문서번호 APCC-출장-18-1077(2018-11-12)

결재	연구원	팀장	부서장	부서장
	11/12 이현주	11/12 이우섭	대결 11/12 윤여훈	대결 11/12 윤여훈
협조				

TRAVEL REPORT FORM
출장보고서

I. Travel Overview 출장개요

1. Traveler(s) 출장자

Department 소속	Position 직위(직급)	Name 성명	Note 비고
기후사업본부 기후분석팀	연구원	이현주	

2. Travel Period 출장기간

- 출장기간 : 2018년10월28일-11/02일, 학회기간: 2018년10월28일-11월1일 (4일간)

3. Occasion and destination 행사 및 출장지

- 학회명 : 11th ASEAN Climate Outlook Forum (ASEANCOF-11)
  장 소 : 쿠알라룸푸르, 말레이시아

II. Major Activities 주요업무 수행내용

1. Main Contents and Activities 주요내용 및 활동

○ 참가 회의명 : 11th ASEAN Climate Outlook Forum (ASEANCOF-11)

- ASEANCOF는 WMO가 공식적으로 후원하는 Regional Climate Outlook Forum (RCOF) 중 하나로, ASEAN (Association of Southeast Asian Nations)지역의 기후 전망을 위한 회의임
- ASEAN 지역 (Indonesia, Thhailand, Vietnam, Malaysia, Philippines, Singapore, Myanmar, Cambodia, Laos, Brunei)의 2018/19년 겨울 몬순 (12월-2월) 기온 및 강수 전망에 대한 여러 기관 (WMO LC-LRFMME, UKMO, BOM, ASEAN 회원국 기상청)의 예보 결과를 공유하고, 계절 예측의 농업/식량 분야 활용에 대한 토의를 진행함. 이를 위해 end user격인 Hydro and Agro Informatics Institute (HAII), International Rice Research Institute (IRRI), Mekong River Commission 등의 기관이 참석하여 기후 자료의 활용에 대해 발표하였음. 이와 더불어 극한기후 모니터링을 위해 기후정보의 최종사용자와 각국 기상청 관계자들과의 필요한 정보에 대한 토론이 이루어짐.

○ WMO LC-LRFMME 소개 및 ASEAN지역 2018/19 겨울 기후 전망 발표 [붙임 1]

- 발표 제목: Seasonal Climate Outlook for the 2018 Winter Monsoon Season from WMO LC-LRFMMME
- 발표 내용: WMO LC-LRFMME 소개 및 MME 자료를 이용한 2018/19 DJF 기온, 강수 전망

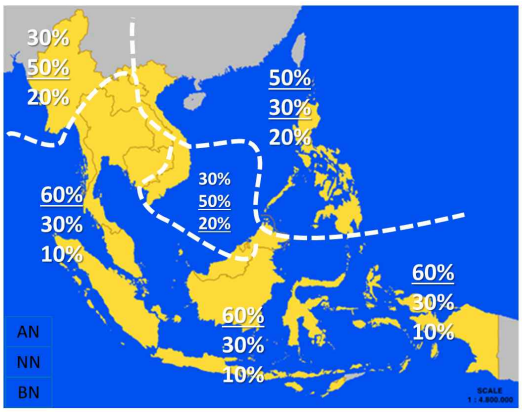
2. Relevance to APEC Climate Center's Activities 결론 및 소감

○ ENSO에 대한 감시 및 전망
- El Nino/Southern Oscillation (ENSO)는 ASEAN 지역 겨울철 강수와 기온의 경년변동에 영향을 미치는 중요한 요인 중 하나임. 현재의 warm neutral ENSO 상태가 겨울철에 El Nino로 발달한 가능성을 약 70% 정도로 예측되고 있으며, 강도는 강하지 않을 것으로 예측됨.

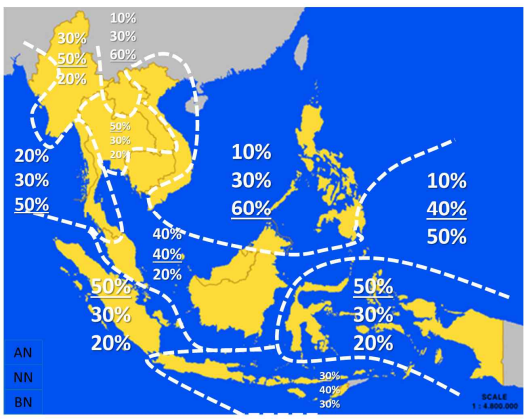
○ IOD에 대한 감시 및 전망
- ASEAN 지역 겨울철에 영향을 미치는 또 다른 요인인 Indian Ocean Dipole (IOD)는 positive 상태였는데 겨울철에는 neutral 상태가 될 것으로 전망하였음

○ Monsoon 활동
- 동아시아 지역에서의 Warm condition으로 인한 약한 고기압성 시스템으로부터 Northeast 몬순이 약할 것으로 전망
- El Nino 발달로 인한 Walker 순환의 변동으로 인해 ASEAN지역에서의 convection이 억제될 것으로 예측됨.

○ Consensus Outlook [붙임 2]
- 2018/19년 겨울 온도는 많은 지역에서 above normal이 될 것이라고 전망함. Thailand, Malaysia, Singapore, Indonesia 등은 약 60%의 above normal로 예측되었으며, Philippines, Myanmar는 약 50%의 확률로 above normal를 전망함. Northern Southern Vietnam, Brunai에서는 Near normal을 전망함 (그림 1)
- 강수는 지역별 격차가 큼. Philippine과 Eastern Malysia, Southern Vietnam은 약 60%의 확률로 below normal을 전망하였으며, 인도네시아의 Java 섬은 약 40%의 near normal을 예측한 반면 Sumatra섬은 약 50%의 above nomal를 전망함 (그림 2)



(그림1) Consensus 2018/19 DJF temperature forecast



(그림2) Consensus 2018/19 DJF precipitation forecast

(사진 1) 11th ASEANCOF 참가자

(사진 2) 11th ASEANCOF 현장

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

[붙임 3] 11th ASEANCOF 발표자료

11TH ASEAN CLIMATE OUTLOOK FORUM (ASEANCOF-11)

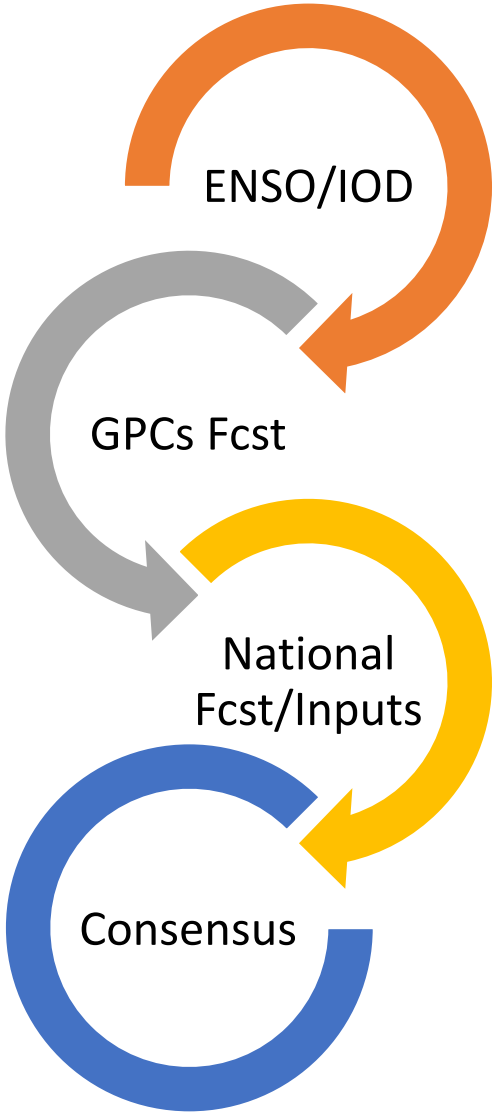
DRAFT CONSENSUS DJF 2018-2019

29 Oct - 01 Nov 2018, Kuala Lumpur
Malaysian Meteorological Department

KEMENTERIAN TENAGA, SAINS, TEKNOLOGI, ALAM SEKITAR DAN PERUBAHAN IKLIM
MET Malaysia
ASMC
ASEAN SPECIALISED METEOROLOGICAL CENTRE
asean
WORLD METEOROLOGICAL ORGANIZATION

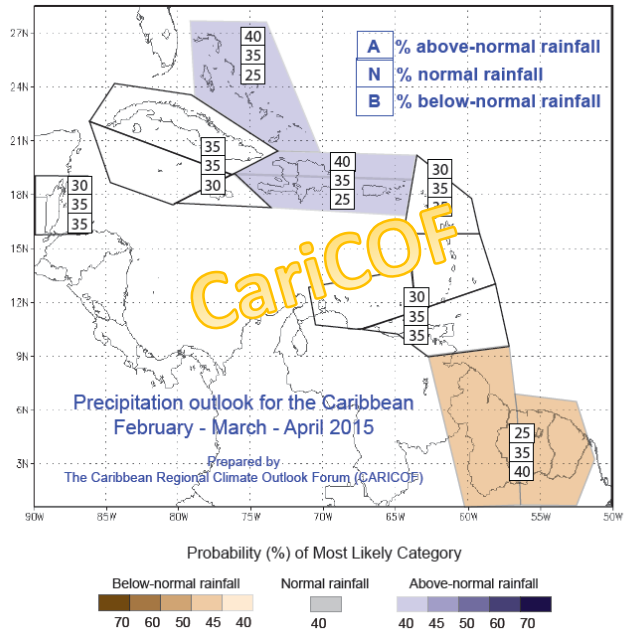
Consensus Process

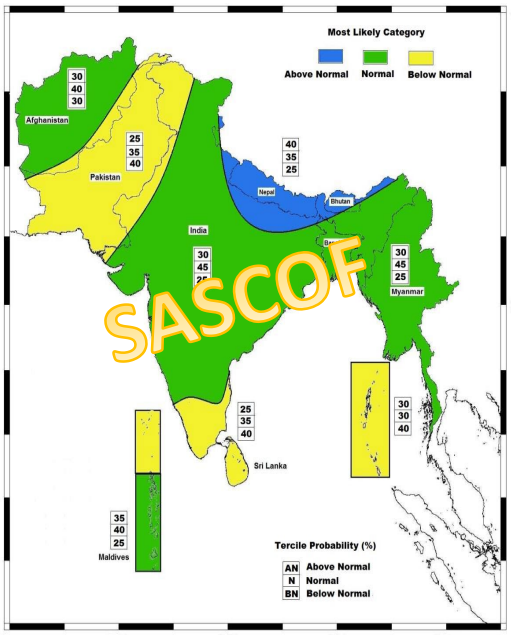
1. Consider current conditions/forecast of key **drivers of seasonal climate** in region (i.e. ENSO, IOD)
2. Start with **GPC/int'l climate centre forecasts** as a basis
3. Include forecast inputs from **local experts** of NMHSs
4. Arrive at a **consensus statement** for the region
   - Strike a *balance* between consistency among all inputs (GPCs, local experts) and a **generic statement** applicable to the region/sub-regions as a whole
   - Target audience: NMHSs

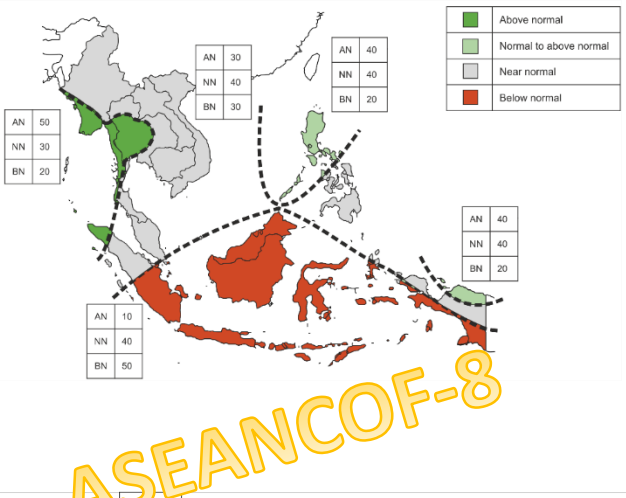


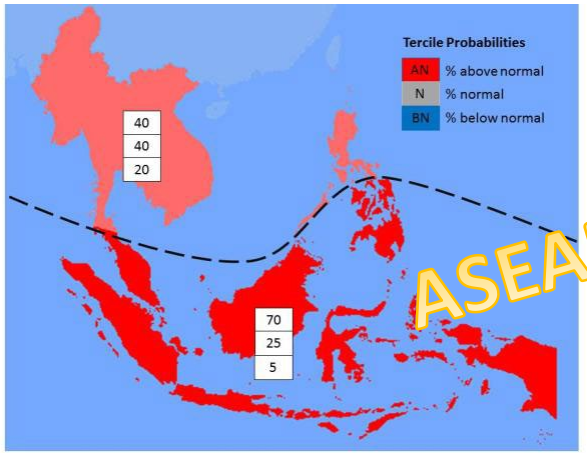
"…. For more information on the boreal winter monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted…"*

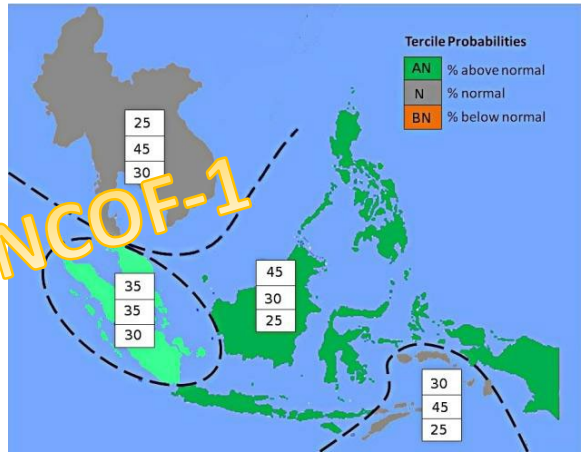
Samples from other/previous RCOFs

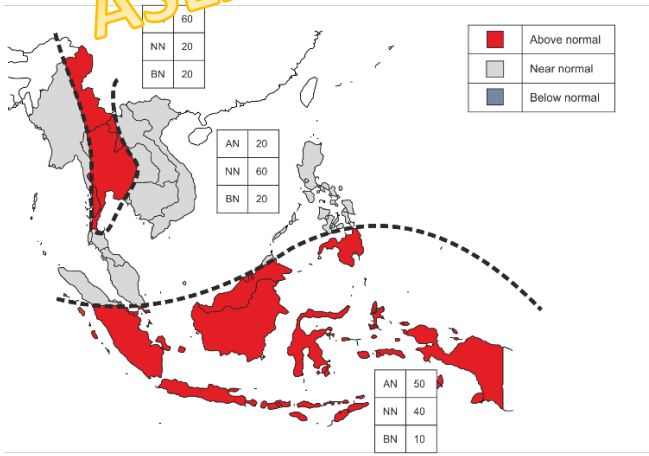








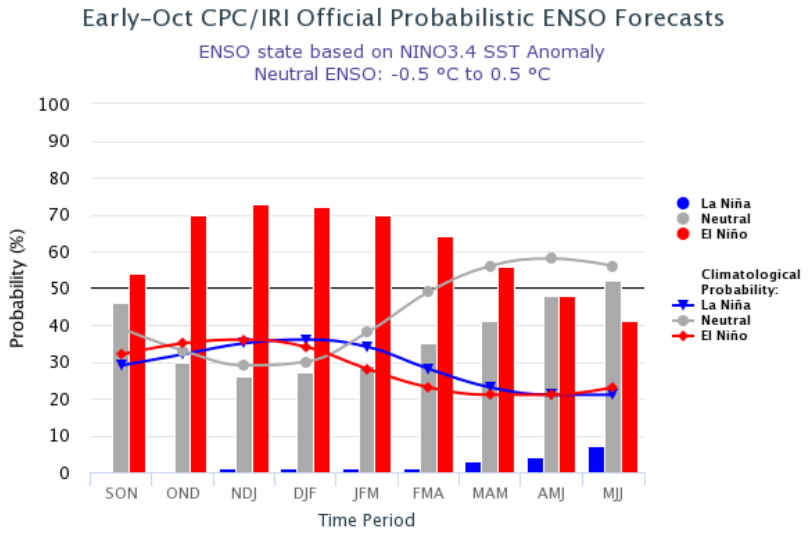


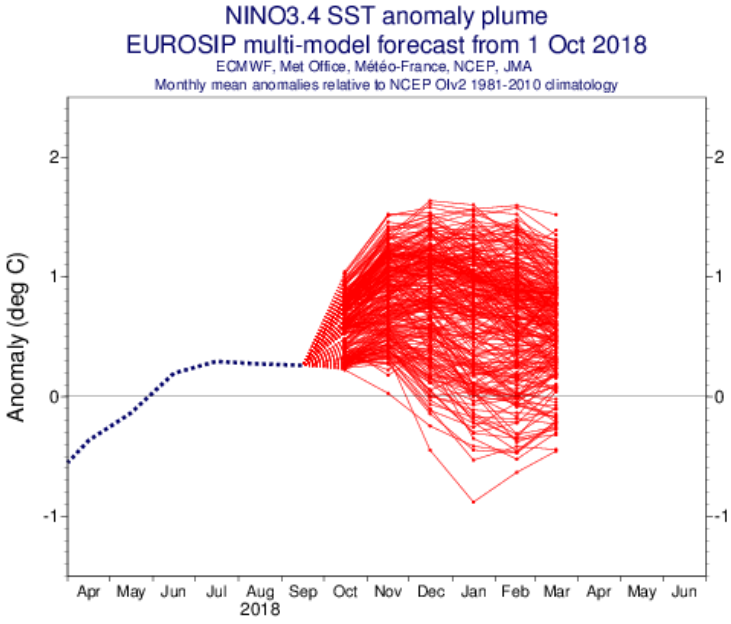


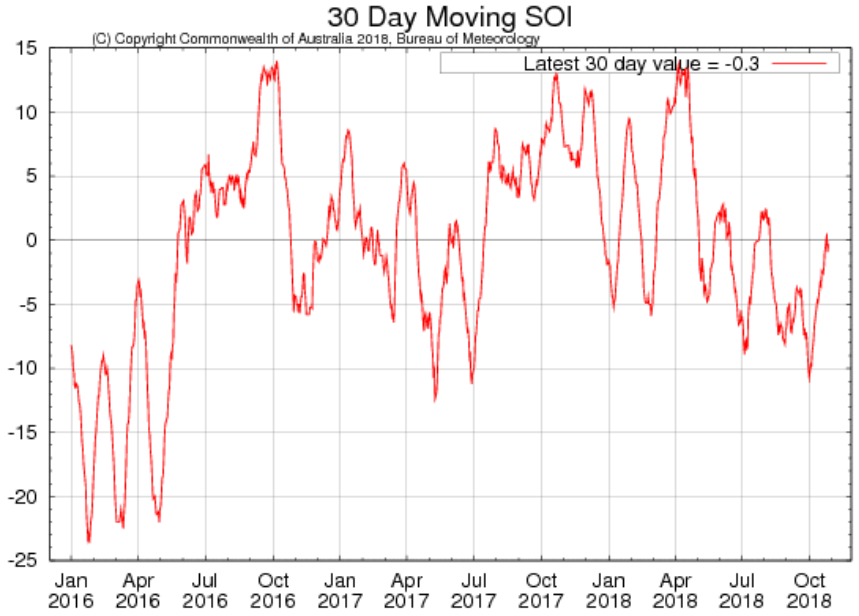
http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html

