문서번호 APCC-출장-18-0943(2018-10-02)

결재	선임연구원	팀장	부서장	원장직무대행
	10/01 전종안	10/02 이우섭	10/02 유진호	10/02 유진호
협조	팀장			
	10/02 문자연			

TRAVEL REPORT FORM
출장보고서

I. Travel Overview 출장개요

1. Traveler(s) 출장자

Department 소속	Position 직위(직급)	Name 성명	Note 비고
기후사업본부	기후분석팀장	이우섭	
	선임연구원	전종안, 김해정	

2. Travel Period 출장기간
2018.9.2.-2018.9.9

3. Occasion and destination 행사 및 출장지
2018 EMS 학회 참석 및 발표, 부다페스트 (헝가리)

II. Major Activities 주요업무 수행내용

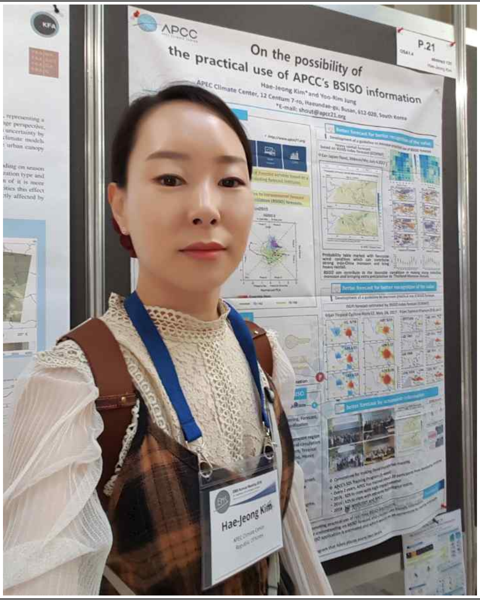
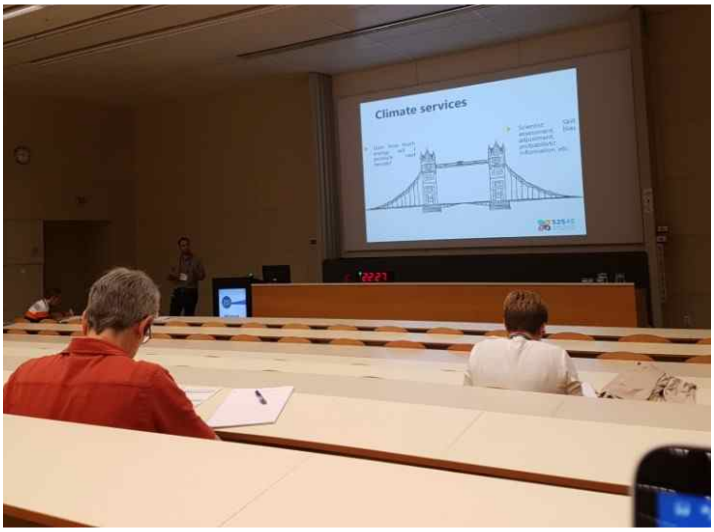
1. Main Contents and Activities 주요내용 및 활동

○ EMS Annual Meeting 2018은 “Weather and climate : global change and local hazards” 이란 주제로 변화하는 기후의 영향, 특히 빈번하게 발생하고 있는 기상/기후의 위험성이 인간, 자연 및 인프라에 미치는 영향에 대해 정보를 공유하는 학회임.

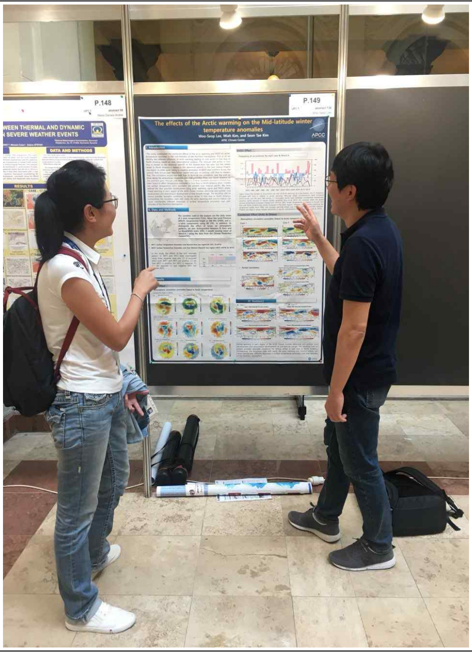
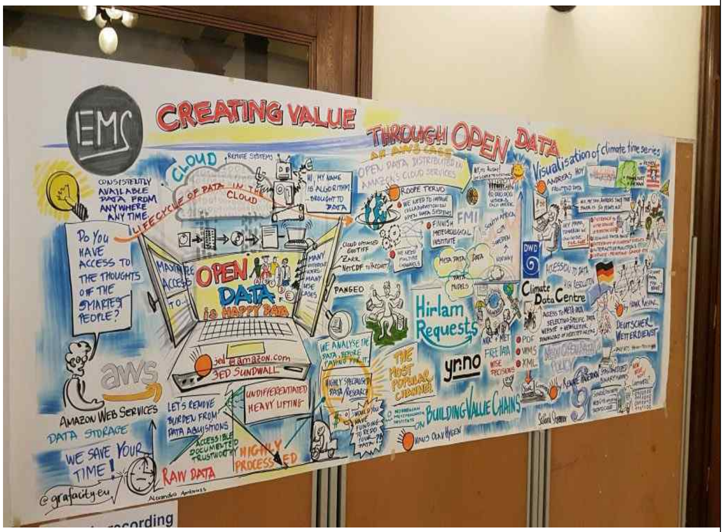
가. 김해정 선임연구원

— 발표 세션 : OSA - Operational Systems and Applications
— 세션 제목 : OSA1.4 - Probabilistic and ensemble forecasting from short to seasonal time scales
— 발표 제목 : On the possibility of the practical use of APCC’s BSISO information
— 발표 일자 : 9월 5일 (수) ~ 7일 (금), P21
— Poster pitches 일자 : 9월 7일 (금) 10:15, Room E Ⅱ

– APCC에서 실시간으로 서비스 하고 있는 BSISO 예측 정보를 계절내 시간 규모에서 발생하는 다양한 수문·기상학적 현상들(호우 발생 확률 예보, 태풍 발생 예측 등)에 대해 사용자가 유용하게 활용할 수 있음을 소개하고 그 방법론에 대해 논의하였음.
– 세션 발표 중 특히 Climate Service에 있어서 S2S4E Project의 활동이 인상 깊었고 기후서비스를 바라보는 각 party(scientist, producers, providers, transmission system operators, users 등)의 입장과 그 간극을 메우기 위한 과정들에 대해 이해하는 좋은 기회가 되었음.

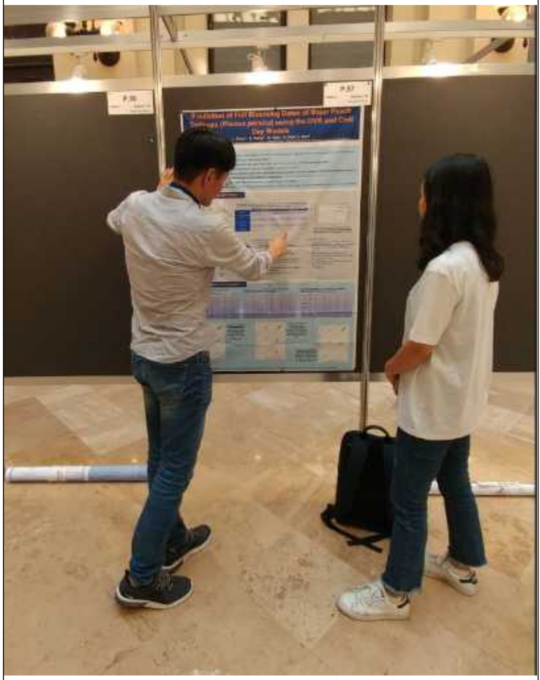
	
김해정 선임연구원의 발표	S2S4E Project 활동에 대한 발표

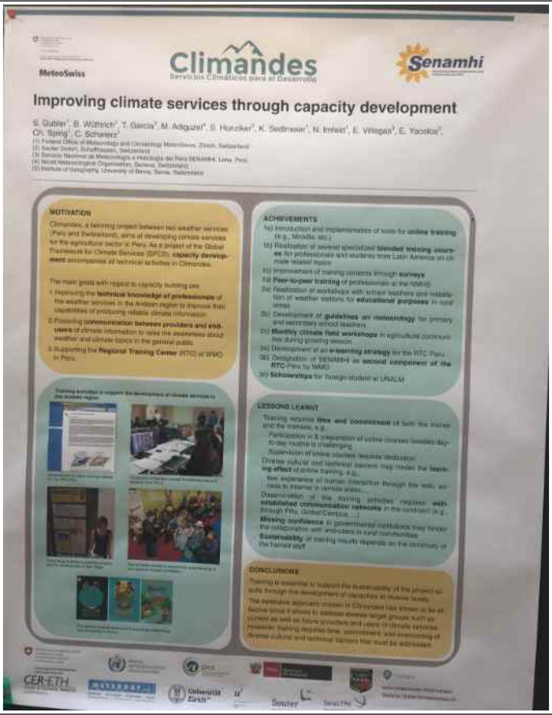
나. 이우섭 선임연구원
– 발표 세션 : UP-Understanding Weather & Climate Process
– 세션 제목 : UP1 – Atmospheric processes and severe weather/UP1.1 Atmospheric dynamics and predictability
– 발표 제목 : The effects of the Arctic warming on the Mid-latitude winter temperature anomalies
– 포스터 Display : 9월 5일 (수) ~ 7일 (금), P149
– 발표일자 : 9월 6일 (목) 09:30-10:30
– 대기과정과 극한 기상에 관련된 많은 연구 발표가 있었으며, 크게 대기 역학 과정, AO와 ENSO가 극한에 미치는 영향, 모형의 지면과정, 모형의 극한기상 예측성 분석등에 대한 연구발표가 있었음.
– 또한 중위도 지역의 한파 발생원인을 조사하고 예측에 대한 연구들을 토대로, 유럽 및 동아시아 한파의 발생 원인을 이해하고 향후 예측성에 대한 논의가 있었음. 향후 중위도 지역 한파 예측에 도움이 될 것으로 판단됨.

