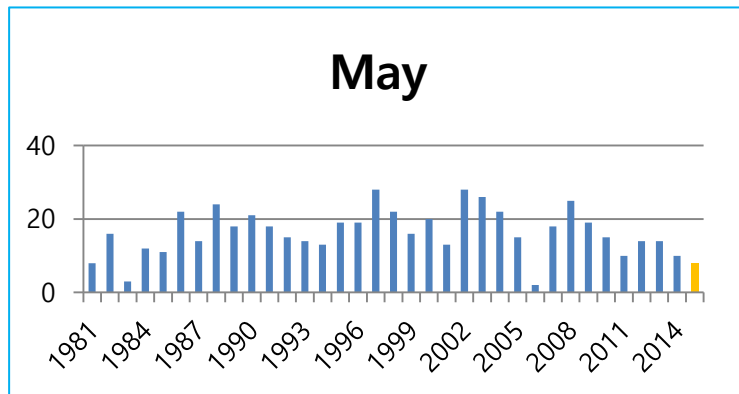
- 제10호 태풍 린파(LINFA)는 마카오에서 제출한 이름으로 연꽃을 의미함.
- 다음 정보는 오늘(3일) 16시 30분경에 발표될 예정임.
- 4일, 5일 후 태풍 위치가 유동적일 수 있으니, 이후 발표되는 기상정보에 유의바람.

Application Possibility : Typhoon



TC activity in 2015

Number of strong BSISO day (BSISO 1)

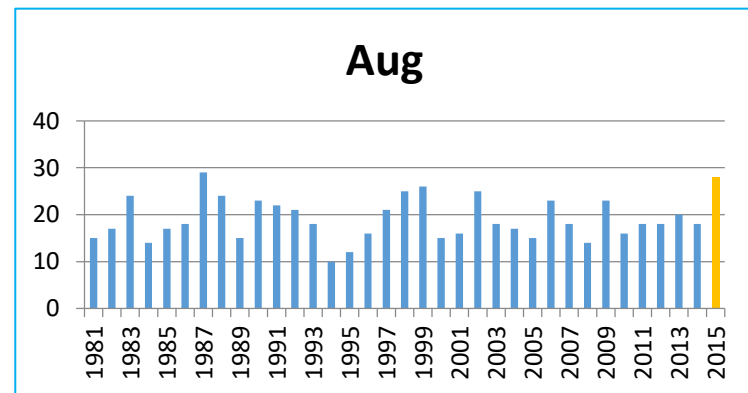
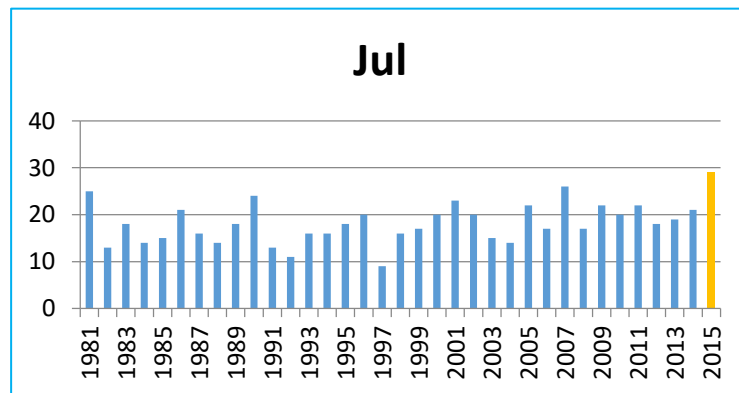
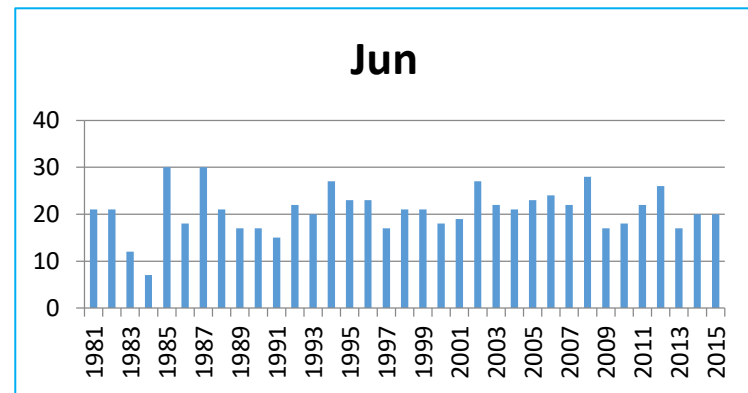
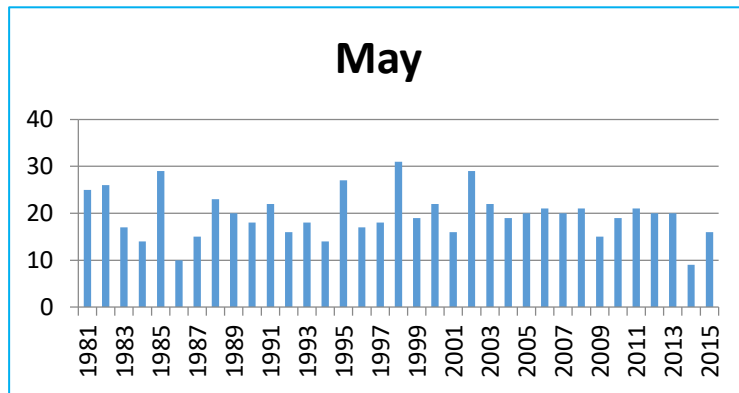


Application Possibility : Typhoon



TC activity in 2015

Number of strong BSISO day (BSISO 2)

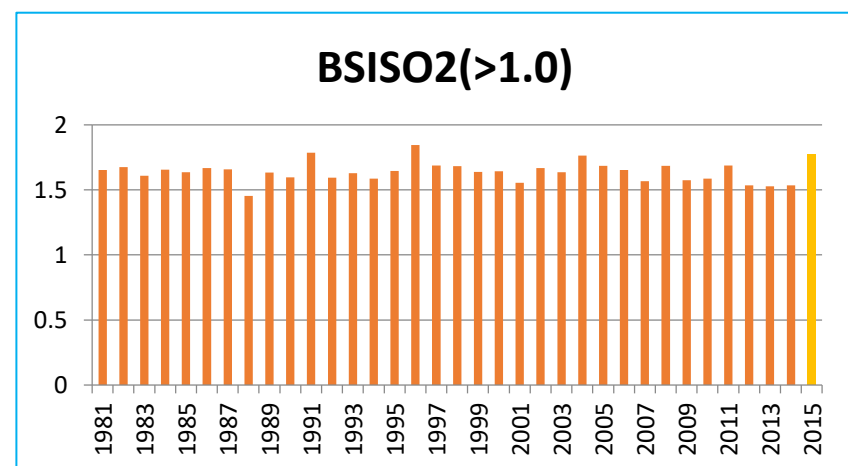
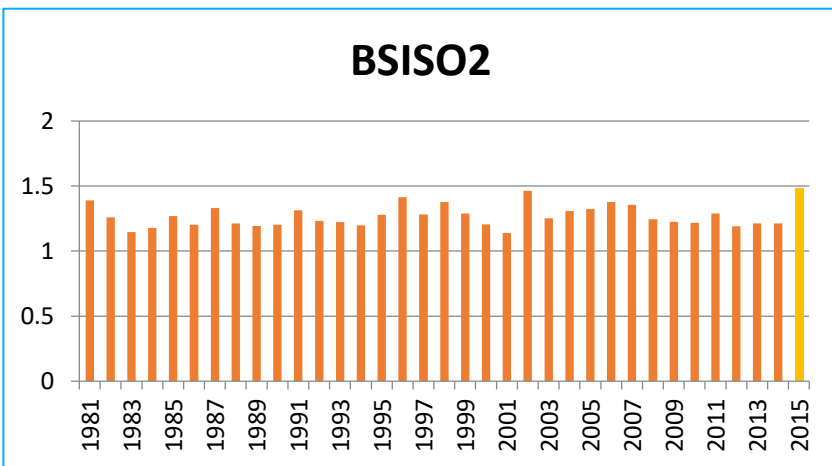
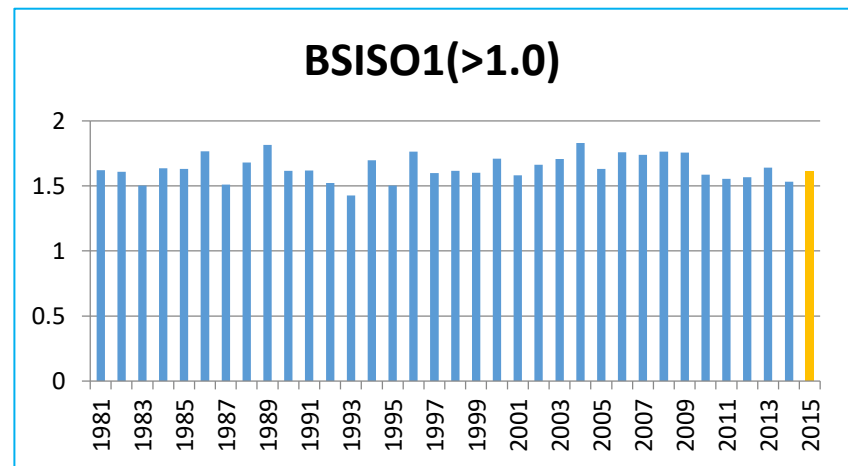
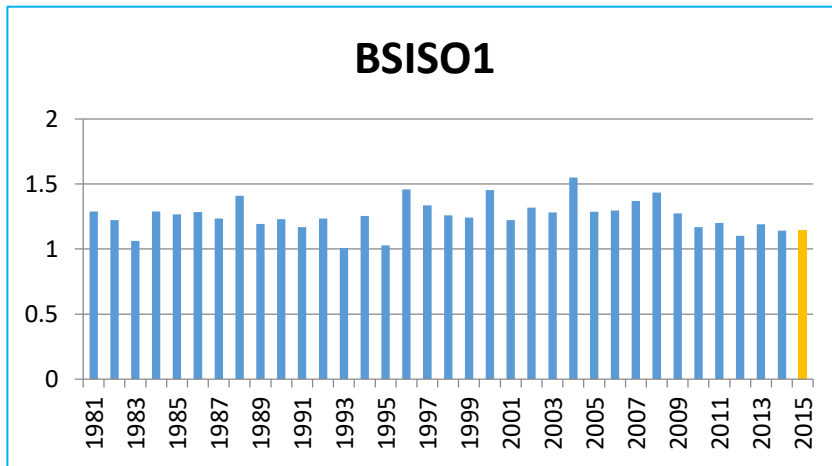


Application Possibility : Typhoon



TC activity in 2015

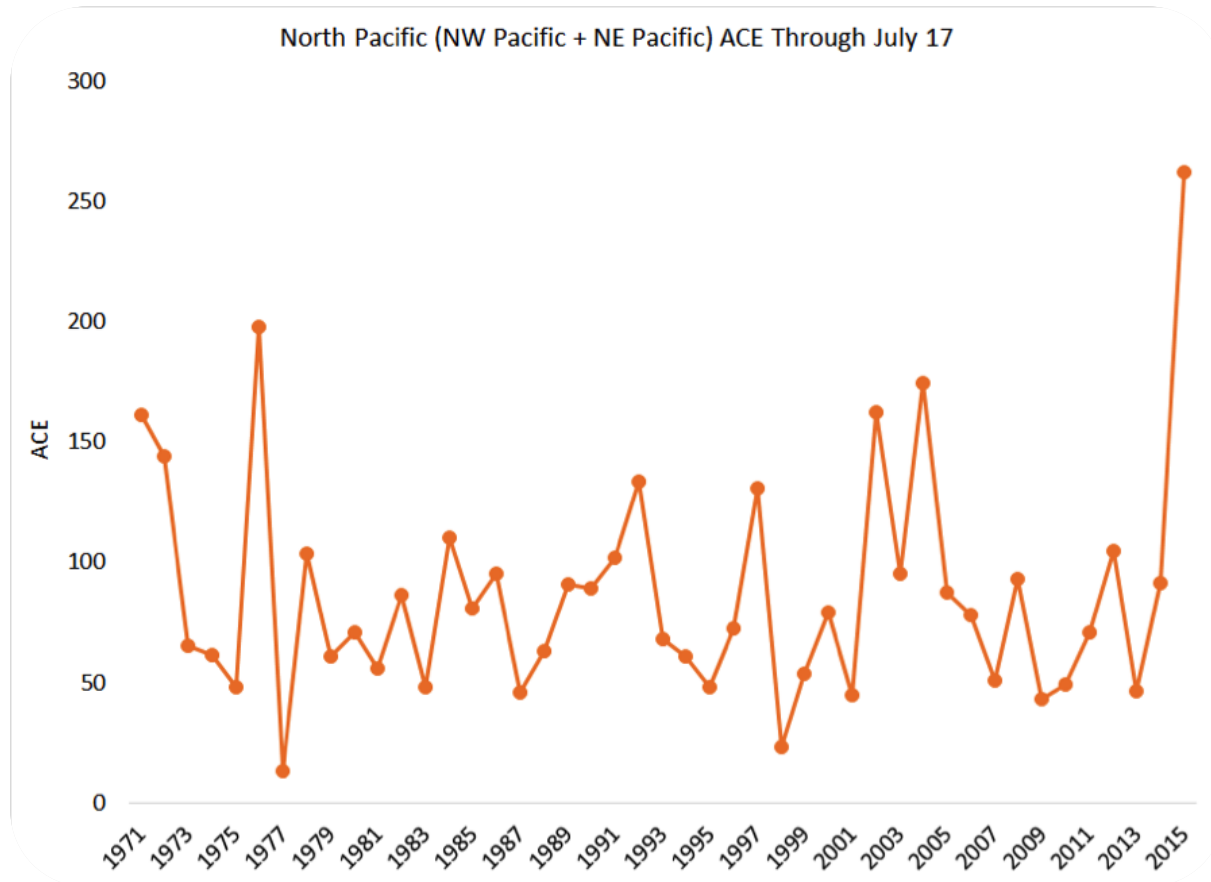
Averaged BSISO amplitude



Application Possibility : Typhoon



TC activity in 2015



Source: Philip J. Klotzbach, Colorado State University

North Pacific ACE is 30% higher for this time of year than at any other time since 1971!

Application Possibility : Typhoon



TC activity in 2015

TC development in conjunction with El Nino/MJO

EL NINO MEETS MJO

Source: Chris Borg, Surfline

When atmospheric and oceanic oscillations combine

By Chris Borg

Published: July 8, 2015 Views: 12,189

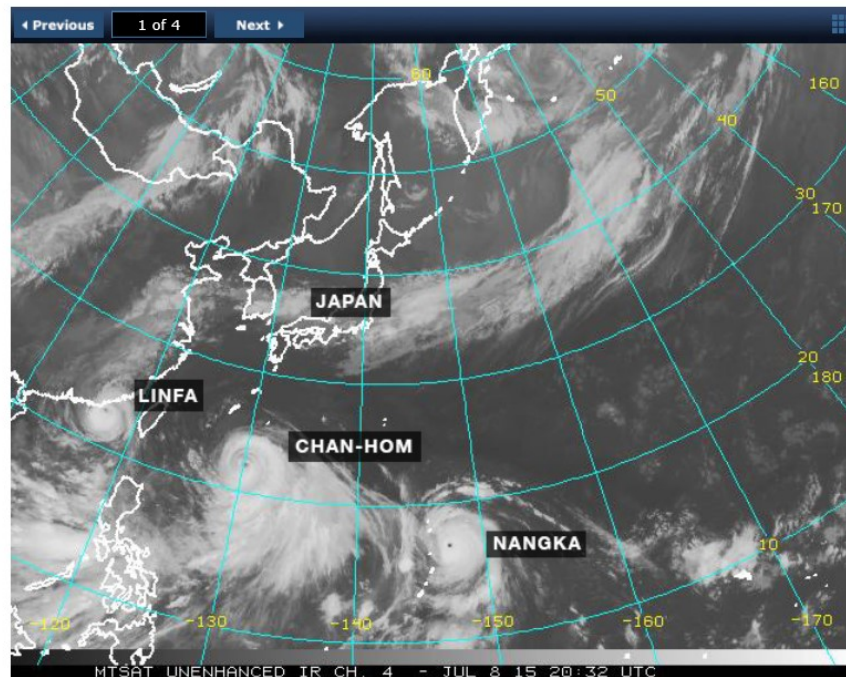


The words "El Nino" have made their way back into the news over the last few months by slowly, but surely, warming up waters of the tropical Pacific.

Now that El Nino has strengthened and is on the verge of breaking some temperature records in the central tropics, the world's best known atmospheric/oceanic event is being credited with causing nearly every weather anomaly anywhere in the Pacific. Of course not all of those claims are valid. While El Nino is definitely the star of the show, there are other players involved too. Like the MJO, for instance.



Handhu Fahli: Male Atolls



MTSAT UNENHANCED IR CH. 4 - JUL 8 15 20:32 UTC
The West Pacific tropics are going looney right now thanks primarily to the active phase of the MJO, but also to strengthening El Nino conditions. Image courtesy of NOAA.

Application Possibility : Typhoon

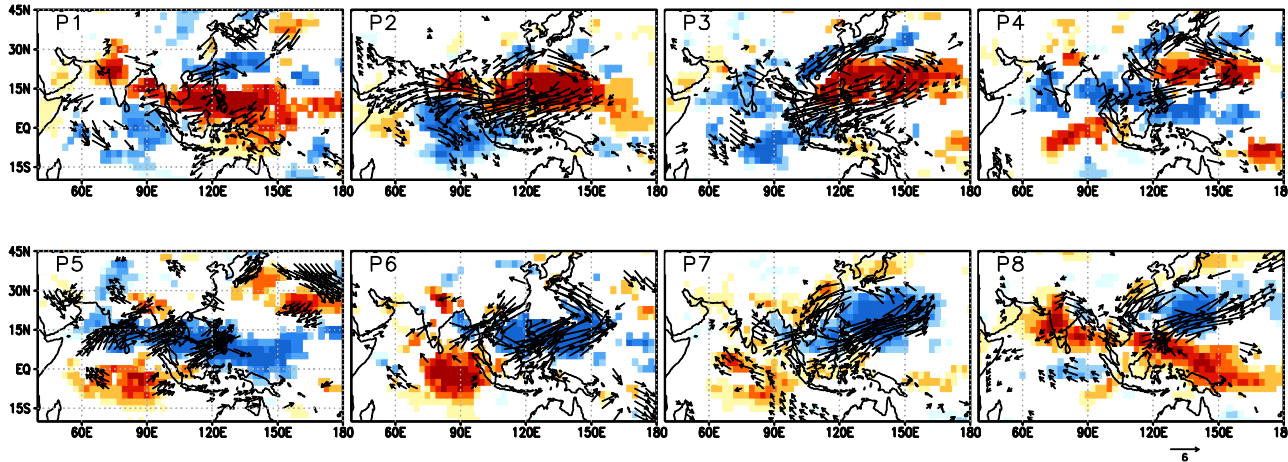


BSISO-TC activity relationship

OLR & 850hPa wind composite anomaly

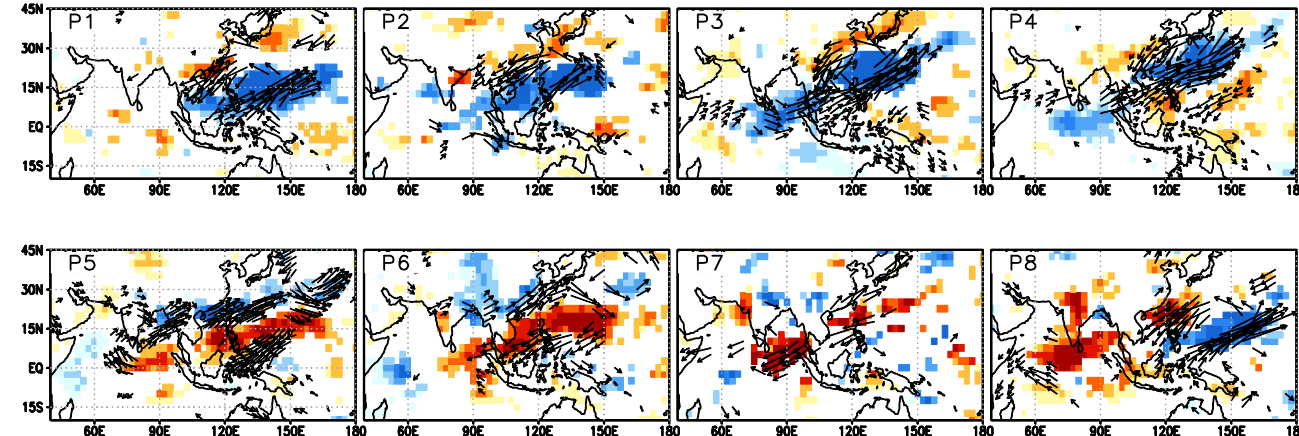
a)