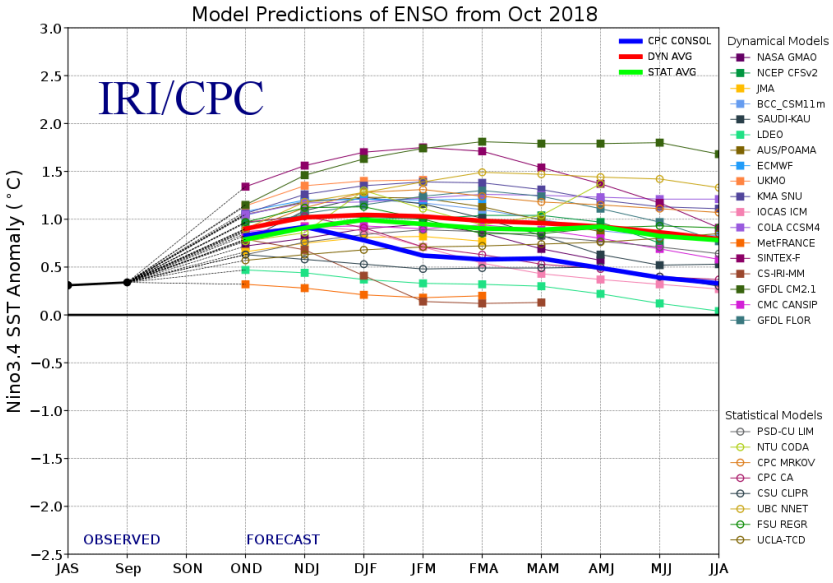
DRAFT Consensus

ENSO Forecast



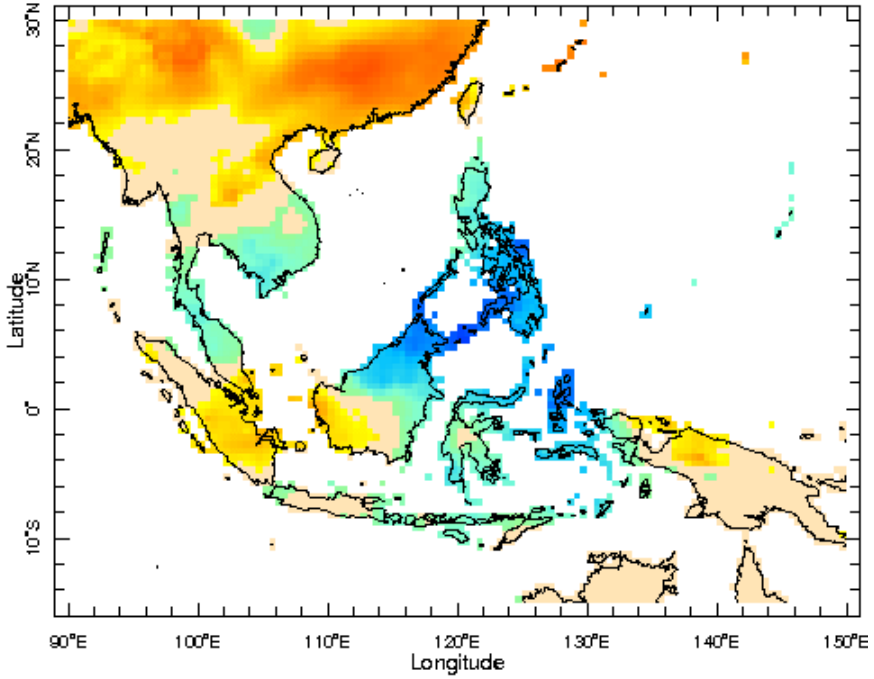




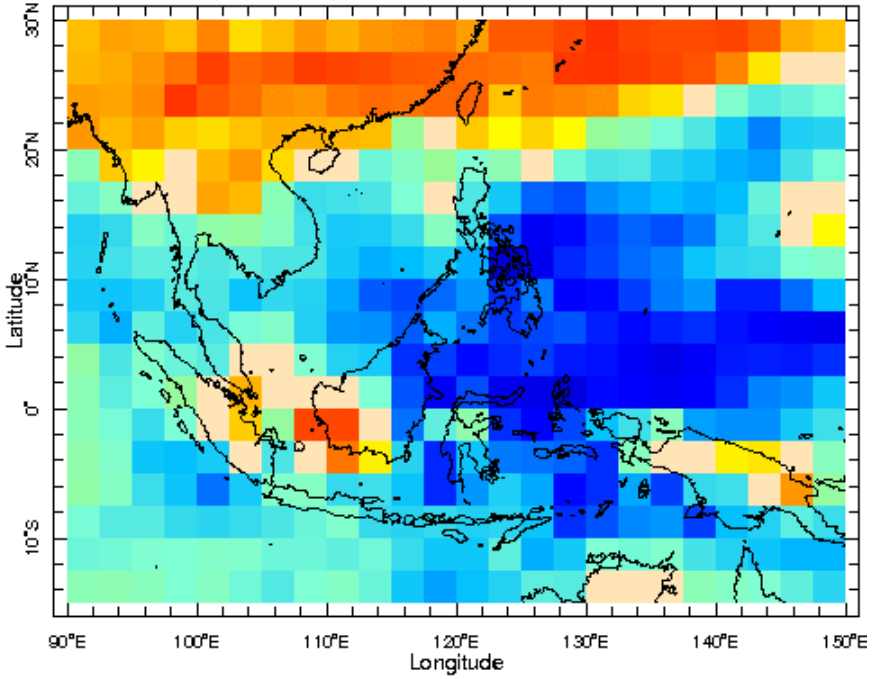


Correlation: Nino3.4 and Rainfall (IRIDL) - DJF

1951-2007 APHRODITE vs Nino3.4

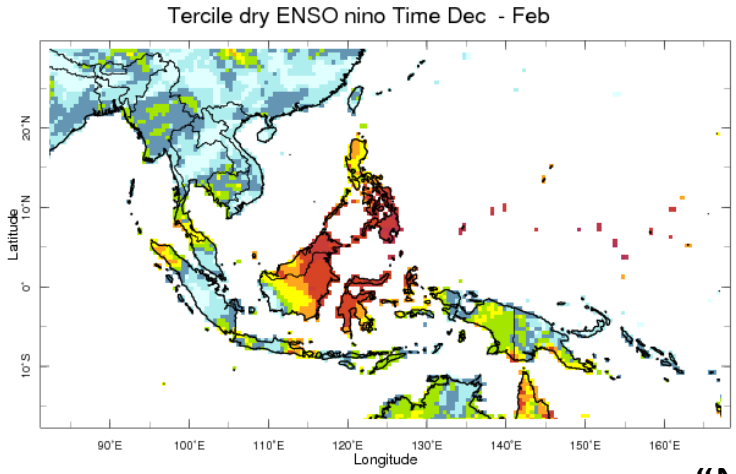


1979-2015 GPCP vs Nino3.4

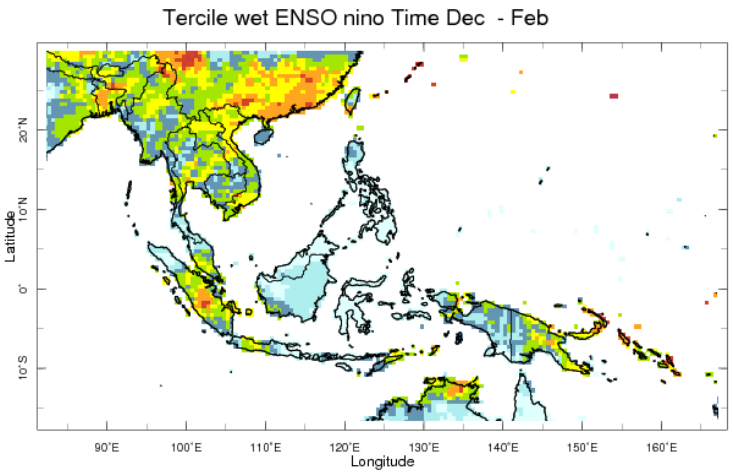


Tercile Probability of the Seasonal Characteristics of Daily Precipitation Conditioned on El Nino (IRIDL)

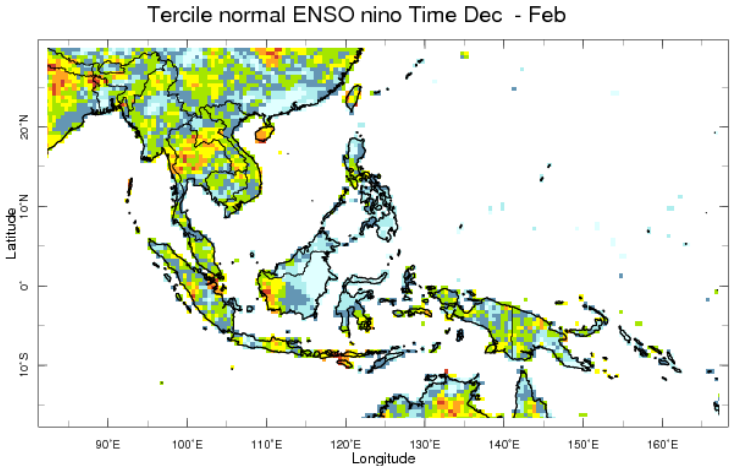
“Below Normal”

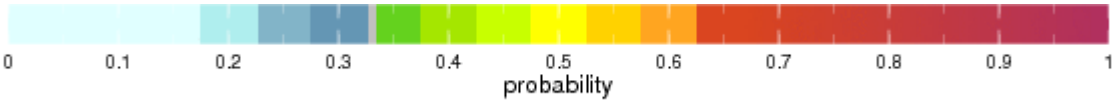


“Above Normal”



“Near Normal”





ENSO/Large-scale Drivers Statement

ENSO

- Currently warm-neutral conditions.
- El Nino predicted with 70% chance for DJF 2018-19
- Intensity unlikely to be strong, more likely weak than moderate.

IOD

- Recently slightly positive index (warmer western Indian ocean SST, and cooler eastern Indian Ocean SST). But IOD predicted to be neutral in DJF 2018-19.

Monsoon Activity

- Due to warmer conditions over East Asia, weaker high pressure system → NE monsoon winds expected to be weaker
- Coupled with changes in Walker Circulation due to ENSO, convection will be suppressed for the region.

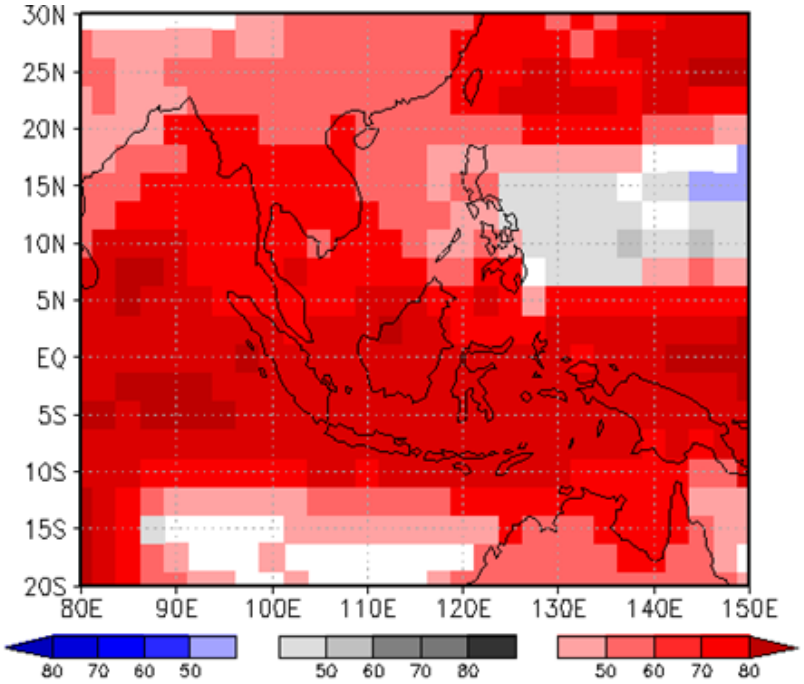
Tropical Cyclone

- Below normal activity (frequency) for DJF.

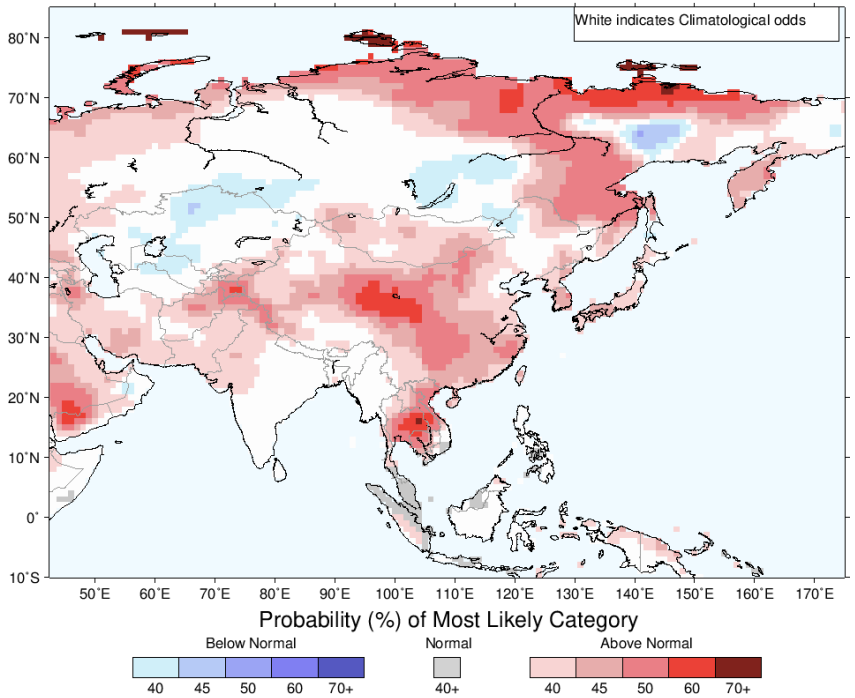
DJF Temperature OUTLOOK

Probabilistic Forecasts

❖ Probabilistic WMOLC LRFMME



IRI Multi–Model Probability Forecast for Temperature for December–January–February 2019, Issued October 2018



EUROSIP multi-model seasonal forecast

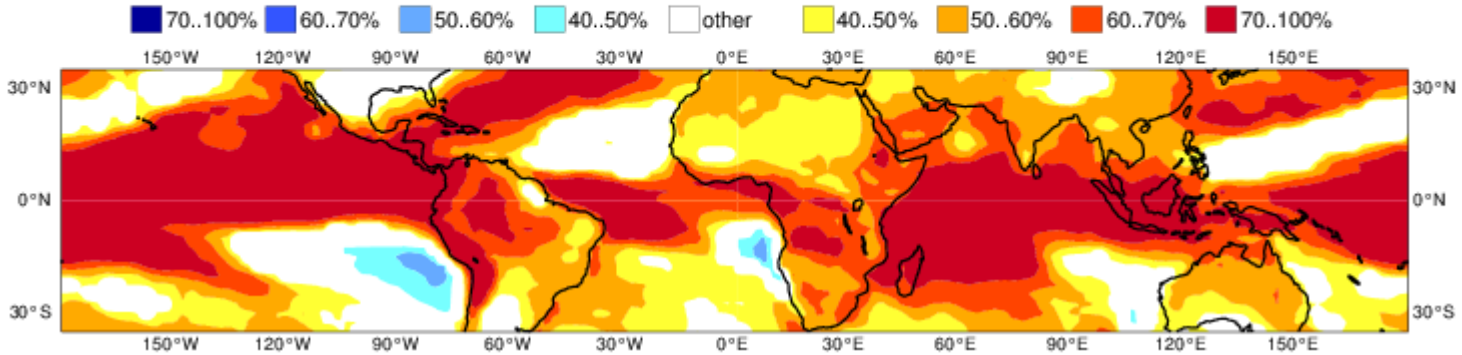
Prob(most likely category of 2m temperature)

