

# Agenda 5: Looking Forward

## i. Atmosphere

Victoire Laurent  
Météo France

# Precipitation Outlook



# Precipitation Outlook for NDJ 2022 to FMA 2023

## WMO LC LRF MME

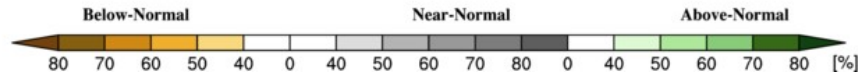
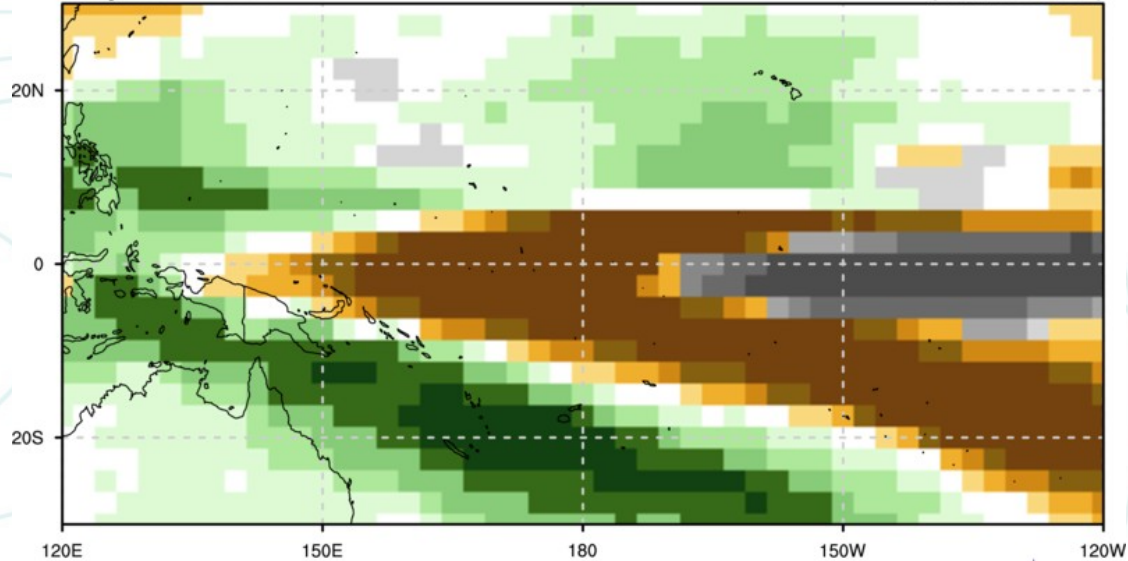
**2022NDJ:** Dry conditions (>80%) along the western equatorial Pacific and the central and eastern off-equatorial; Wet conditions for the south-western off-equatorial region; Near normal (>70%) along the central and eastern equatorial Pacific

Probabilistic Multi-Model Ensemble Forecast

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington

Precipitation : NDJ2022

(issued on Oct2022)



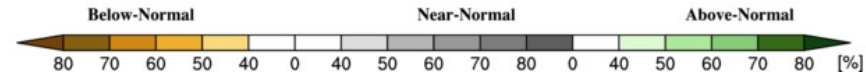
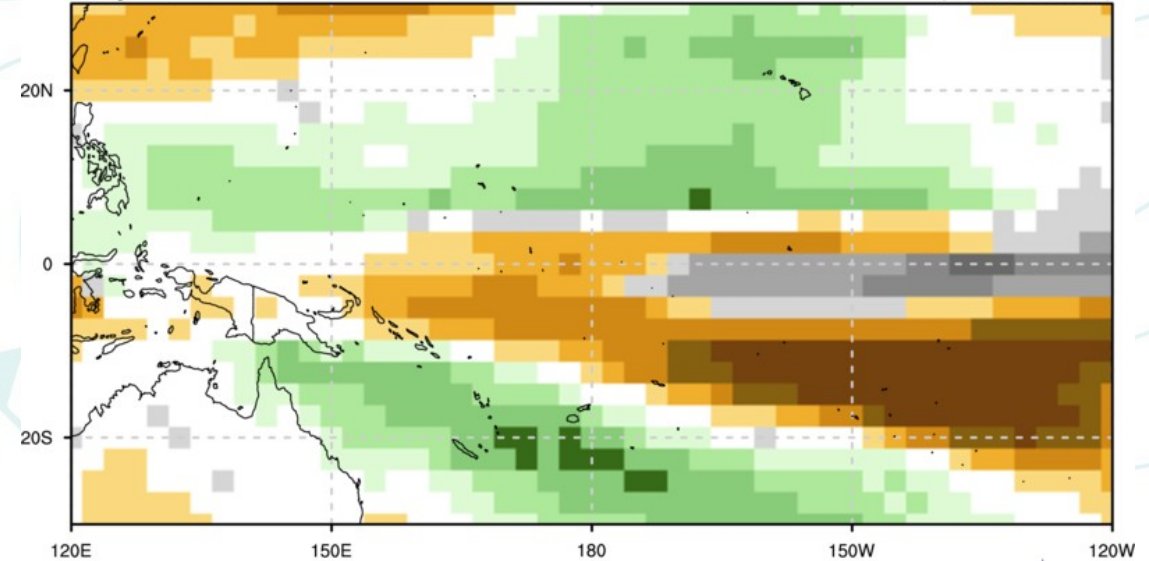
**2023FMA:** Weakening chances for dry, wet and normal conditions except for the eastern off-equatorial where probability for dry conditions stay more than 80%.