	
이우섭 선임연구원의 발표	기후서비스 관련 포스터

다. 전종안 선임연구원

- 발표 세션 : OSA – Operational Systems and Applications
- 세션 제목 : OSA2 – Applications of meteorology /OSA2.3 Agricultural meteorology & phenology
- 발표 제목 : Prediction of full blooming dates of major peach cultivars (*Prunus persica*) using the DVR and Chill Day models
- 포스터 Display : 9월 5일 (수) ~ 7일 (금), P.57
- 발표일자 : 9월 7일 (금) 10:30-11:30,
- 기상과 관련한 위험은 추수시기 조절, 살충제 살포나 관개시스템 등으로 줄일 수 있으며, 작물의 기상에 대한 반응은 다양한 기법으로 모니터링이 가능함.
- 이와관련하여, 의사결정시스템, 농림기상모형, 이상기후의 농업에대한 영향, 위성이나 지상설치 장비이용 모니터링, 기후변화와 이해당사자와 관련한 내용 등 다양한 주제의 발표가 있었음.
- 고품질의 기후서비스 제공을 위해 기후자료의 품질을 높이려는 노력과 함께, 여러 이해당사자들의 역량 강화를 위해 다양한 노력을 하고 있었으며, 이러한 노력은 APCC의 기후서비스 확대를 위한 노력과도 부합하고 있음





전종안 선임연구원의 발표	기후서비스향상을위한 역량강화 포스터

2. Relevance to APEC Climate Center's Activities 결론 및 소감

❍ 김해정 선임연구원

 — 유럽의 지리적 환경, operational forecast에 대한 연구 활동의 비활성화, 유럽에서 비교적 낮은 APCC 인지도 등으로 BSISO(열대 현상)에 대한 관심이 다소 적은 것으로 보였음.

 — 당초 OSA 세션 중 OSA2.2 (Sub-seasonal-to-seasonal (s2s) predictions and societal applications) 세션에 발표를 신청 하였으나 세션이 없어짐에 따라 OSA1.4로 편성되어 기후 정보 활용에 대한 관심이 높은 유럽 학회에서 마저도 순수 연구에 비해 practical use를 위한 연구의 활동 비중이 작다는 현실을 체감하였음.

 — 이는 여전히 climate application/climate service 가 미개척지임을 방증하는 한 예로써 추후 관련 분야에서 APCC의 도약을 기대해볼만함.

 — 저조한 관심에도 불구하고 APCC의 활약을 담은 발표들 통해 기후 연구에 있어서 다양한 approach 들이 있음을 인지시키고자 하는 노력에 일조하였으리라 기대함.

❍ 이우섭 선임연구원

 — 극지역 온난화가 겨울철 중위도 기온에 미치는 영향과 더불어 엘니뇨와 관련된 대기 패턴의 변화에 대한 추가적인 연구가 필요할 것으로 보임.

 — 극지역의 예측정확도를 높이기 위한 모델링 연구가 많이 진행되고 있음. 극지역의 모형 예측성이 높아진다면 중위도 지역 한파의 예측성을 높을 수 있을 것으로 기대됨.

❍ 전종안 선임연구원

- MDPI (http://www.mdpi.com)는 open access 출판사로 스위스에 본부가 있으며, 중국과 스페인에 사무실을 두고 있으나, 유럽의 연구자들의 참여가 저조함. 본 학회에 유럽 연구자의 참여를 확대하기위해 부쓰를 설치하고 홍보활동을 하였음. APCC도 국내외 학회에 부쓰설치 등의 홍보활동 강화가 필요할 것으로 판단 됨.
- 이와 같이 본 컨퍼런스에서 소개하고 발표한 다양한 연구사례와 동향 파악을 통하여 APCC의 연구역량 강화 및 지속적 APCC의 연구 및 기후서비스 활동 소개를 통하여 기후서비스 확대 도모가 필요할 것으로 판단 됨.

3. Suggestions and Remarks 건의사항

III. References (Presented and Collected Materials) 주요 수집자료

(with attachment of any information or report in case of attendance of conferences, workshops and meetings) 학술대회, 워크숍, 회의 등 참석 시 관련 정보 및 문서 첨부

General information

The EMS Annual Meeting: European Conference for Applied Meteorology and Climatology 2018 is held in Budapest, Hungary, from 3 to 7 September 2018. The conference is open to the scientists of all nations.

Official language

The official language of the EMS Annual Meeting 2018 is English. Simultaneous interpretation is not provided. It is therefore expected that authors are able to present their research more or less fluently in the English language.

Rules of conduct

- Smoking is prohibited in the entire conference building.
- It is prohibited to copy any presentation from the desktops in the lecture rooms.
- Please switch off any mobile phones in the lecture rooms.
- It is prohibited to take photos of any scientific material at the conference.
- Professional and respectful conduct of all attendees is expected. Bullying, harassment, intimidation or discrimination of any kind will not be tolerated.

Insurances

The organizers cannot accept liability for personal accident, loss or damage to private property, which may be incurred as a result of the participation in the EMS Annual Meeting 2018. Participants are, therefore, advised to arrange appropriate insurance cover. This should extend not only to travel but also to cancellation costs.

Conference organization

Copernicus Meetings

Bahnhofsallee 1e
37081 Göttingen
Germany

Phone +49 551 90 03 39 20
Fax +49 551 90 03 39 70

meetings@copernicus.org

Supporters & sponsors

Registration

General information

The registration rates will be published in mid-April. Conference registration will be available from May.

Registration for the EMS Annual Meeting 2018 is by payment of the appropriate registration fee. There is no waiving of registration fees except for scientists receiving support.

Registration fees cover access to all scientific events, refreshments during the coffee breaks, and the icebreaker reception.

The EMS aims to make the Annual Meeting more sustainable and minimize the use of resources. During the abstract submission, authors are asked to indicate whether a printed programme book is needed. According to the outcome, only a limited number of programme books will be available.Copies for every one's use will be distributed around the conference venue; personal copies will be handed out on request at the registration desk.
Please be aware that the mobile app (continuous updates) and the EMS2018 website will offer the option of generating and printing your own personal programme.

Offset your carbon footprint

Within the registration you will have the option to compensate the CO_2 emission caused by your travel to Budapest.

Early registration rate

- When registering for the early registration rate, there are two payment options: (a) by **credit card** or (b) by **bank transfer**.
- Participants from most European countries can choose to receive their name badges by airmail about 8–10 days prior to the conference if payment is received by 23 July 2018.

Standard registration rate

- You can register online until the end of the conference, but you can only pay by **credit card**.

On-site registration

On-site registration at standard registration rates will be possible during the conference week (payment by cash or credit card) at the times given below.

Day	Time
Sunday, 2 September 2018:	15:00–18:00
Monday–Thursday, 3–6 September 2017:	08:00–18:00
Friday, 7 September 2017:	08:00–12:00

Instructions for online registration

- Please ensure you have read and understood the cancellation policy on registration conditions as provided on the website.
- All information should be typed in upper and lower case (e.g. John Smith).
- You will have the opportunity to review and edit any registration details before the final stage of payment.
- 60 minutes is the maximum time allowance to complete the form before the system times out.
- The current versions of Firefox, Google Chrome, and Internet Explorer are the preferred platforms for use of the forms.

Terms and conditions

General

- Pre-registration at early registration must be accompanied by payment. Otherwise, it will not be processed and the standard registration rates will be applied.
- Registrations are for the persons specified and are non-transferable.
- Registration for the conference implies the acceptance of the rules of conduct.