Forecast start reference is 01/10/18

Unweighted mean

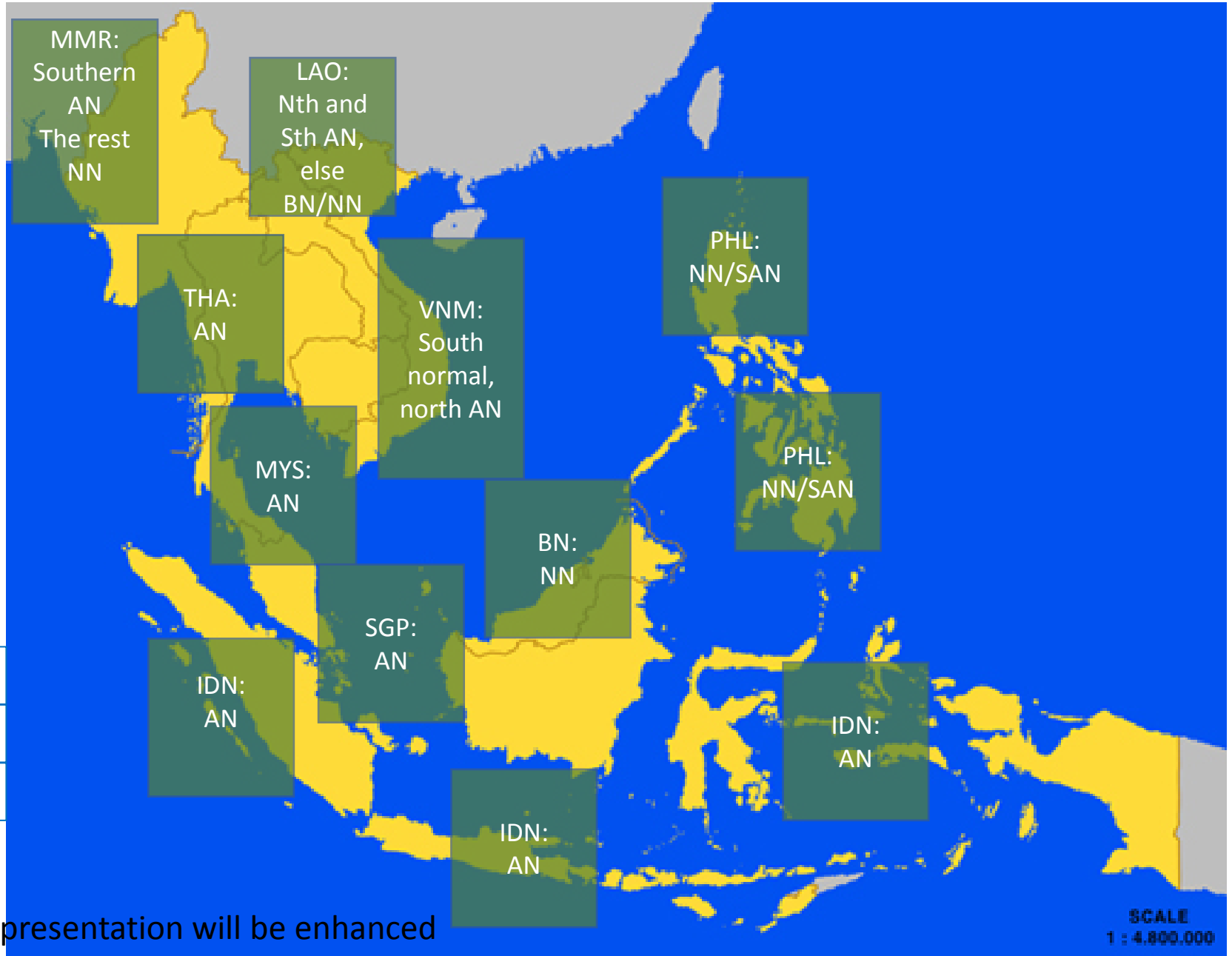
ECMWF/Met Office/Meteo-France/NCEP/JMA

DJF 2018/19



2-MTH LEAD

NMSs DJF Temperature Forecast (draft)



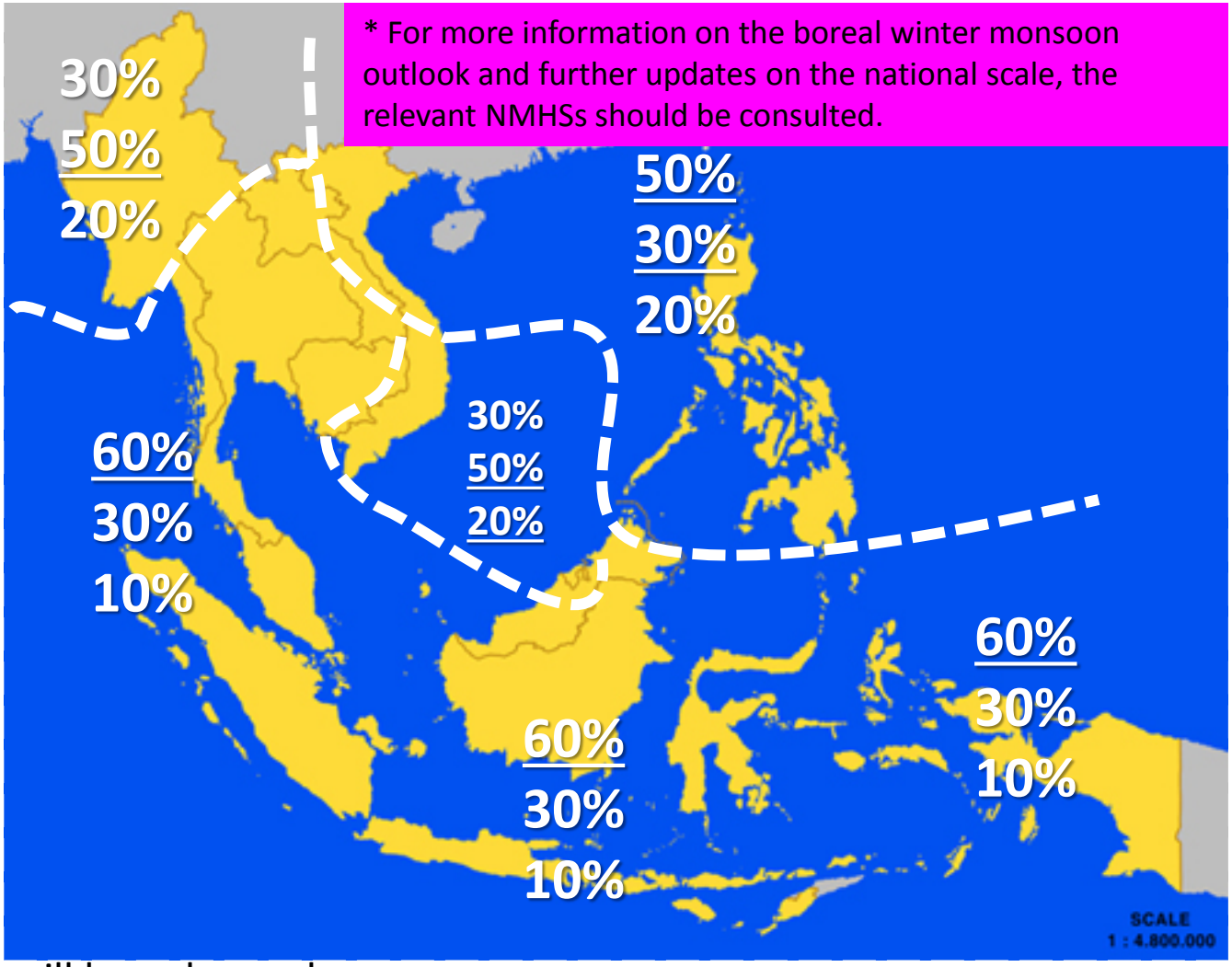
AN

NN

BN

Map presentation will be enhanced

Consensus DJF Temperature Forecast (draft)



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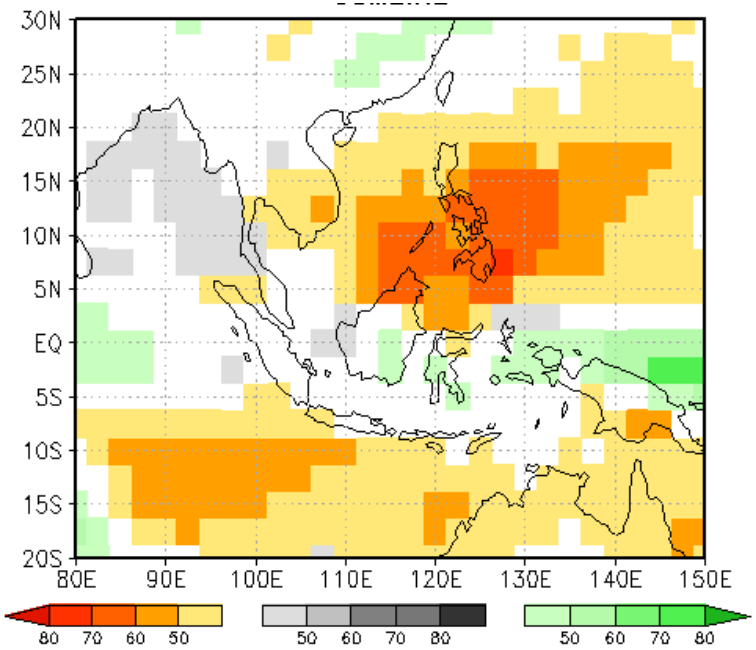
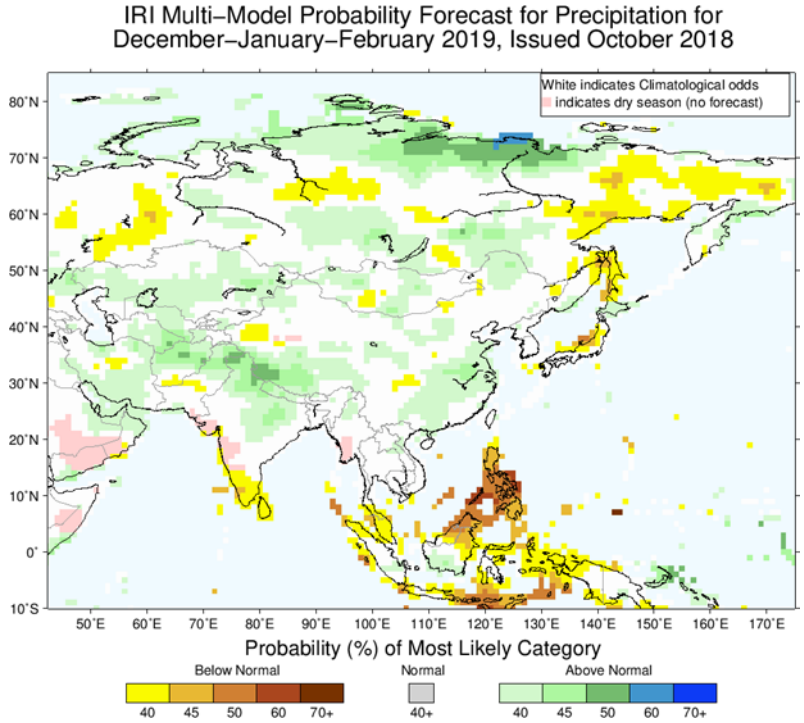
Map presentation will be enhanced

DJF Rainfall OUTLOOK

Probabilistic Forecasts

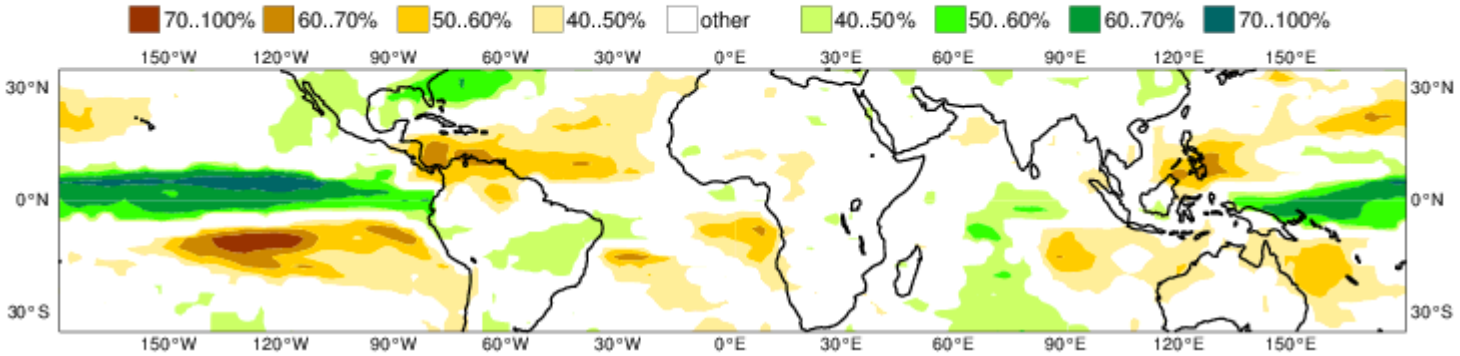
❖ Probabilistic MME





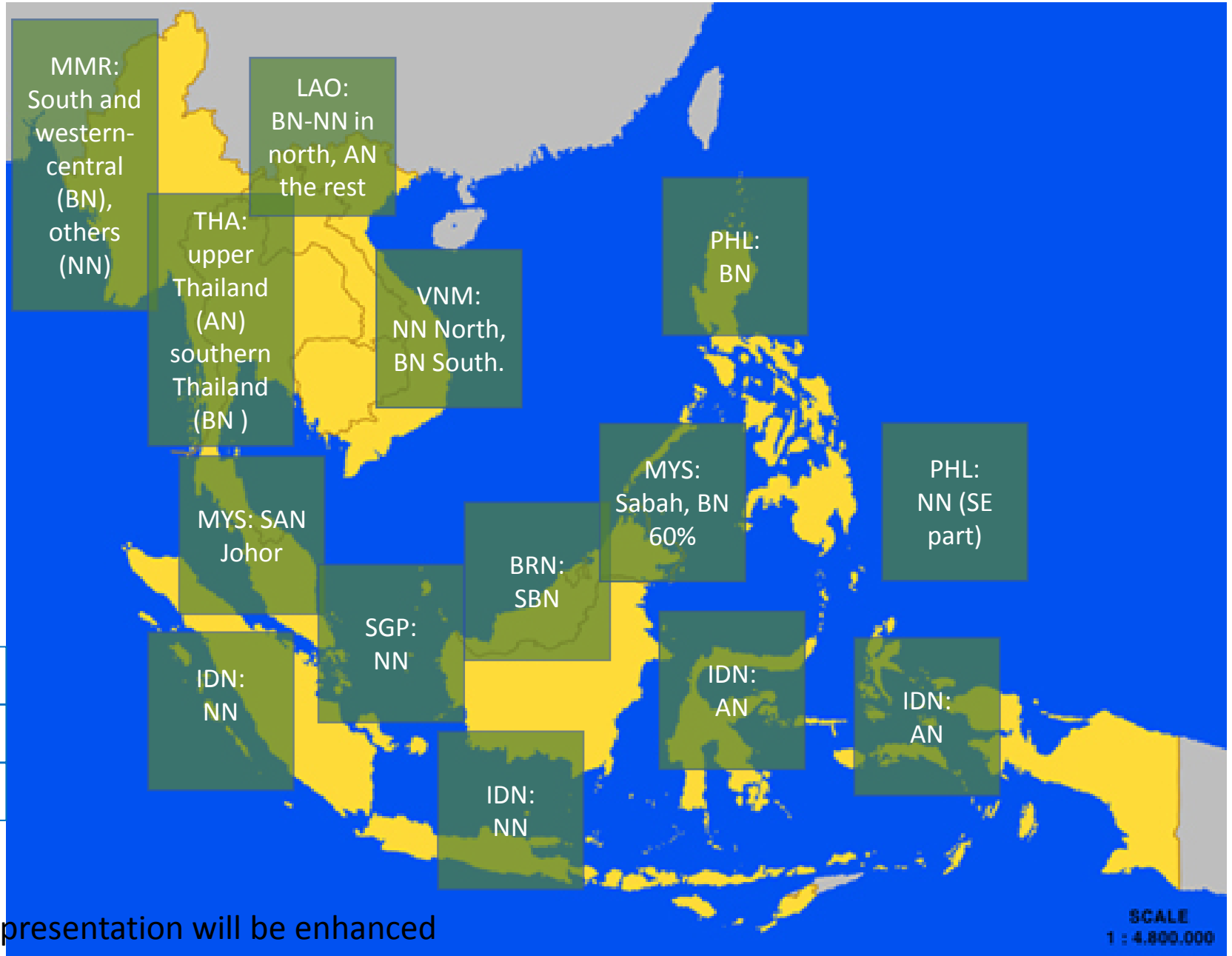
EUROSIP multi-model seasonal forecast
Prob(most likely category of precipitation)
Forecast start reference is 01/10/18
Unweighted mean

ECMWF/Met Office/Meteo-France/NCEP/JMA
DJF 2018/19



2-MTH LEAD

NMSs DJF Rainfall Forecast (draft)