Probabilistic Multi-Model Ensemble Forecast

Beijing, Montreal, Seoul, Tokyo, Washington

Precipitation : FMA2023

(issued on Oct2022)



# Precipitation Outlook for NDJ 2022

**NIWA**  
**ICU**

**BoM**  
**ACCESS-S**

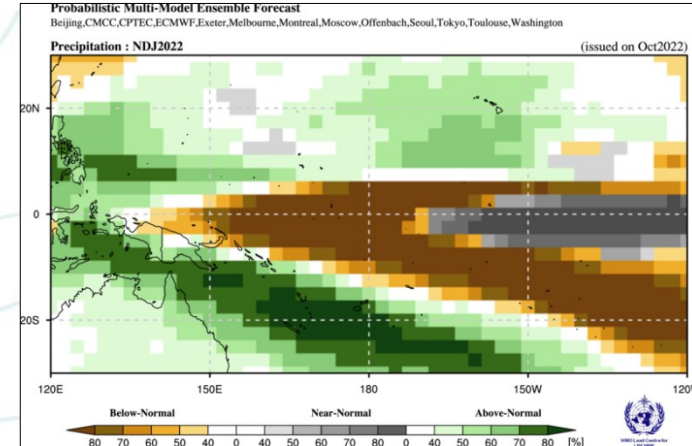
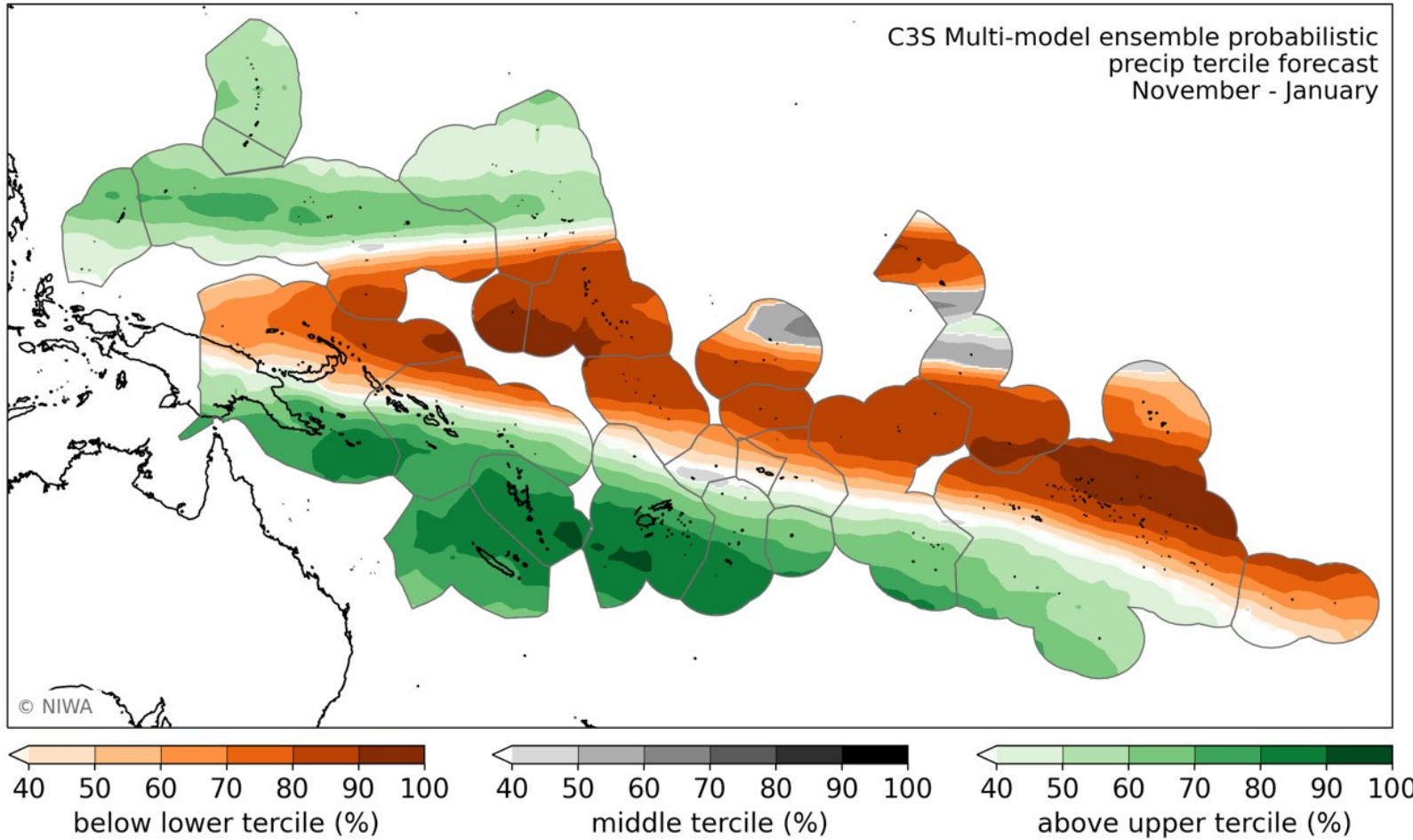
**NOAA**  
**NMME**