The effects of the Arctic warming on the Mid-latitude winter temperature anomalies

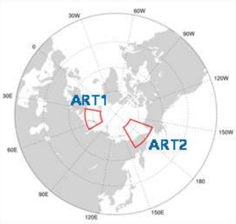
Woo-Seop Lee, Miah Kim, and Seon Tae Kim

APEC Climate Center

I. Introduction

This study investigated the combined effects of the arctic warming and ENSO on winter temperature anomalies in the mid-latitudes of the Northern Hemisphere. First of all we identify two different influences of arctic warming leading to cold winter in East Asia or North America, based on daily observational analysis. The unusual cold winter in East Asia is related to the abnormal warmth of the Barents-Kara Sea area, but the severe winter in North America is related to the abnormal warmth in the East Siberia-Chukchi Sea region. In other word, owing to negative anomalies of MSLP over northern Korea, the cyclonic flow occurs over Manchurian region and acts as running cold flow to western Asia. The circulation occurs low-level flow in front of the circulation, and the cold air flows along the anticyclonic circulation. The cold advection flows into North America, so the continent goes through cold winter. Similarly, El Nino-Southern Oscillation (ENSO) has been found to affect temperature anomalies in East Asia or North America when notable sea surface temperature (SST) anomalies are present over tropical pacific. We have defined the four possible combinations using arctic warming signal and ENSO phase. Global warming in each region of the Arctic Ocean involves abnormal anti-cyclone rural development and downstream development of mid-latitude trough. The resulting cold air stream provides favorable conditions for serious winter in East Asia or North America. Furthermore, the circulation state with nearly the arctic warming and nino3.4 indices can cause considerably different responses in surface temperature anomalies over mid-latitudes of the Northern Hemisphere.

II. Data and Methods



The variables used in the analysis are the daily mean of 2-mtre temperature (T2m), Mean Sea Level Pressure (MSLP), Geopotential height at 500 hPa (Z500), and u-,v-wind components using 00 UTC. In addition, to distinguish the effect of ocean on atmospheric patterns, we also distinguished between El Nino and La Nina(ENSO) index (ONI; 3 month running mean of Nino3.4) using the data from the Climate Prediction Center(CPC).

- **ART1: Surface Temperature Anomalies over Barents-Kara Sea region(30-70˚E, 70-80˚N)**
- **ART2: Surface Temperature Anomalies over East Siberian-Chuckchi Sea region (160˚E-160˚W, 65-80˚N)**

In this study, the effects of the 2mT anomaly pattern of ART1 and ART2 were investigated using three separate data sets. C1 is assigned when both ART1 and ART2 are positive. C2 are that ART1 is positive but ART2 is negative. C3 has the opposite C2 sign, negative ART1 but positive ART2.

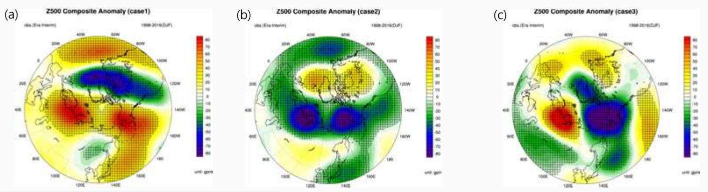
	CASE 1	CASE 2	CASE 3
ART1	+	+	
ART2	+	-	
case total	*880*	*874*	*711*

III. Results

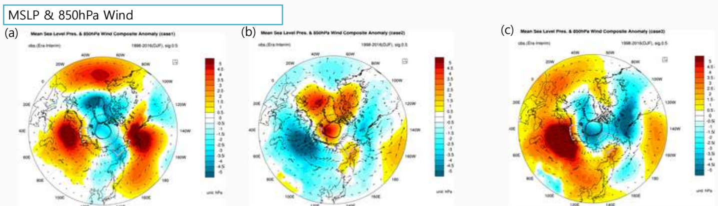
Arctic Effect

- **Atmospheric circulation anomalies linked to Arctic temperature**

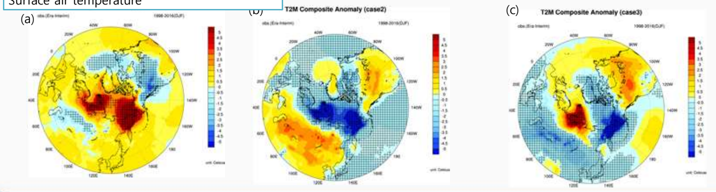
Geopotential Height at 500hPa



MSLP & 850hPa Wind



Surface air temperature



ENSO Effect

Frequency of occurrences for each case & Nino3.4

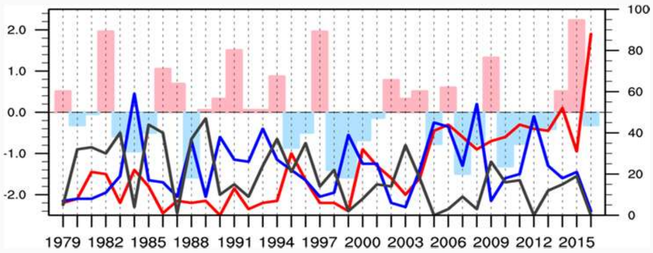
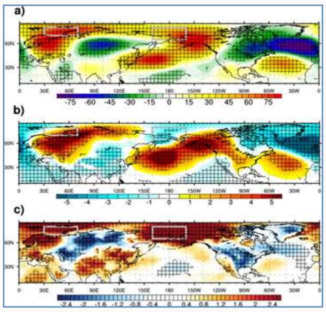


Figure shows the number of occurrences per year of Arctic warming. As a key feature, the C1 frequency increases with time in relation to global warming. Although GHGs concentrations have increased continuously over the past half-century, C1 fluctuation trends have exhibited considerable interdecadal variation, partly because of natural climate variability (Kug et al, 2015). For example, when the global surface temperature increased sharply from 1979 to 1997, winter temperatures increased in Europe, East Asia and North America but hardly increased in the polar regions. However, Arctic surface warming has progressed rapidly since 1998, with stronger warming trends over the Barents-Kara and East Siberian-Chukchi sea regions where marked reductions in sea-ice concentration have occurred (Kug et al., 2015).

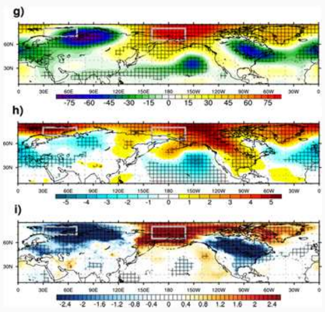
Combined Effect (Artic & Ocean)

- **Atmospheric circulation anomalies linked to Arctic temperature**

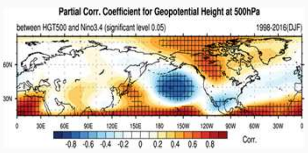
Case 1

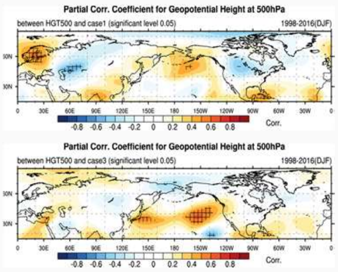


Case 3



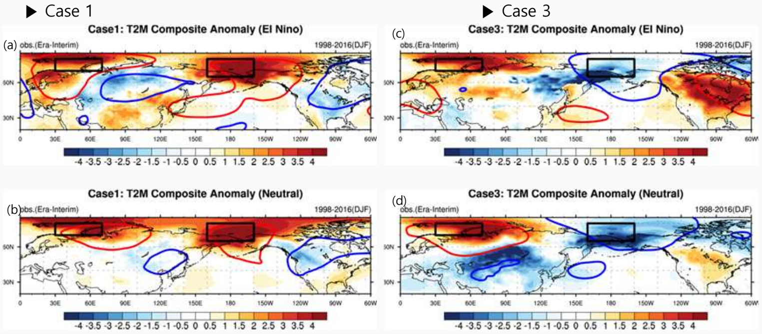
- **Partial Correlation**





IV. Summary

▶ Case 1 ▶ Case 3



Global warming in each region of the Arctic Ocean involves abnormal anti-cyclone rural development and downstream development of mid-latitude trough. The resulting cold air stream provides favorable conditions for serious winter in East Asia or North America. Furthermore, the circulation state with nearly the arctic warming and nino3.4 indices can cause considerably different responses in surface temperature anomalies over mid-latitudes of the Northern Hemisphere

Prediction of Full Blooming Dates of Major Peach Cultivars (*Prunus persica*) using the DVR and Chill Day Models