AN
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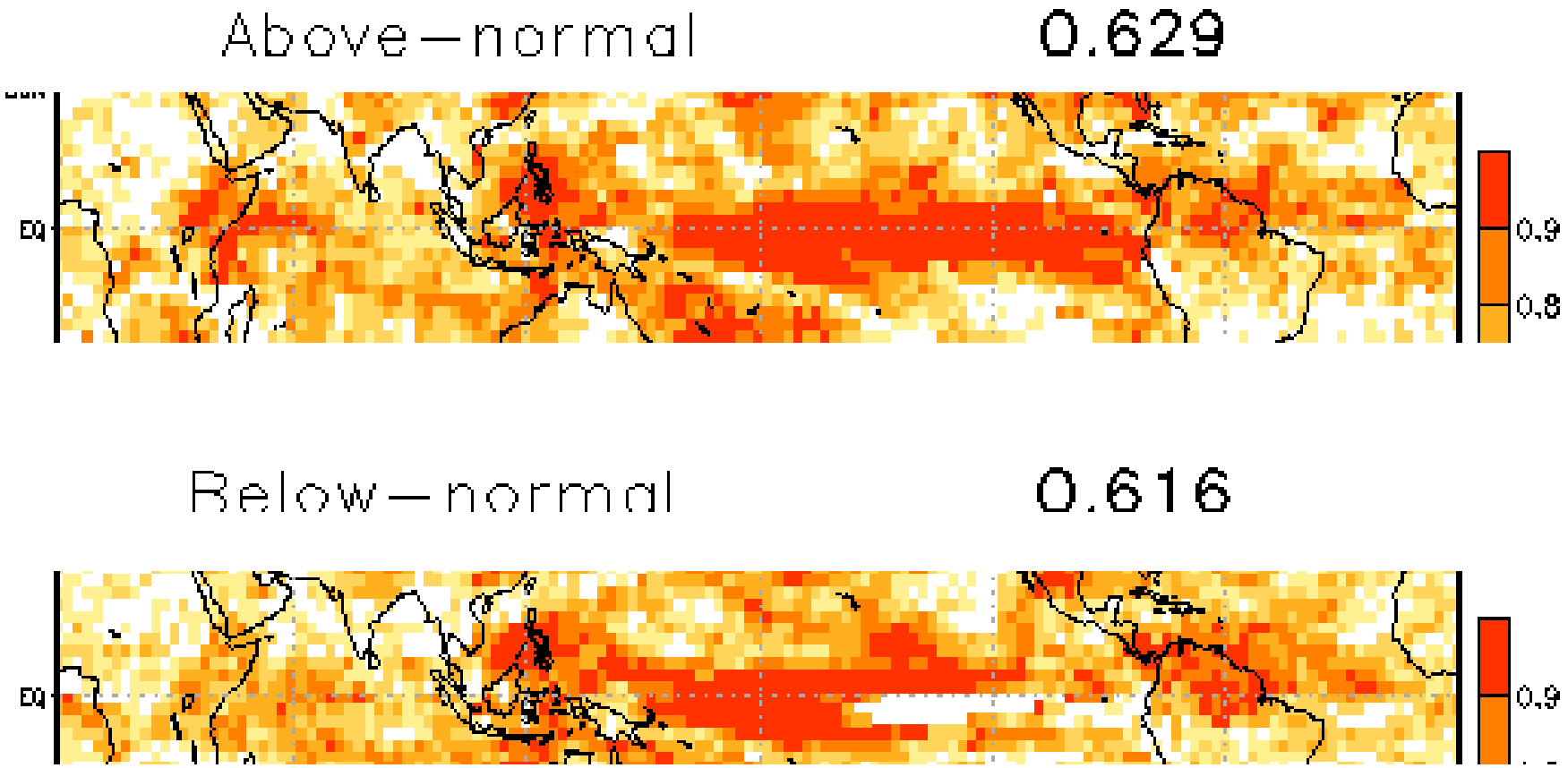
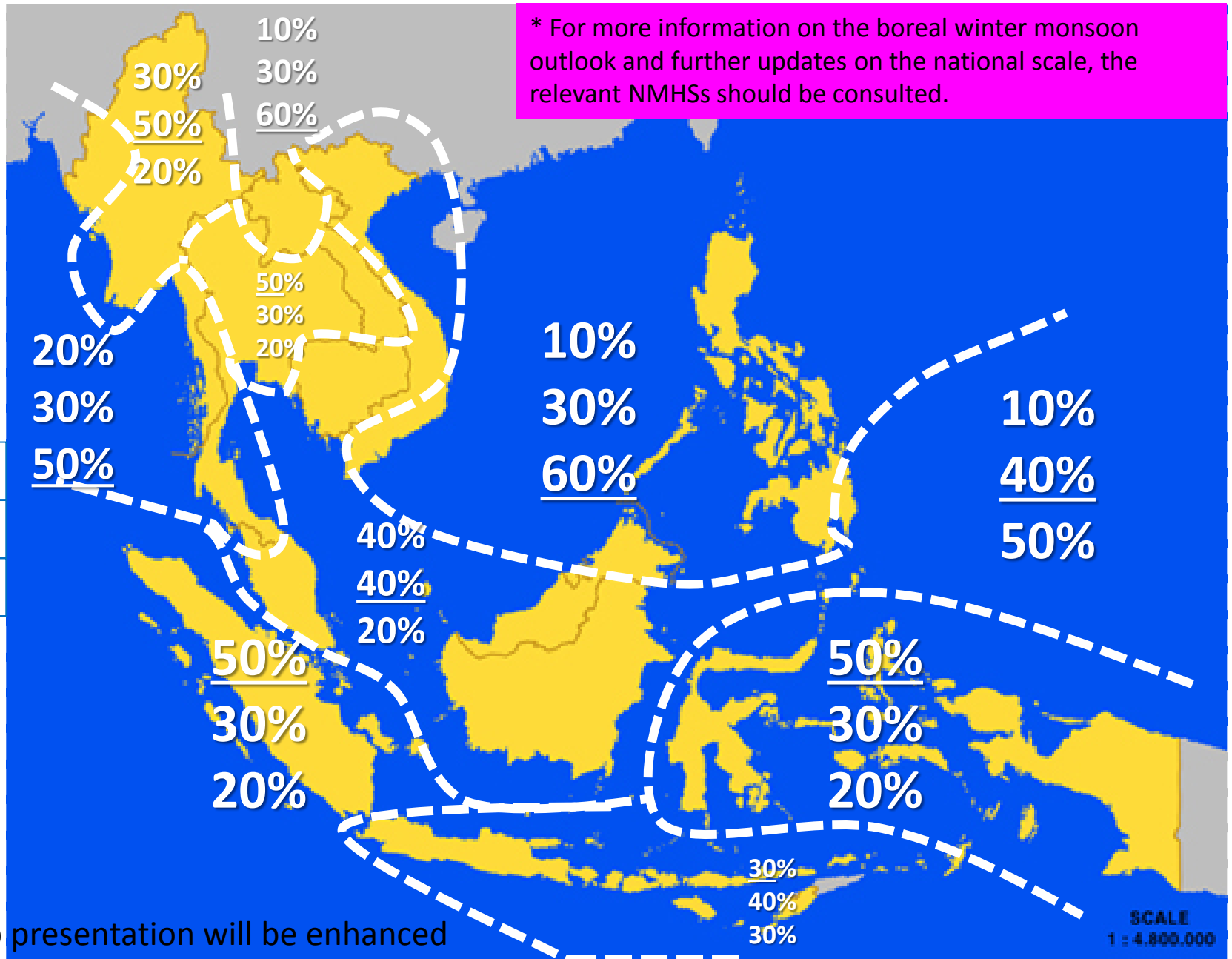
Map presentation will be enhanced

WMOLC-LRFMME ROC SCORES (DJF)



Good skill of dynamical models only over eastern Maritime Continent (Philippines and some Indonesian island), and central and south Vietnam.

Consensus DJF Rainfall Forecast (draft)



Map presentation will be enhanced

Draft Consensus Statement

PRECIPITATION

"For the upcoming NH winter (Dec-Jan-Feb) season, **below normal** conditions are favoured over Philippines, Southern Vietnam, northern Laos, Central and Southern Myanmar, Southern Thailand, and northern Borneo. Elsewhere **near to above normal** rainfall conditions are favoured."

TEMPERATURE

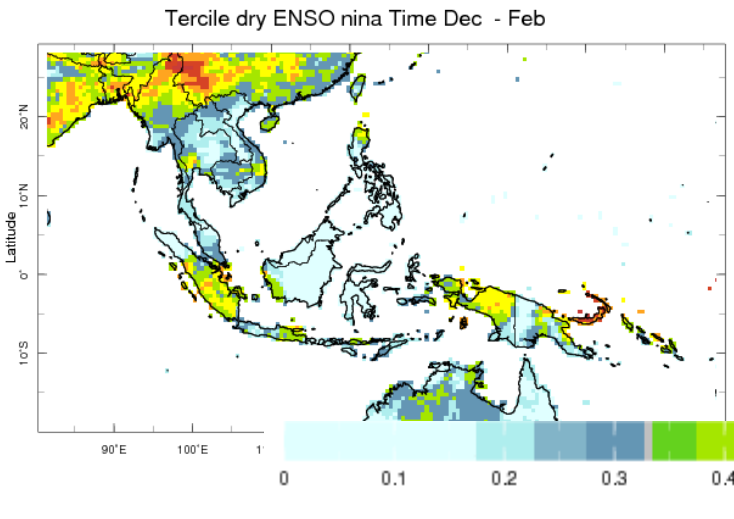
"**ABOVE normal** temperatures are favoured over much of the Southeast Asia region for the upcoming NH winter (Dec-Jan-Feb) season. **Near normal to above normal temperatures** are favoured over Southern Vietnam, Brunei, and northern-central Myanmar."

** For more information on the boreal winter monsoon outlook and further updates on the national scale, the relevant NMSs should be consulted.*

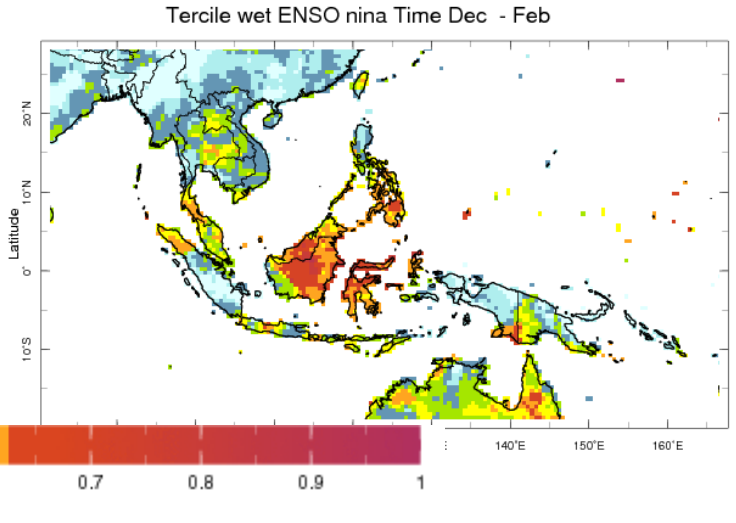
Thank You

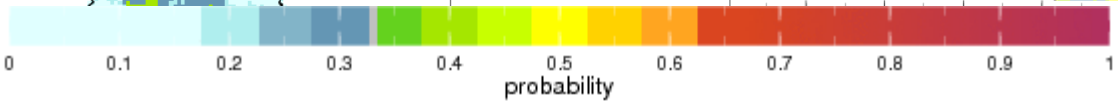
Tercile Probability of the Seasonal Characteristics of Daily Precipitation Conditioned on La Nina (IRIDL)

"Below Normal"

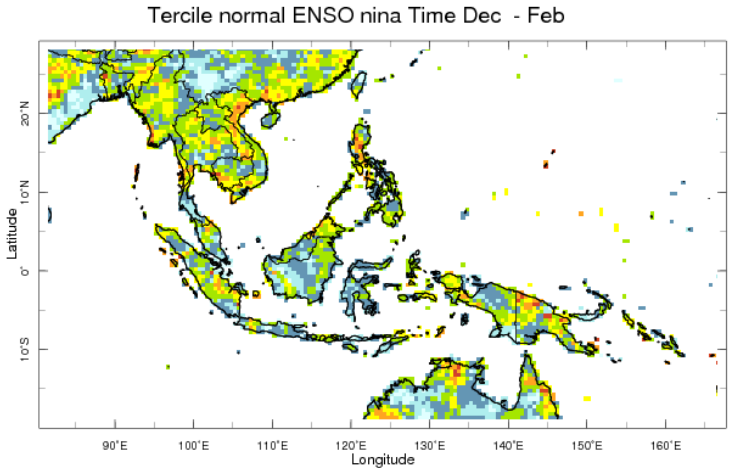


"Above Normal"

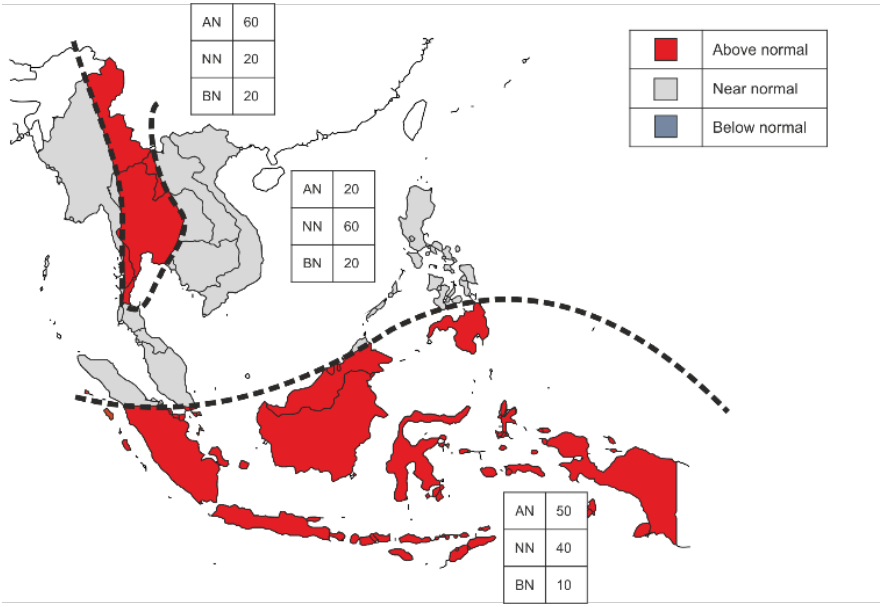


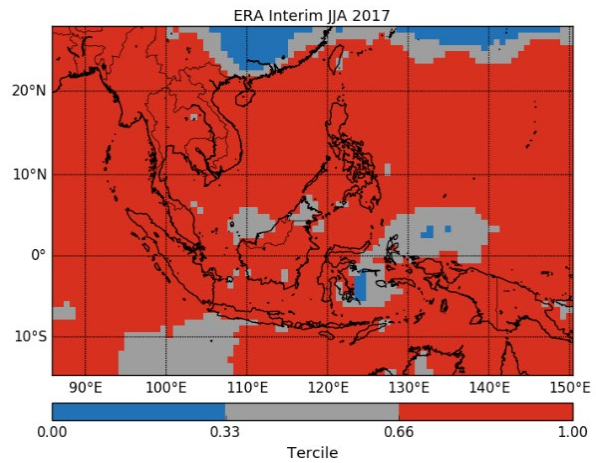


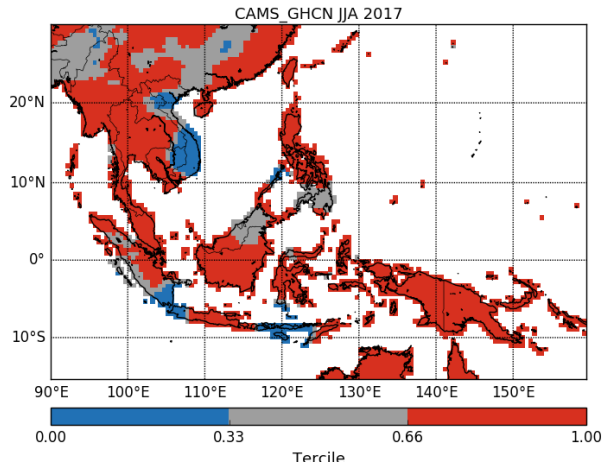
"Near Normal"



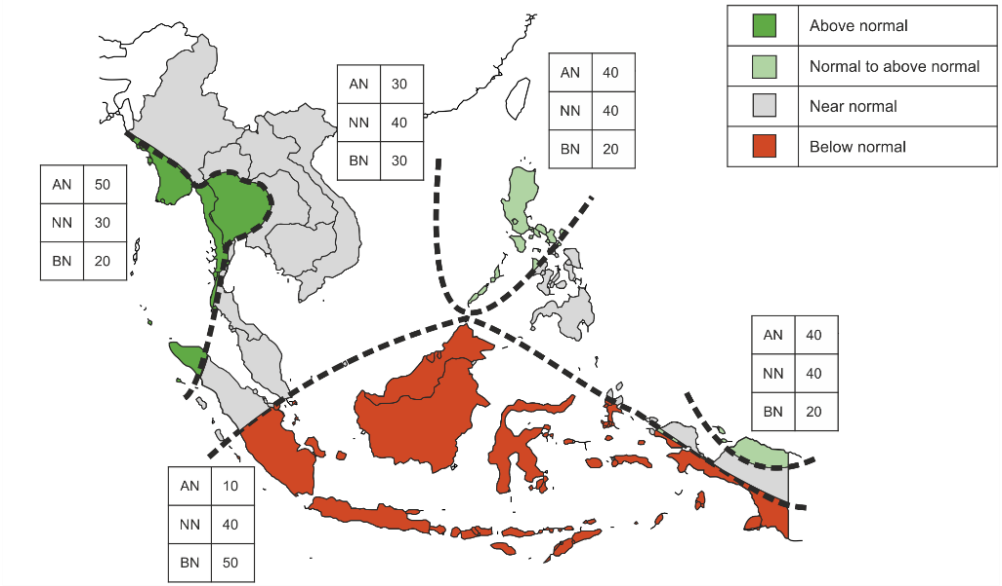
Review of JJA 2017 Forecast

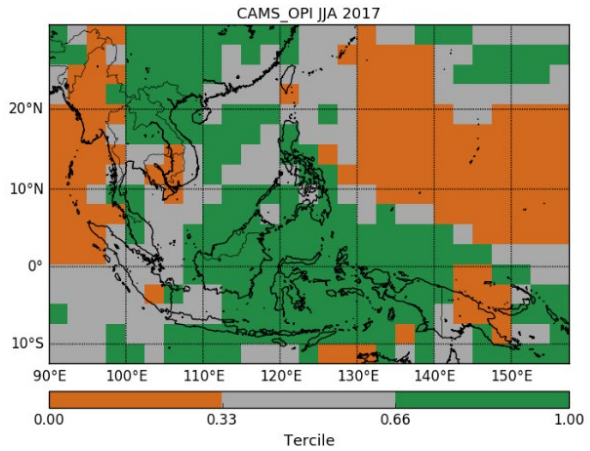


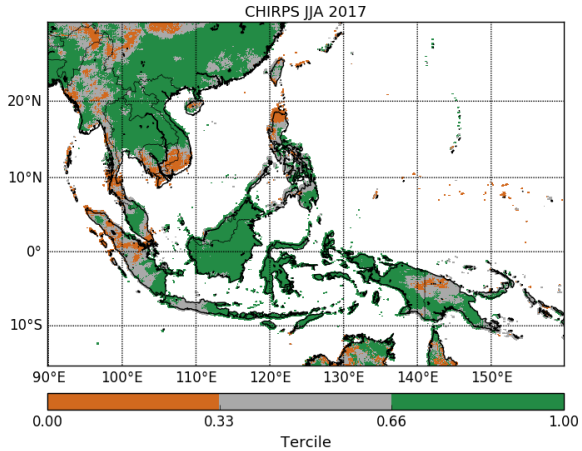




- Most of Southeast Asia observed normal to above normal temperature.
- Vietnam below normal temperature was observed in Vietnam based on the CAMS_GHCN data, ERA Interim data and Vietnam's national assessment recorded above normal temperature.
- More stations in Peninsular Malaysia as well as central and southern Myanmar recorded near normal temperatures rather than above normal







- Large portion of the region that received higher rainfall amounts than predicted.
- Based on both gridded products and reviews by NMHSs, most of Borneo and Indonesia experienced above normal rainfall, in contrast to the low forecasted probability of 10%.
- This may be tied to the smaller than anticipated impact of the possible El Niño and the positive IOD. However, JJA is the dry season for these regions, which makes anomalous wet conditions difficult to forecast.