**APCC**  
**PMME**

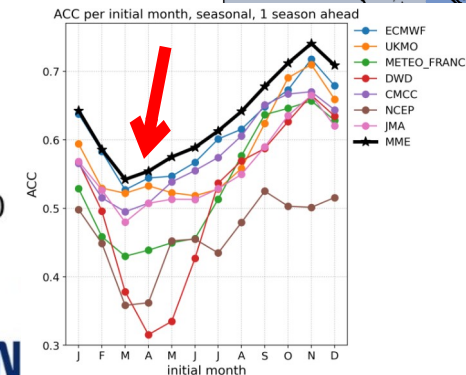
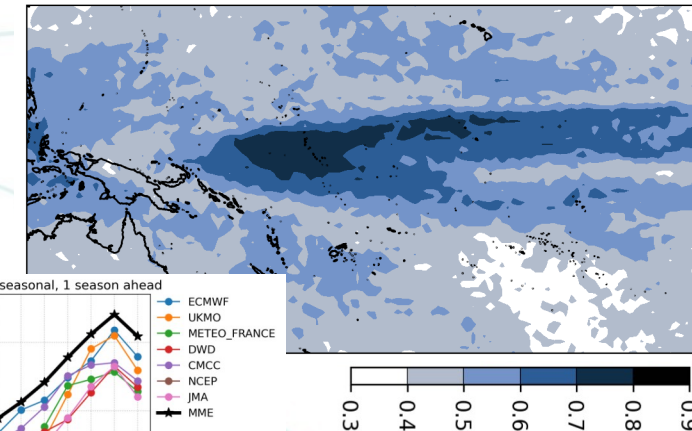
**CLIK-P**