BSISO1 AUG

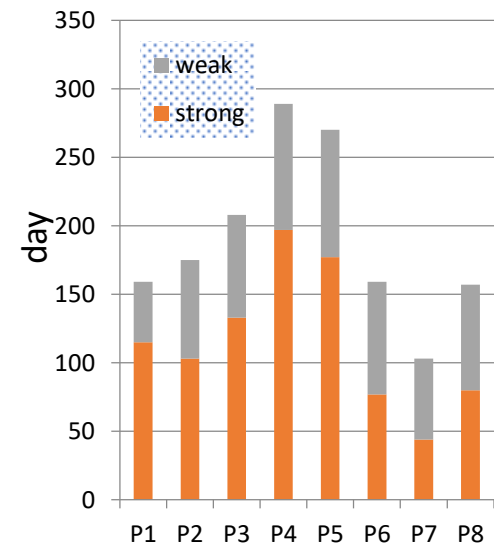
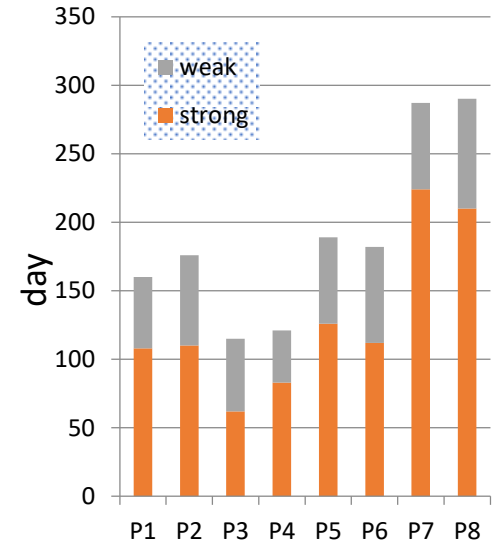


b)

BSISO2 AUG



BSISO-TC relationship

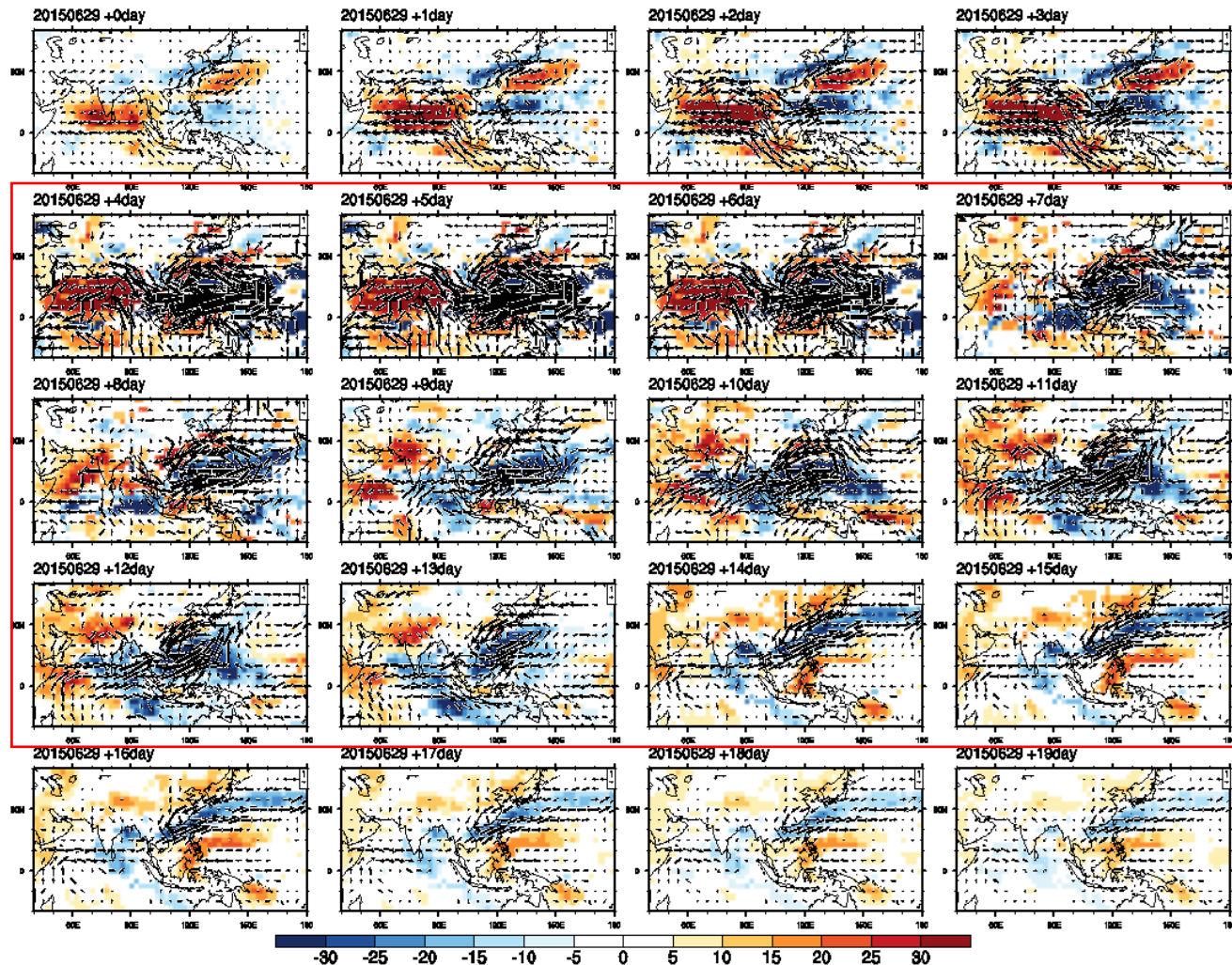


Application Possibility : Typhoon



BSISO-TC activity relationship

BSISO1+BSISO2 OLR&850hPa Wind anomaly (ECM) *Forecast*

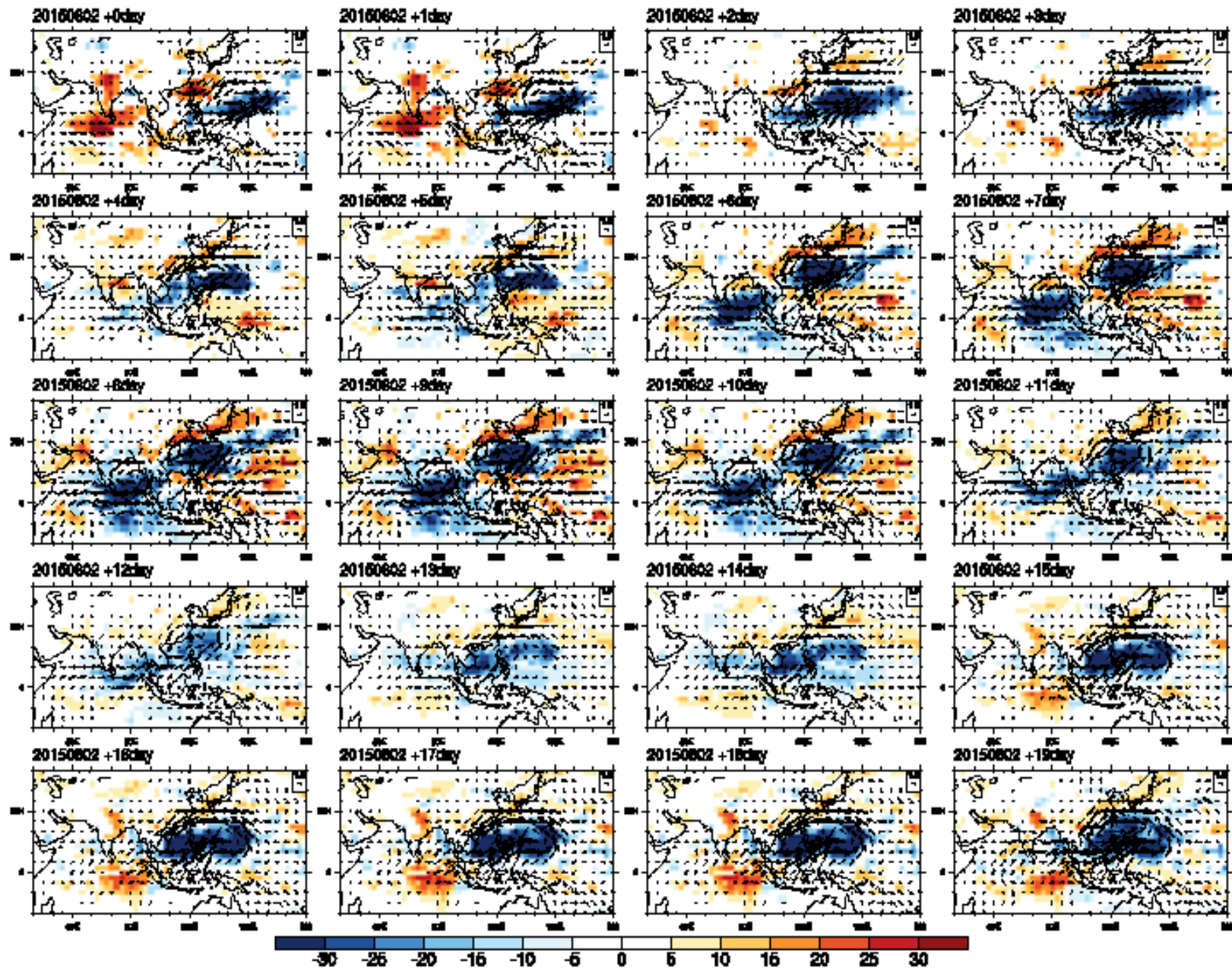


9 : Chanhom
10 : Linfa
11 : Nangka

Application Possibility : Typhoon

2016

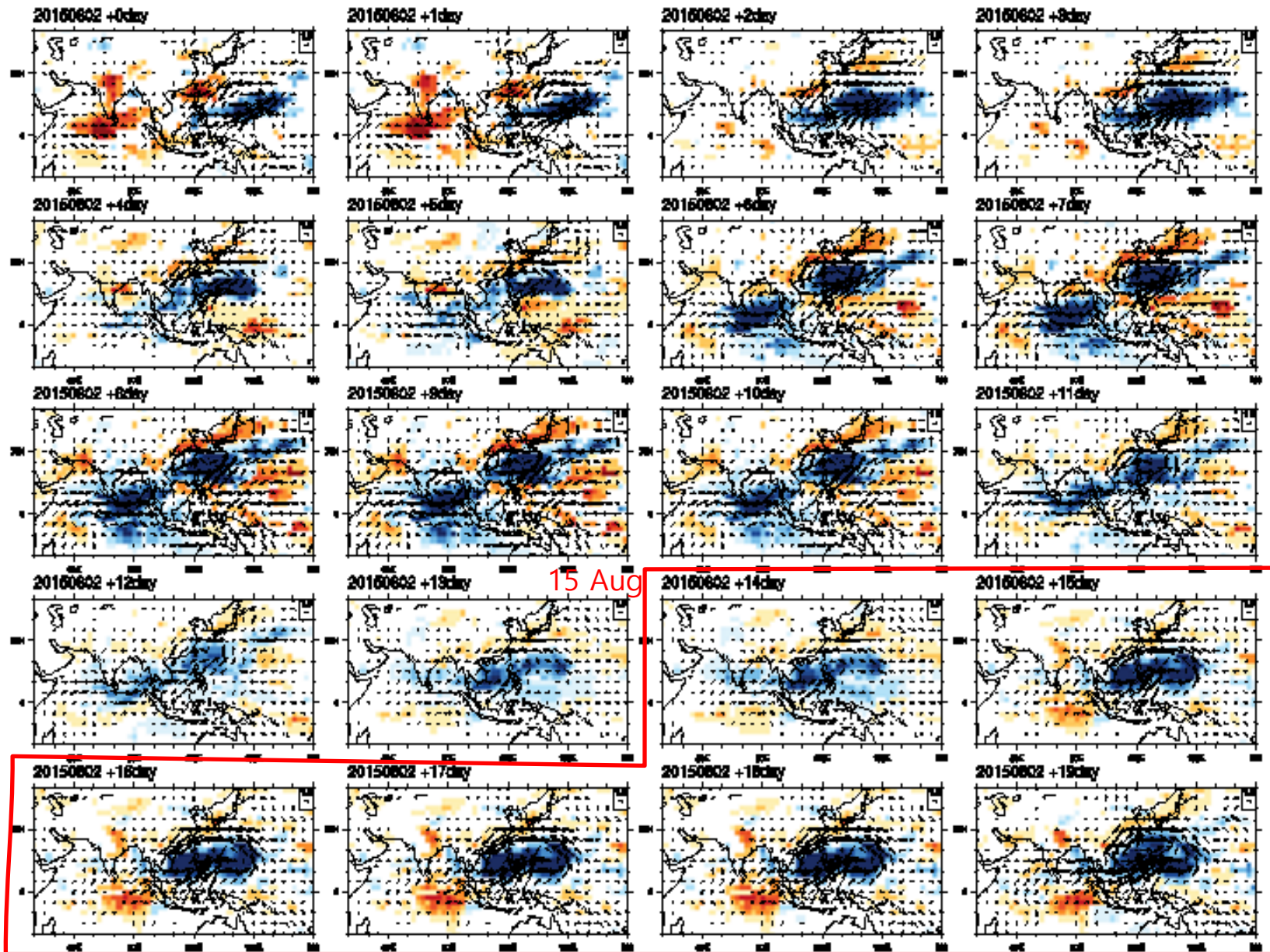
BSISO1+BSISO2 OLR&850hPa Wind anomaly (BOM) 2 AUG.~21 AUG.



Application Possibility : Typhoon

2016

BSISO1+BSISO2 OLR&850hPa Wind anomaly (BOM) 2 AUG.~21 AUG.



Application Possibility : Typhoon



BSISO-TC activity relationship

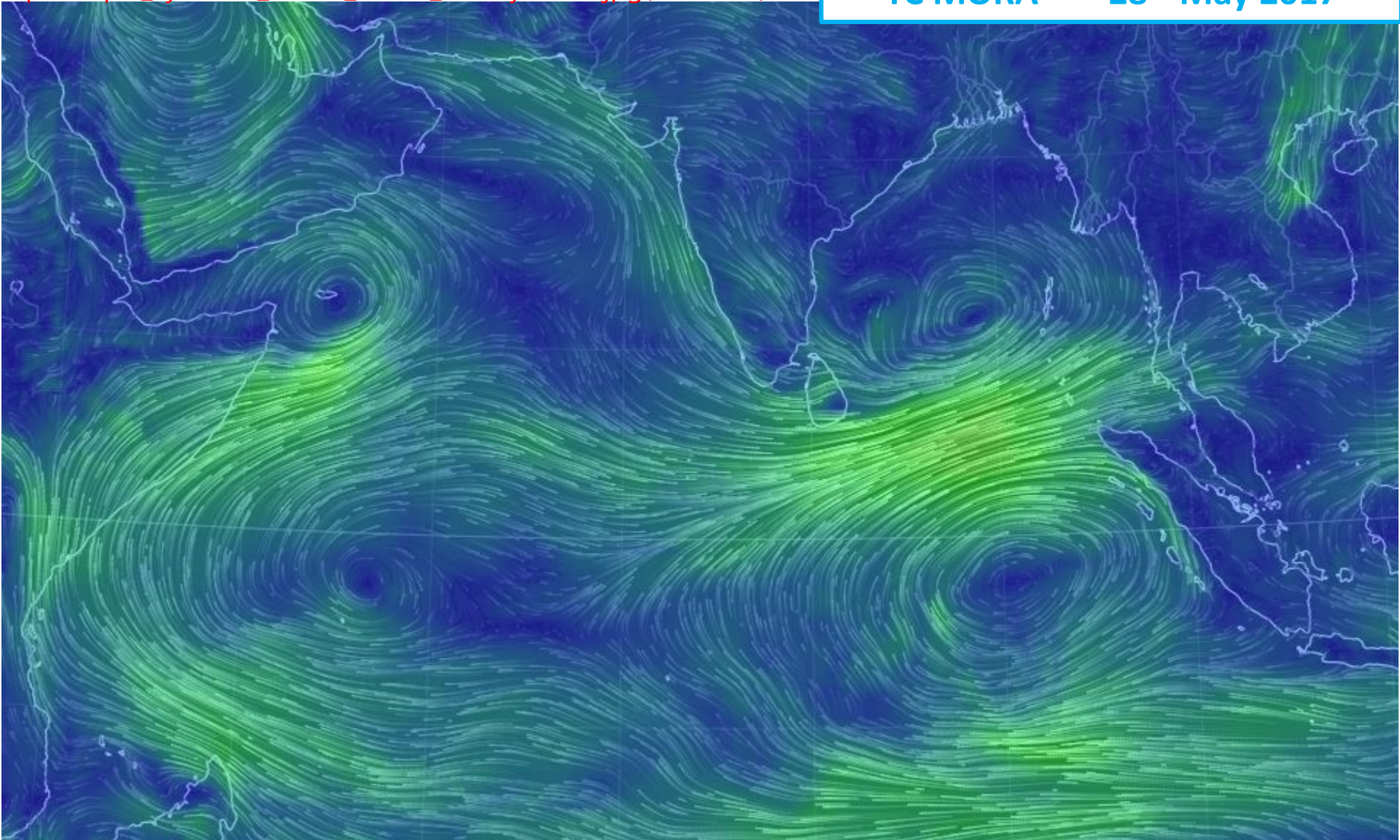
Is there any relationship between strong BSISO activity and TC activity in 2015?

Can BSISO forecast give some information on early detection for typhoon formation?

→ *BSISO-WP TC relationship*

: Focused on the *TC related variables* (e.g. Nolan et al., 2007; Camargo et al., 2000)

Absolute vorticity at 850 hPa, relative humidity at 700 hPa, maximum potent intensity, vertical shear between 850 and 200 hPa, Genesis Potential Index



Here is an interesting cyclonic formation in the Indian Ocean (see the attached image). One each in the Arabian Sea and Bay of Bengal and two more just south of the equator. Are they all interconnected? Any comments on this particular formation? I see that there are some studies on cross-equatorial twin cyclones, where each cyclone impact the growth and track of the other cyclone.