ASEAN CLIMATE OUTLOOK FORUM (ASEANCOF)

29 October - 2 November 2018

CONCEPT NOTE FOR ASEANCOF-11

MALAYSIAN METEOROLOGICAL DEPARTMENT, MALAYSIA

Background

The ASEAN Climate Outlook Forum (ASEANCOF) was established in 2013, following the strong support given by the 35th Meeting of the ASEAN Sub-Committee on Meteorology and Geophysics (ASCMG) held in Manado, Indonesia (2-4 July 2013) for the proposal for a Regional Climate Outlook Forum (RCOF) in Southeast Asia. The RCOF concept was initiated by the World Meteorological Organization/Climate Information and Prediction Services (WMO/CLIPS) project, in collaboration with National Meteorological and Hydrological Services (NMHSs), regional/international climate centres among many other partners. ASEANCOF aims to provide collaboratively developed and consensus-based seasonal climate outlooks and related information on a regional scale. These activities support decision making to manage climate-related risks and support sustainable development.

Past ASEANCOF Sessions

Three ASEANCOFs (ASEANCOF-1, -3, and -5) held in November 2013, 2014, and 2015 respectively were hosted by the Centre for Climate Research Singapore (CCRS) ahead of the December-February (DJF) boreal winter monsoon seasons. ASEANCOF-4 meeting was hosted by the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG) for the boreal summer monsoon season of 2015, while ASEANCOF-7 (November 2016) was conducted in Manila by the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) and ASEANCOF-9 was hosted in Hanoi by Viet Nam Meteorological and Hydrological Administration. ASEANCOF-2, -6, -8 and -10 for the boreal summer monsoon seasons of 2015, 2016, 2017 and 2018 were held through online correspondence in a bid to make optimal use of resources.

All ASEANCOF were well attended with representations from the ASEAN NMHSs, the WMO's Global Producing Centres of Long-Range Forecasts (GPCs), and the end-user community. Also present were representatives from WMO Lead Centre for Long Range Forecast Multi-Model Ensemble (WMO LC-LRFMME) and, in some sessions, the APEC Climate Centre (APCC) and the International Research Institute for Climate and Society (IRI). For the purpose of capacity development, international experts were invited to deliver talks on scientific aspects of seasonal predictions and also to provide training during practical workshop sessions. Technical support and co-sponsorship, through partners, from WMO have been provided for these events.

A thematic approach to ASEANCOF was adopted in 2013 at ASEANCOF-3 and -4 where end-users in the region's water sector were invited to provide feedback on the available climate information and to share on the sector's requirements. Subsequently ASEANCOF-5, -7 and -9 had its own themes, respectively, on the use of subseasonal-to-seasonal predictions, prediction of extreme events, and agricultural applications.

Detailed meeting reports are available at: http://asmc.asean.org/asmc_asean_conf_about/.

ASEANCOF-11
This proposal relates to the eleventh ASEANCOF meeting.

Timing: The DJF boreal winter monsoon season ASEANCOF sessions are typically held in the second half of November to benefit from the latest model forecast available from the WMO LC-LRFMME. Owing to the busy start of the monsoon season in that period for the host, Malaysian Meteorological Department (MMD), and the opportunity to effectively combine with another WMO regional meeting (SEMDP, see below), it has been proposed for ASEANCOF-11 to be held on 29 October – 2 November 2018.

Theme: The theme proposed for this year's ASEANCOF is to explore the utilisation of space-based observation data and products for monitoring weather and climate extremes on a routine basis, in response to current and future user requirements. To this end and to optimise the region's meeting resources, it has been proposed for this year's Forum to be held back-to-back with the WMO Space-based Weather and Climate Extremes Monitoring (SWCEM) demonstration Project (SEMDP) Training Workshop. Through this back-to-back arrangement, the ASEANCOF-11 will include a capacity-building component by riding on SEMDP's training activity on the use of satellite for deriving rainfall information and the generation of trial remote-monitoring products for extremes (droughts and floods).

User representatives from the relevant sectors will be invited to discuss their sector-specific benefits and requirement of the products proposed to be explored by the SEMDP.

Participation: All ASEAN NMHSs, WMO, GPCs, international experts, and other end users through invitation. User representatives from the water, agricultural and related disaster risk management sectors are also proposed to be invited from the ASEAN member countries.

GENERAL OUTLINE OF ASEANCOF-11/SEMDP TRAINING WORKSHOP

First two days (29-30 Oct 2018): ASEANCOF-11

Day 1

- Opening science talk on monitoring/predictability of extremes.
- Regional outlook (DJF 2017-18) from Global Producing Centres/International Climate Centres.
- National outlook (DJF 2017-18) from ASEAN National Meteorological and Hydrological (NMHSs).

Day 2

- End-user talks on requirements for seasonal forecasts applications/for monitoring of extremes.
- Discussions on/gathering requirements of end-users for monitoring of extremes.
- Science talk: available tools, techniques, and data for monitoring of extremes.
- Draft outlook and consensus-building.
- Presentation of Consensus Outlook.

Following two days (31 Oct-1 Nov 2018): WMO SEMDP TRAINING WORKSHOP
Training session with *identified* ASEAN participants, trainers and end-users. Focus on:

- Introduction to space-based rainfall monitoring and products.
- Lecture and Practicals: GSMaP by JAXA and NOAA/NWS/CPC.
- Demonstration/exercises: Case studies on Persistent Heavy Rainfall & Drought at ASEAN region.

Last day (2 Nov 2018): SG-SEMDP MEETING *(not for ASEANCOF participants)*

- Reviewing the performance of the SEMDP products.
- Discussions on possible developments for SEMDP.
- Finalising the SEMDP implementation plan.

WMO Lead Centre for
Long-Range Forecast Multi-Model Ensemble

Seasonal Climate Outlook for the 2018 Winter Monsson Season from WMO LC-LRFMME

Hyun-Ju Lee and WMO LC-LRFMME Team

What is WMO LC-LRFMME?

13 WMO-designated Global Producing Centres (GPCs) for long-range forecasts

- adhering to agreed procedures/ standards in delivery of global long-range forecasts (e.g. products, timeliness, verification/ validation info, system documentation)

Linkage is needed among GPCs and other organizations including NMHSs, RCCs and RCOFs to ensure wider and more effective use of LRF

What is WMO LC-LRFMME?

1. Data collection & standardization

(6variables, GRIB1)

2.Producing seasonal forecast

Deterministic Forecast
- Simple Composite Mean
- Regular Multiple Regression
- Singular Value Decomposition
- Genetic Algorithm

Probabilistic Forecast
- Probabilistic MME

3. Producing verification data

Deterministic Verification
- ACC, RMSE, MSSS, GSS

Probabilistic Verification
- Reliability Diagram
- ROC curve & ROC score
- BS and BSS

4. Dissemniation

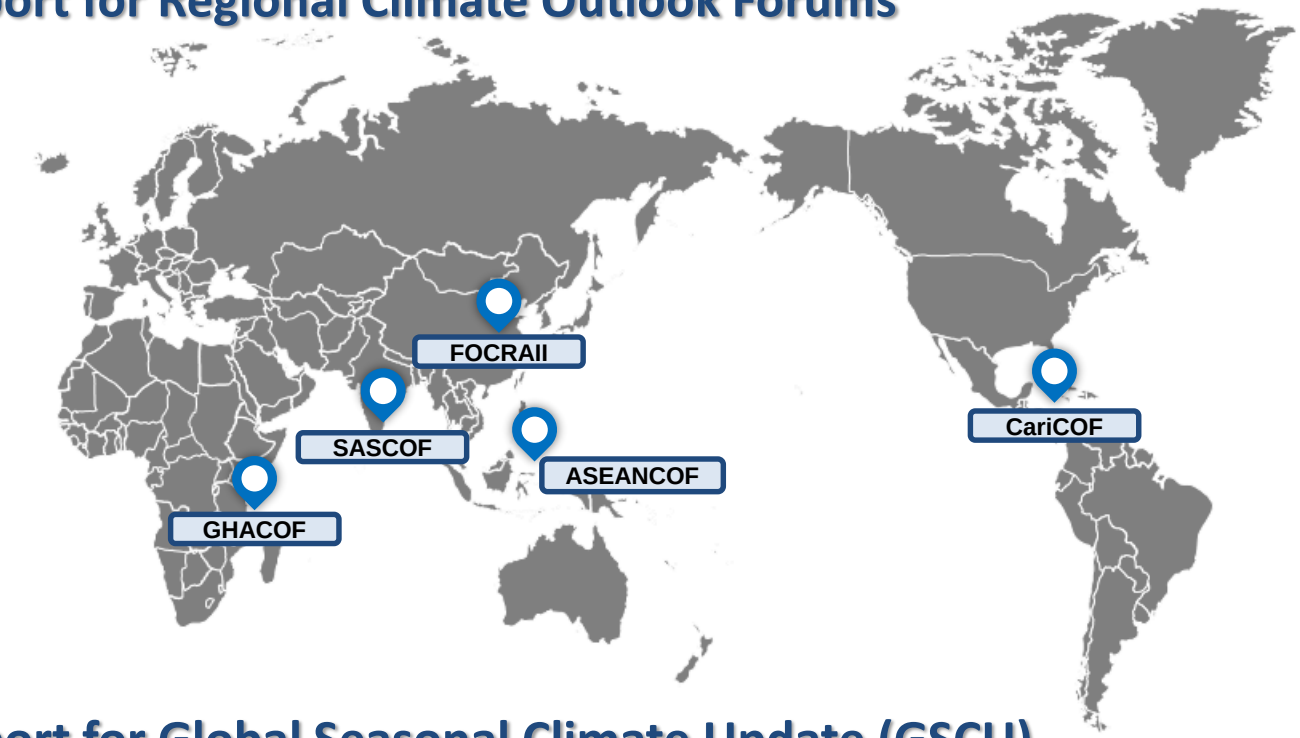
Display graphics on Website of WMO LC-LRFMME

WMO Global Producing Centres

- **Beijing:** China Meteorological Administration (CMA) / Bejing Climate Center (BCC)
- **CPTEC:** Center for Weather Forecasting and Climate Research / National Institute for Space Research (INPE), Brazil
- **ECMWF:** European Centre for Medium-Range Weather Forecasts
- **Exeter:** Met Office, United Kingdom
- **Melbourne:** Bureau of Meteorology (BOM), Australia
- **Montreal:** Meteorological Service of Canada (MSC)
- **Moscow:** Hydrometeorological Centre of Russia
- **Offenbach:** Deutsher Wetterdienst Wetter und Klima aus einer Hand
- **Pretoria:** South African Weather Services (SAWS)
- **Seoul:** Korea Meteorological Administration (KMA)
- **Tokyo:** Japan Meteorological Agency (JMA) / Tokyo Climate Center (TCC)
- **Toulouse:** Météo-France
- **Washington:** Climate Prediction Center (CPC) / National Oceanic and Atmospheric Administration (NOAA), United States of America

Activities of WMO LC-LRFMME

❖ Support for Regional Climate Outlook Forums



In 2017,

SASCOF-11	9/25-227 (Male, Maldives)
ASEANCOF-9	11/15-17 (Hanoi, Viet Nam)

❖ Support for Global Seasonal Climate Update (GSCU)

- A new Initiative for Consensus-Based Real Time Monitoring and Prediction of Seasonal Climate of the World
- To provide the world community with an expert consensus on the state of the global climate with an outlook for the upcoming season along with information on robustness of the available forecast signals.
- To strengthen international collaboration and information flow between global, regional and national level operational climate monitoring and prediction centres
- For use by RCCs, RCOFs and NMHSs for assistance in preparation of regional and national climate Updates

Progress of WMO LC LRFMME in 2018

2018

Mar — ECMWF: System 4 → System 5

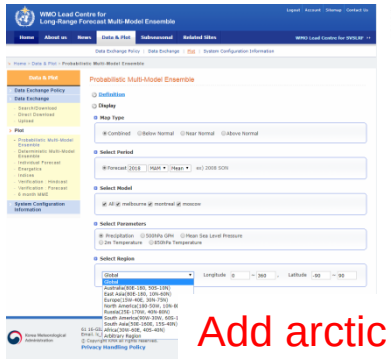
May — WMO LC-LRFMME: Polar map Display system

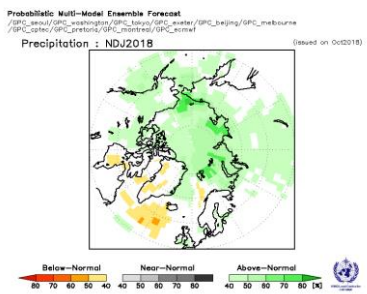
Sep — Toulouse: MF-ARP5 → MF-S6

Oct — Offenbach: GCFS1.0 → GCFS2.0

Dec — WMO LC-LRFMME: (TBD) Consistency May display system

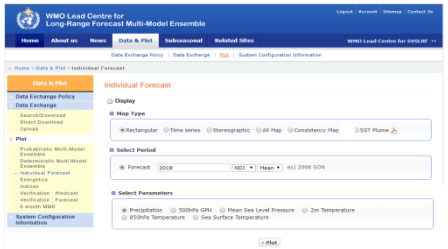
(ex) Data & Plot > PMME
Data & Plot > DMME (SCM, SLR, SVD, GA)

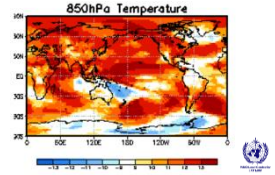




Add arctic map

(ex) Consistency Map display system for each variable in Webpage





Add the function of selecting variable for consistency map

Plan of WMO LC LRFMME in 2019

2019

(Plan)
Renewal of website
Providing the GSCU through website

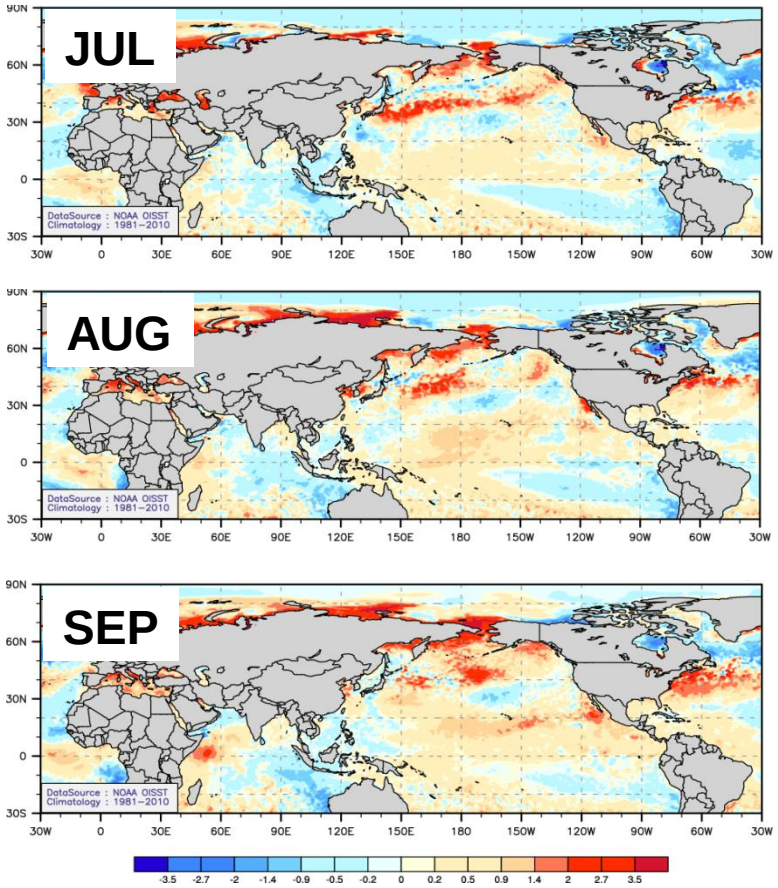
» Main page of WMO LC-LRFMME website

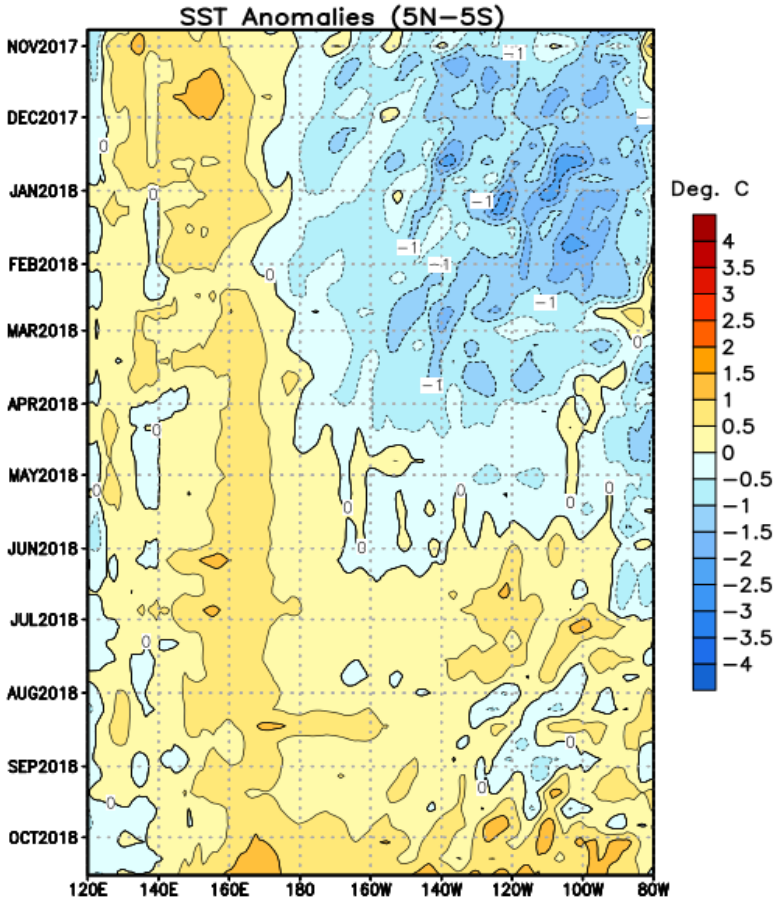
Current Oceanic Condition
(Tropical Pacific Ocean & Indian Ocean)