**PICASO**

**SCOPIC**



C3S MME, Accuracy [0 - 1], 1 season ahead





# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

NOAA  
NMME

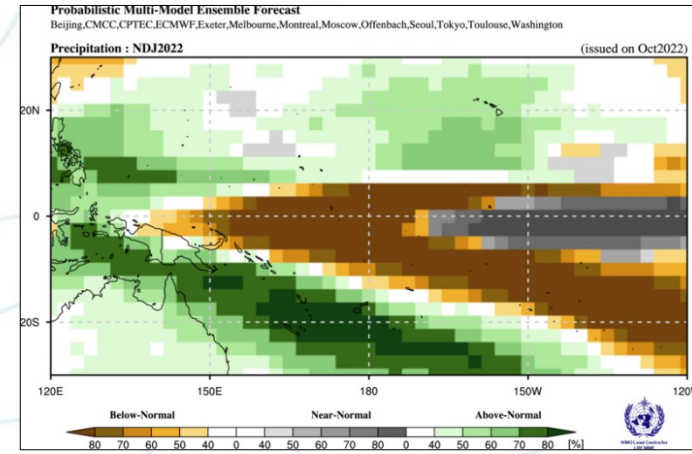
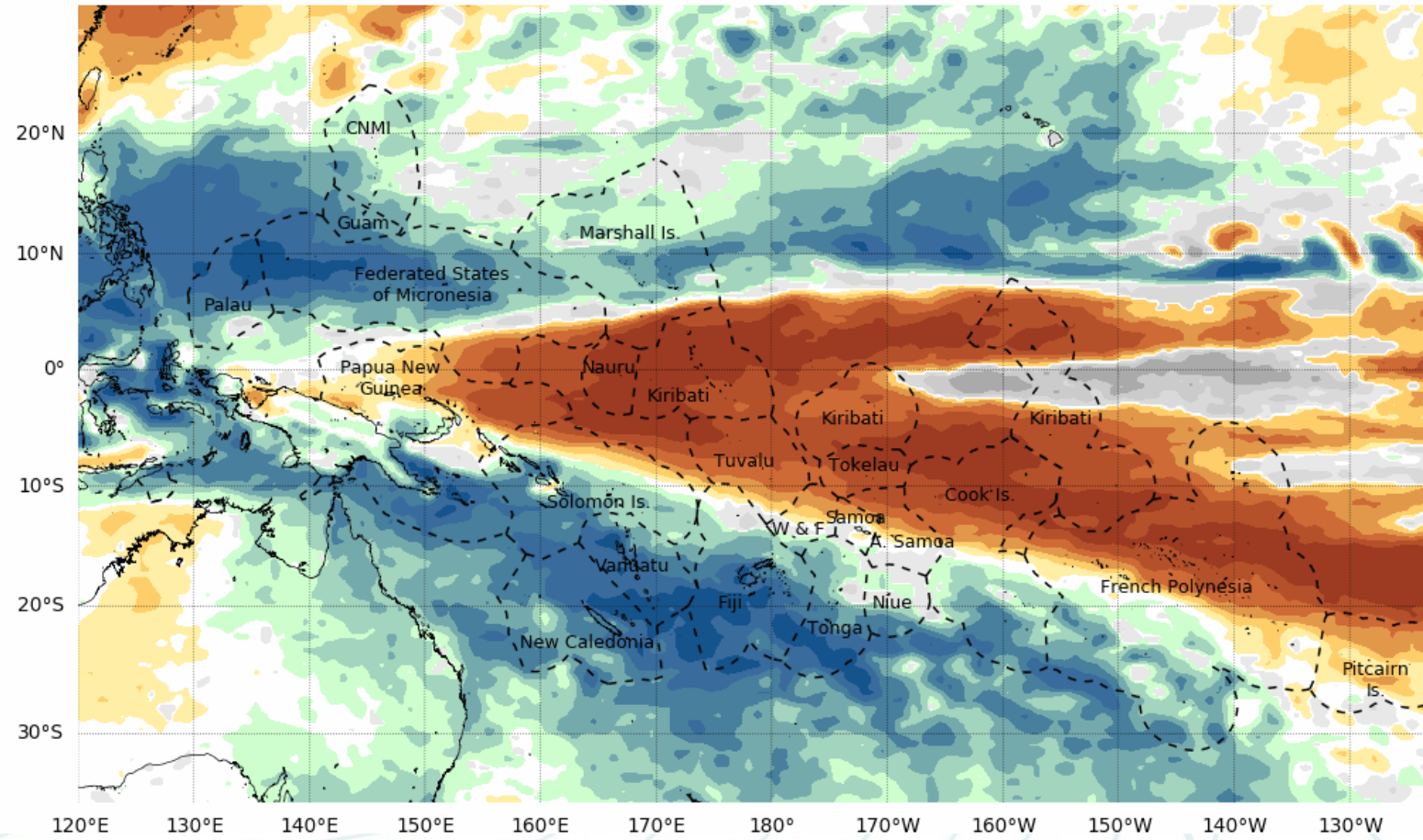
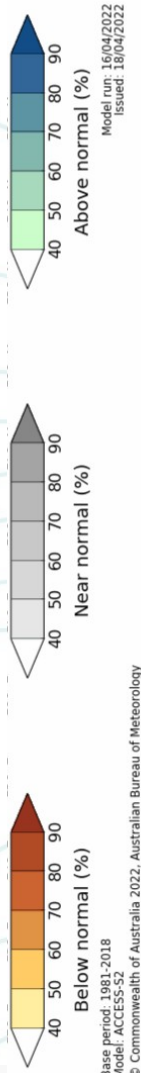
APCC  
PMME