Here is one study: <http://onlinelibrary.wiley.com/doi/10.1029/2000JD000066/full>

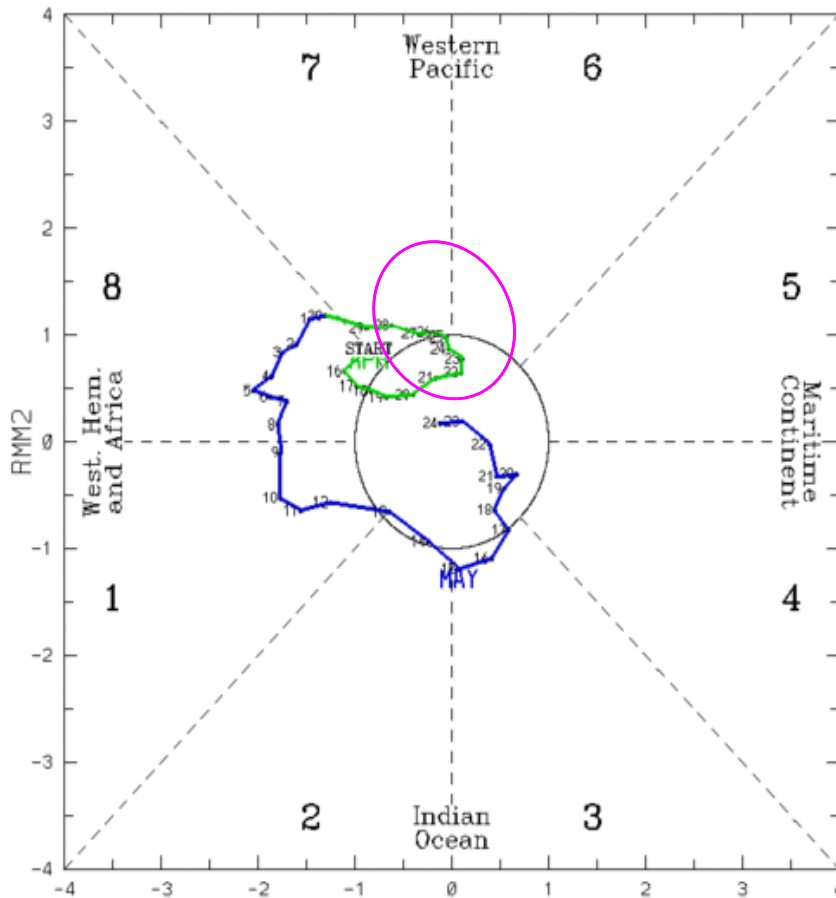
Regards, Roxy

Application Possibility : Typhoon



BSISO-TC activity relationship

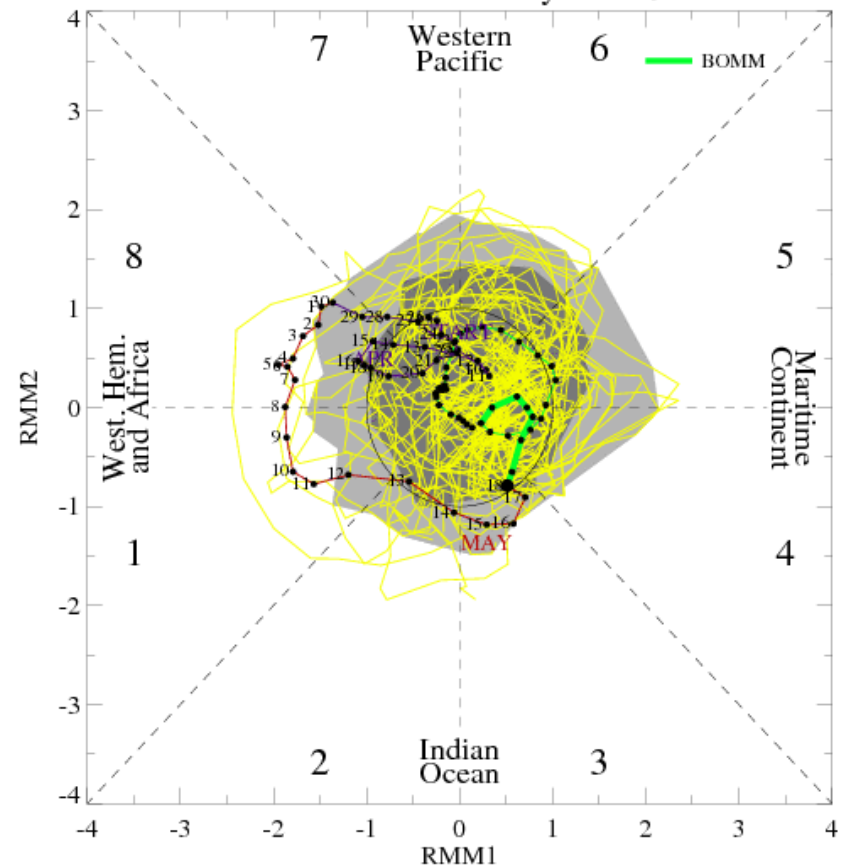
(RMM1,RMM2) phase space for 15-Apr-2017 to 24-May-2017



Labelled dots for each day.

Blue line is for May, green line is for Apr, red line is for Mar.

MJO Index Forecast for 18May2017-29Jun2017



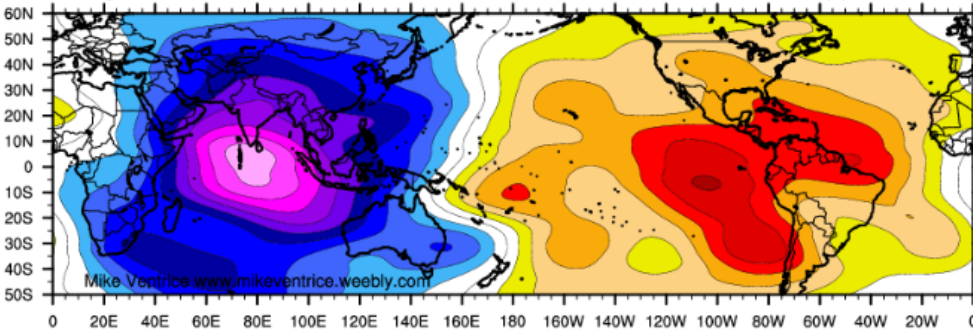
MJO filtered VP200 Forecast

TC MORA

28th May 2017

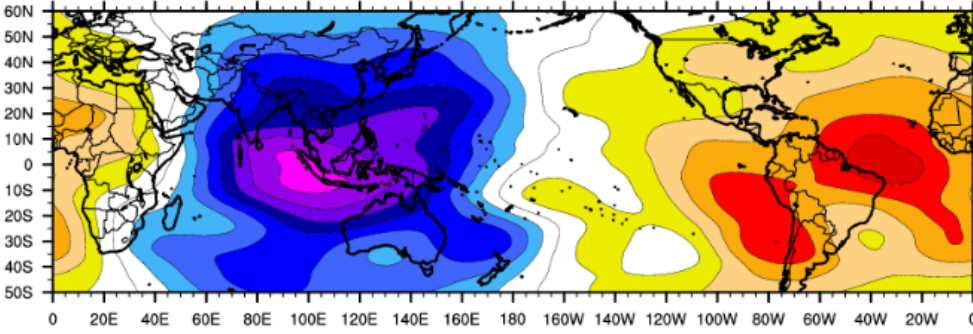
Today

[Updated: 5/26/2017]



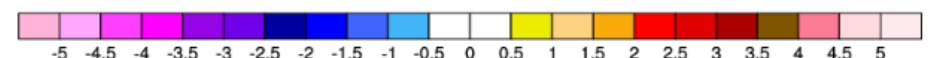
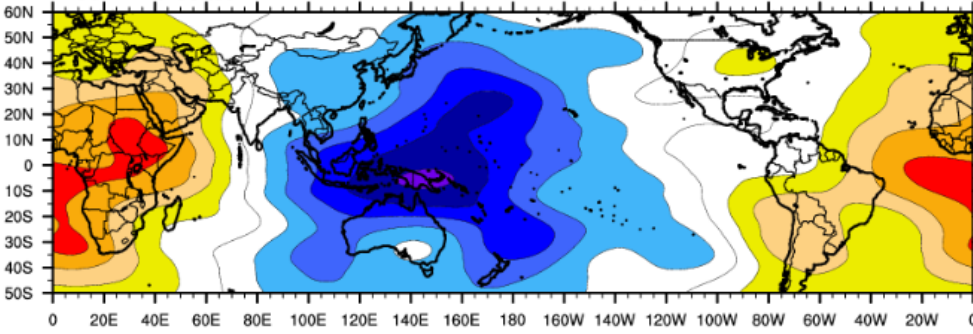
Week 1 Forecast

[0000 UTC 27 May 2017 - 0000 UTC 2 Jun 2017]



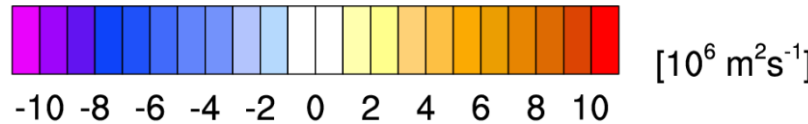
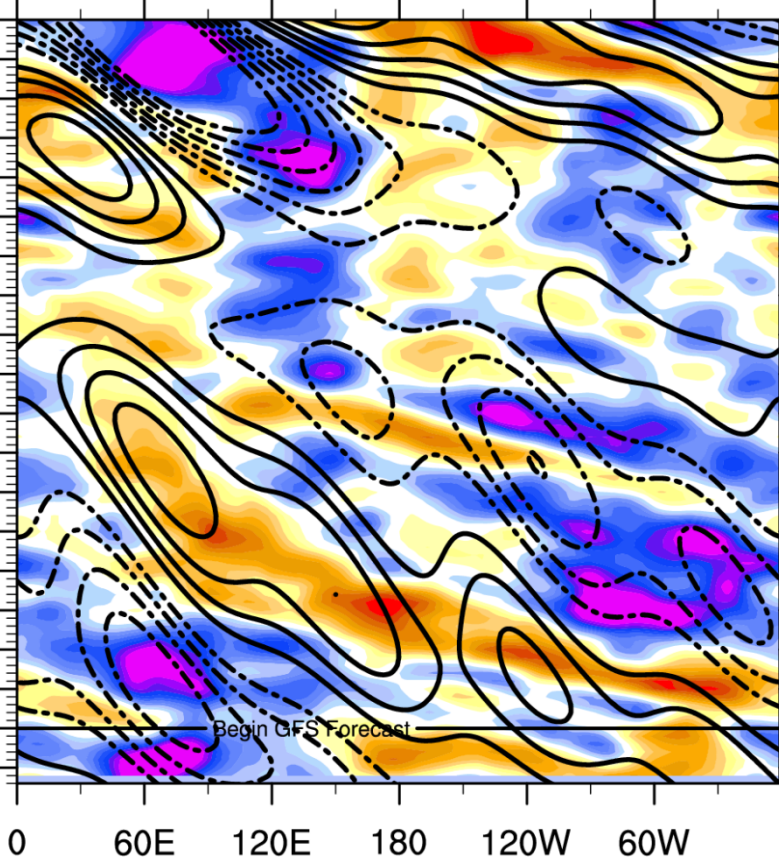
Week 2 Forecast

[0000 UTC 3 Jun 2017 - 0000 UTC 9 Jun 2017]



5S-5N: 200-hPa velocity potential anomalies

- Feb 24
- Mar 01
- Mar 06
- Mar 11
- Mar 16
- Mar 21
- Mar 26
- Mar 31
- Apr 05
- Apr 10
- Apr 15
- Apr 20
- Apr 25
- Apr 30
- May 05
- May 10
- May 15
- May 20
- May 25
- May 30



Application Possibility : Typhoon

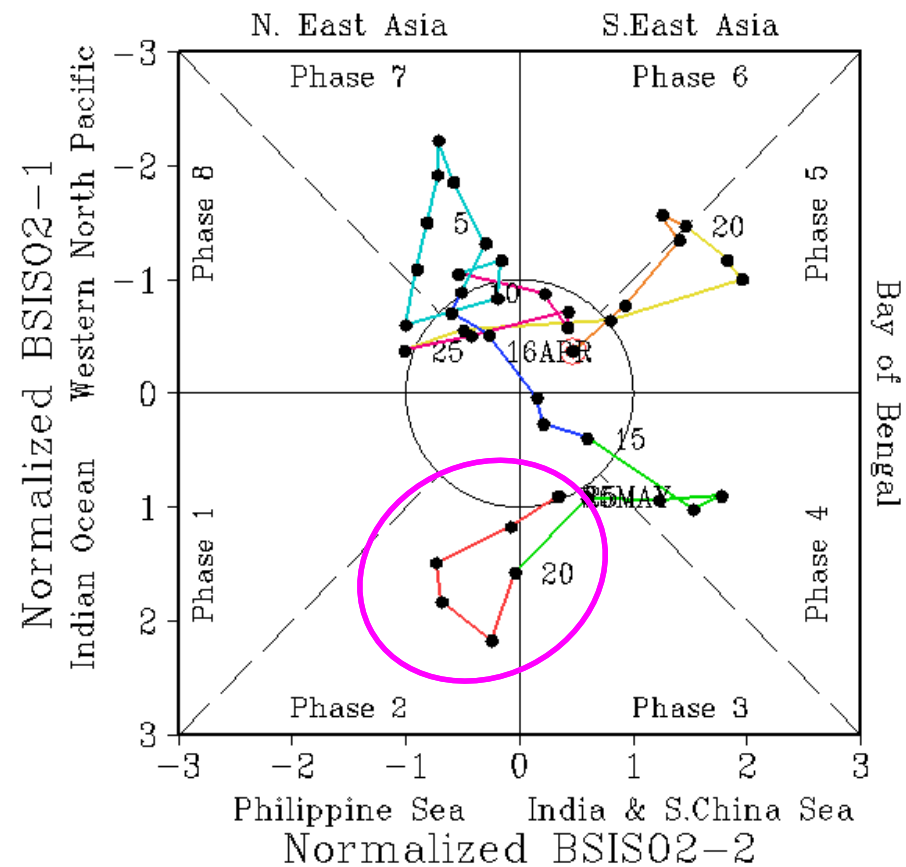
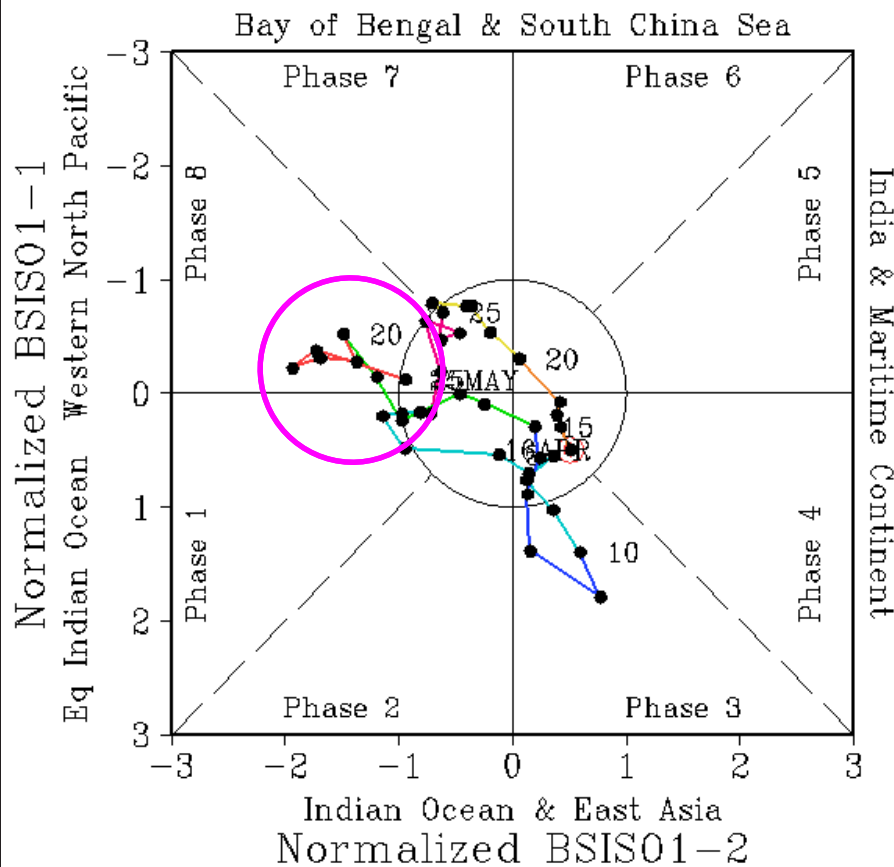


BSISO-TC activity relationship

BSISO Monitoring for 16Apr2017~25May2017

BSISO 1

BSISO 2

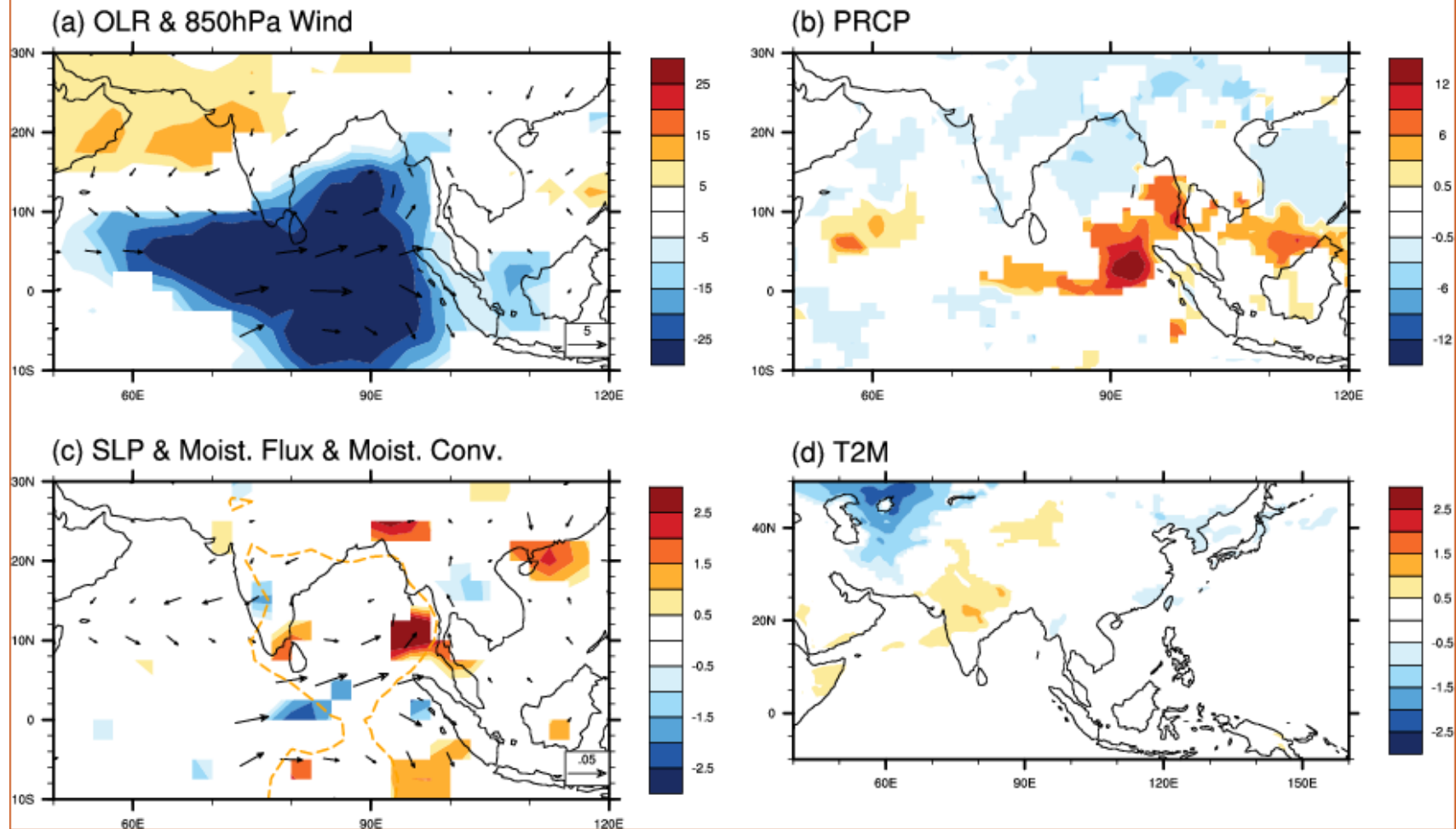


Application Possibility : Typhoon



BSISO-TC activity relationship

BOM fields estimated by BSISO index: 20170521(+4day)

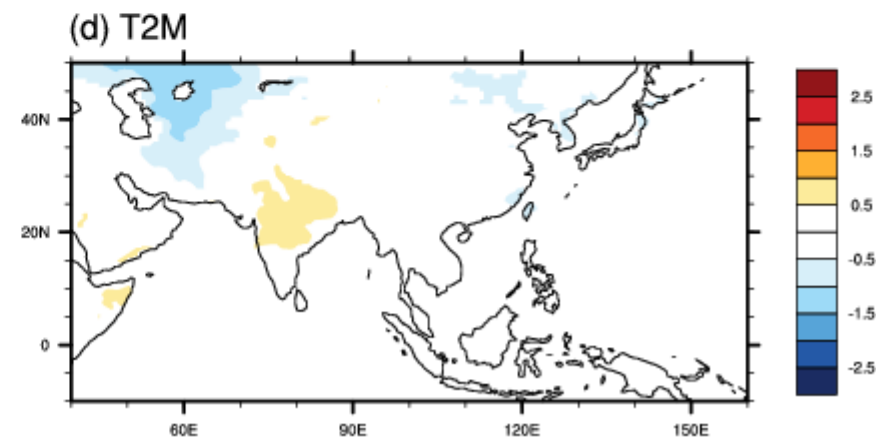
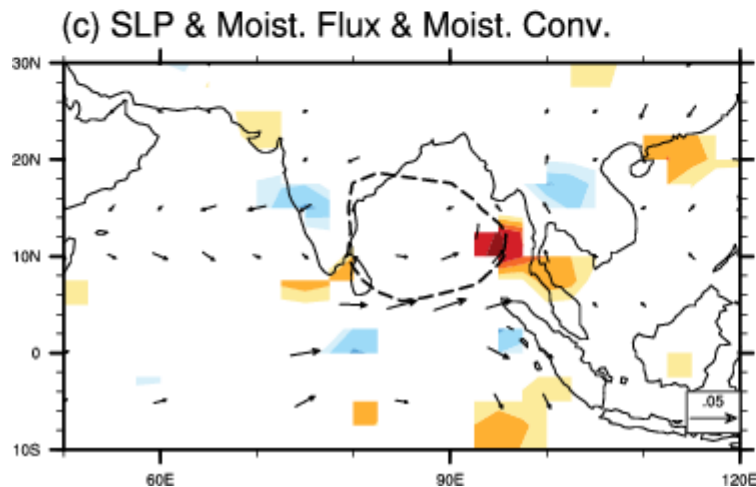
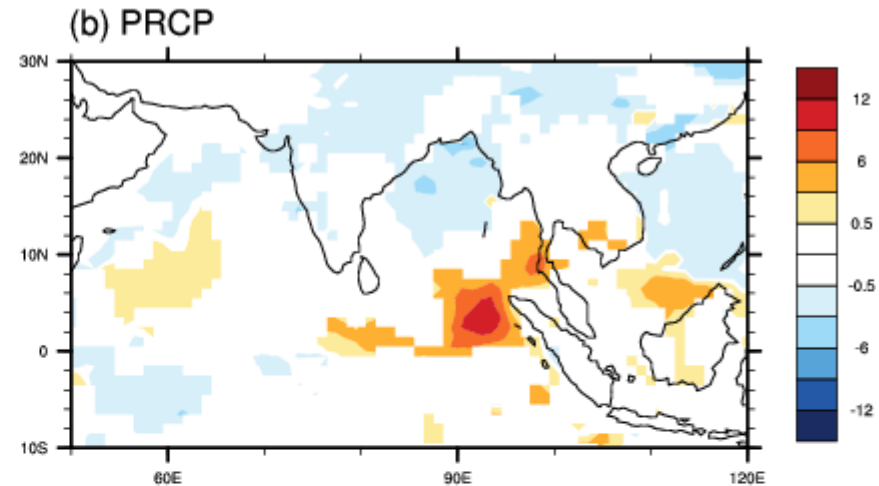
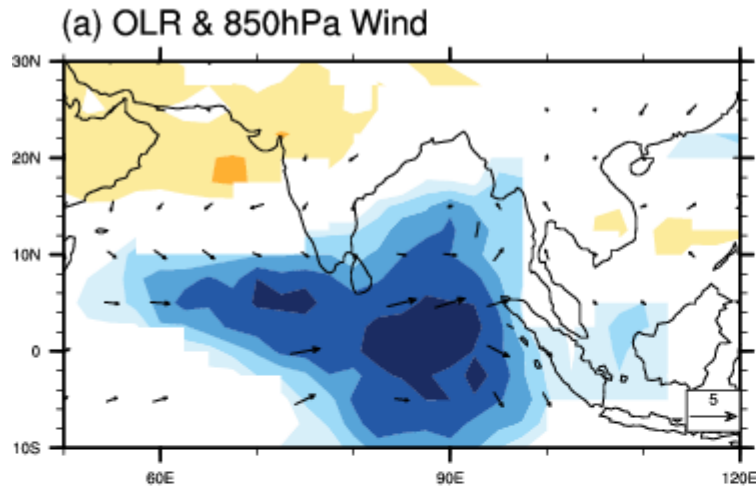