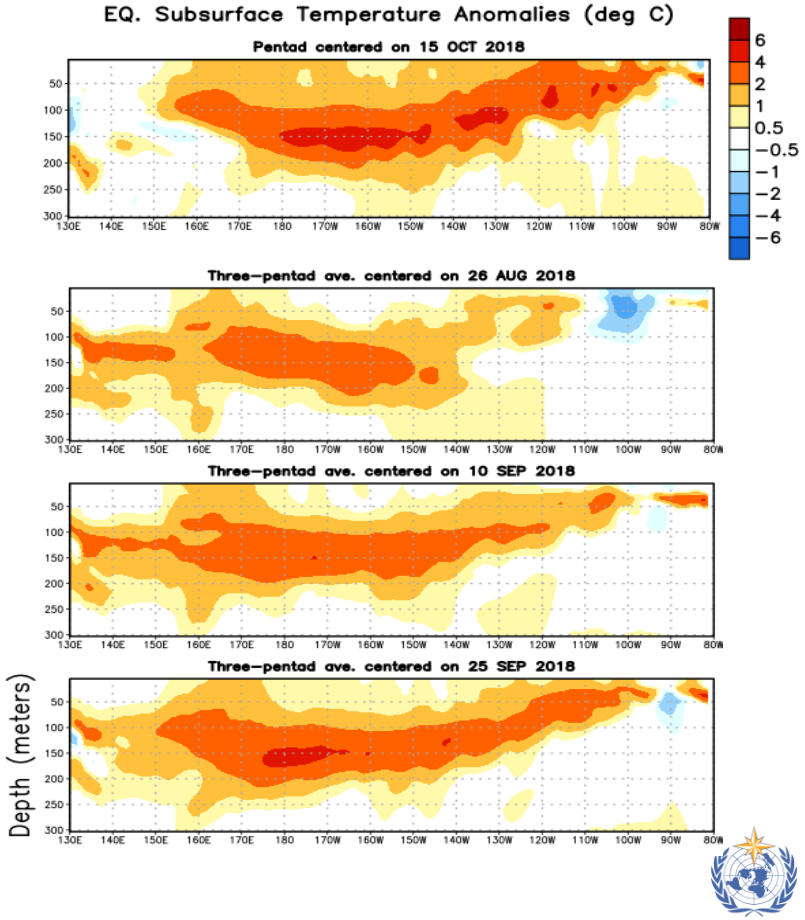
Global Producing Centres

Recent Evolution of Equatorial Pacific Ocean SST

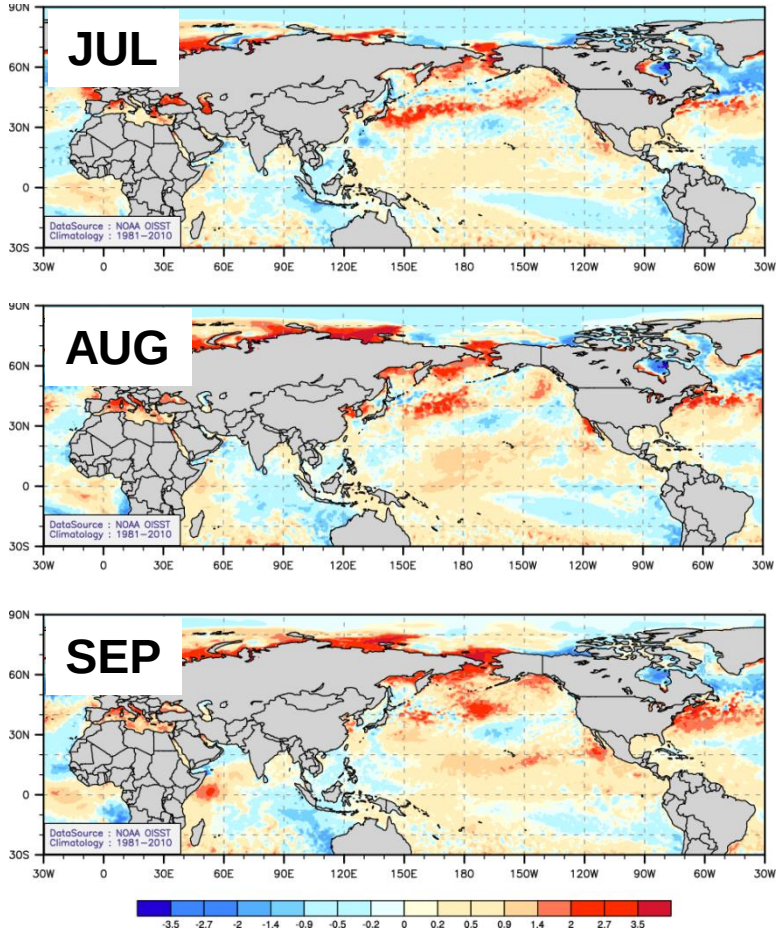
- Positive SST anomalies strengthened across the central and eastern equatorial Pacific.
- Pacific Equatorial subsurface temperature anomalies show warm anomalies in the eastern part in the recent week.
- The warm subsurface temperature anomalies have been strengthened in the last two months.
- Developing El Nino-like pattern



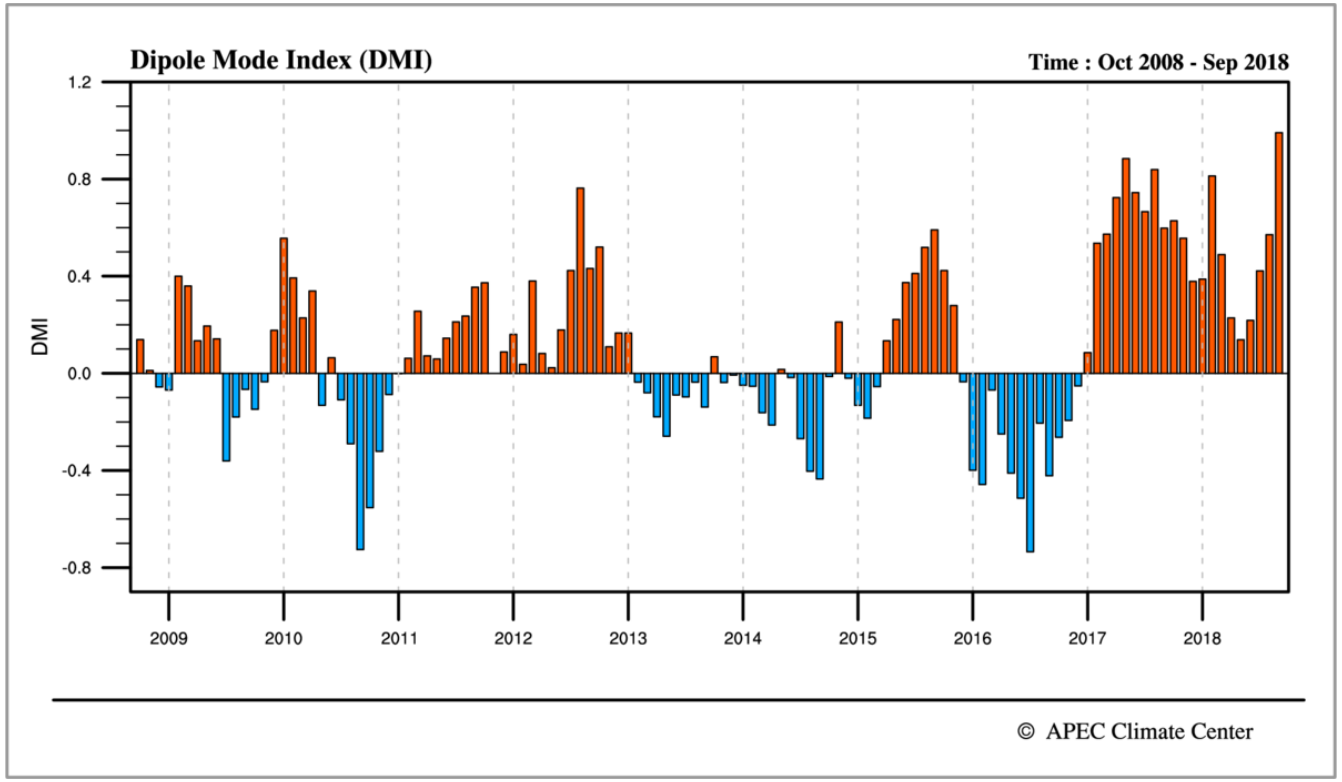




Recent Evolution of Equatorial Indian Ocean SST



- In the western Indian Ocean, SST anomalies were warm, while in the eastern part, the SST anomalies were cold during September.
- Negative SST anomaly was observed near Indonesia and in the eastern Indian Ocean.
- The Indian Ocean Dipole (IOD) index is positive recently.



WMO Lead Centre for
Long-Range Forecast Multi-Model Ensemble

Seasonal Outlook for DJF 2018/19

Global Producing Centres

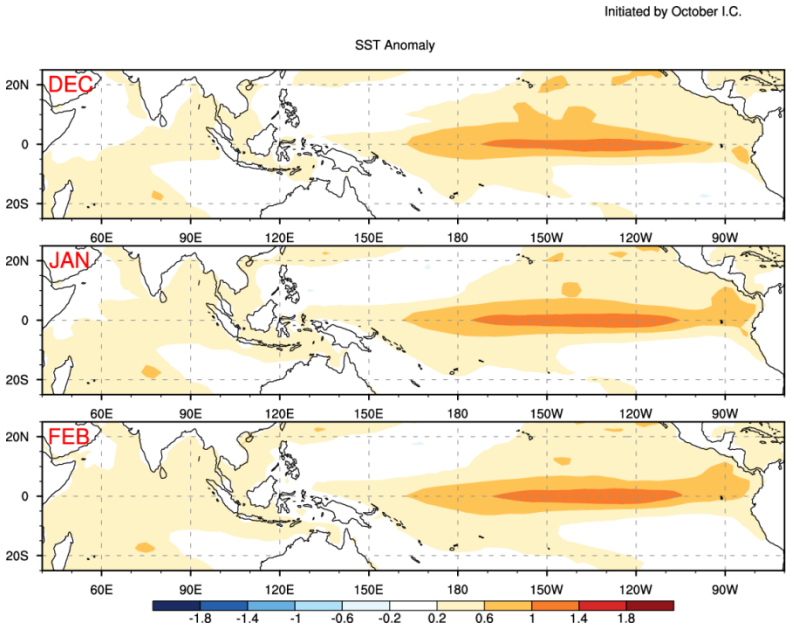
Participating GPCs for DJF 2018/19 Prediction

			Initial Conditon	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5	Lead 6
	GPC	Institute	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Beijing	BCC							
2	CPTEC	CPTEC							
3	ECMWF	ECMWF							
4	Exeter	UKMO							
5	Melbourne	BoM							
6	Montreal	MSC							
7	Offenbach	DWD							
8	Seoul	KMA							
9	Toulouse	Met.France							
10	Washington	NCEP							
11	Moscow	HMC							
12	Pretoria	SAWS							
13	Tokyo	TCC							

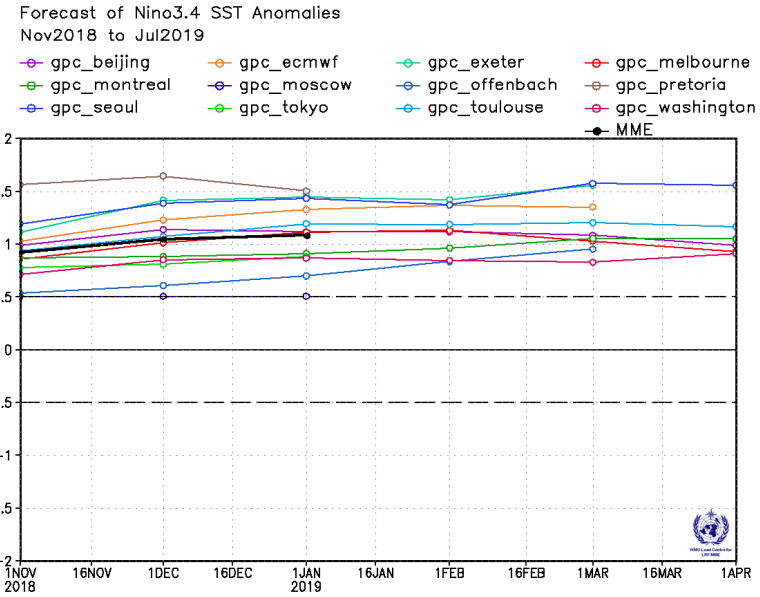
9 GPCs for PMME
10 GPCs for DMME

- Common Period : 1993-2009 (17years)
- Variable : 2m temperature, precipitation, mean sea level pressure, 850hPa temperature, 500hPa GPH, sea surface temperature (if available)

Prediction of Equatorial Pacific Ocean SST

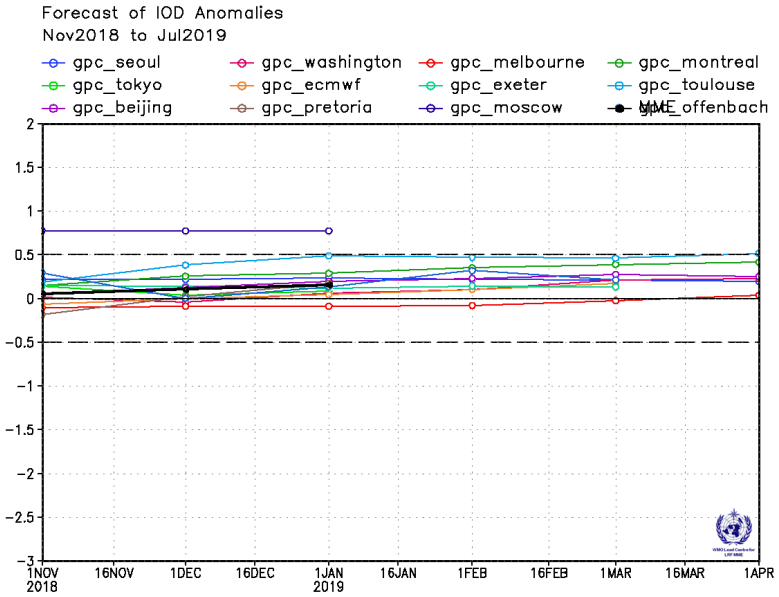


❖ *ENSO*



- Warm SST anomalies are predicted in the eastern tropical Pacific during DJF.
- El Nino is predicted during DJF 2018 in the marjority of models.

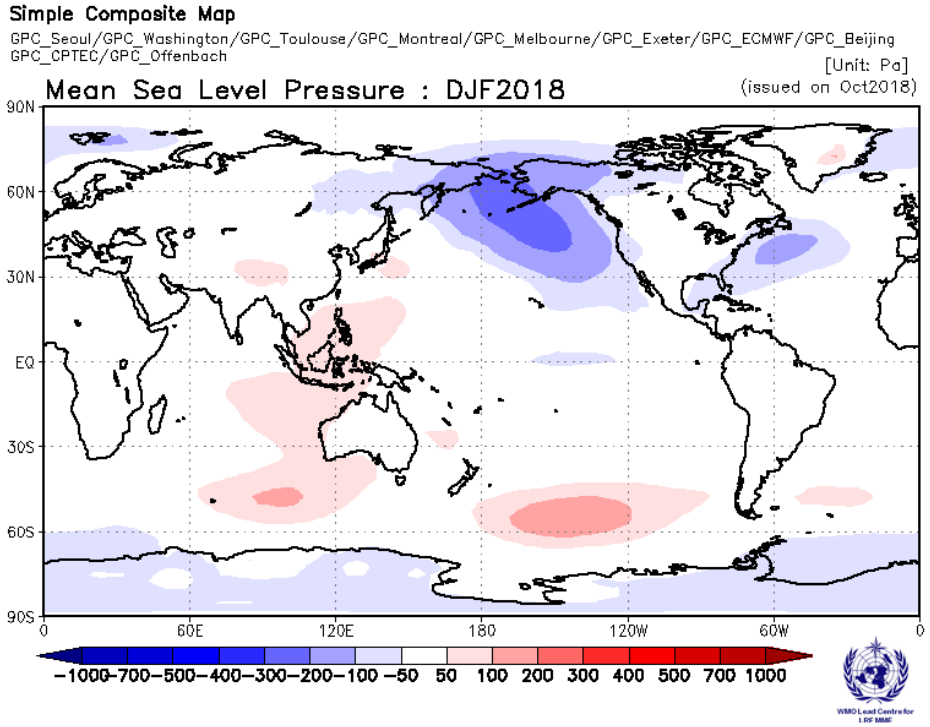
❖ *IOD*



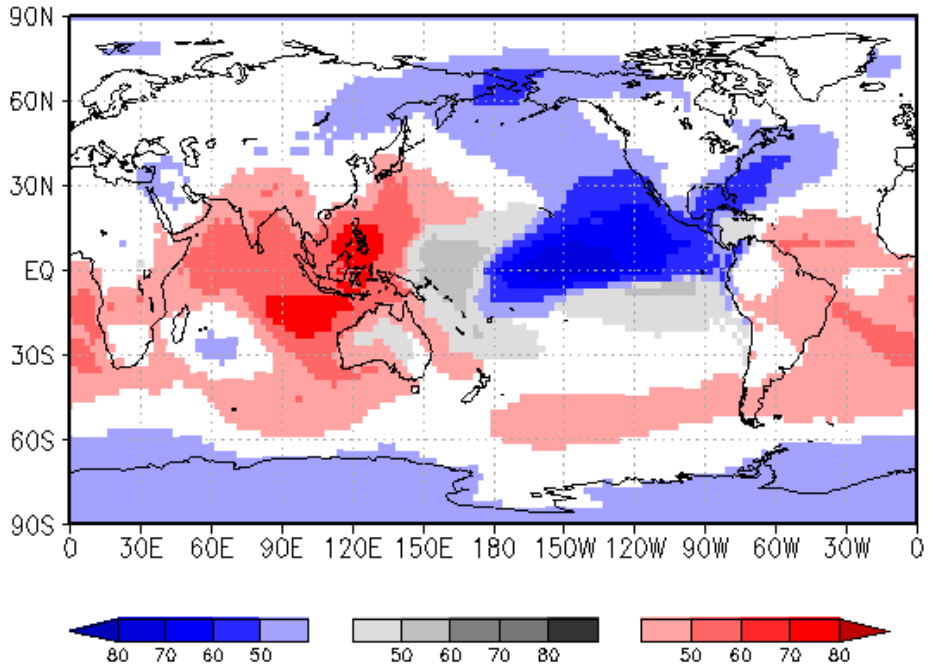
- The week zonal gradient of SST in the Indian Ocean is predicted during DJF.
- Neutral IOD is predicted.