CLIK-<sup>(P)</sup>

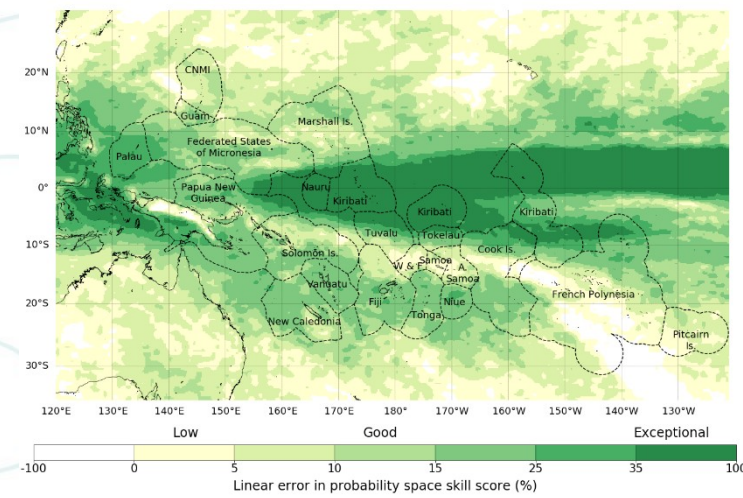
PICASO

SCOPIC

Tercile rainfall probabilities for November 2022 to January 2023



Tercile seasonal rainfall past accuracy for November - January. Lead time: 1 months



Run date: 9th October  
Data source: ACCESS-S2 and ERA5 Climate Reanalysis  
© Commonwealth of Australia 2022. Australian Bureau of Meteorology. Supported by COSPPac  
Shapefile data extracted from Flanders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at <http://www.marinegovernance.org/>