Application Possibility : Typhoon



BSISO-TC activity relationship

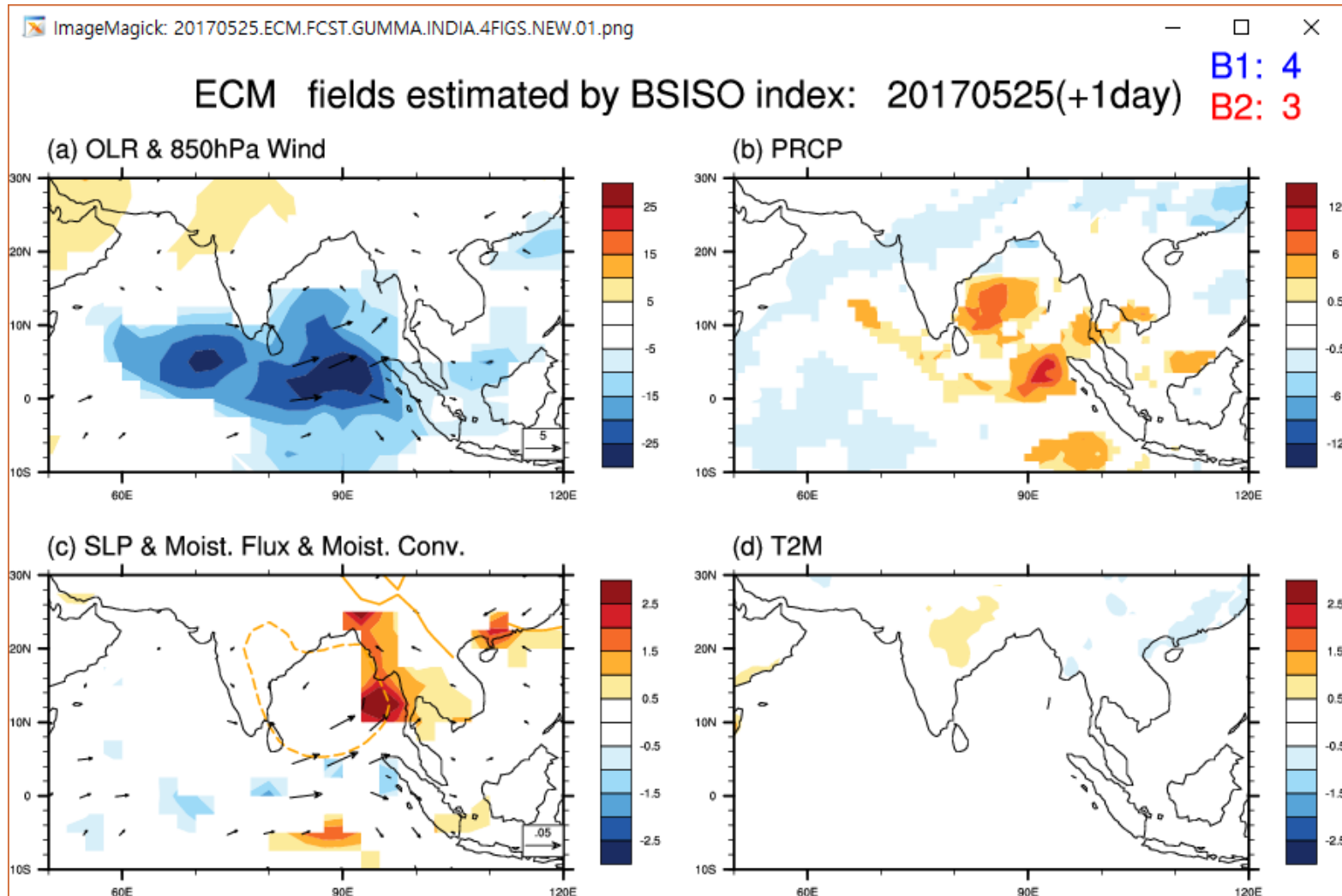
ECM fields estimated by BSISO index: 20170522(+3day)



Application Possibility : Typhoon



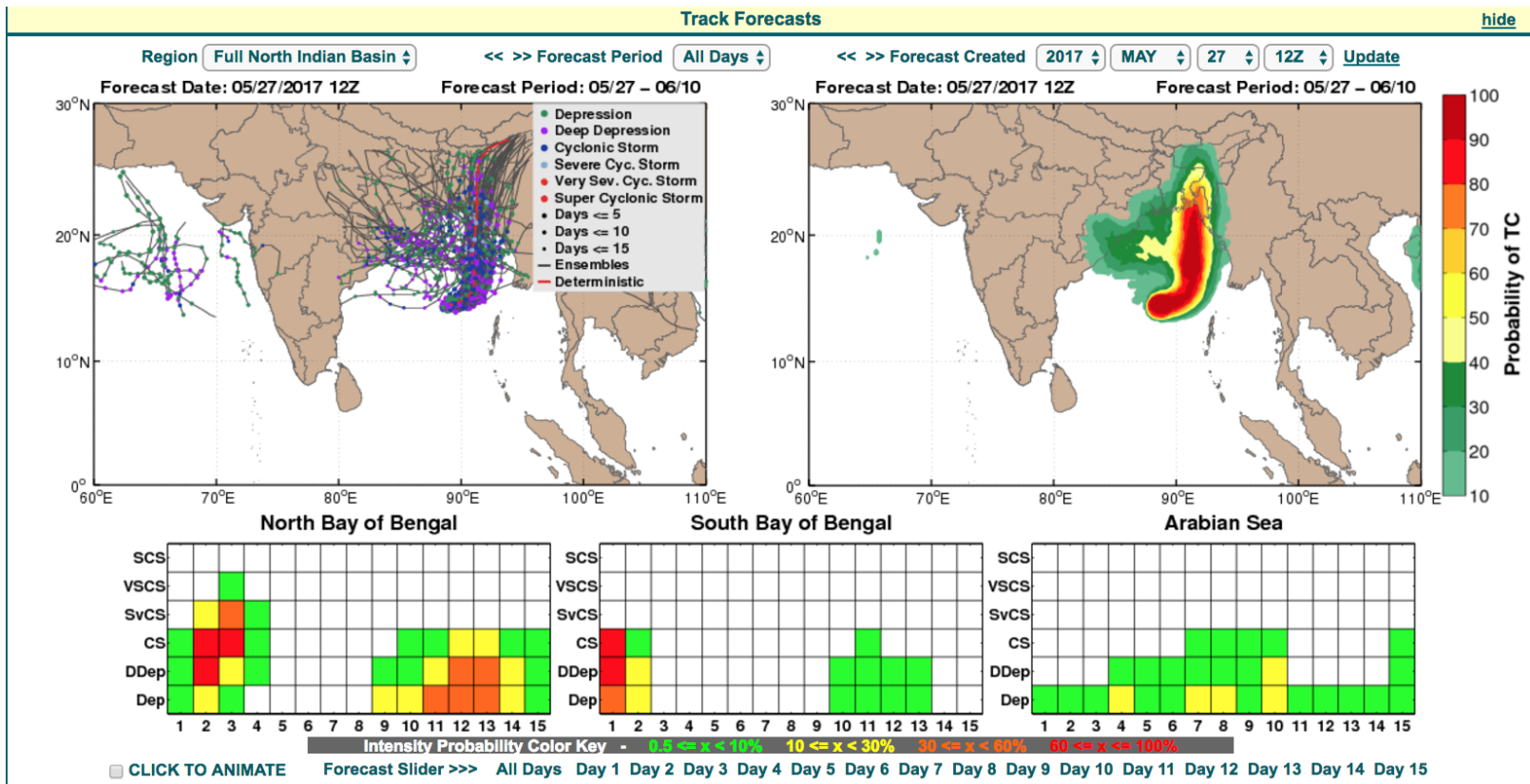
BSISO-TC activity relationship



Roxy

I am jumping in to discussion rather late. What you have shown is cyclonic circulations and not the cyclonic formation. These do not have vertical continuity in the vorticity field. These are not seen on the next days chart also. Such cyclonic circulations are seen to present every day on the Indian land area at lower and middle troposphere. These are formed by conversion of shear vorticity into curvature vorticity and from energetic's point of view Kz to K_e conversion. Sometimes these are formed due to meeting of winds from two directions which produces convergence and vorticity. These do not have vertical structure like lows , depressions. Their lifetime is also small (one day). They do not travel much.

jrk



Hi All,

Please see below the CFAN forecast for eminent TC approaching Bangladesh.. Surprisingly, no warnings from IMD, BMD, Bangladesh FFWC or RIMES. This is alarming (and disappointing) given that the CFAN EC-based forecast suggests a severe TC landfalling within 3 days!.

I will keep you posted. PW



India Meteorological Department.
Earth System Science Organisation.
(Ministry of Earth Sciences).

BULLETIN NO.: 01 (BOB 02/2017).

TIME OF ISSUE: 0900 HOURS IST

DATED: 28.05.2017.

FROM: INDIA METEOROLOGICAL DEPARTMENT (FAX NO. 24643965/24699216/24623220).

TO: CONTROL ROOM, NDM, MINISTRY OF HOME AFFAIRS (FAX.NO. 23093750).

CONTROL ROOM NDMA (FAX.NO. 26701729).

CABINET SECRETARIAT (FAX.NO.23793144).

PS TO HON'BLE MINISTER FOR S & T AND EARTH SCIENCES (FAX NO.23316745).

SECRETARY, MOES, (FAX NO. 24629777).

SECRETARY, DST (FAX NO. 26863847/-2418).

H.Q. (INTEGRATED DEFENCE STAFF AND CDS) (FAX NO. 23005137/23005147).

DIRECTOR GENERAL, DOORDARSHAN (23385843).

DIRECTOR GENERAL, AIR (25843825).

PIB MOES (FAX NO. 23389042).

UNI (FAX NO. 23355841).

D.G. NATIONAL DISASTER RESPONSE FORCE (NDRF) (FAX NO. 26105912).

CHIEF SECRETARY, GOVT.OF WEST BENGAL (033-22144328).

CHIEF SECRETARY, GOVT.OF TRIPURA (0381-2414013).

CHIEF SECRETARY, GOVT.OF MANIPUR (0385-2452629, 0385-2451144).

CHIEF SECRETARY, GOVT.OF MIZORAM (0389-2322745, 0389-2314627).

CHIEF SECRETARY, ANDAMAN & NICOBAR ISLANDS (FAX No. 03192-223331).

Sub: Depression over Central Bay of Bengal.

Latest observations & satellite imagery indicate that a depression has formed over central Bay of Bengal and lay centred at 0530 hrs IST of today, the 28th May, 2017 near Latitude 14.0° N and Longitude 88.5° E, about 950 km south of Kolkata and 980 km south-southwest of Chittagong. The system is very likely to move north-northeastwards and reach Bangladesh coast by 30th May 2017 forenoon. It is very likely to intensify into a deep depression during next 24 hours.

Warning:

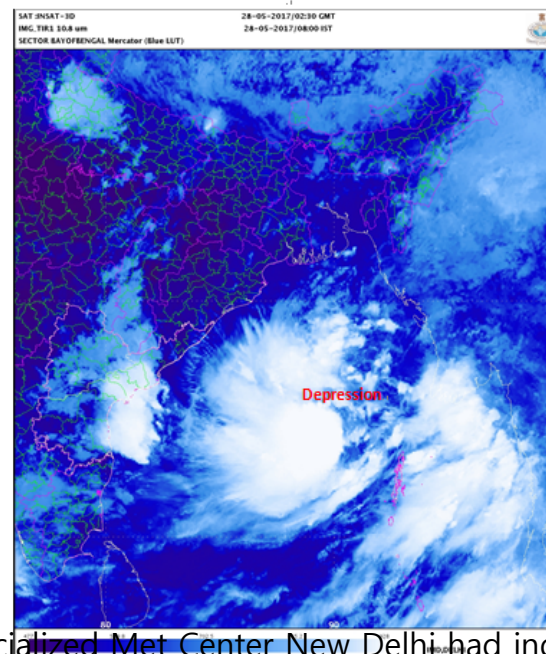
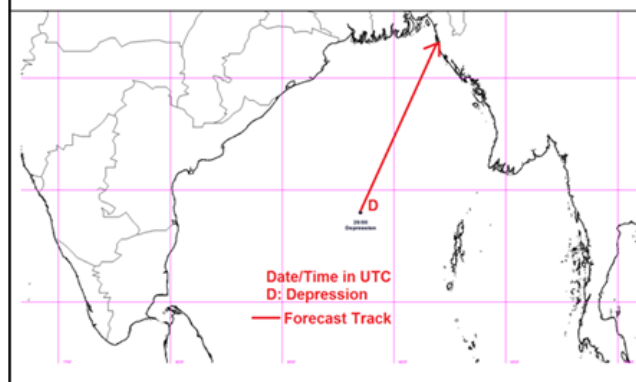
- (i) **Wind warning:** Squally winds speed reaching 40-50 kmph gusting to 60 kmph would prevail along & off Andaman Islands and adjoining Sea areas during next 48 hours.
- (ii) **Sea condition:** Sea condition would be rough to very rough along & off Andaman Islands during next 48 hours.
- (iii) **Fishermen Warning:** Fishermen are advised not to venture into sea along & off Andaman Islands during next 48 hrs. Fishermen out at sea are advised to return to the coast.

The next bulletin will be issued at 1130 hrs IST of 28th May 2016.

(Naresh Kumar).
Scientist-D.
RSMC, New Delhi.

Copy to: DFDD, Pune/ACWC Kolkata /ACWC Chennai/CWC Vishakhapatnam/CWC Bhubaneswar/MC Hyderabad.

OBSERVED POSITION AND FORECAST TRACK OF DEPRESSION OVER BAY OF BENGAL BASED ON 0000 UTC OF 28TH MAY, 2017



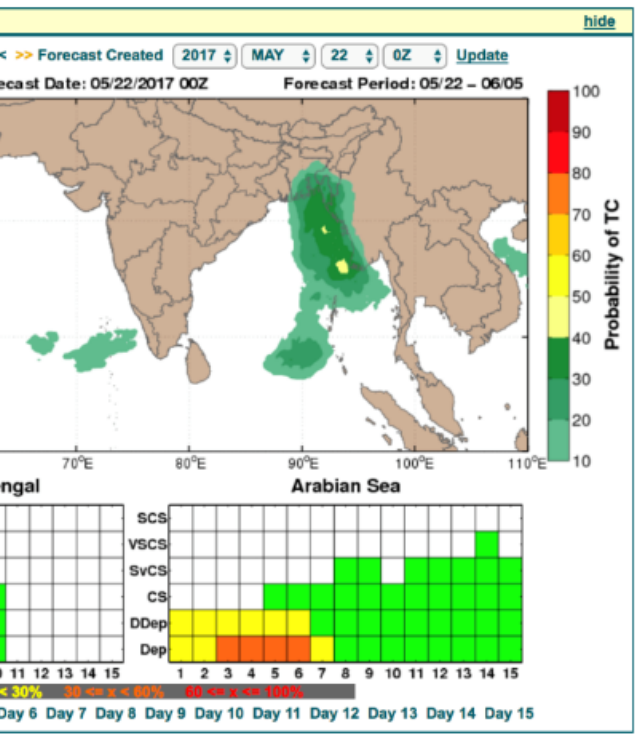
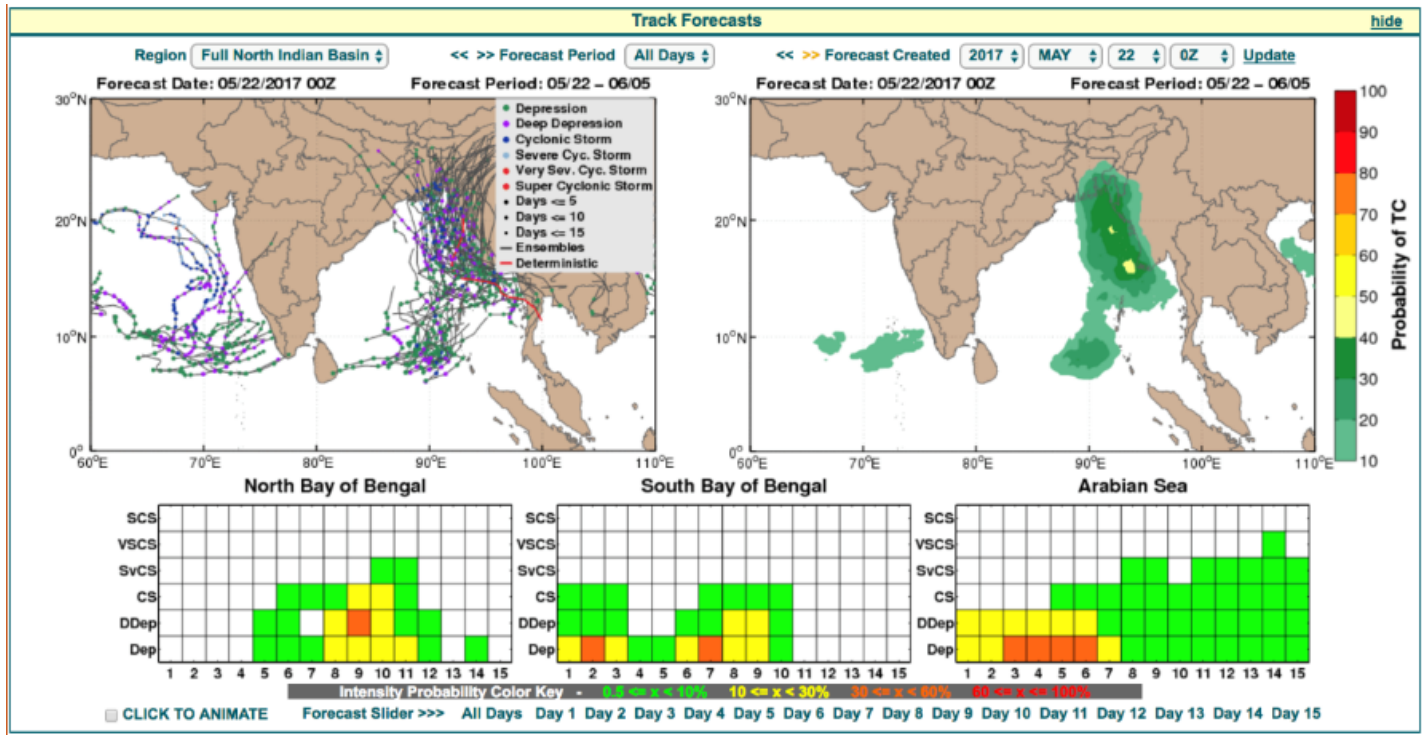
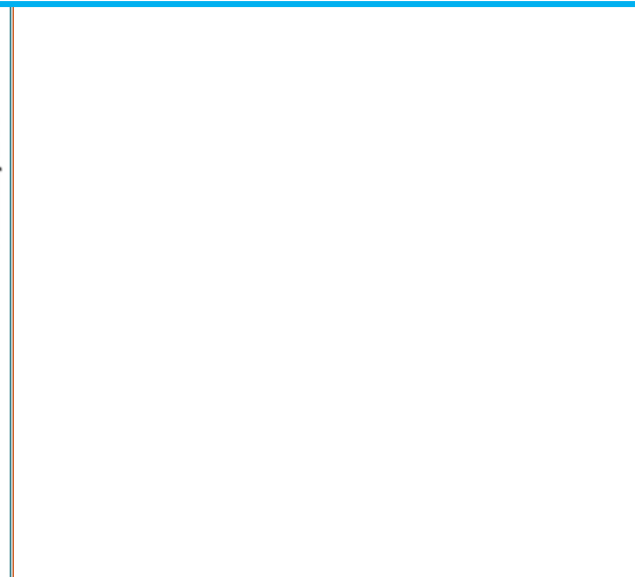
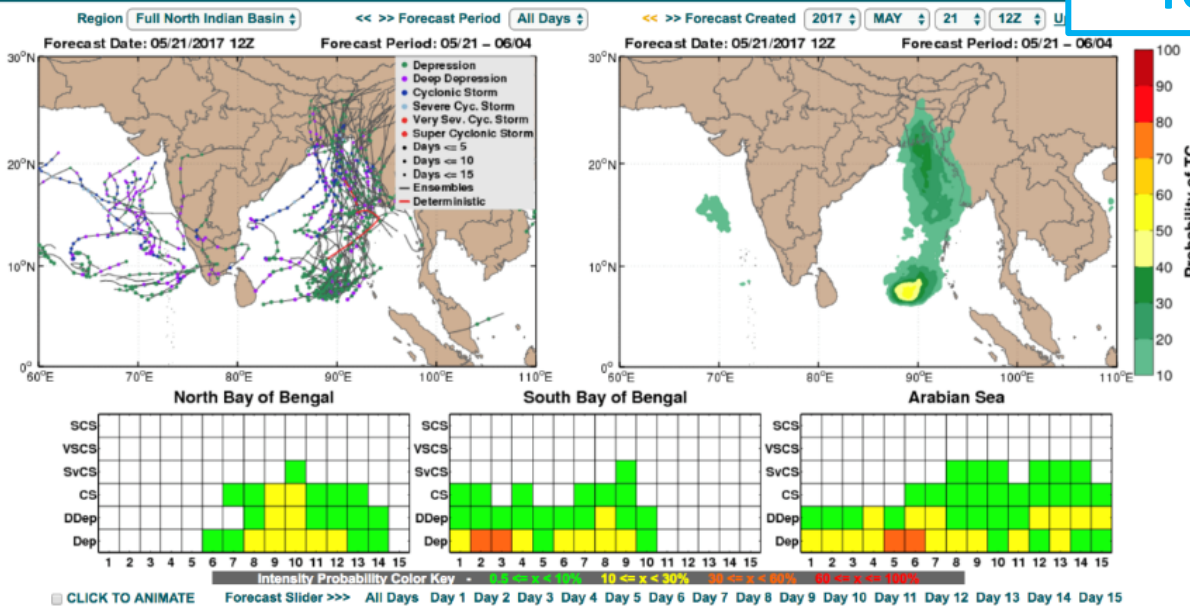
Dear All,