MME : Sea level pressure for DJF 2018/19

Deterministic MME

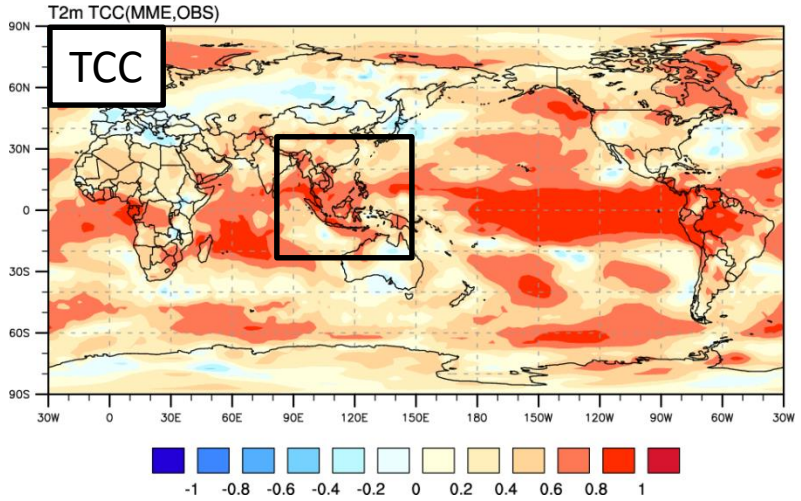


Probabilistic MME



- Positive SLP anomalies are predicted over a large part from the Indian Ocean to the western tropical Pacific.
  -> suppressed convection activity
- More than 50% probabilities are predicted above normal SLP in western Pacific and Indian Ocean.
- Positive SLP anomalies are located in tropical western Pacific – El Nino like convection pattern

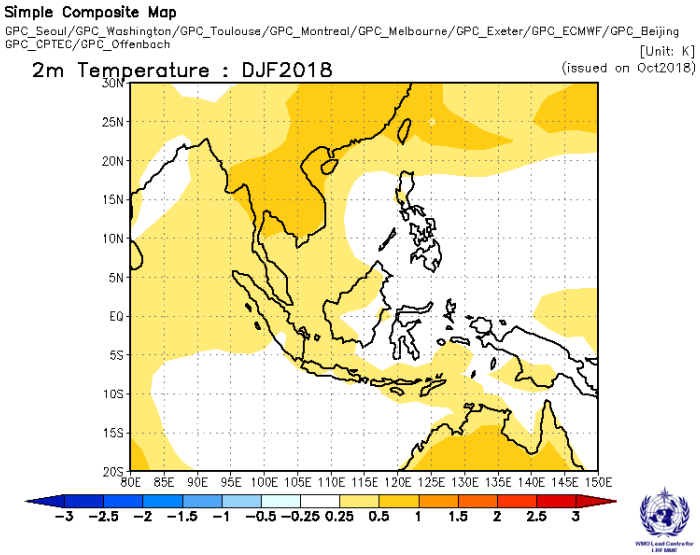
MME : 2m temperature for DJF 2018/19



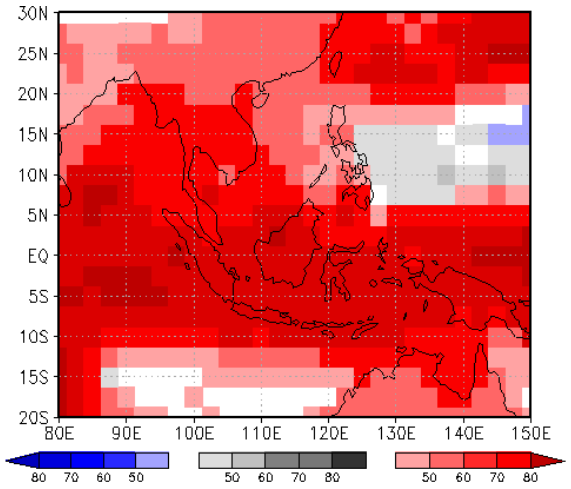
- The TCC (Temporal Correlation Coefficient) skills in the ASEAN region are quite good in DJF season.
- The ROC (Relative Operating Characteristics) skills are quite good for above/below normal during DJF season. But for Normal condition, the ROC skills are not reliable.

- The MME predicts warm temperature over the Southeastern Asia

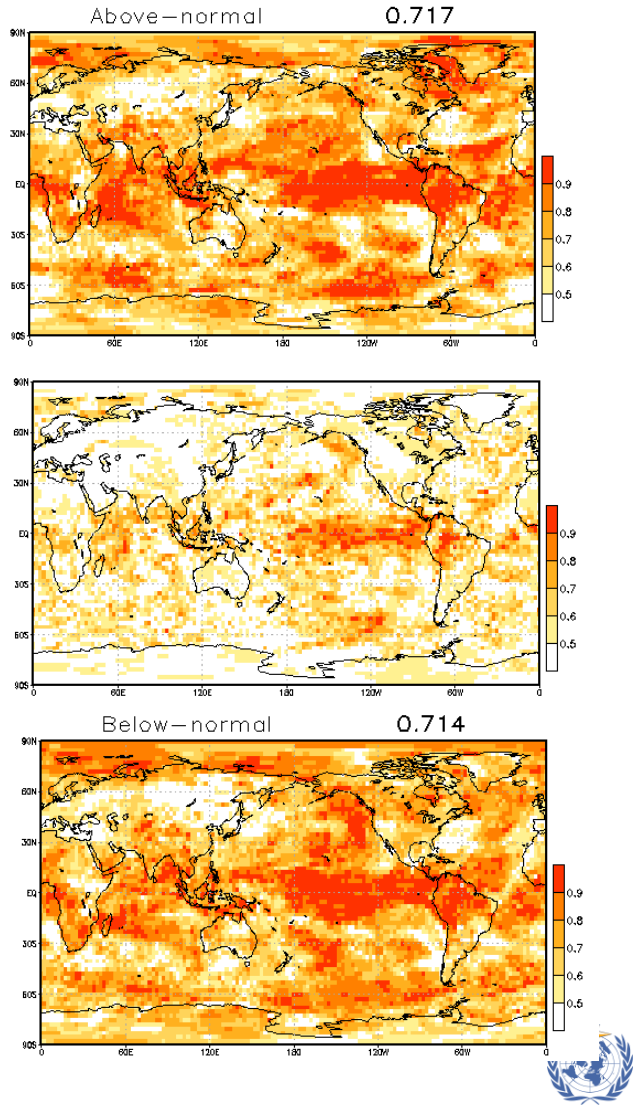
Deterministic MME



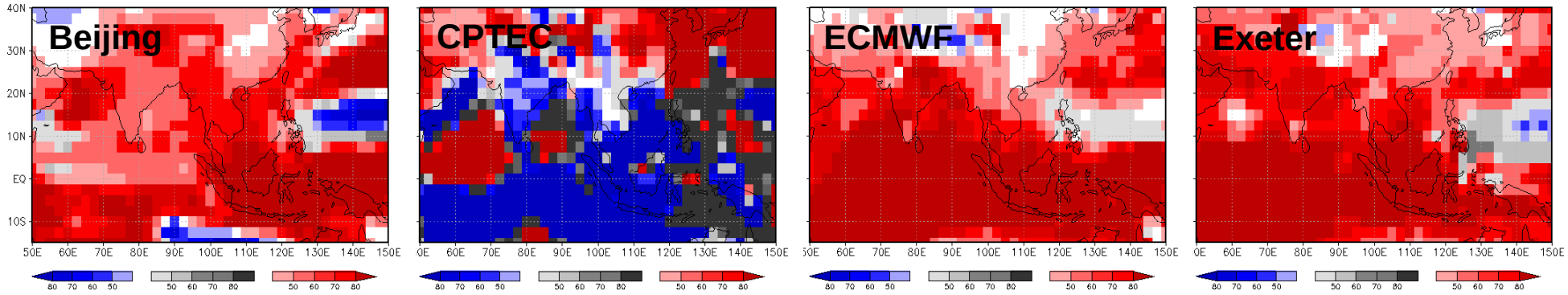
Probabilistic MME

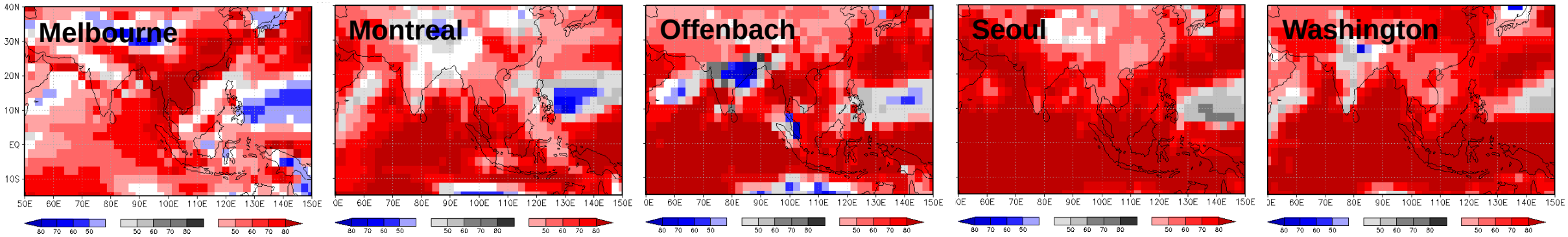


ROC Score



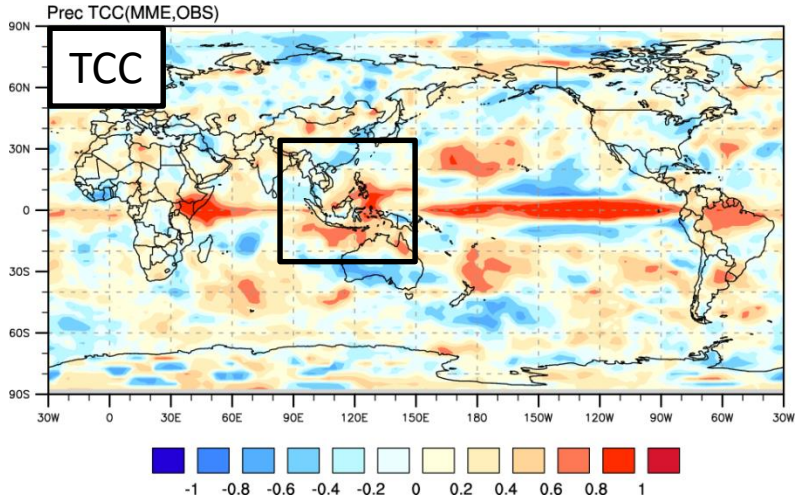
Individual forecast : 2m temperature for DJF 2018/19





- Most GPCs represent warm condition over ASEAN region.
- CPTEC shows cold temperature over ASEASN region.

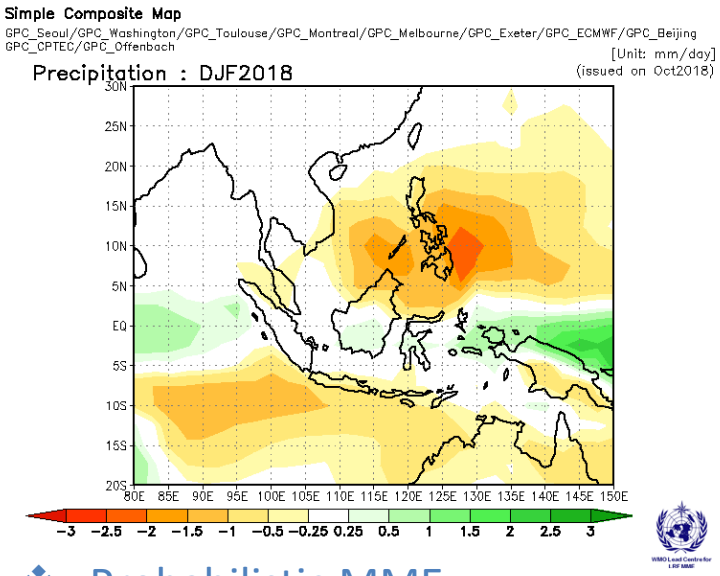
MME : Precipitation for DJF 2018/19



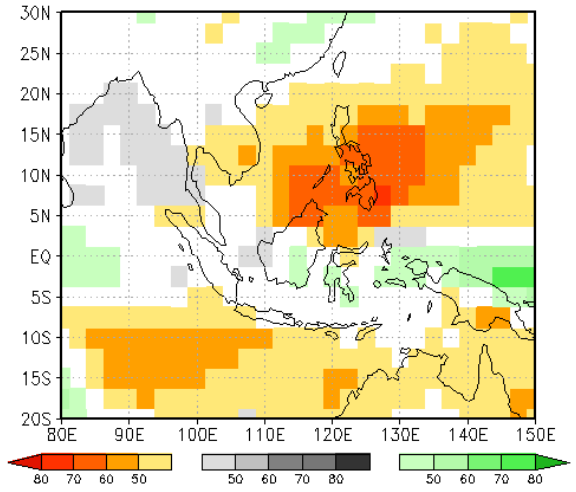
- TCC skills in the ASEAN region are relatively high compared to other regions but are low compared to those of temperature.

- Dry anomalies are predicted over eastern part of Maritime Continents (Philippines, Vietnam), while wet anomalies are predicted in southern part of Borneo
- There are some uncertianties over Indonesia, Malysia.