Base period: 1981-2018  
Issued: 19/01/2022

# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

NOAA  
NMME

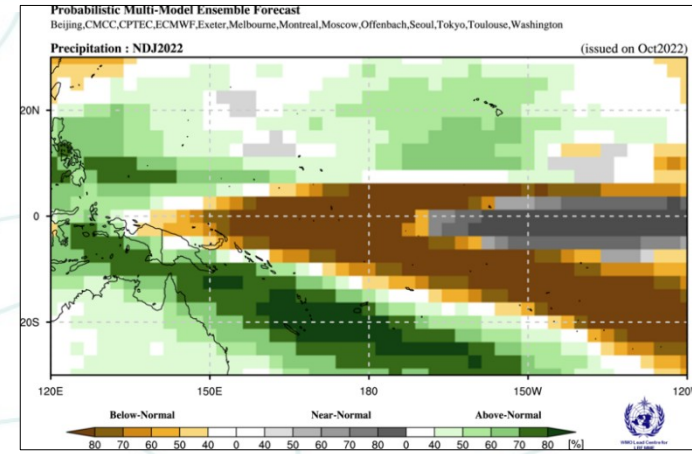
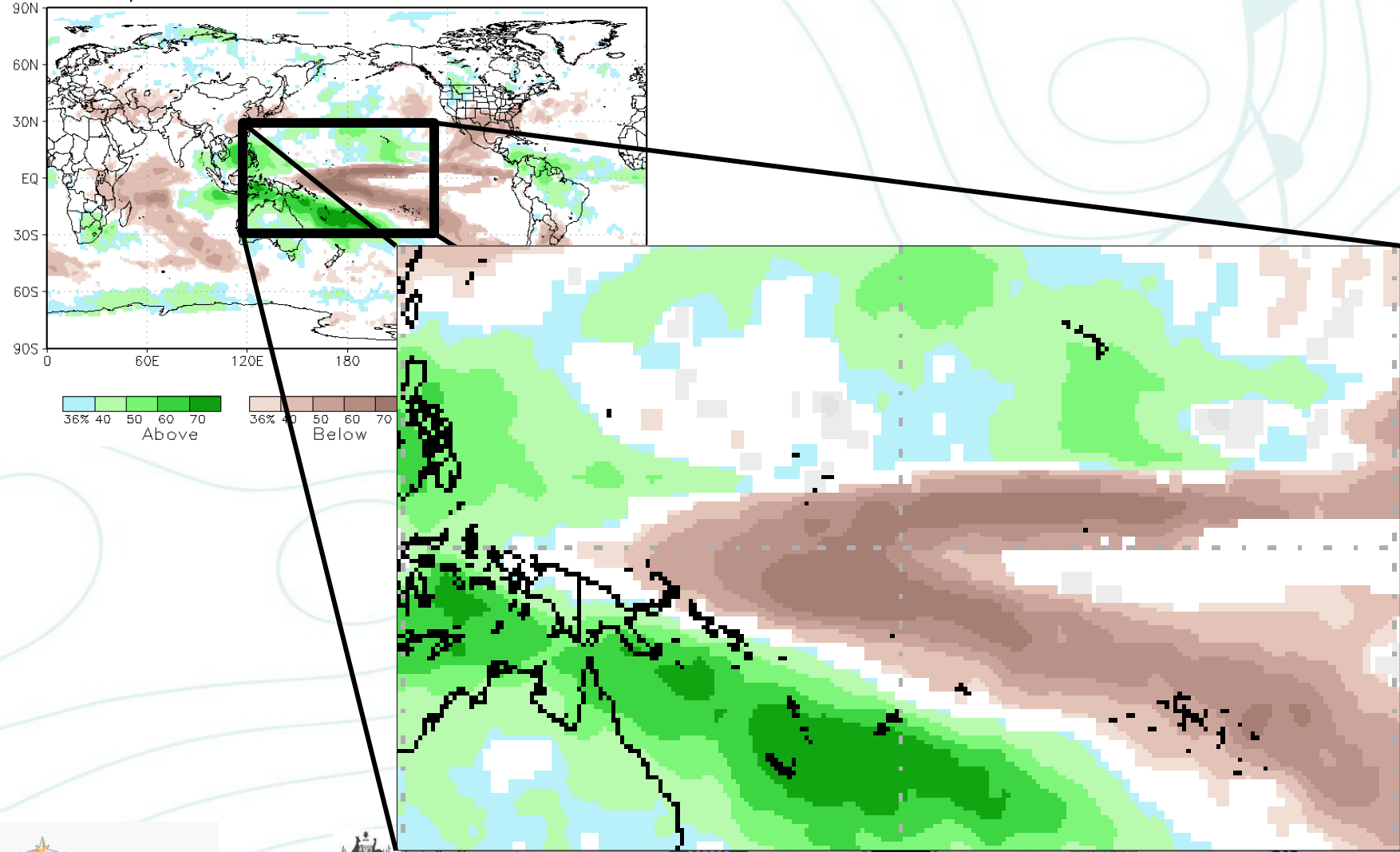
APCC  
PMME