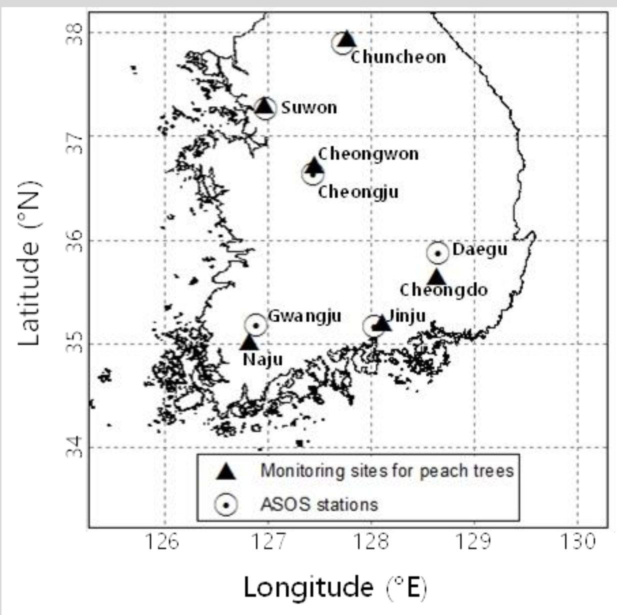
J. Chun[1], K. Kang[2] , D. Kim[1], H. Han[3], I. Son[3]

[1]APEC Climate Center, [2]bNational Oceanic and Atmospheric Administration, [3]National Institute of Horticultural and Herbal Science

INTRODUCTION

- Recently, bud-burst and flowering dates of fruit crops showed a tendency to become earlier and an increase in the variabilities of temperature in spring lead to the high risk of frost damage to fruit crops (Honjo, 2007)
- Since full blooming dates of peach trees are earlier than other fruit crops, the risk of peach trees can be higher than others.
- The accurate prediction of full blooming dates of fruit crops can be useful to reduce the damage.
- However, the full blooming date prediction model for peach tree used by the Rural Developmental Administration (RDA) were developed using only one cultivar (‘Youmyeong’) and observations from a station (Suwon, South Korea).
- This RDA’s model might not adequately reflect the characteristics of peach cultivars or regions.
- The objective of this study was to develop the full blooming date prediction models for major peach cultivars using the temperature-based models.

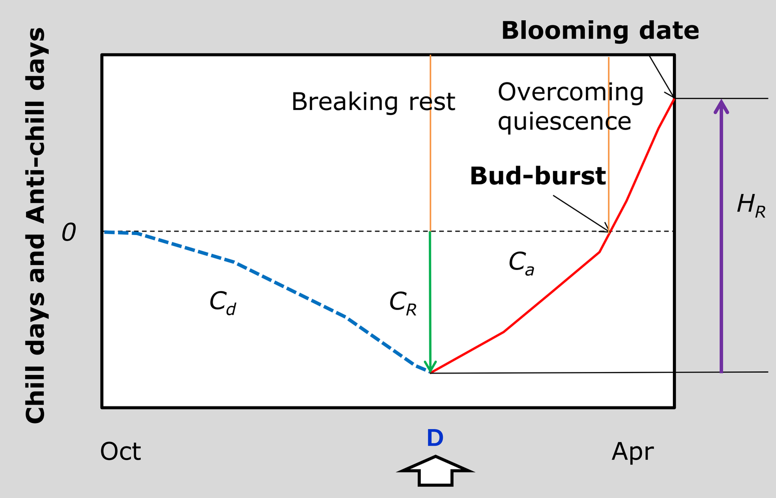
MATERIALS AND METHODS



Location map of Automated Synoptic Observing System (ASOS) stations nearest to monitoring sites for bud-burst and full blooming dates of peach trees in this study.

Accumulation of chill days and anti-chill days for the five cases of the chill day and new chill day models (Adapted from “Improvement of chilling and forcing model to predict bud-burst,” by Cesaraccio et al., 2006).

Cases (°C)	Chill day model: Chill days (C_d)	Chill day model: Anti-chill days (C_a)	New chill day model: Chill days (C_d)	New chill day model: Anti-chill days (C_a)
$0 \le T_C \le T_n \le T_x$	$C_d = 0$	$C_a = T_M - T_C$	$C_d = 0$	$C_a = T_M - T_C$
$0 \le T_n \le T_C \le T_x$	$C_d = -\left[(T_M - T_n) - \frac{(T_x - T_C)^2}{2(T_x - T_n)}\right]$	$C_a = \frac{(T_x - T_C)^2}{2(T_x - T_n)}$	$C_d = \frac{(T_n - T_C)^2}{2(T_n - T_x)}$	$C_a = \frac{(T_x - T_C)^2}{2(T_x - T_n)}$
$0 \le T_n \le T_x \le T_C$	$C_d = -(T_M - T_n)$	$C_a = 0$	$C_d = T_M - T_C$	$C_a = 0$
$T_n \le 0 \le T_x \le T_C$	$C_d = -\left[\frac{T_x^2}{2(T_x - T_n)}\right]$	$C_a = 0$	$C_d = (T_M - T_C) - \left[\frac{T_n^2}{2(T_n - T_x)}\right]$	$C_a = 0$
$T_n \le 0 \le T_C \le T_x$	$C_d = -\frac{T_x^2}{2(T_x - T_n)} - \frac{(T_x - T_C)^2}{2(T_x - T_n)}$	$C_a = \frac{(T_x - T_C)^2}{2(T_x - T_n)}$	$C_d = \frac{(T_n - T_C)^2}{2(T_n - T_x)} - \frac{T_n^2}{2(T_n - T_x)}$	$C_a = \frac{(T_x - T_C)^2}{2(T_x - T_n)}$



Sequential dormancy model (Adapted from “Improvement of chilling and forcing model to predict bud-burst,” by Cesaraccio et al., 2005).

Observed bud-burst and full blooming dates in Julian day at study sites.

Site	Cultivar	Bud-burst date: N	Bud-burst date: MEAN±STD (Julian day)	Full blooming date: N	Full blooming date: MEAN±STD (Julian day)
Chuncheon	chh	10	90.4±2.4	10	112.3±4.1
	ymn	14	89.7±4.3	17	114.1±5.3
Suwon	cbj	17	90.4±5.1	27	111.2±4.7
	chh	9	88.4±3.5	9	109.2±4.6
	ymn	18	90.7±5.1	31	113.3±4.9
Cheongwon	chh	6	89.8±5.1	6	107.2±6.4
	ymn	6	92.7±3.8	6	111.0±4.2
Cheongdo	cjo	5	89.0±3.0	10	103.9±3.9
	jhw	5	89.0±3.0	9	103.8±3.9
	ymn	8	84.9±6.6	11	103.9±4.1
Naju	chh	6	81.3±2.6	6	101.3±4.2
	ymn	7	82.3±3.1	7	102.1±3.5
Jinju	chh	8	78.9±6.9	8	99.1±5.2
	ymn	9	79.0±6.6	9	102.4±3.2

Developmental rate (DVR)

- $DVR_T = A + B \times T$
  - Proc REG (SAS statistical software)
- $DVR_T = \alpha \times e^{(\beta \times T)}$
  - Proc NLIN, Method=Levenberg-Marquardt method (SAS statistical software)
- The number of days required for flowering: daily mean temperature ≥ 5°C since Jan. 30.
- DVR: the reciprocal of the number of days required for flowering
- Full blooming date: $\sum(DVR_T) \ge 1.0$

Iteration method

- $5 \le T_C \le 10$ (by 0.1), $-70 \le C_R \le -150$ (by 1)
- Identifying the date D, when $\sum|C_d| \ge |C_R|$
- Predicted bud-burst dates, when $\sum|C_a| \ge |C_R|$
- Best combination of T_c and C_R, for minimizing the RMSE between obs. and pred. bud-burst dates
- H_R: Accumulating C_a until the blooming dates from the date D
- Averaging H_R

RESULTS AND DISCUSSION

Fitted exponential models and goodness-of-fit measures for the DVR models.

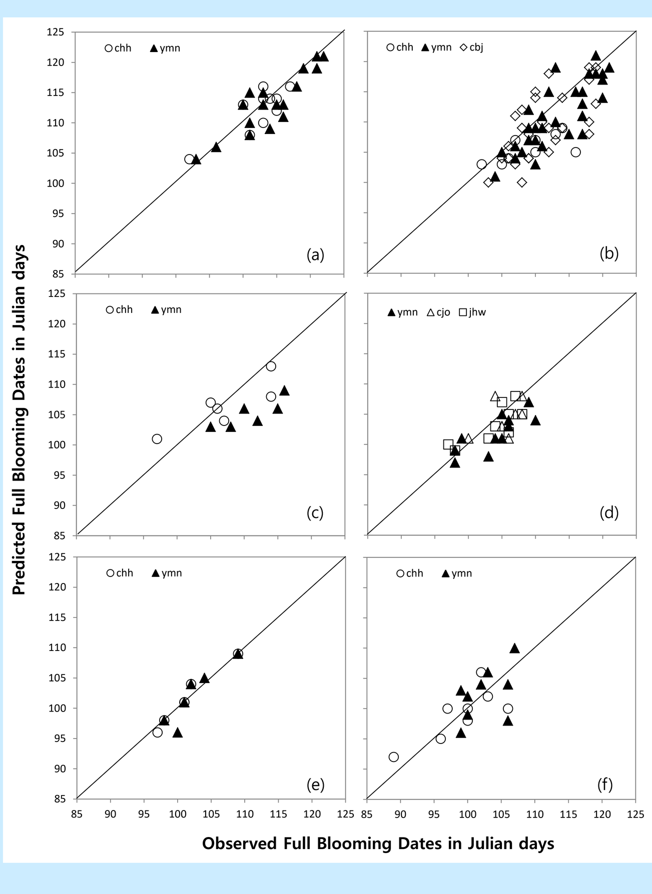
Site	Cultivar	C in eq. [2]	D in eq. [2]	MAPE (%)		R^2		RMSE (day)	
Chuncheon	chh	0.014	0.062	1.79	1.77	0.67	0.75	2.28	2.46
	ymn	0.010	0.093	1.76		0.78		2.57	
Suwon	cbj	0.008	0.127	3.35	3.06	0.43	0.63	4.62	4.33
	chh	0.004	0.194	3.37		0.45		4.88	
	ymn	0.007	0.138	2.72		0.65		3.87	
Cheongwon	chh	0.011	0.077	2.50	3.85	0.74	0.54	3.32	5.04
	ymn	0.002	0.261	5.20		0.68		6.31	
Cheongdo	cjo	0.010	0.077	2.01	2.17	0.56	0.58	2.55	2.71
	jhw	0.012	0.065	1.93		0.63		2.26	
	ymn	0.006	0.129	2.51		0.64		3.15	
Naju	chh	0.016	0.053	0.50	0.76	0.96	0.89	0.91	1.41
	ymn	0.017	0.043	0.99		0.83		1.73	
Jinju	chh	0.022	0.029	2.51	2.78	0.60	0.48	3.08	3.40
	ymn	0.020	0.028	3.02		0.25		3.65	
Entire set				2.54		0.75		3.61	