Related to this I would like to bring to your notice that IMD/Regional Specialized Met Center New Delhi had indicated in their morning Bulletin of 26th May with 51% to 75% probability of cyclogenesis in next 48 to 72 hrs. Thereafter regular bulletins are being issued with raising probability to 76% to 100% on 27th morning. Latest Bulletin is copied below. You may refer website www.rsmcnewdelhi.imd.gov.in for updates.

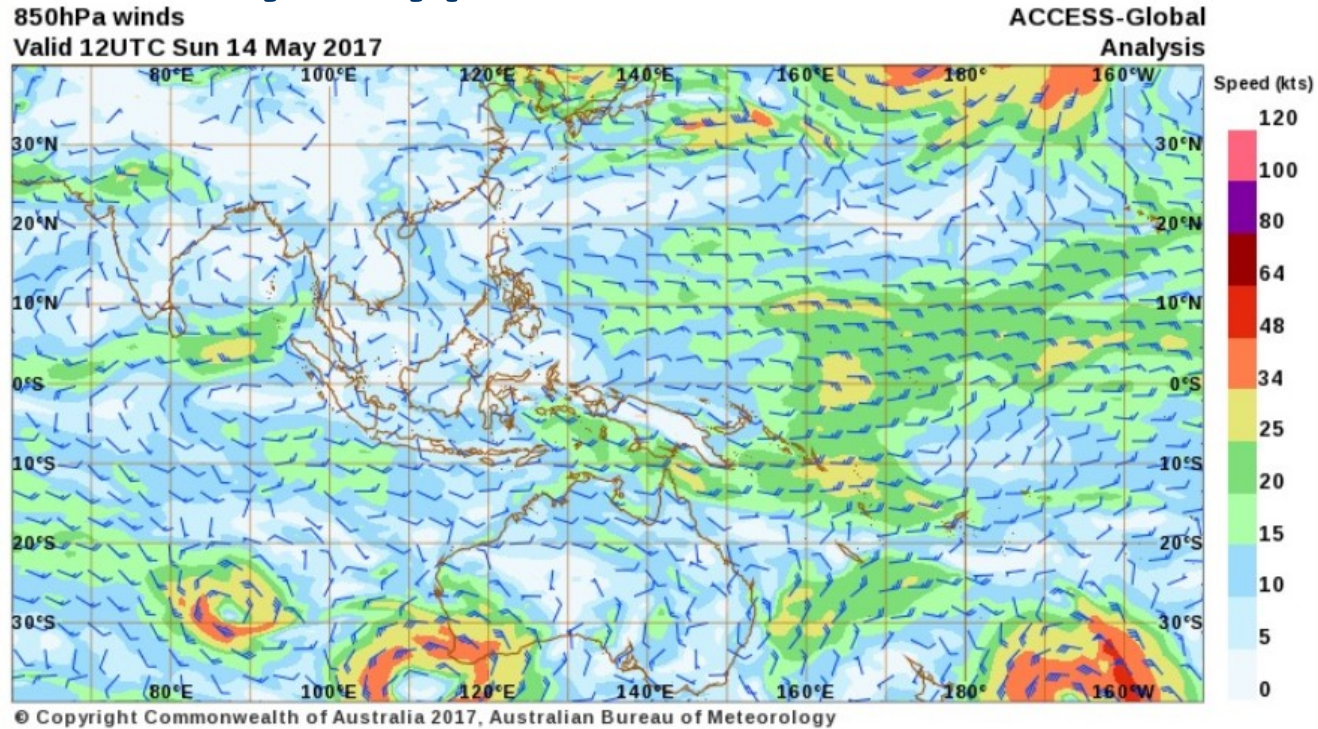
Sharing forecasts/warnings are most welcome. Let us all work towards safer world by providing timely warnings.

With best wishes, Ajit Tyagi

Track Forecasts



Application Possibility : Typhoon



Hi,

The 850hPa wind jet in the equatorial Indian Ocean:

This low level wind jet in the Indian Ocean has been there, almost stationary, for two weeks now.

To illustrate I have attached three 850hPa analyses from 12UTC on 14 May, 24 May and 29 May.

This jet was the main synoptic feature associated with the very heavy rainfall on the South and Southwest coasts of Sri Lanka around 24-25 May, which led to the devastating flooding and loss of life.

In addition, it was the central westerly as part of the structure of the twin cyclones, one of which became tropical storm Mora.

The twin cyclones have been discussed a bit already, and as pointed out they have the dynamical structure of an $n=1$ Rossby Wave. Still, to me its mysterious. What has maintained this feature for so long? Why stationary? (Rossby wave embedded in a background westerly flow?).

What effect has such a sustained wind had on the underlying ocean?

Any dynamical insights out there?

I'll get out of your way

John McB

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Sri Lanka floods: Nearly 500,000 displaced as death toll rises

27 May 2017 | [Asia](#)[f](#) [t](#) [m](#) [e](#) [Share](#)

The BBC's Azzam Ameen joins rescuers in Sri Lanka

At least 126 people have been killed and nearly 500,000 displaced in Sri Lanka following flooding and mudslides triggered by monsoon rains, the government says.

Top Stories

MI5 probes Manchester bomber 'warnings'

The security service will look into how it handled tip-offs about the threat posed by Salman Abedi.

22 minutes ago

BA flight disruption enters third day

3 hours ago

N Korea fires third missile in three weeks

2 hours ago

Features



The women accused of killing Kim Jong-nam

Peter

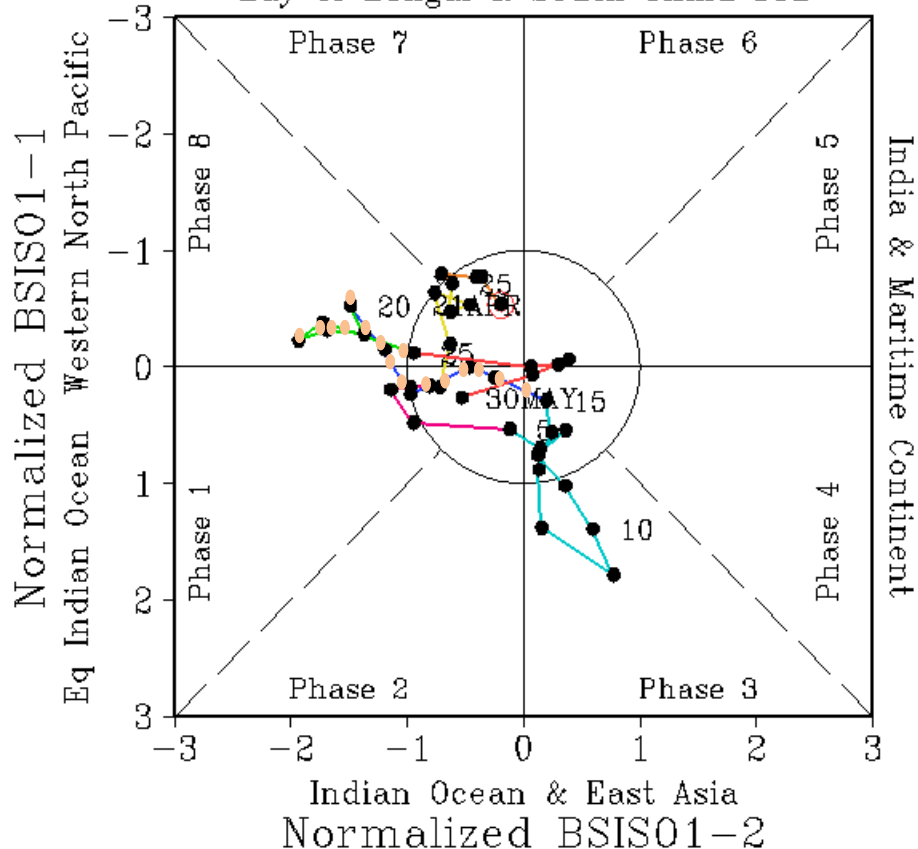
Thanks for sharing CFAN forecasting - it is rather surprising why there is no forecast from the regional met services. Any ideas of recent floods in Sri Lanka - every monsoon is so different and intriguing...and keeps us busy <http://www.bbc.com/news/world-asia-40070660>

-Anna

BSISO Monitoring for 21Apr2017~30May2017

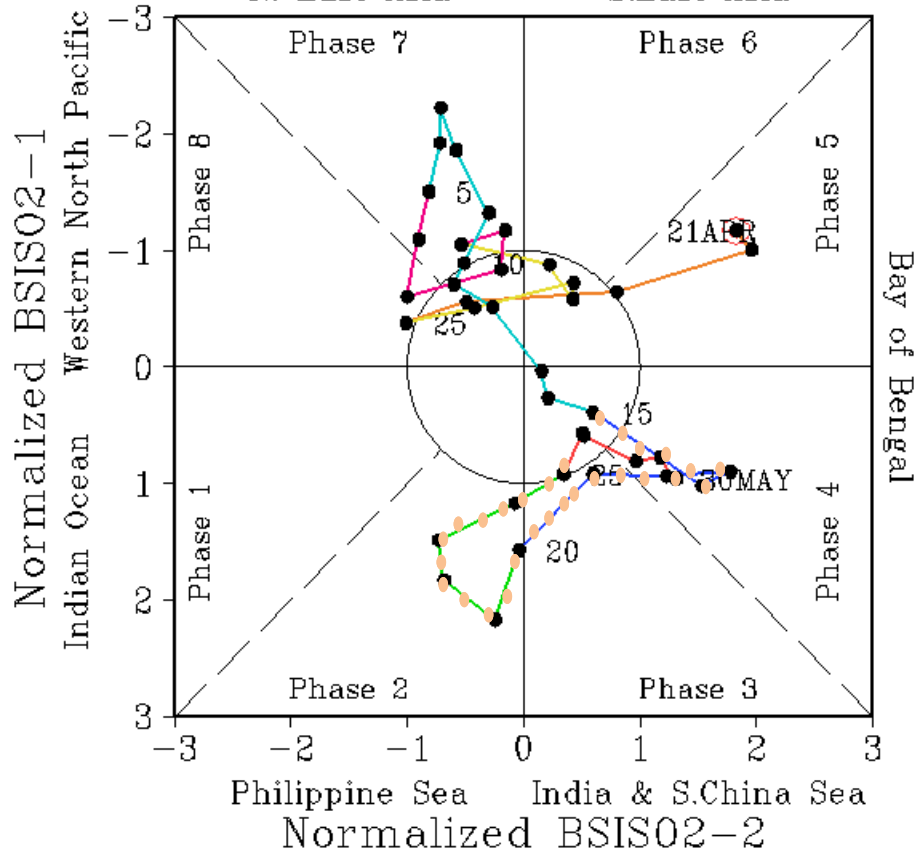
BSISO 1

Bay of Bengal & South China Sea



BSISO 2

N. East Asia S.East Asia



B1 is active in Phase 8

B2 is active in Phase 4-3-2

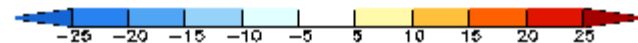
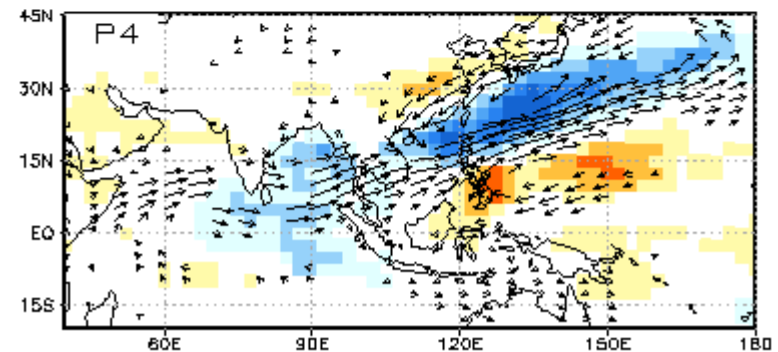
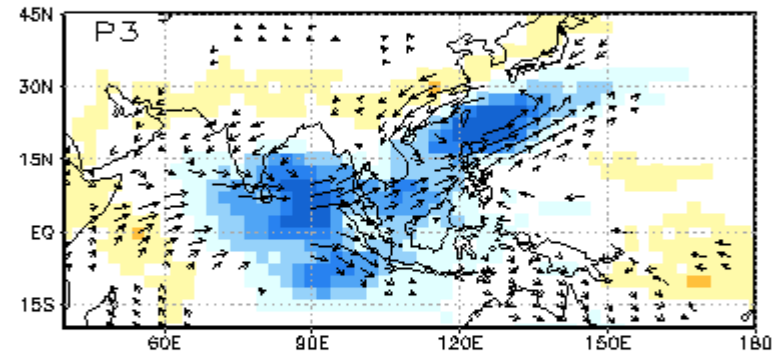
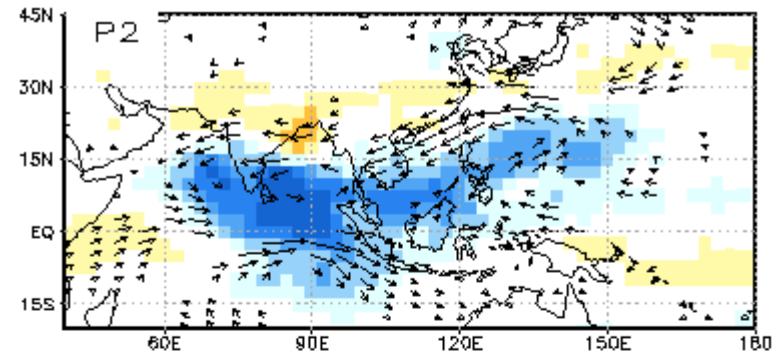
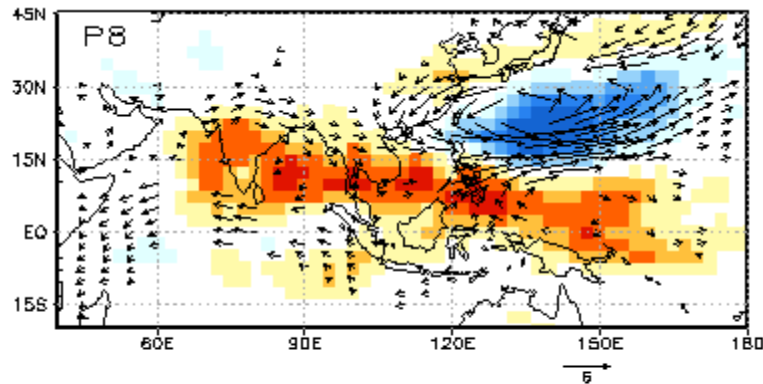
Application Possibility : Typhoon

BSISO2



BSISO-TC activity relationship

BSISO1



Thought that BSISO2 might contribute to stationary westerlies over the equatorial Indian ocean.