CLIK-<sup>®</sup>P

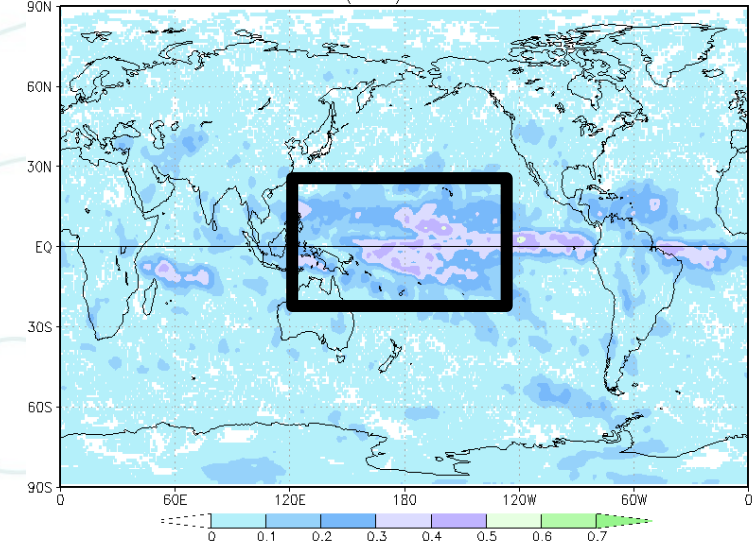
PICASO

SCOPIC

NMME prob fcst Prate IC=202210 for lead 1 2022 NDJ



Prec. rate Skill (RPS) IC=04 for Lead 1 MJJ





# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

NOAA  
NMME

APCC  
PMME

CLIK-<sup>(P)</sup>

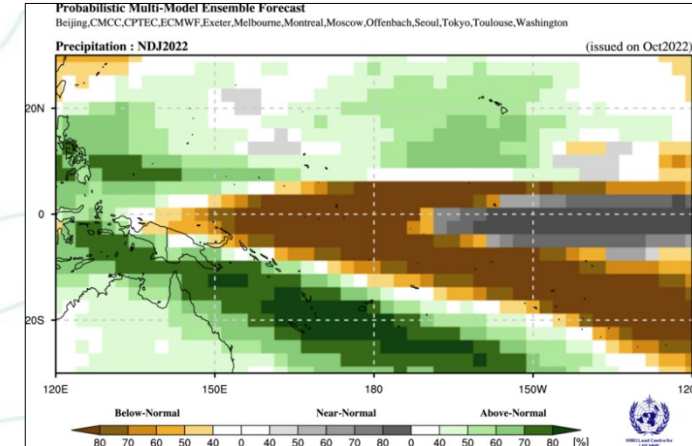
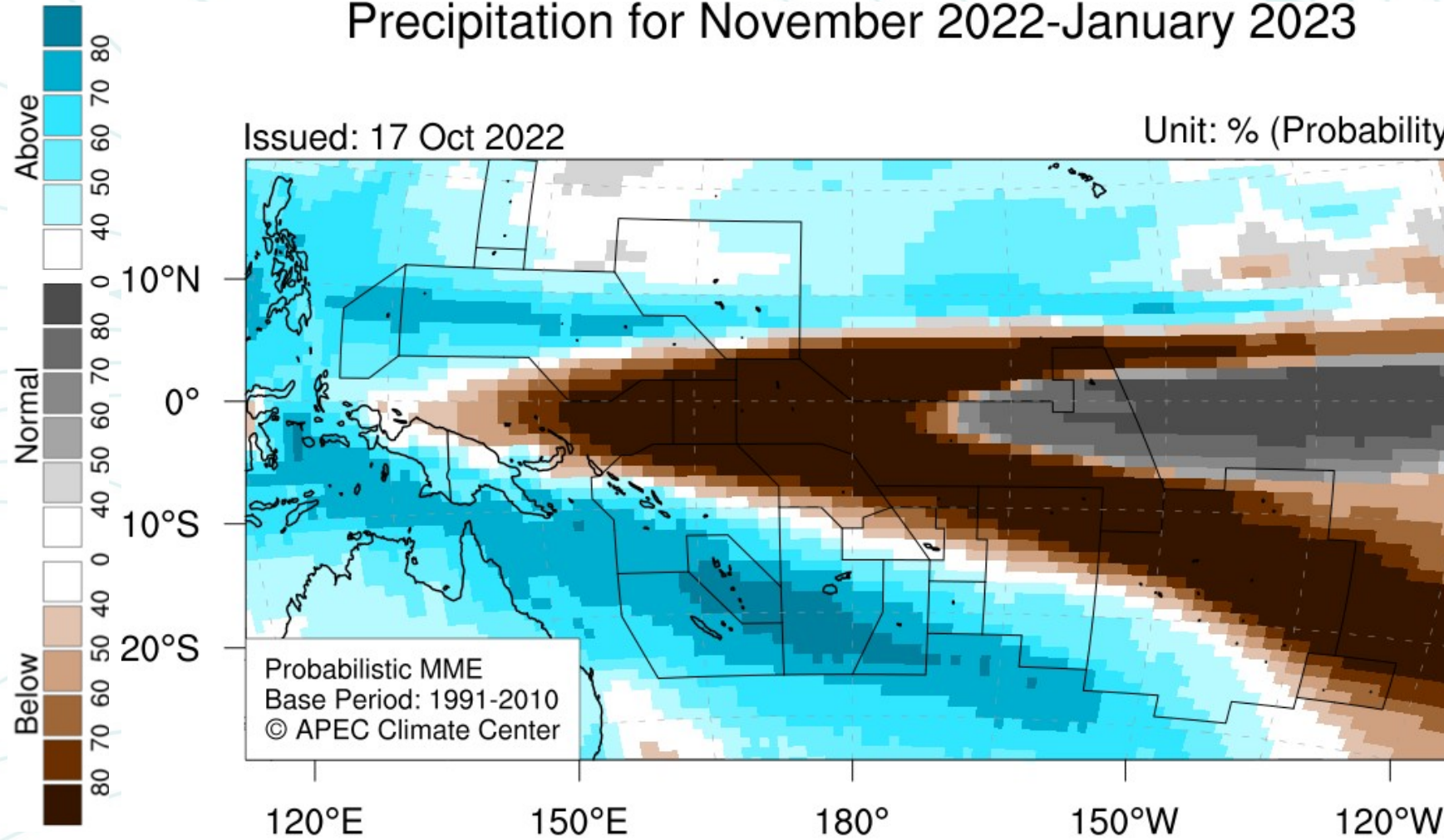
PICASO