Estimated parameters (TC, CR, and HR) and goodness-of-fit measures for the Chill day models.

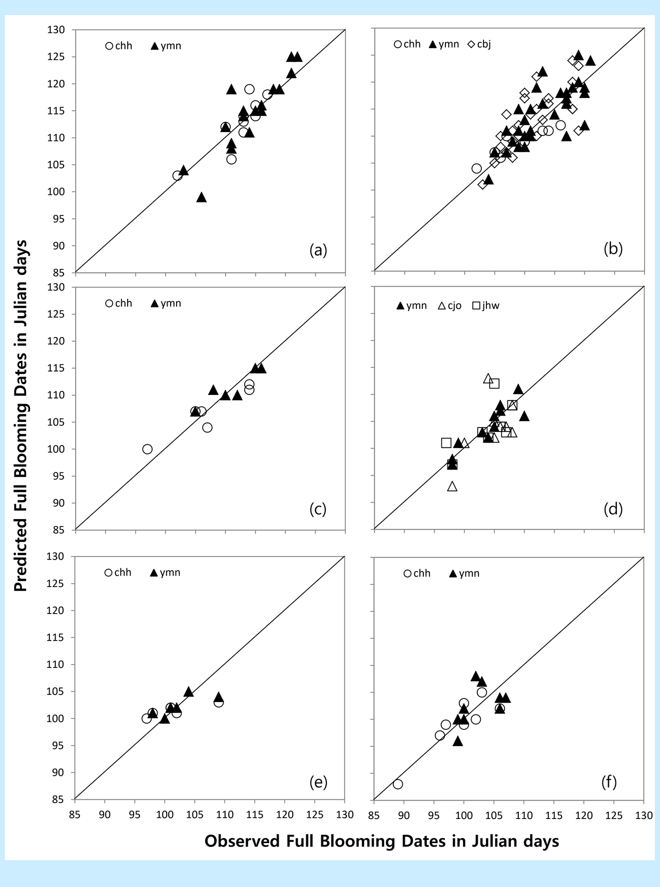
Site	Cultivar	T_C	C_R	H_R	MAPE (%)		R^2		RMSE (day)	
Chuncheon	chh	5.0	-100	244.0	1.69	1.91	0.72	0.79	2.51	2.96
	ymn	5.0	-110	245.0	2.04		0.80		3.19	
Suwon	cbj	5.0	-107	232.9	2.94	2.51	0.54	0.72	4.15	3.71
	chh	5.0	-107	240.1	1.82		0.85		2.31	
	ymn	6.0	-73	180.2	2.33		0.59		3.63	
Cheongwon	chh	5.0	-133	261.8	2.19	1.71	0.88	0.63	2.45	2.12
	ymn	7.0	-95	199.2	1.22		0.83		1.73	
Cheongdo	cjo	9.0	-73	137.2	2.69	2.11	0.44	0.54	3.92	3.08
	jhw	9.0	-73	134.0	2.36		0.42		3.23	
	ymn	5.2	-130	277.4	1.38		0.81		1.81	
Naju	chh	8.0	-71	149.6	2.44	1.94	0.73	0.57	3.08	2.69
	ymn	8.0	-74	150.0	1.51		0.59		2.30	
Jinju	chh	6.0	-123	215.7	1.99	2.36	0.80	0.64	2.24	2.82
	ymn	5.1	-148	271.0	2.70		0.26		3.25	
Entire set					2.22		0.80		3.22	

Estimated parameters (TC, CR, and HR) and goodness-of-fit measures for the new chill day models.

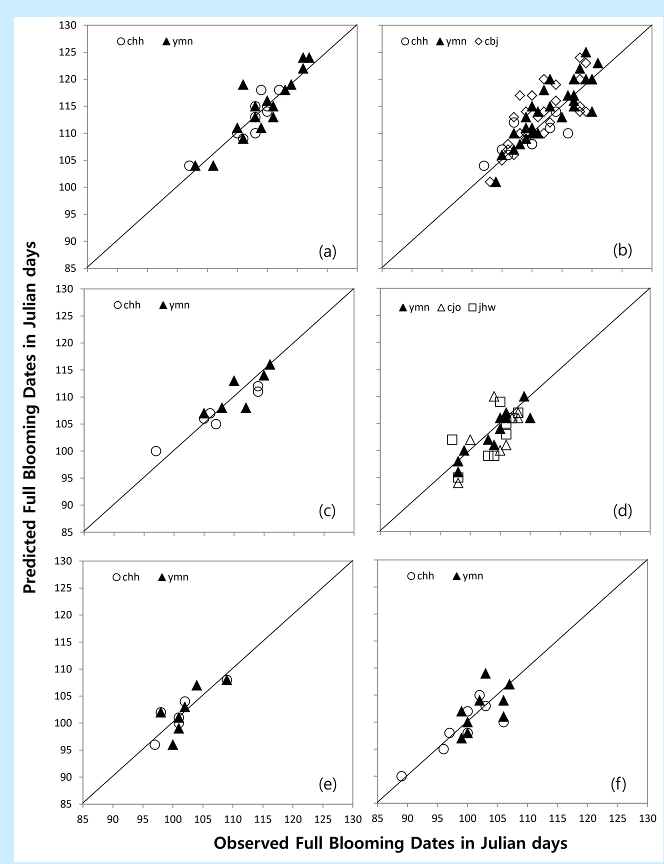
Site	Cultivar	T_C	C_R	H_R	MAPE (%)		R^2		RMSE (day)	
Chuncheon	chh	5.0	-82	231.3	1.34	1.54	0.78	0.81	1.97	2.40
	ymn	5.2	-92	228.5	1.66		0.81		2.61	
Suwon	cbj	6.0	-81	186.6	3.01	2.38	0.56	0.79	4.18	3.52
	chh	5.9	-81	196.3	2.12		0.53		3.00	
	ymn	5.0	-93	210.2	1.91		0.74		2.99	
Cheongwon	chh	7.0	-82	176.2	1.87	1.69	0.95	0.68	2.16	2.20
	ymn	7.0	-87	186.1	1.51		0.67		2.24	
Cheongdo	cjo	5.0	-140	272.1	2.80	2.29	0.56	0.61	3.42	2.92
	jhw	5.0	-140	266.5	2.93		0.45		3.38	
	ymn	5.3	-131	263.2	1.30		0.83		1.78	
Naju	chh	5.1	-114	236.5	1.50	1.83	0.77	0.65	1.96	2.32
	ymn	5.1	-114	234.9	2.12		0.57		2.59	
Jinju	chh	7.0	-75	153.4	1.97	2.19	0.71	0.62	2.65	2.89
	ymn	6.0	-94	200.7	2.38		0.36		3.09	
Entire set					2.12		0.83		3.02	



Predicted and observed full blooming dates in Julian days at the Chuncheon (a), Suwon (b), Cheongwon (c), Cheongdo (d), Naju (e) and Jinju (f) sites, using the DVR model.



Predicted and observed full blooming dates in Julian days at the Chuncheon (a), Suwon (b), Cheongwon (c), Cheongdo (d), Naju (e) and Jinju (f) sites, using the Chill day model.



Predicted and observed full blooming dates in Julian days at the Chuncheon (a), Suwon (b), Cheongwon (c), Cheongdo (d), Naju (e) and Jinju (f) sites, using the New Chill day model.

- It recommended that the number of observations for the cultivars at each site should be increased to improve the models in the future.