Application Possibility : Typhoon



BSISO-TC activity relationship

WNP TC

Deterministic forecast (ISGPI)

Probability forecast of TC Occurrence

Ongoing research



A new ISGPI for NH summer

$$\text{ISGPI}_{\text{MJJASO}} = (-0.51) * \omega_{500} + (-0.21) * V_{zs} + (0.20) * f_{\zeta_{r850}}$$

Region	ω_{500}	V_{zs}	$f_{\zeta_{r850}}$	Equation
Globe	0.68 ¹	0.72 ²	0.74 ³	$(-0.51) * \omega_{500} + (0.20) * f_{\zeta_{r850}} + (-0.21) * V_{zs}$
IO	0.72 ¹	0.79 ³	0.78 ²	$(-0.56) * \omega_{500} + (0.32) * f_{\zeta_{r850}} + (-0.12) * V_{zs}$
WNP	0.75 ¹	0.78 ²	0.80 ³	$(-0.55) * \omega_{500} + (0.22) * f_{\zeta_{r850}} + (-0.20) * V_{zs}$
ENP	0.81 ¹	0.84 ³	0.84 ²	$(-0.67) * \omega_{500} + (0.24) * f_{\zeta_{r850}} + (-0.02) * V_{zs}$
Western NAT	0.49 ³	0.48 ²	0.45 ¹	$(-0.16) * \omega_{500} + (0.46) * f_{\zeta_{r850}} + (-0.25) * V_{zs}$

BSISO modulation of tropical cyclone genesis and sub-seasonal prediction - A new intraseasonal GPI for Northern Hemisphere(NH) summer (May-Oct)

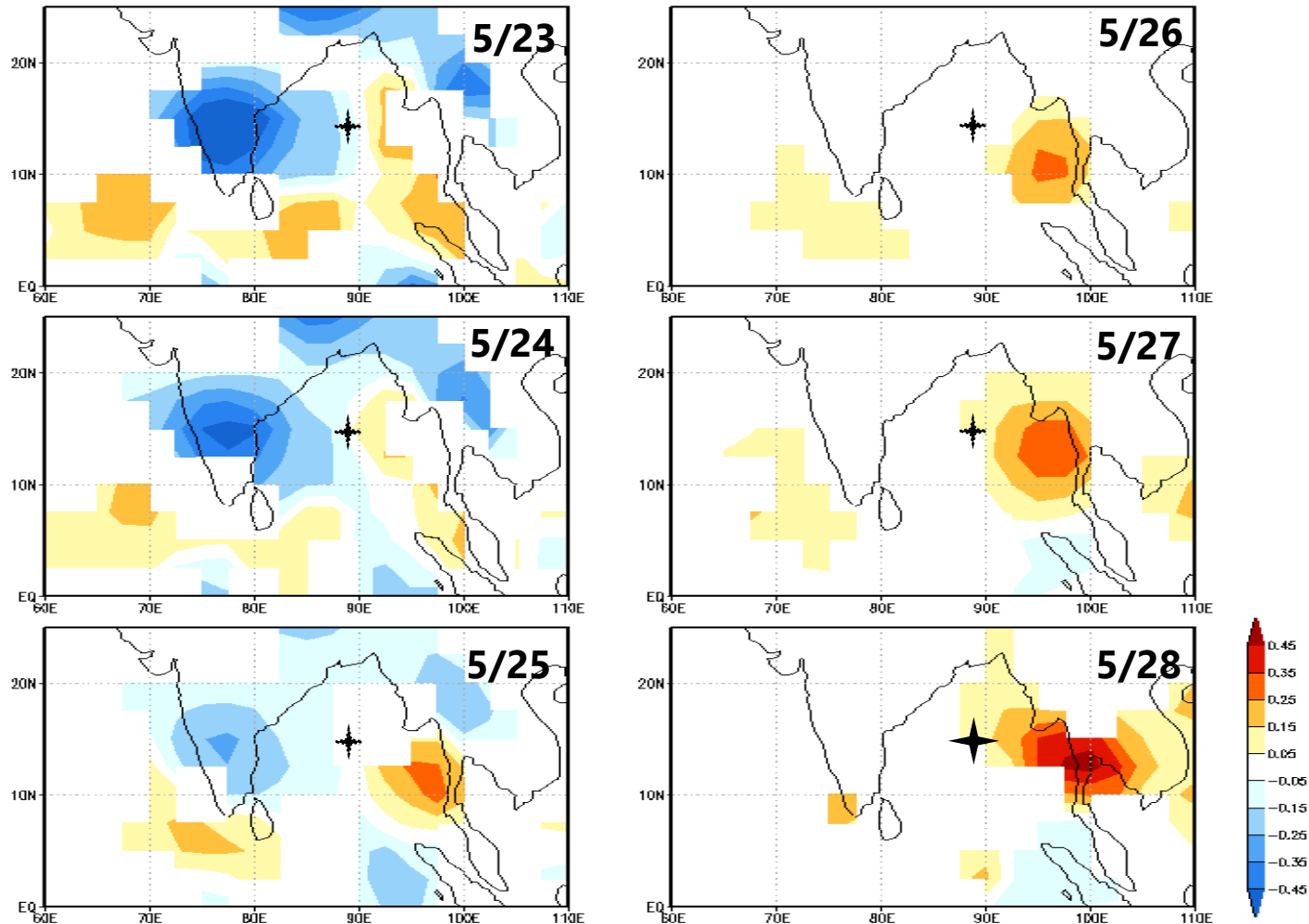
[Moon et al., 2017, submitted to J. Climate]

Application Possibility : Typhoon



BSISO-TC activity relationship

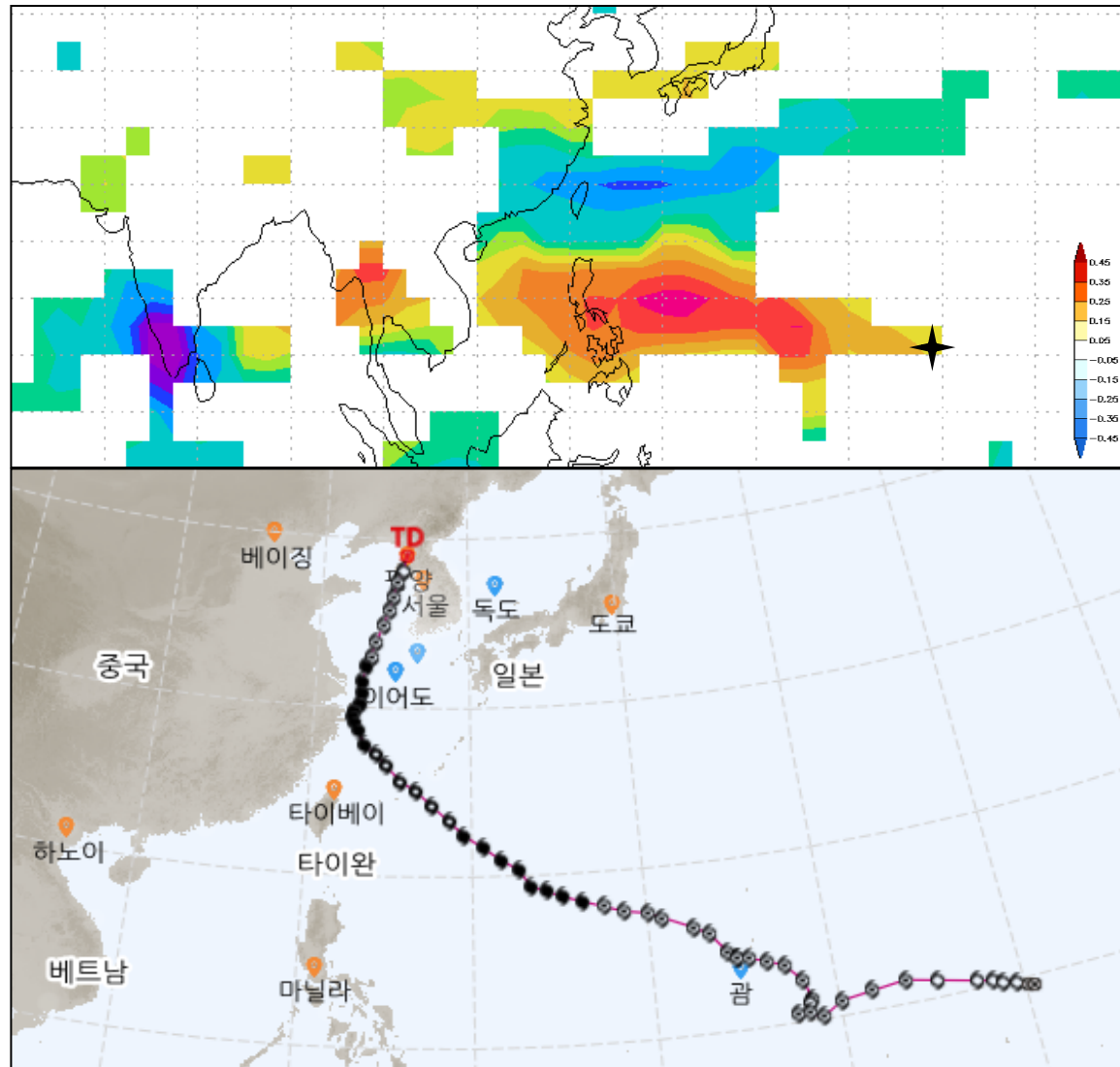
ISGPI estimated by BSISO indices



Application Possibility : Typhoon

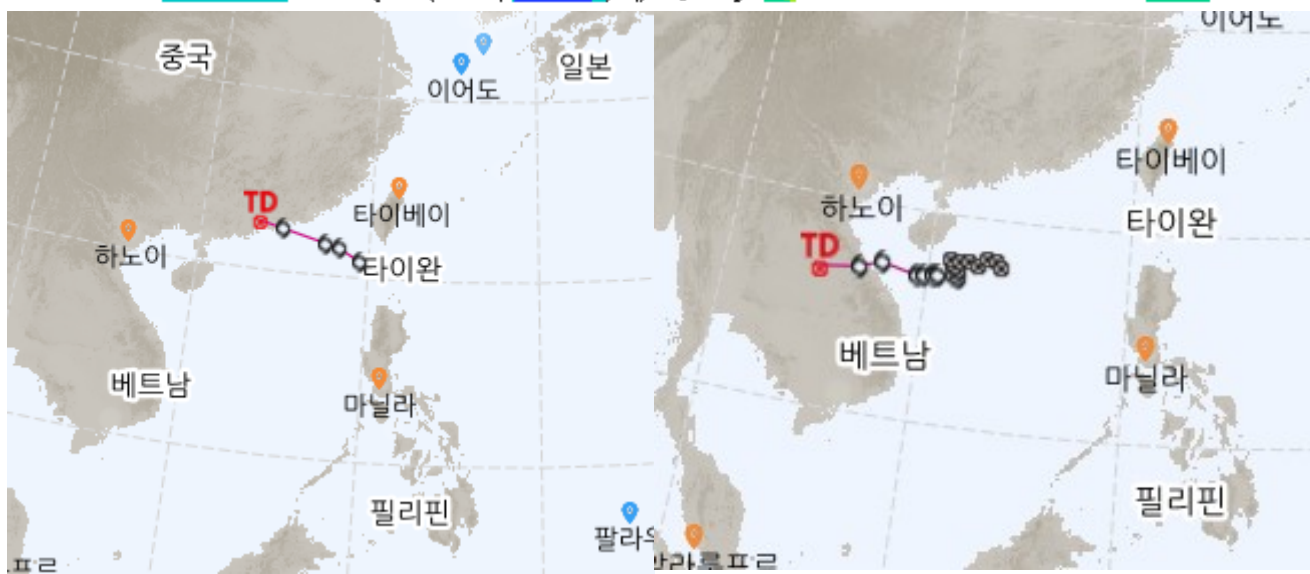
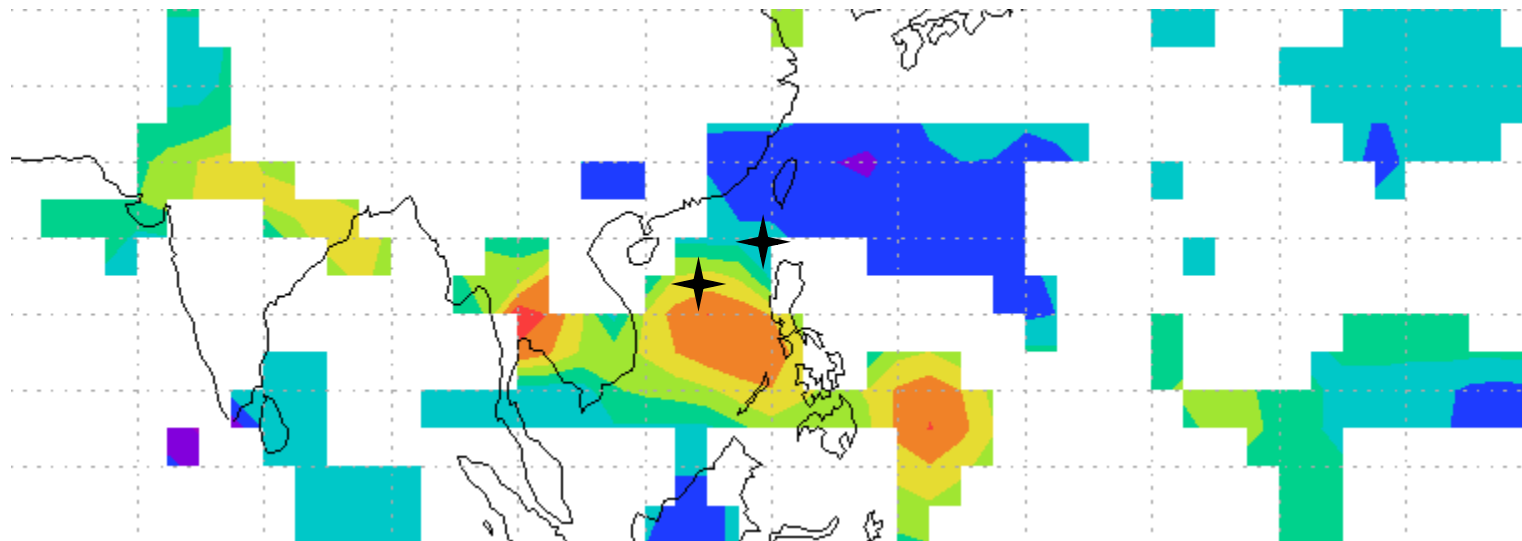


BSISO-TC activity relationship



Application Possibility : Typhoon

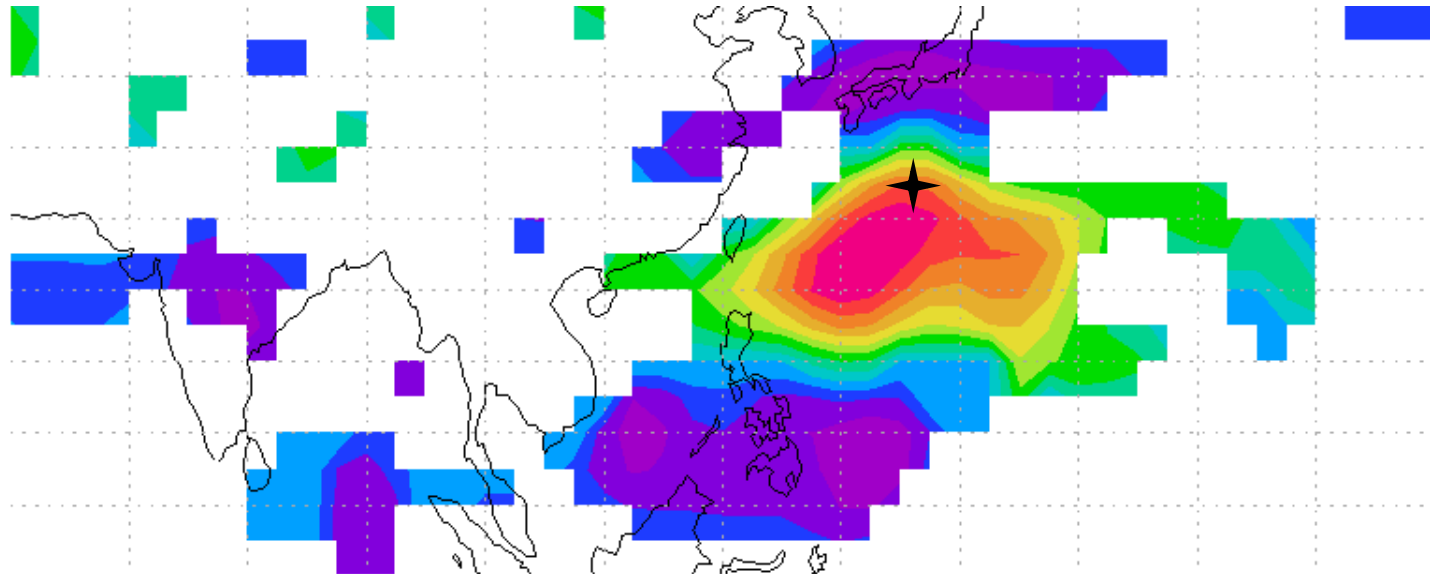
BSISO-TC activity relationship



Application Possibility : Typhoon



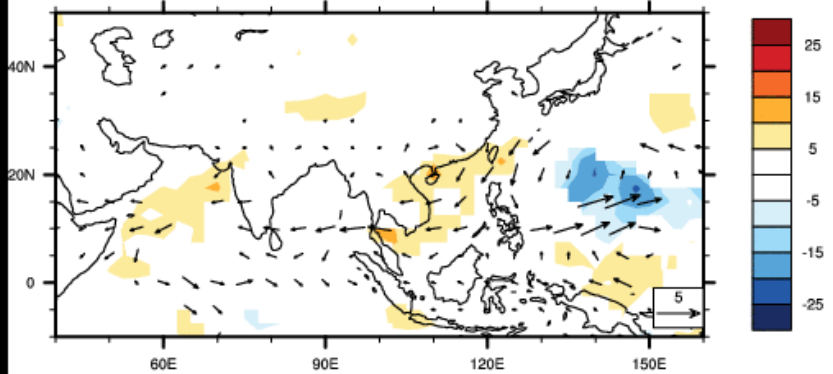
BSISO-TC activity relationship



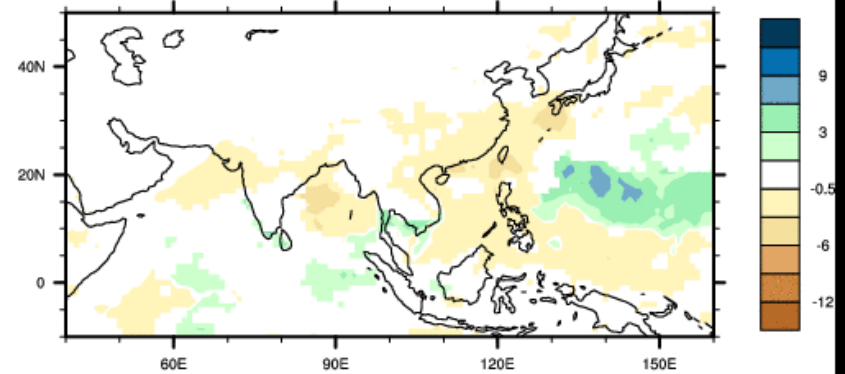
ECM fields estimated by BSISO index: 20171005(+0day) B1: 1

B2: 1

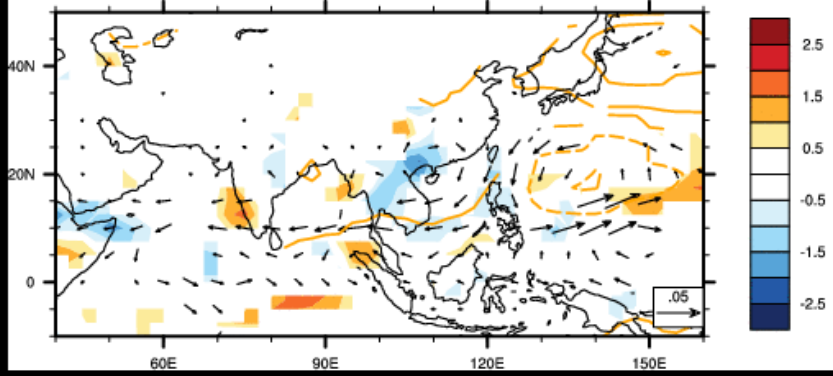
(a) OLR & 850hPa Wind



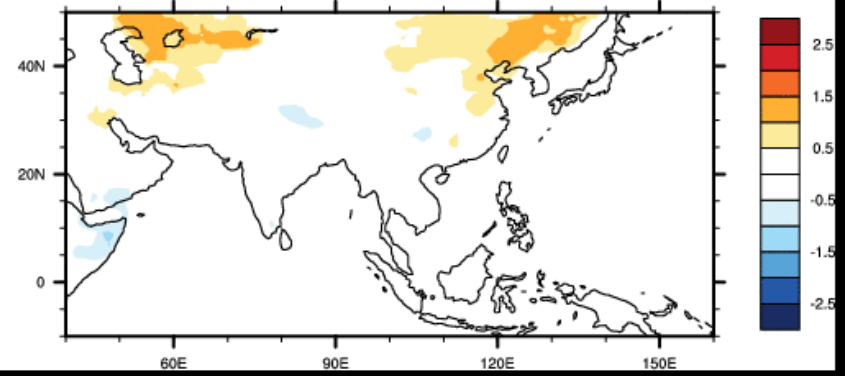
(b) PRCP



(c) SLP & Moist. Flux & Moist. Conv.