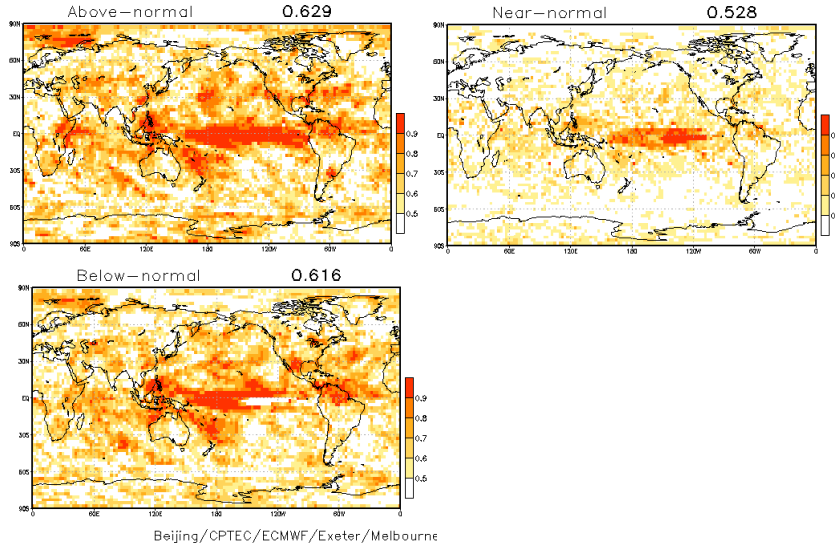
❖ Deterministic MME



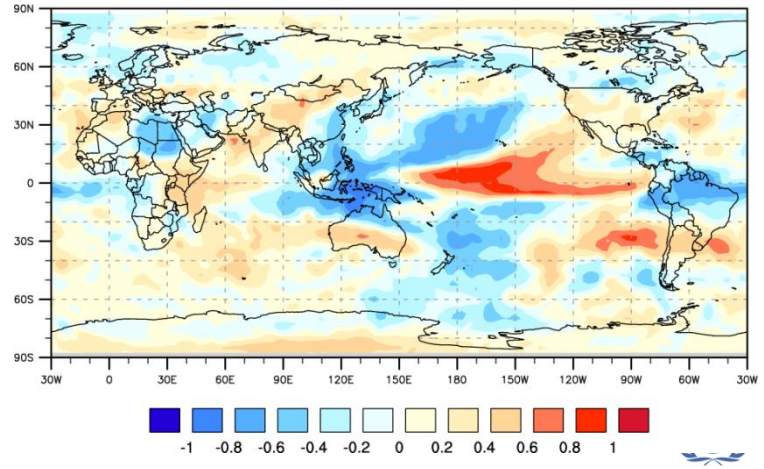
❖ Probabilistic MME



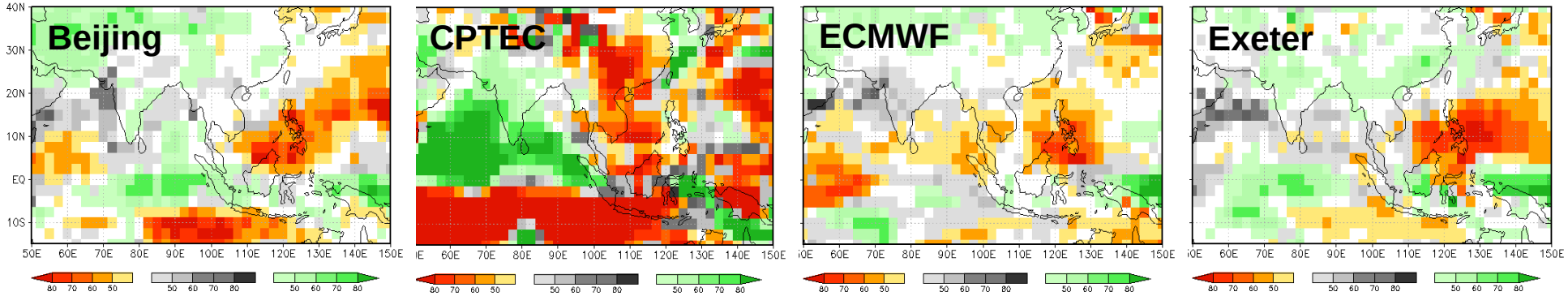
ROC Score

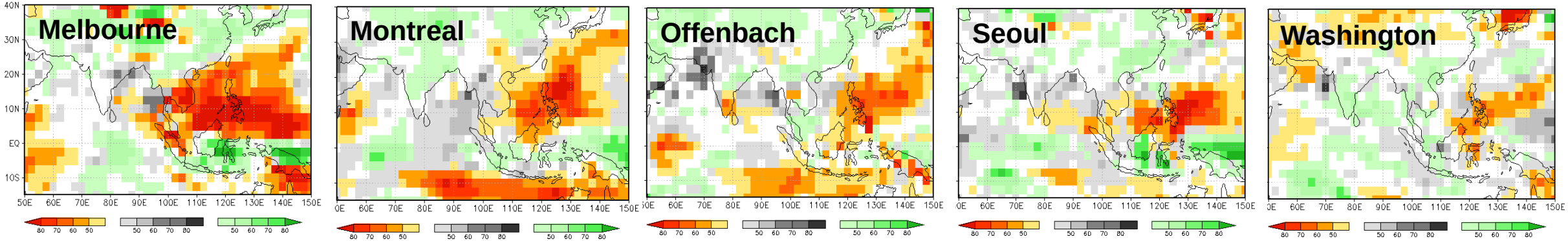


Correlation between precipitation and Nino3.4 on DJF



Individual forecast : Precipitation for DJF 2018/19



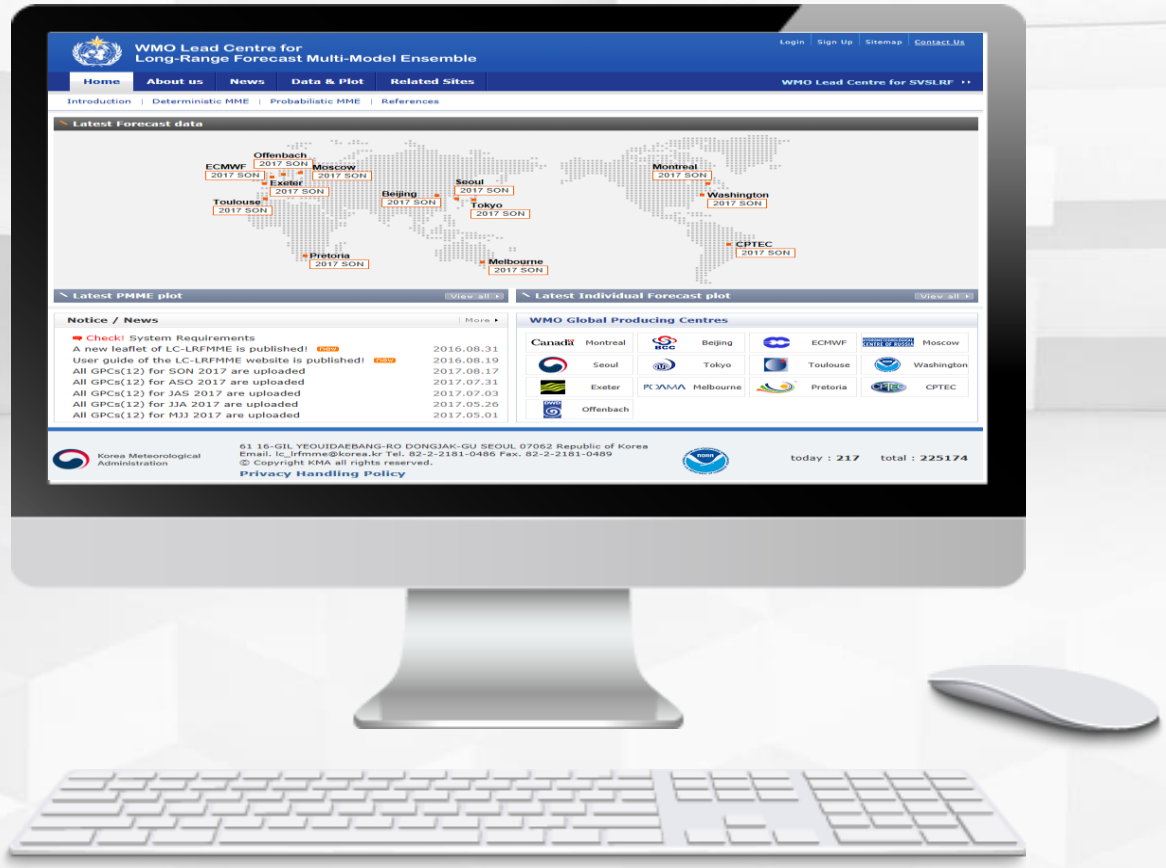


- Dry condition over eastern part of Maritime Continents are dominant.
- There are some uncertianties over Indonesia.

Summary for DJF 2018/19

- **Ocean**
  - **ENSO prediction**
    - Positive ENSO (> 0.5) is predicted during DJF.
  - **IOD prediction**
    - Neutral IOD is predicted.
- **Atmosphere :**
  - **2m Temperature**
    - Warmer than normal conditions are dominant over most ASEAN region.
  - **Precipitation**
    - Dry in eastern part of Maritime Continents
    - Below-normal conditions over eastern part of Maritime Continents
    - Above-normal conditions over southern part of Borneo

http://www.wmolc.org



For more Information, Please contact !

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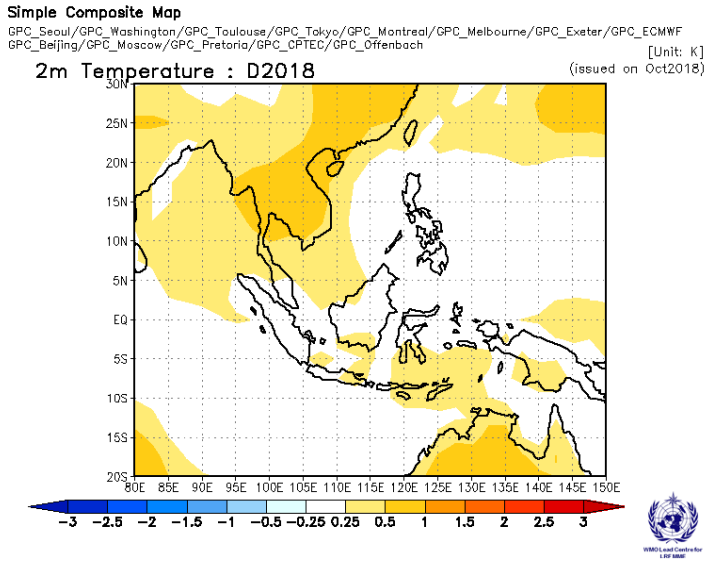
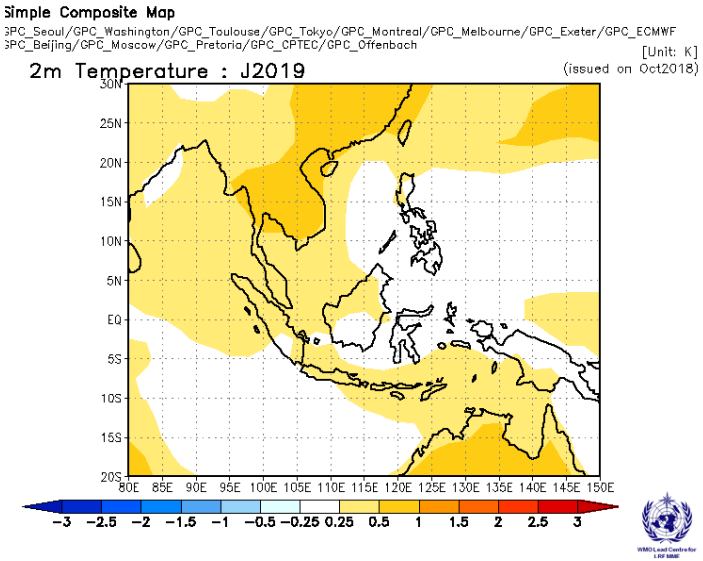
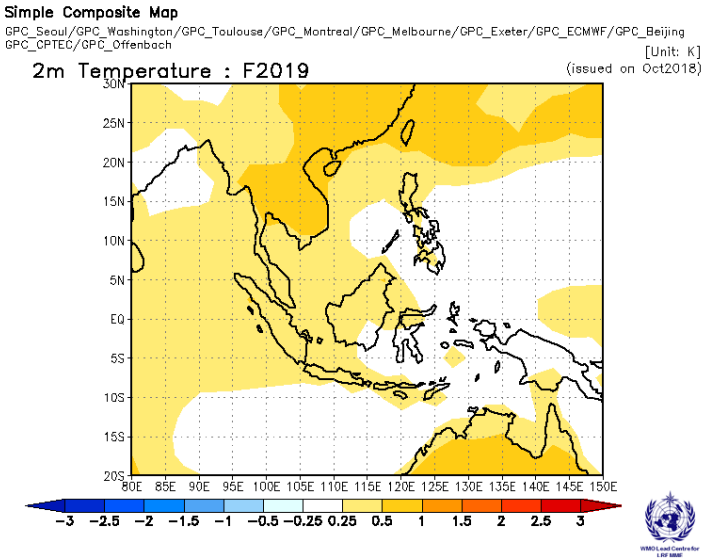
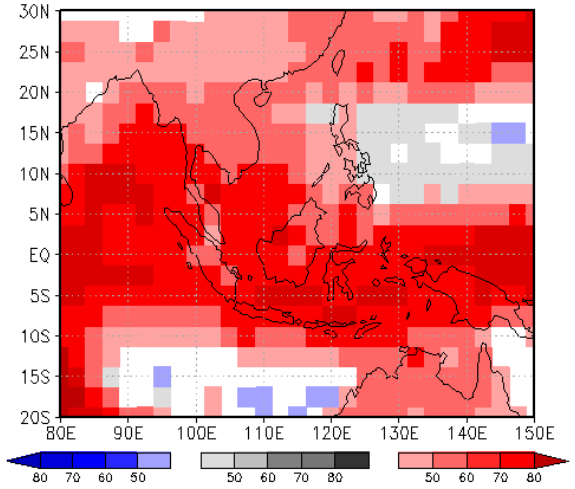
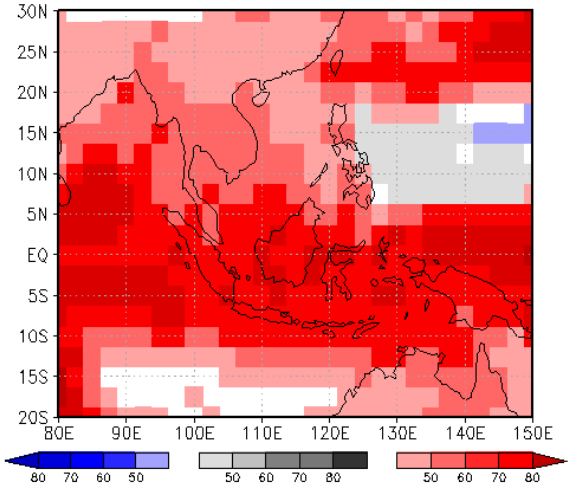
MME : T2m for DJF 2018/19

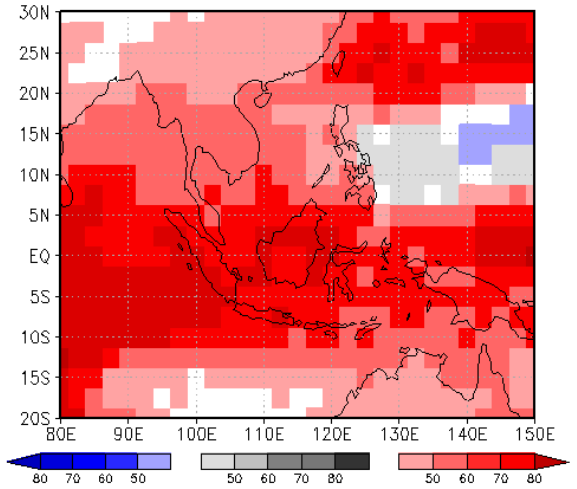




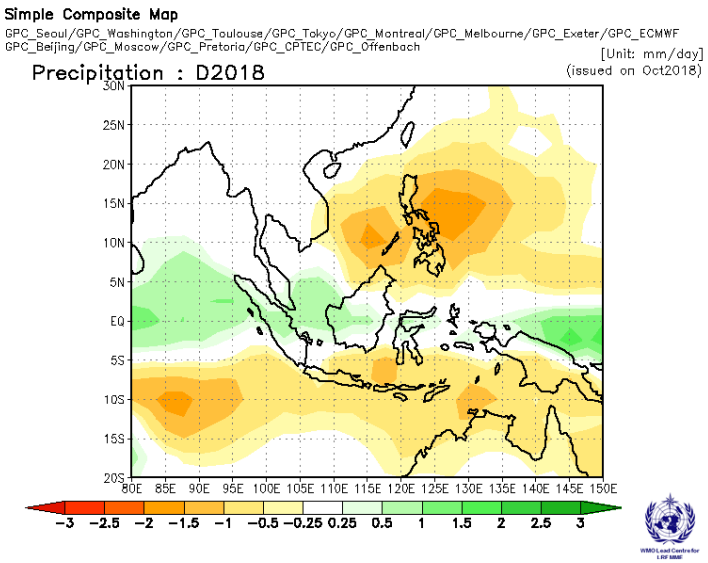


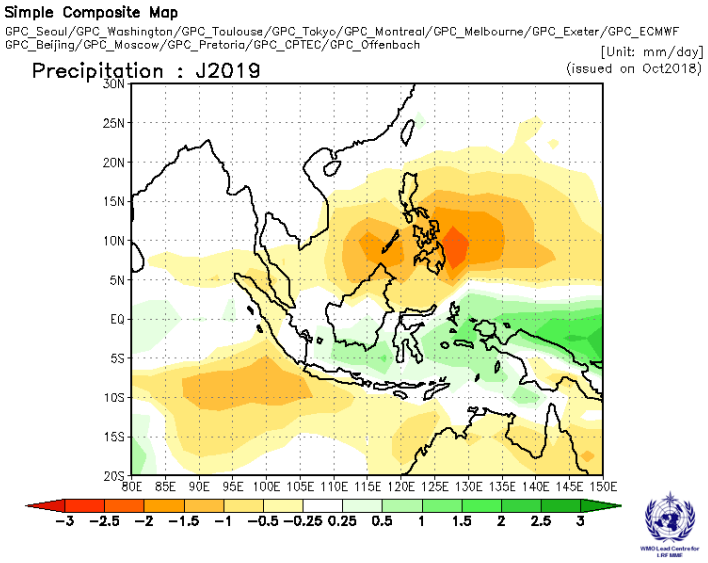


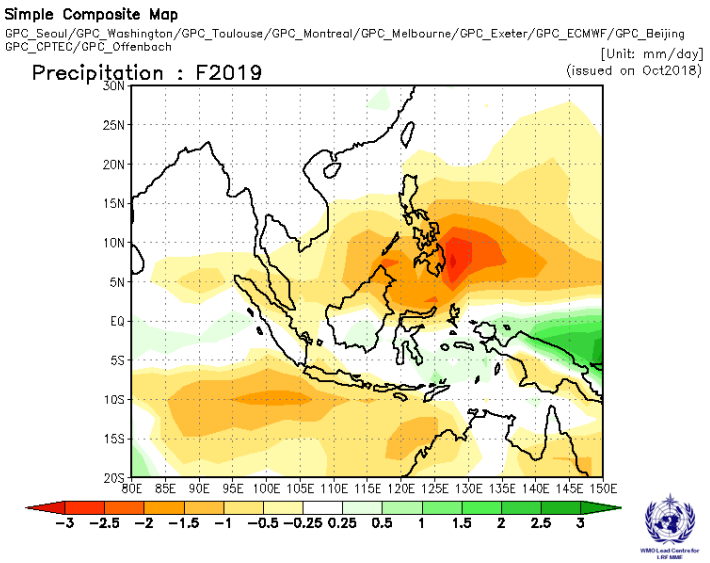


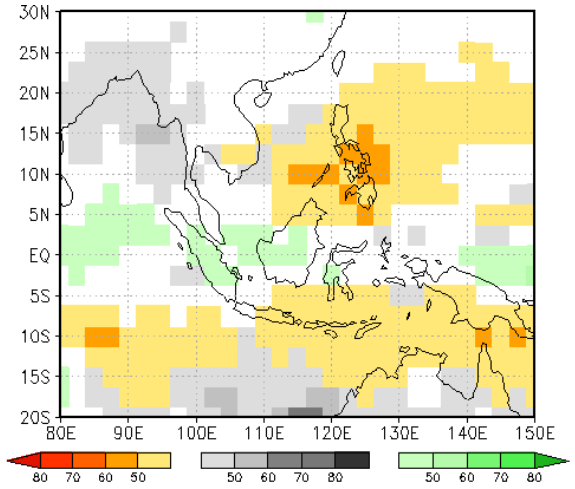


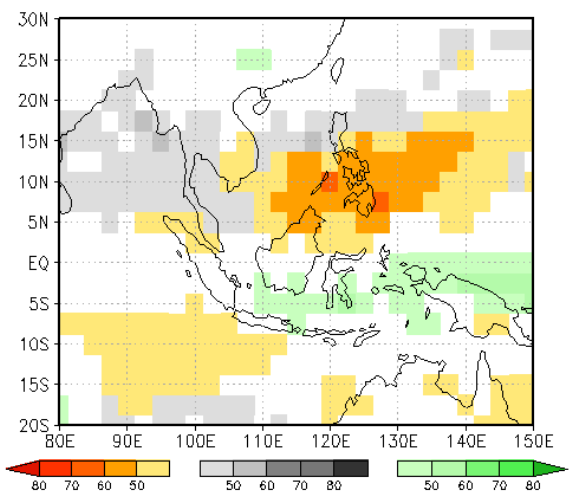
MME : Precipitation for DJF 2018/19

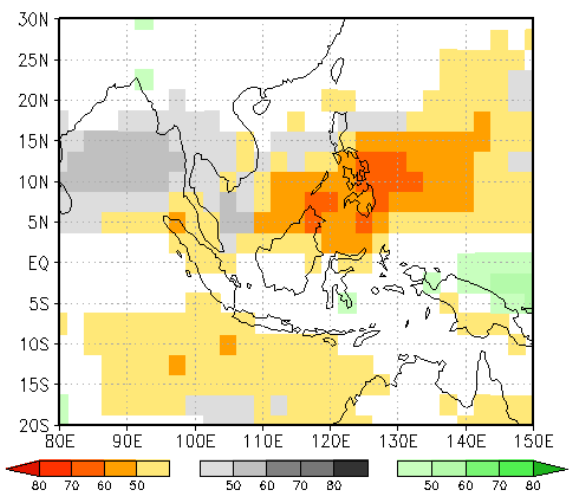












Thank you