On the possibility of the practical use of APCC's BSISO information

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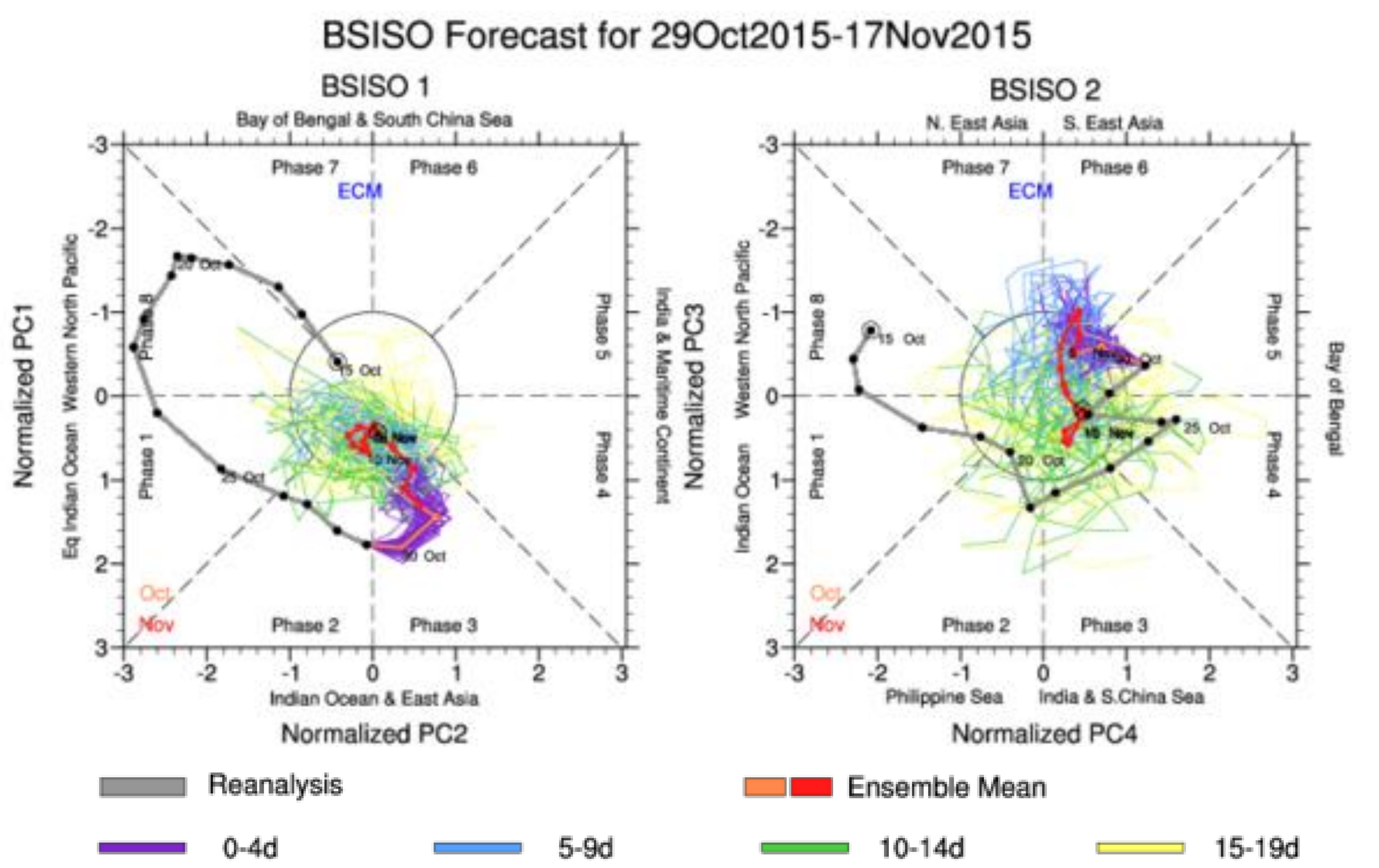
APCC's BSISO Forecast

Climate Prediction & Information Service ✓ *http://www.apcc21.org*

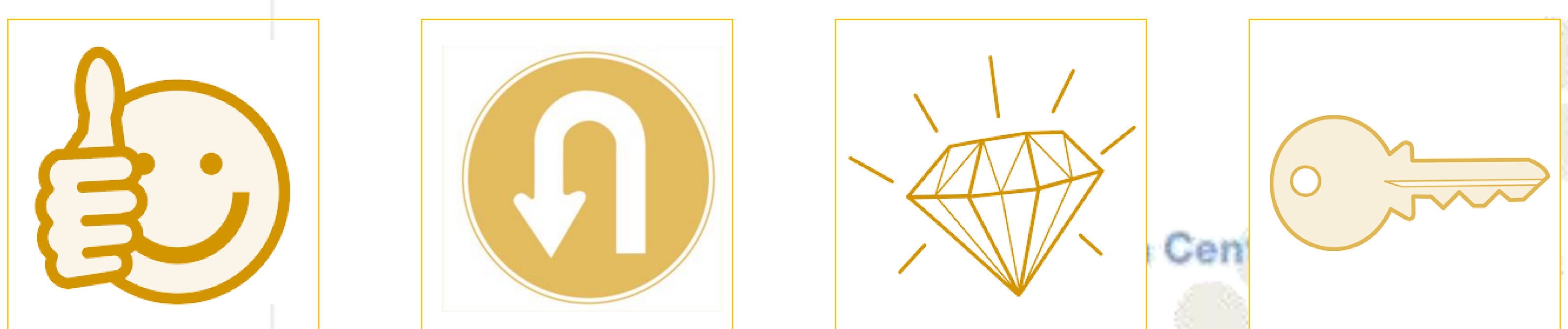
Seasonal Forecast | BSISO Forecast | Climate Monitoring | CLIK | Data Service | CLIPs

APCC has played an important role in providing *seasonal forecast* services based on a multi-model ensemble prediction system from 17 leading forecast institutes.

APCC has scaled up the climate information services to *intraseasonal forecast* by providing the Boreal Summer Intraseasonal Oscillation (BSISO) forecasts.