(d) T2M



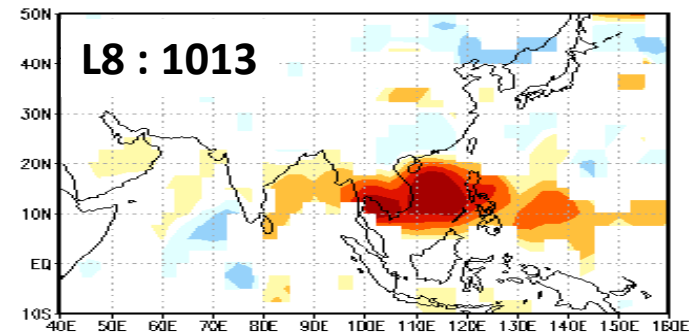
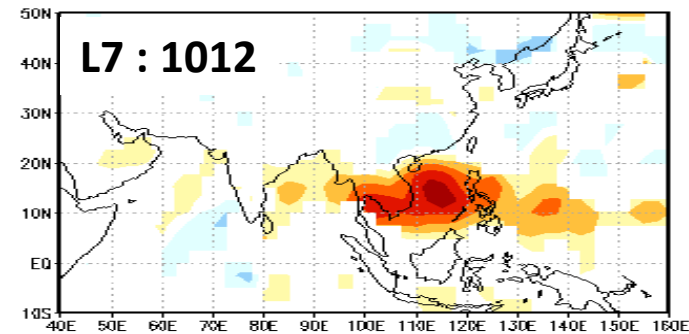
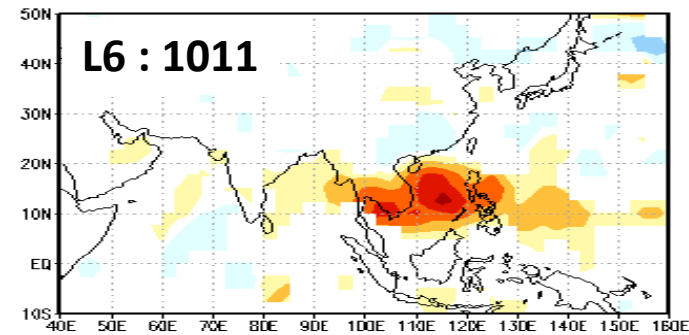
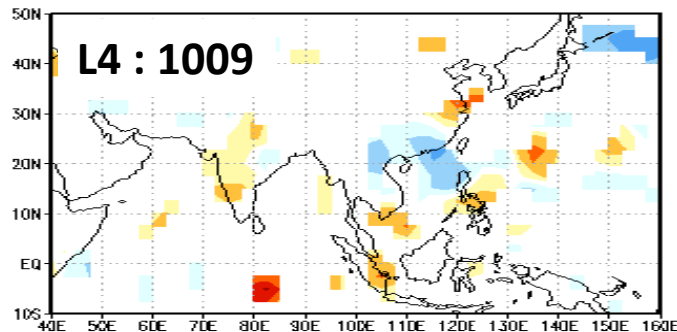
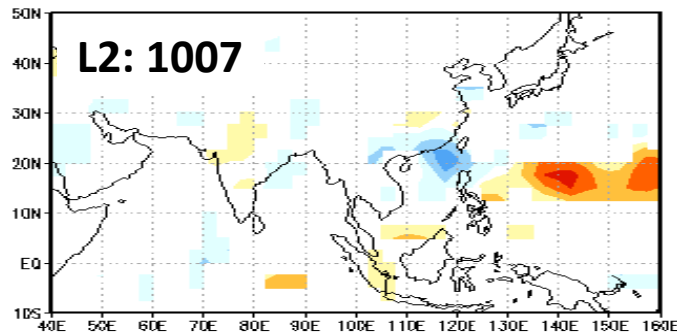
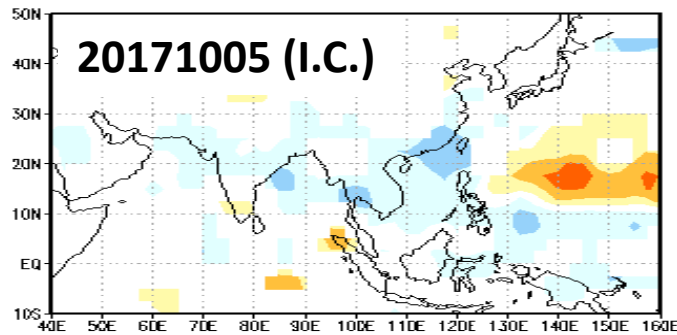
Application Possibility : Typhoon



BSISO-TC activity relationship

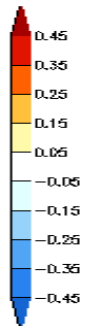
ISGPI forecast using BSISO forecast for TC Khanun (20)

Model : ECMWF



3PM 11th Oct.
TD

12AM 12th Oct
TC [123.6E, 18N]

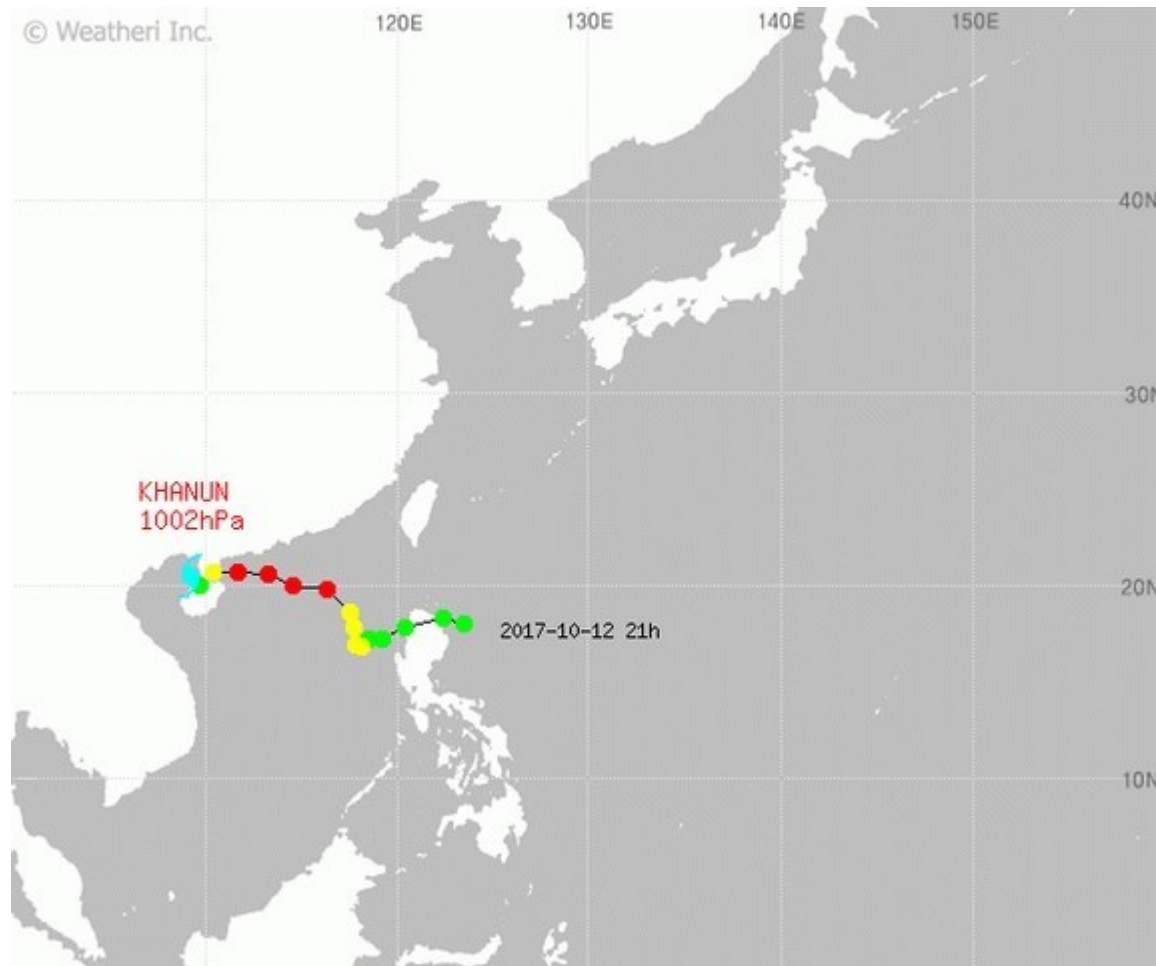


Application Possibility : Typhoon



BSISO-TC activity relationship

TC Khanun (20)



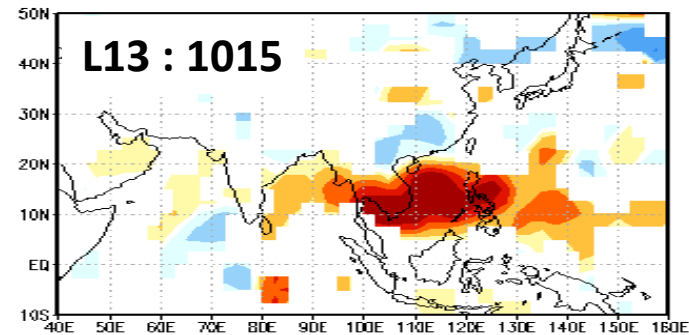
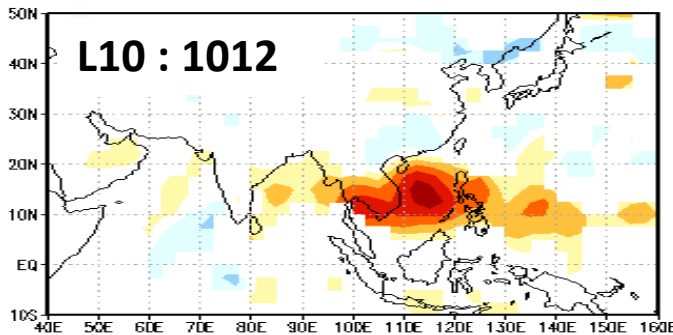
Application Possibility : Typhoon



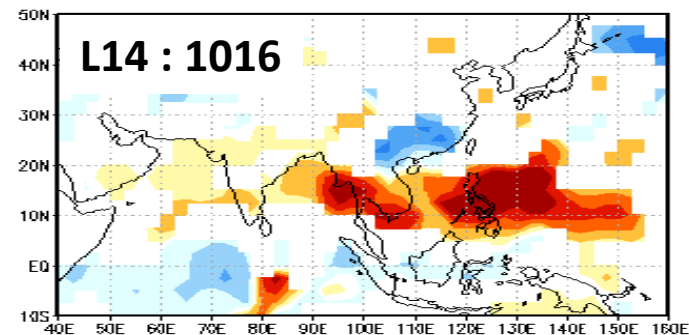
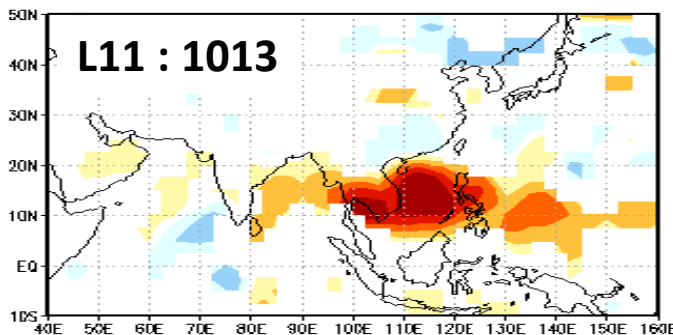
BSISO-TC activity relationship

ISGPI forecast using BSISO forecast for TC Lan (21)

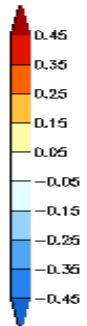
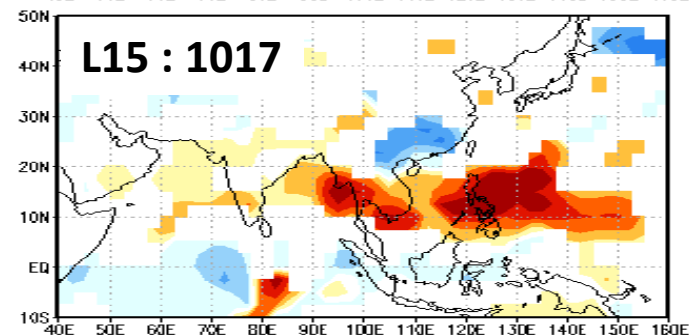
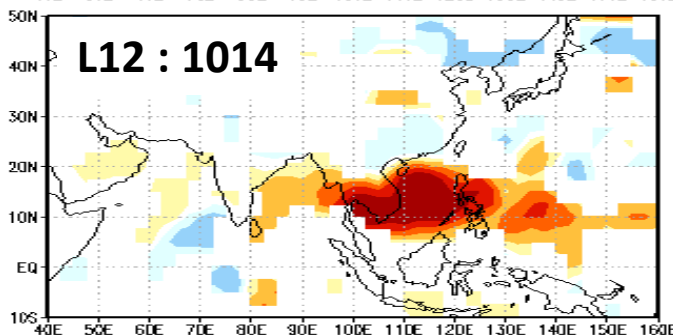
Model : ECMWF



15th Oct
TD



16th Oct
TC

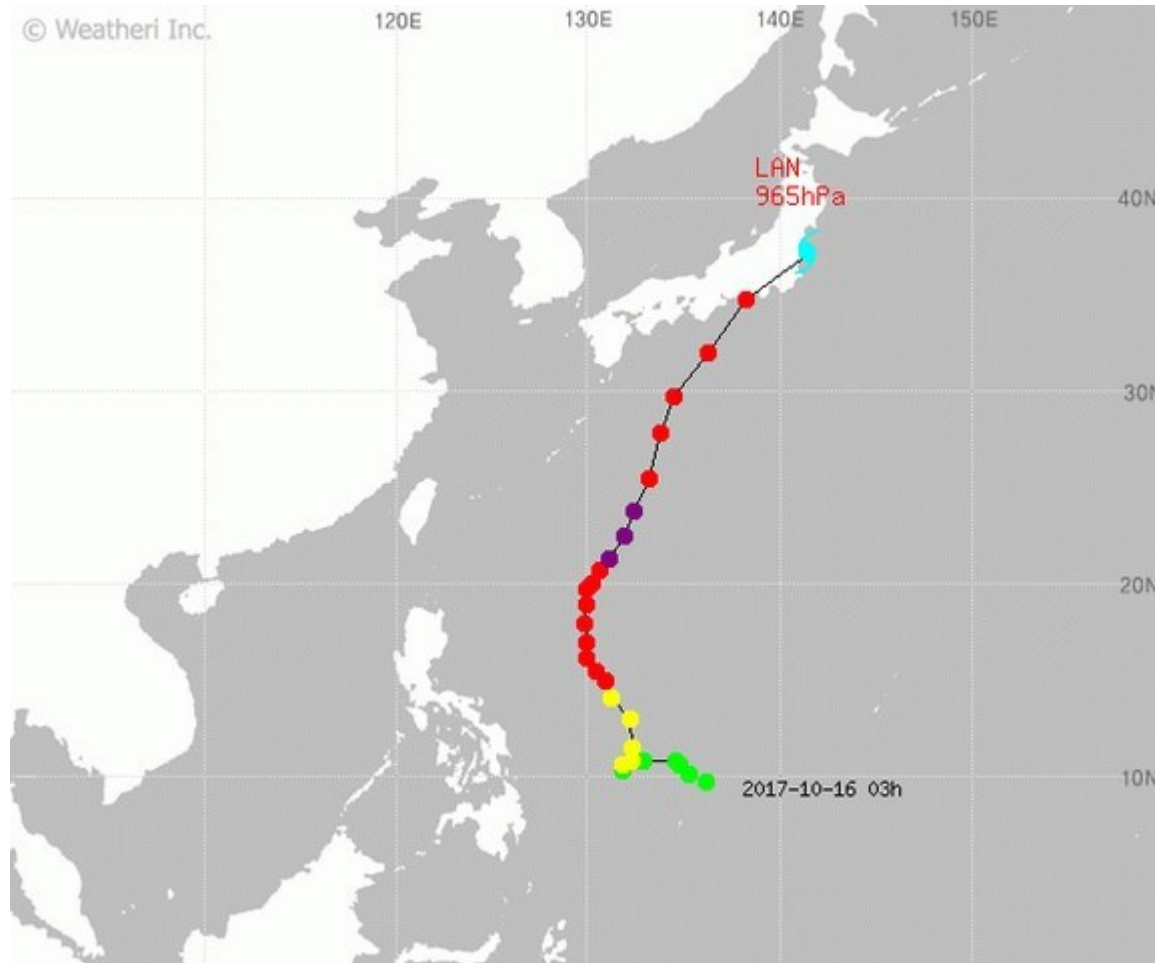


Application Possibility : Typhoon



BSISO-TC activity relationship

TC Lan (21)



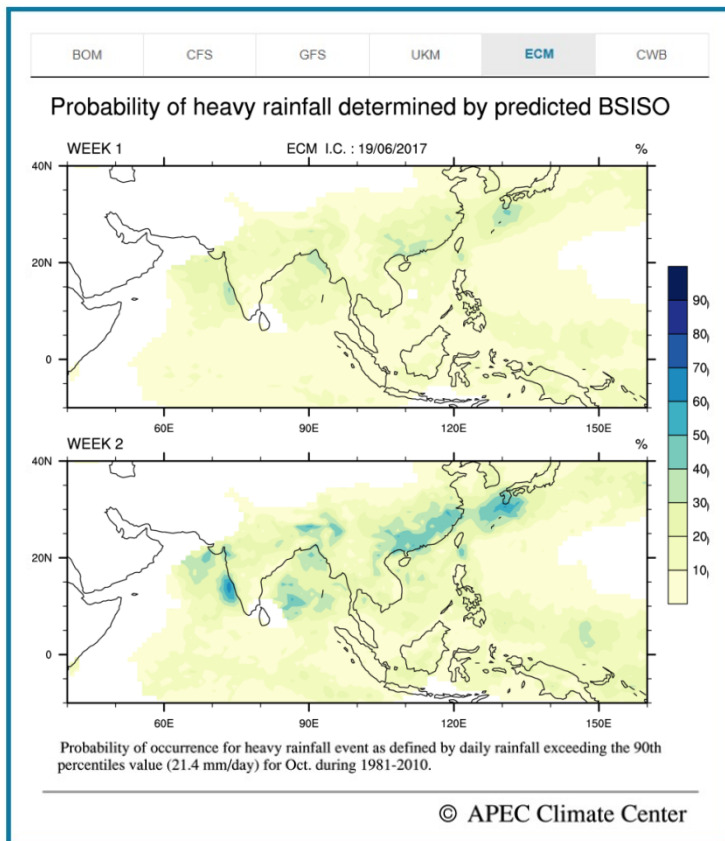


Better forecast from better recognition of the value

Development of a guideline to increase practical use of BSISO forecast

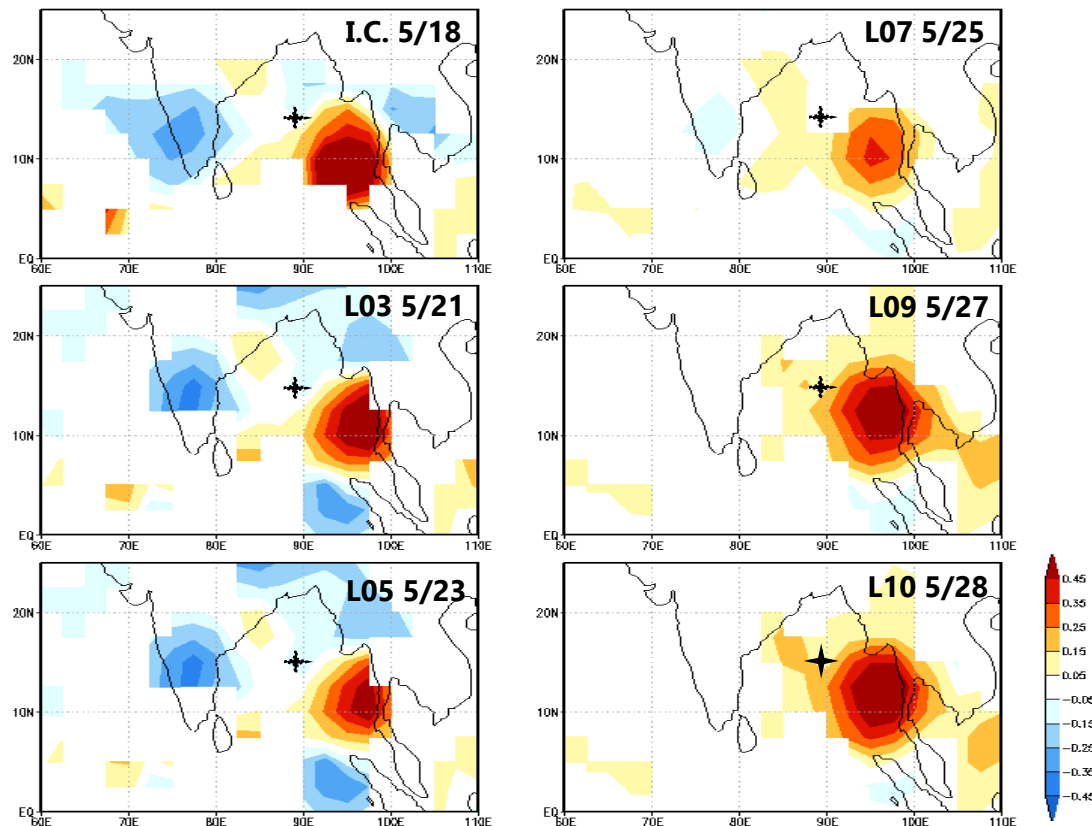
Heavy rainfall forecast based on BSISO index forecast [ECMWF]

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



ISGPI forecast estimated by BSISO index forecast [ECMWF]