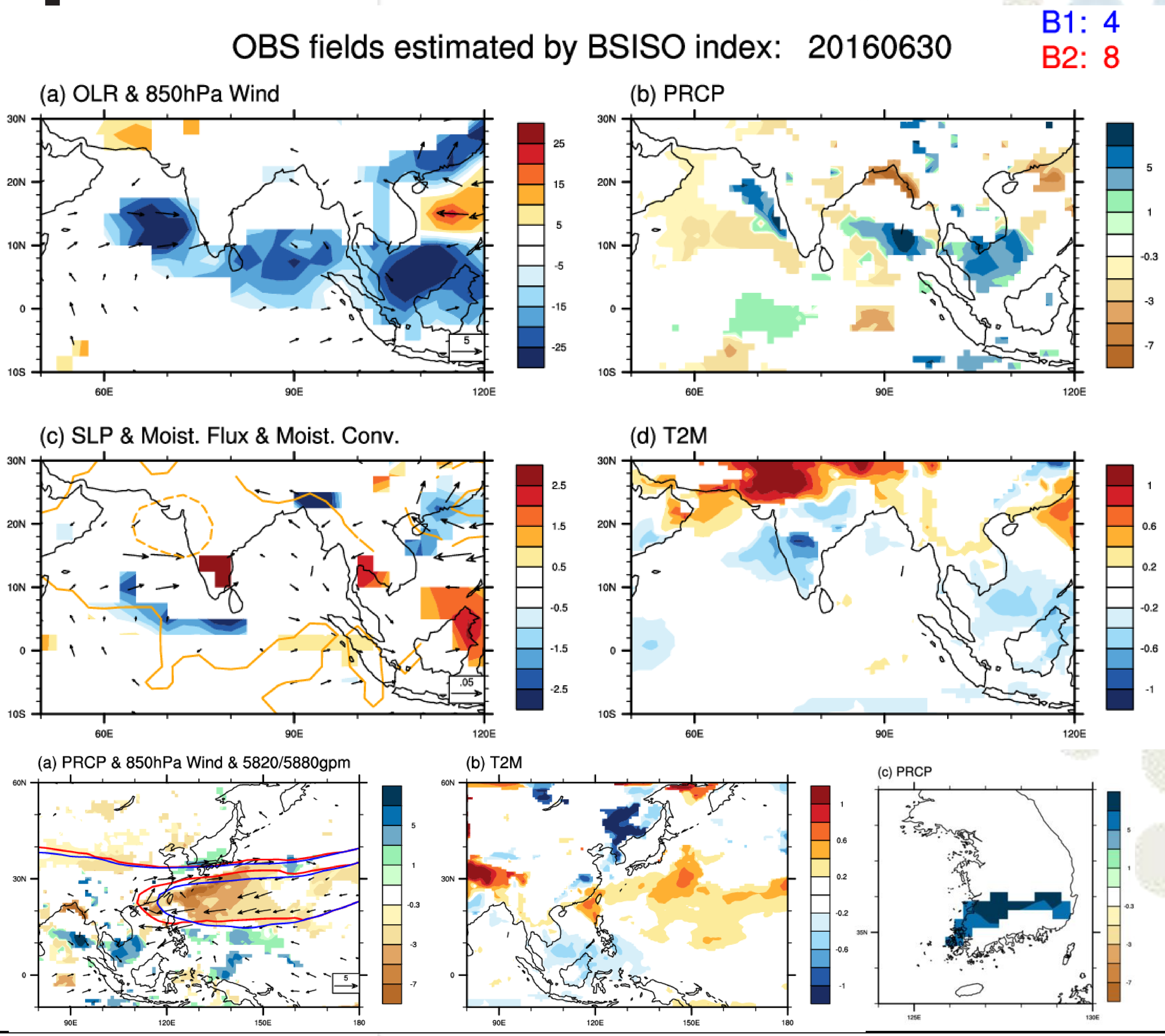
Better forecast? *practical use*



Illegible BSISO index
→ user friendly information

Better forecast for better understanding on BSISO

Extended forecast over Asia-monsoon region estimated by BSISO forecasts



Monitoring, Forecast, Verification

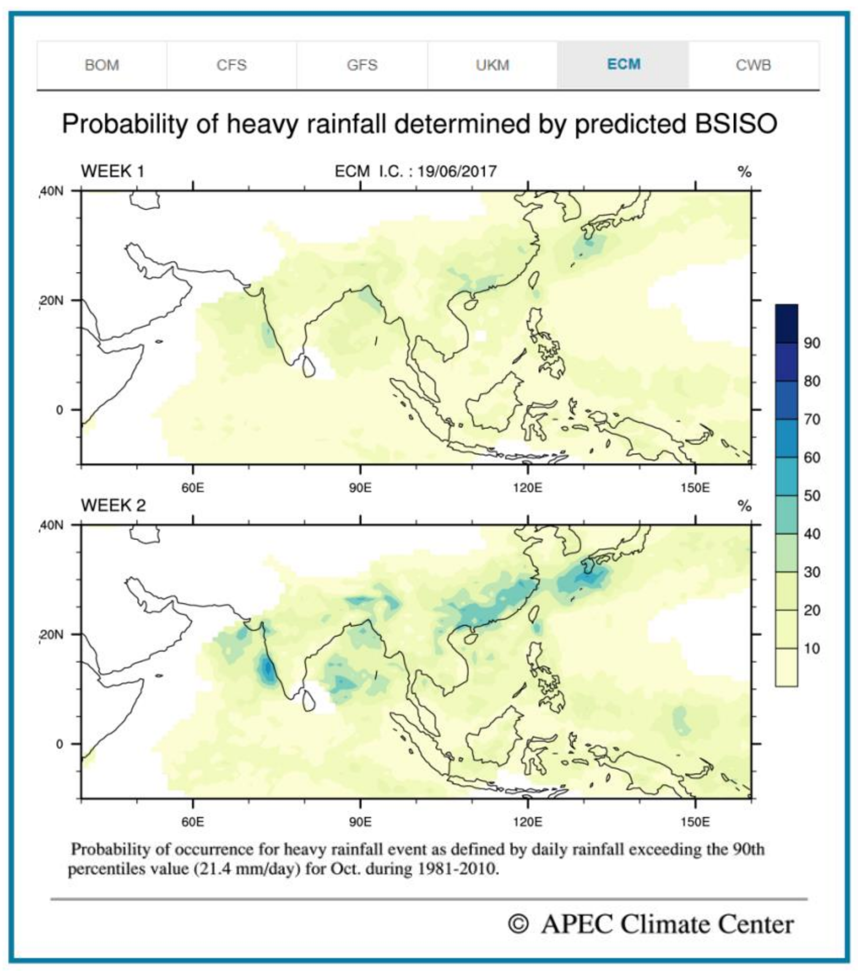
- ❖Asia monsoon region
  : General circulation pattern, Tropical cyclone, Heavy rainfall
- ❖India
  : Monsoon onset, Heat wave
- ❖East Asia
  : Meiyu, Changma, Extreme heat

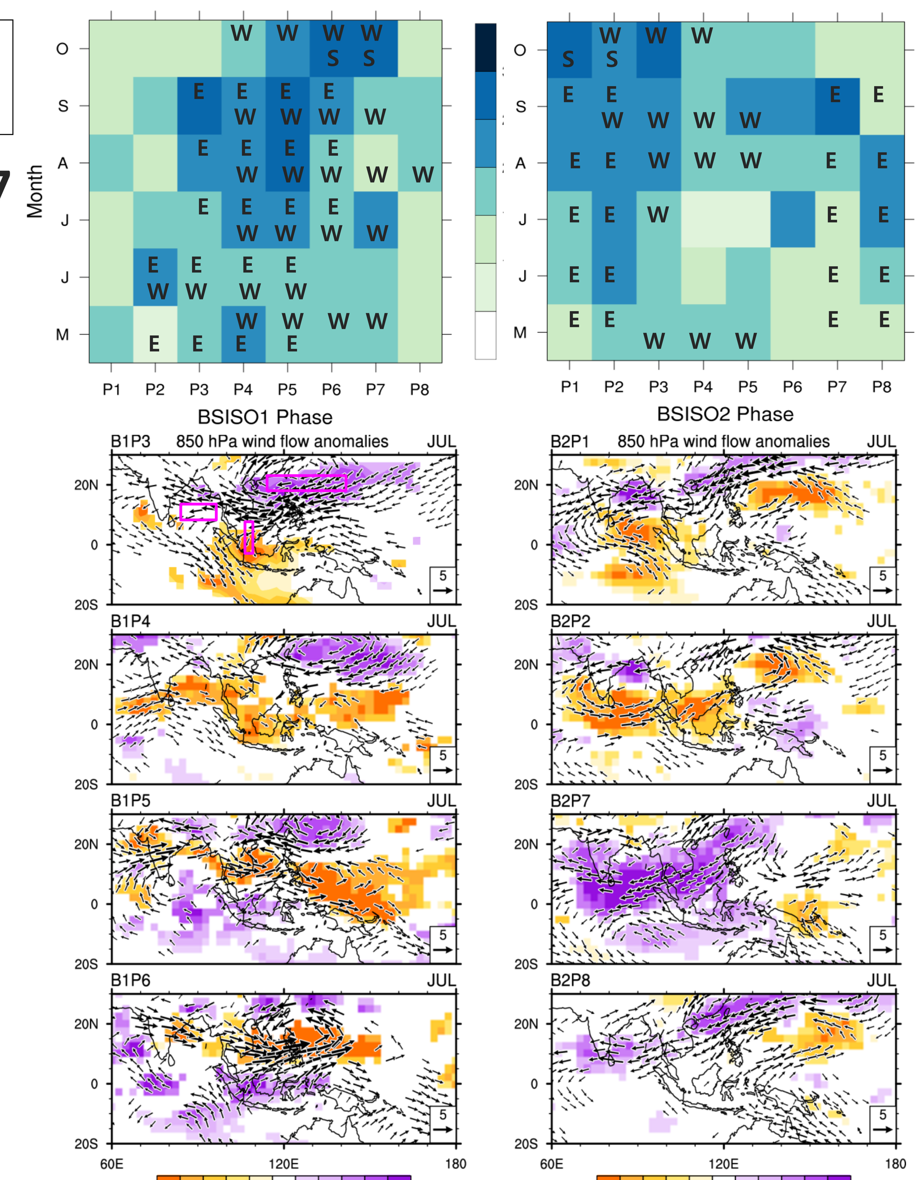
Better forecast for better recognition of the value

Development of a guideline to increase practical use of BSISO forecast

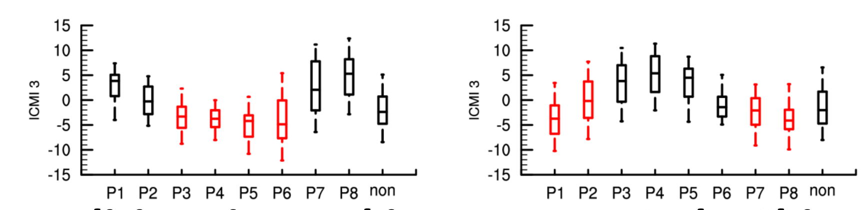
Heavy rainfall forecast based on BSISO index forecast [ECMWF]

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





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



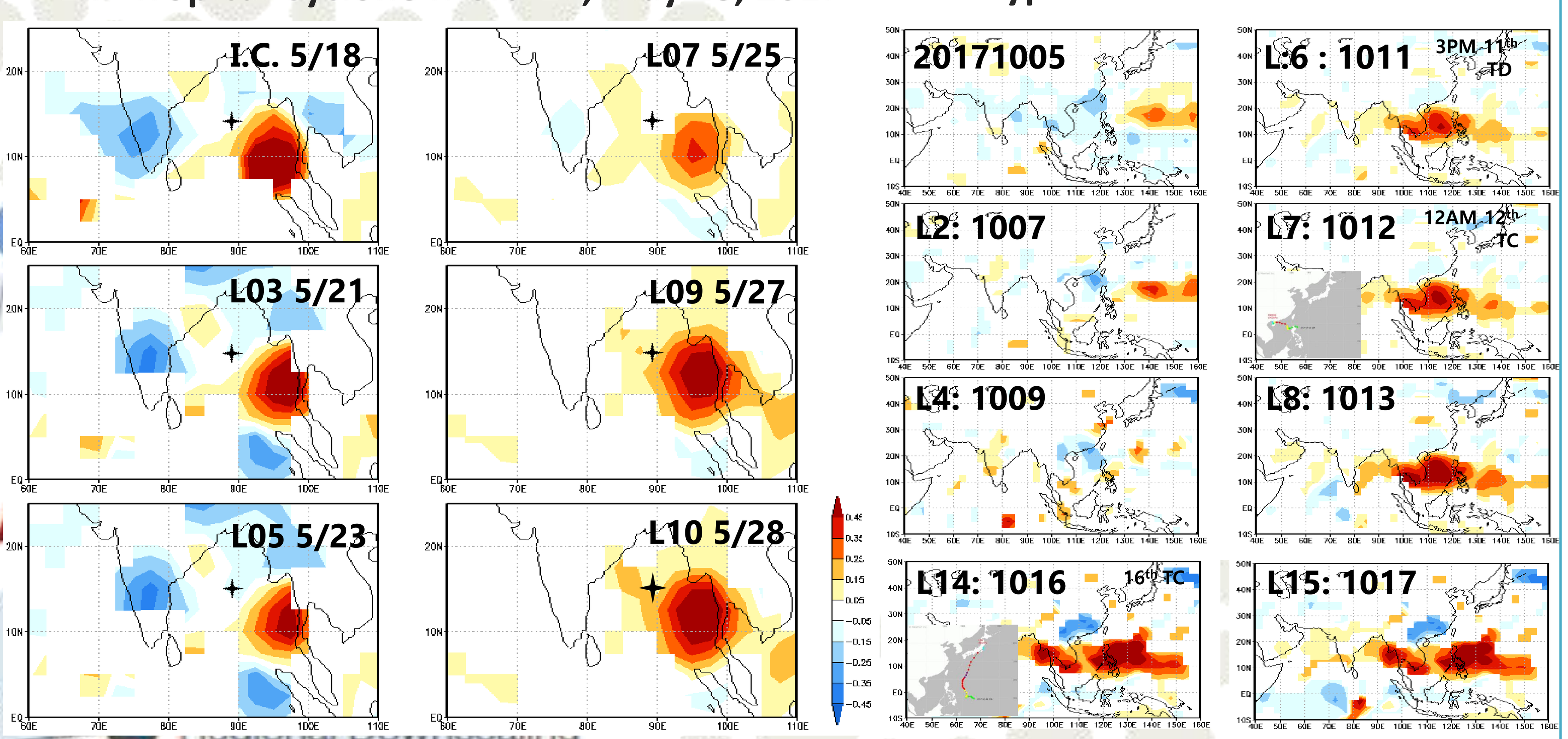
BSISO can contribute to the favorable condition in making strong Indo-China monsoon and bringing extra precipitation to Thailand Monsoon Domain.

Better forecast for better recognition of the value

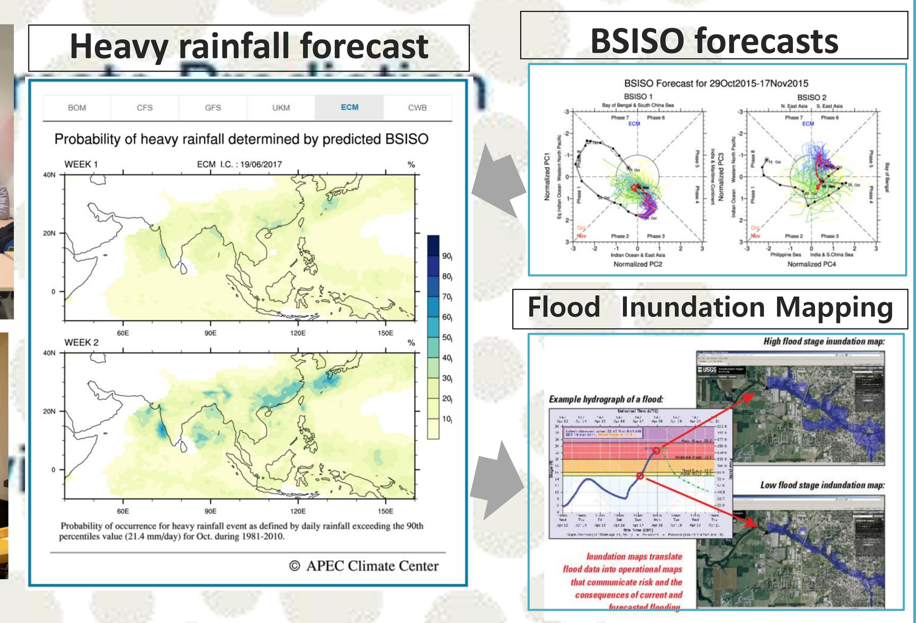
Development of a guideline to increase practical use of BSISO forecast

ISGPI forecast estimated by BSISO index forecast [ECMWF]

❖Ex> Tropical Cyclone Mora-17, May 28, 2017 ❖Ex> Typhoon Khanum-20 & Lan-21



Better forecast by actionable information



- ❖ Cornerstone for making flood inundation mapping
- ❖ 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

- The goal of APCC's BSISO forecasting activity is to produce better forecast by promoting practical use of real-time BSISO information.
- 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 an 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.

On the possibility of the practical use of APCC's BSISO information

Hae-Jeong Kim and Yoo-Rim Jung / Hae-Jeong Kim

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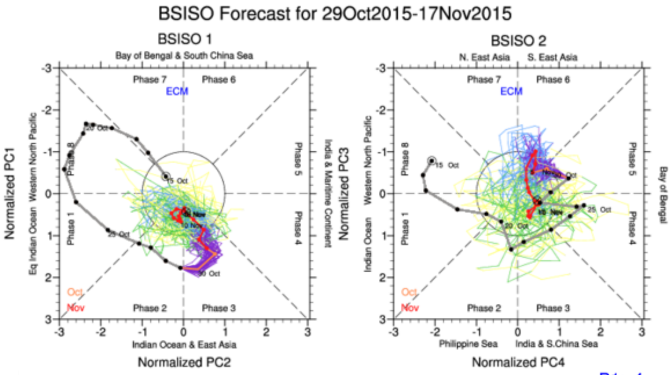

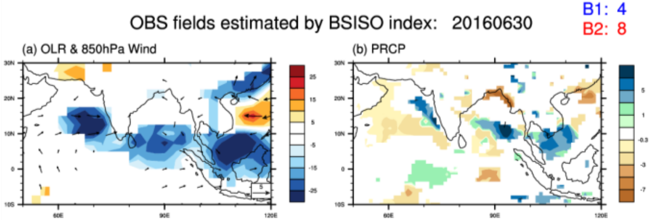

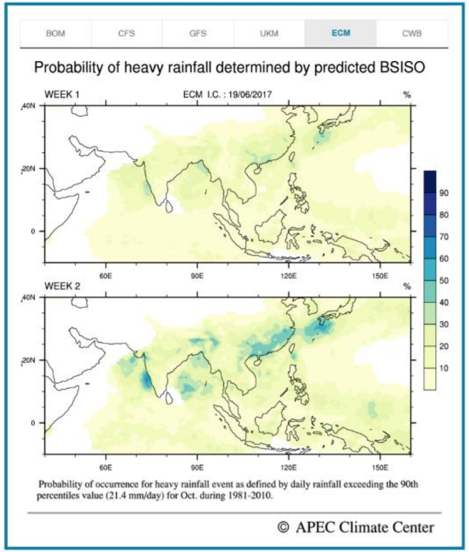

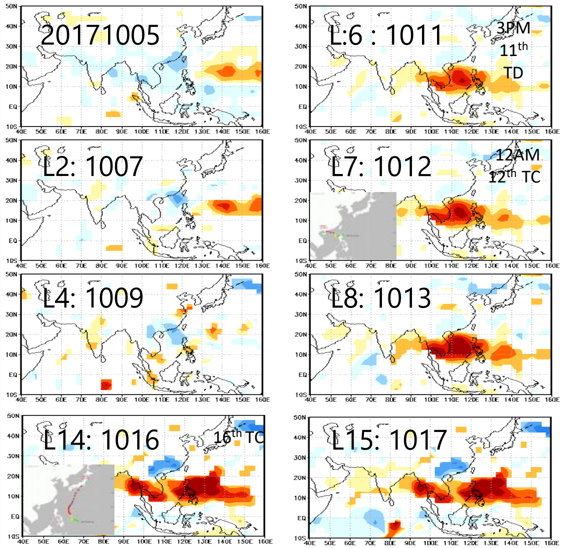

To promote practical use of real-time BSISO information, we've translated the illegible BSISO indices into user friendly information by looking for the possibility of BSISO application.