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



Application Possibility



BSISO-extreme events relationship

'16



'17'18



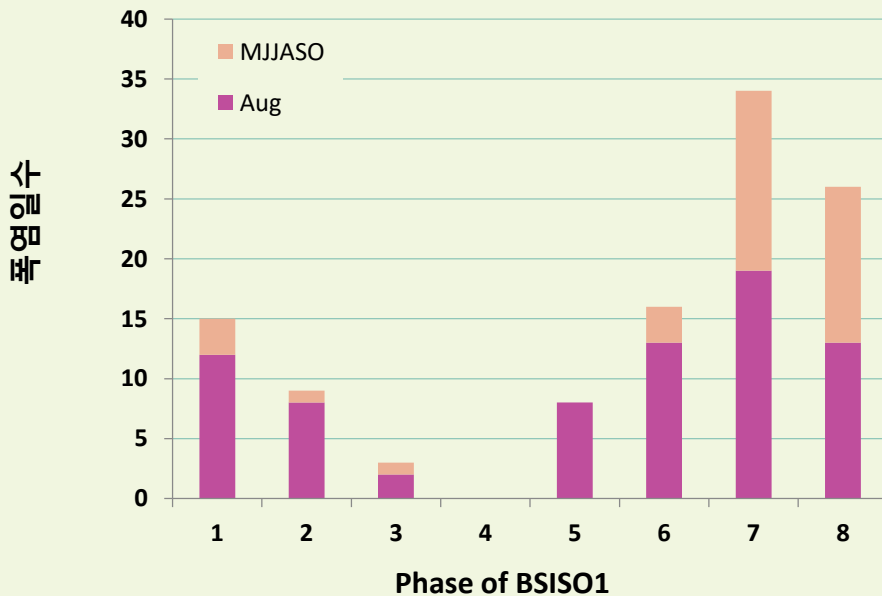
'17'18



Application Possibility : S.Korea heatwave



BSISO-heatwave relationship



'17

폭염인 지점수가 30개 이상일 때 BSISO phase 에 따른 폭염일수
(한반도의 상당한 지역이 폭염으로 고생할 때 BSISO 와의 관련성)

(* 폭염지수 from 이우섭 박사 (1981-2014))

Application Possibility : S.Korea heatwave

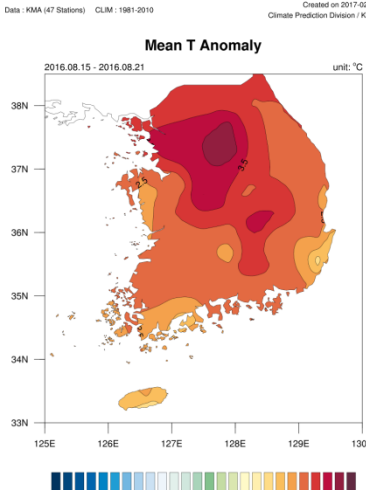
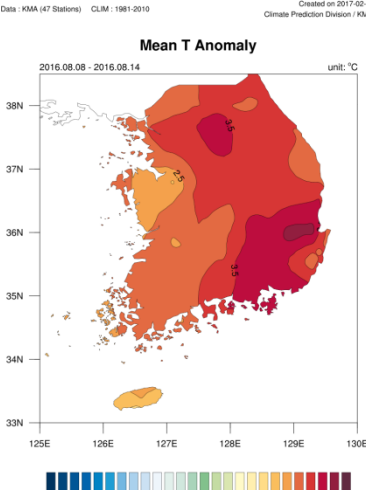
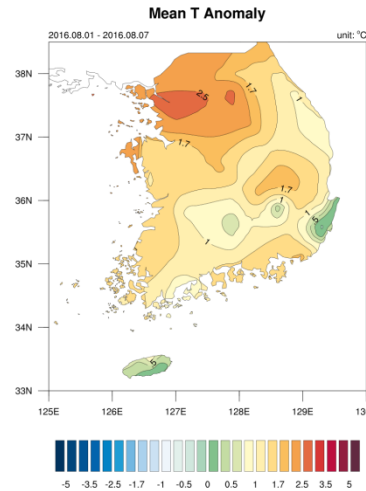
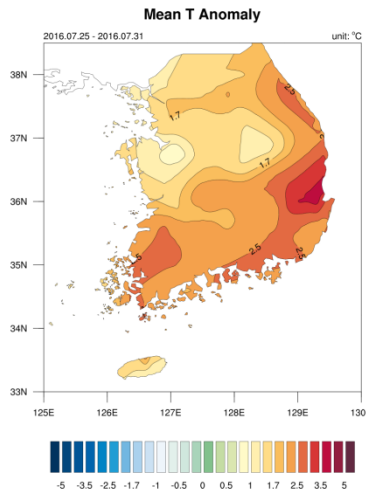
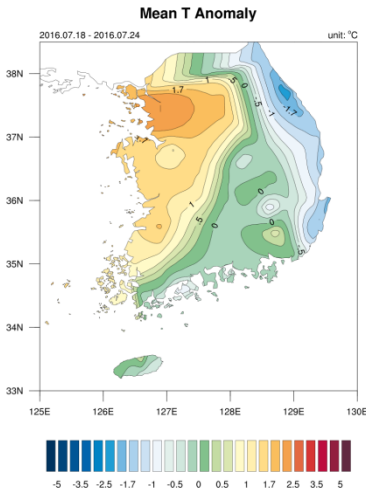
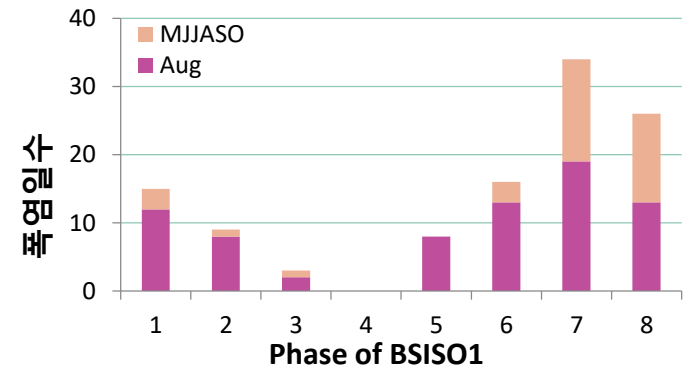
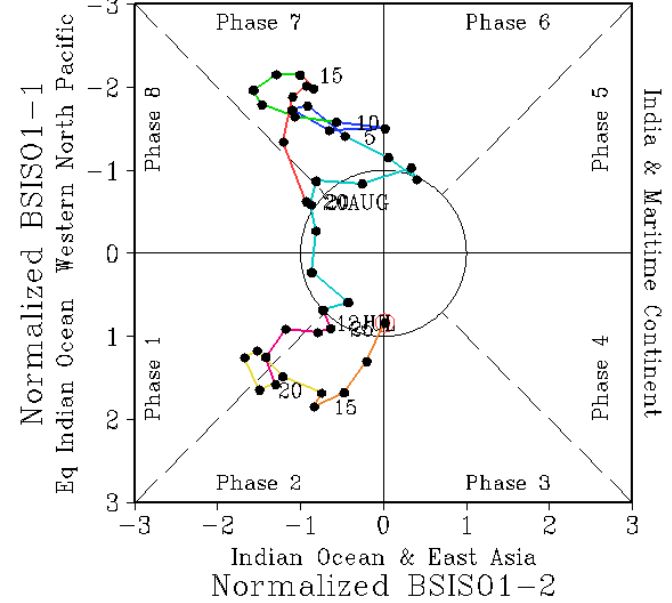


BSISO-heatwave relationship

Monitoring (7/12 ~ 8/20)

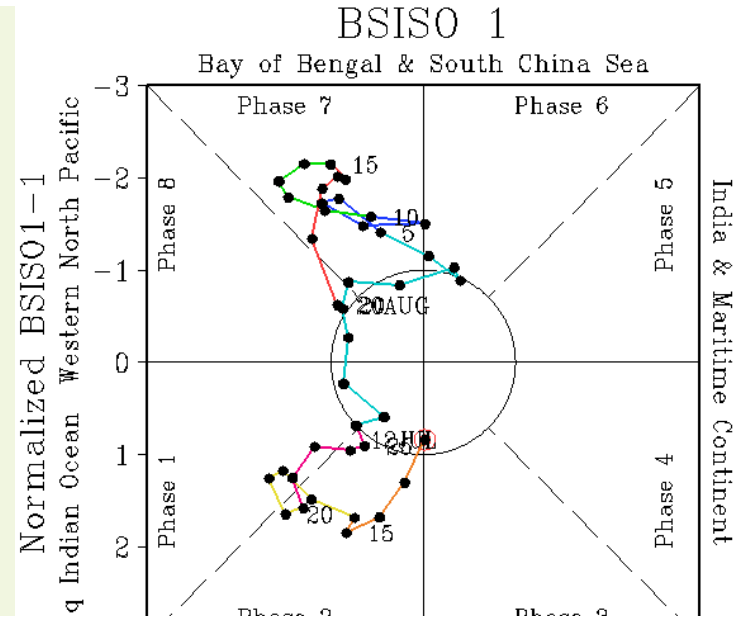
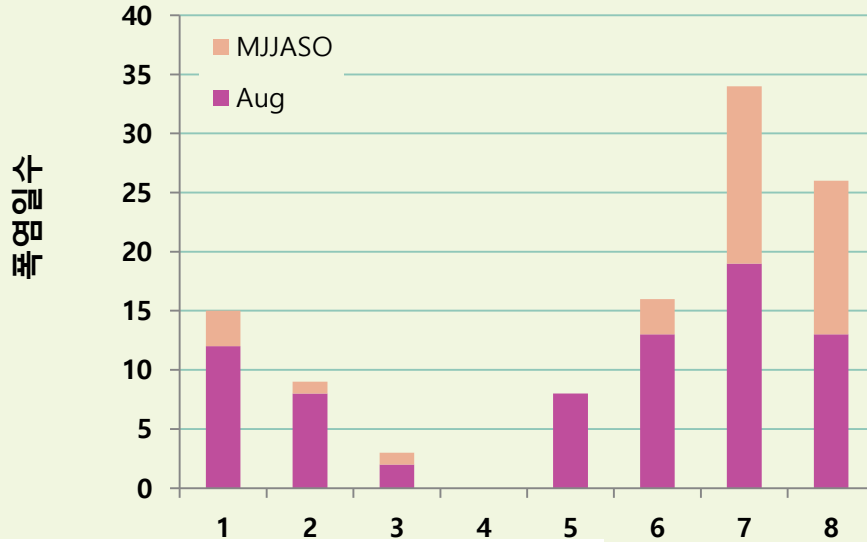
BSISO 1

Bay of Bengal & South China Sea

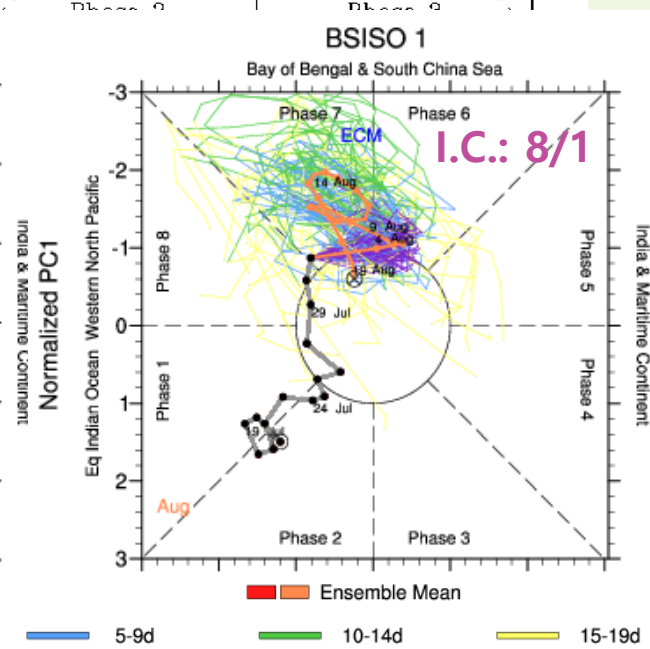
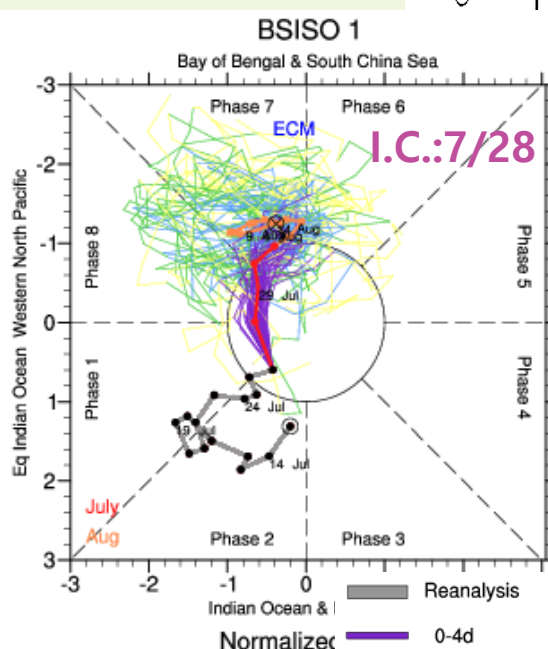
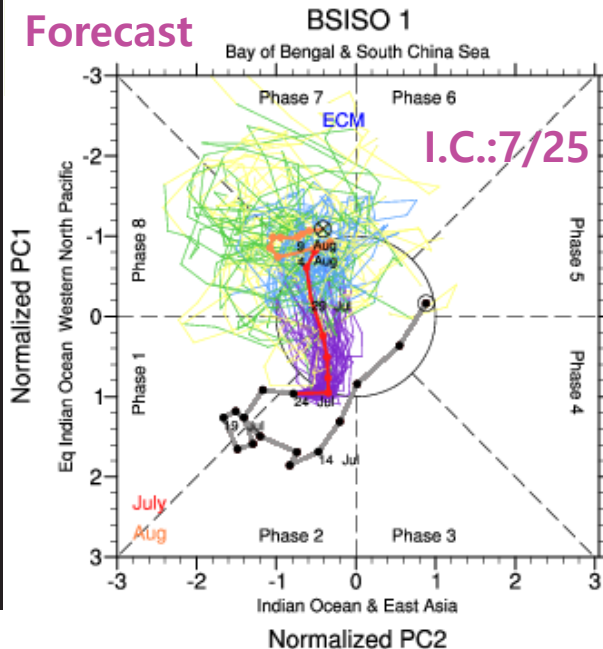


Application Possibility : S.Korea heatwave

Monitoring (7/12 ~ 8/20)

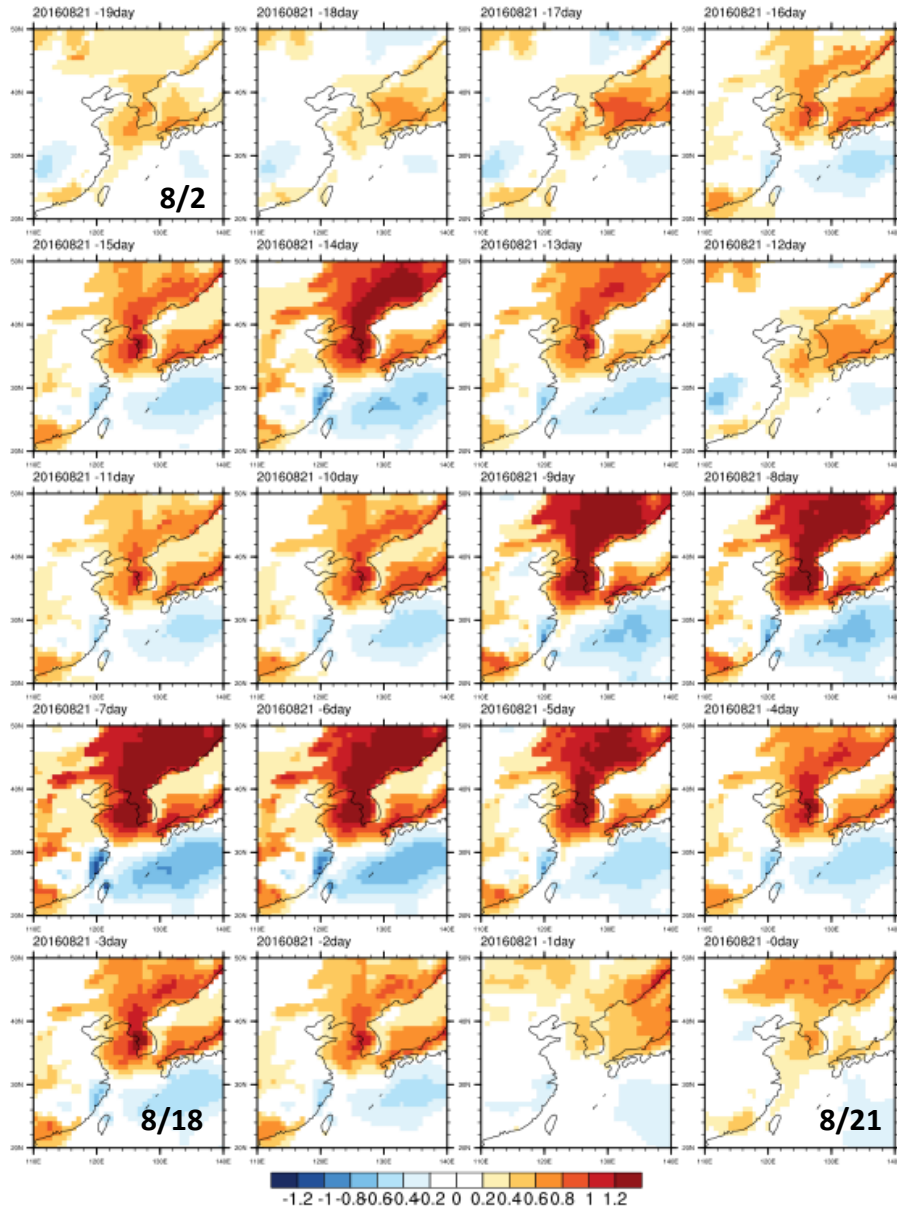


Forecast

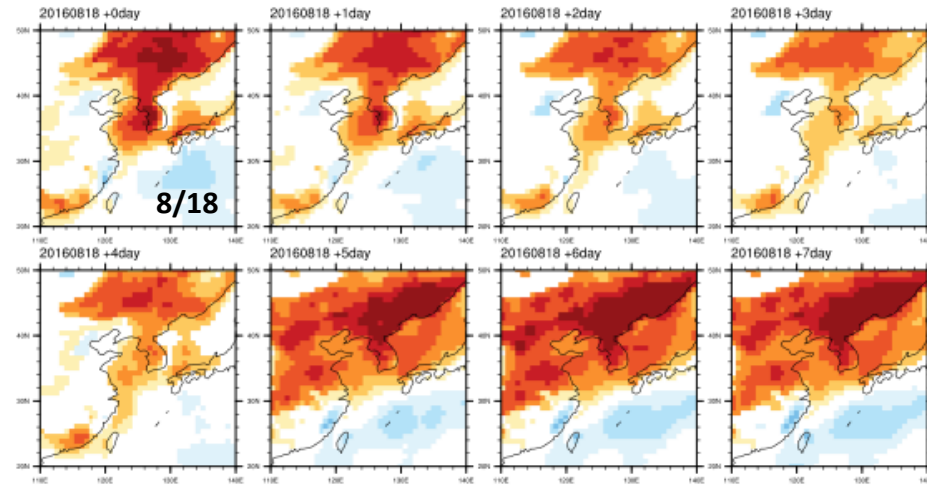


Application Possibility : S.Korea heatwave

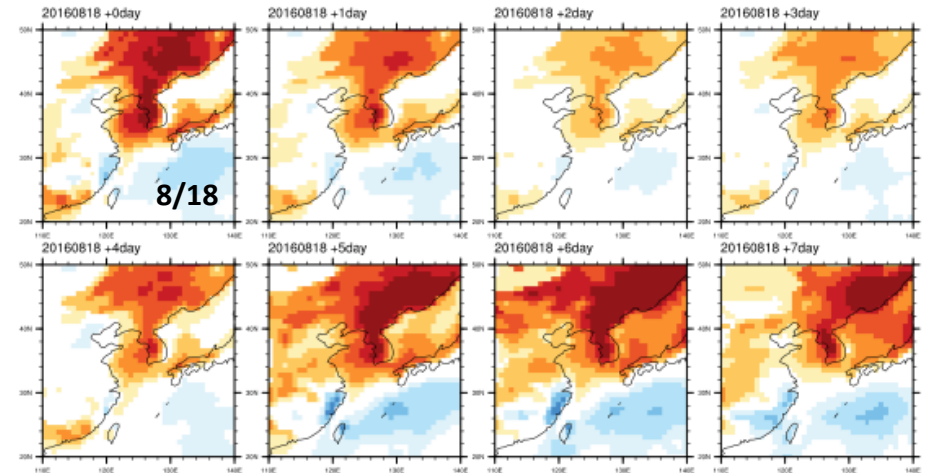
BSISO1+BSISO2 Temperature anomaly (MONITORING)



BSISO1+BSISO2 Temperature anomaly (BOM)



BSISO1+BSISO2 Temperature anomaly (ECM)





Thank you