SCOPIC

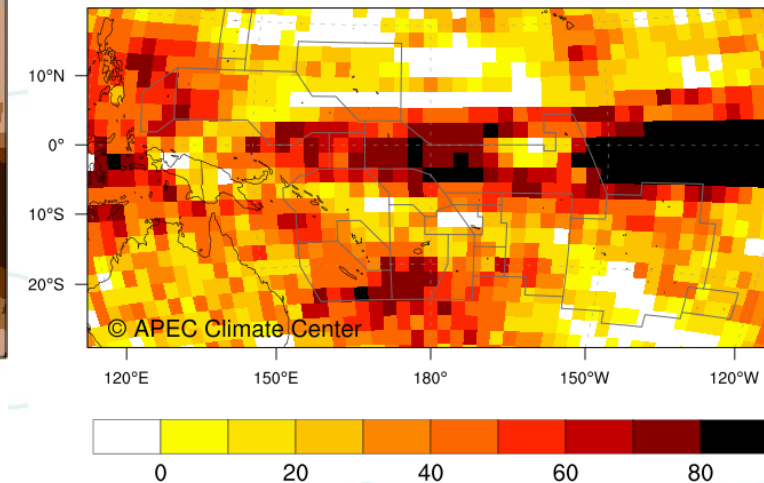
## Precipitation for November 2022-January 2023

Issued: 17 Oct 2022

Unit: % (Probability)



Heidke Skill Score : PREC, NDJ (1991-2010)





# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

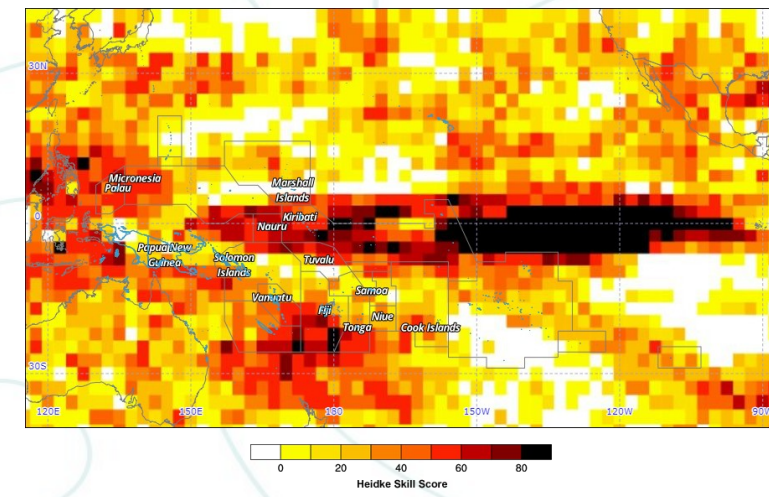
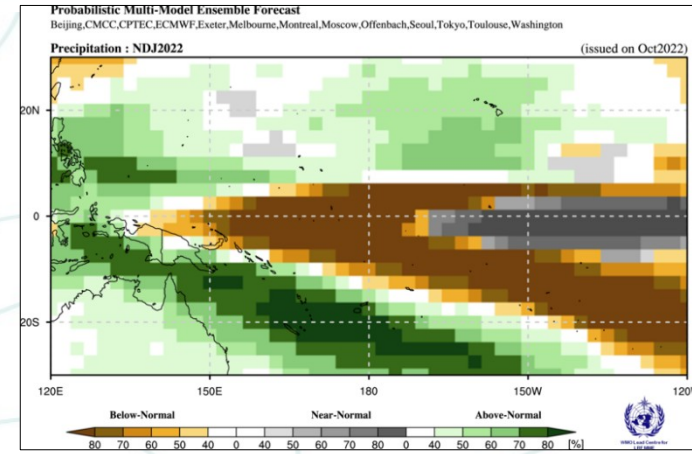
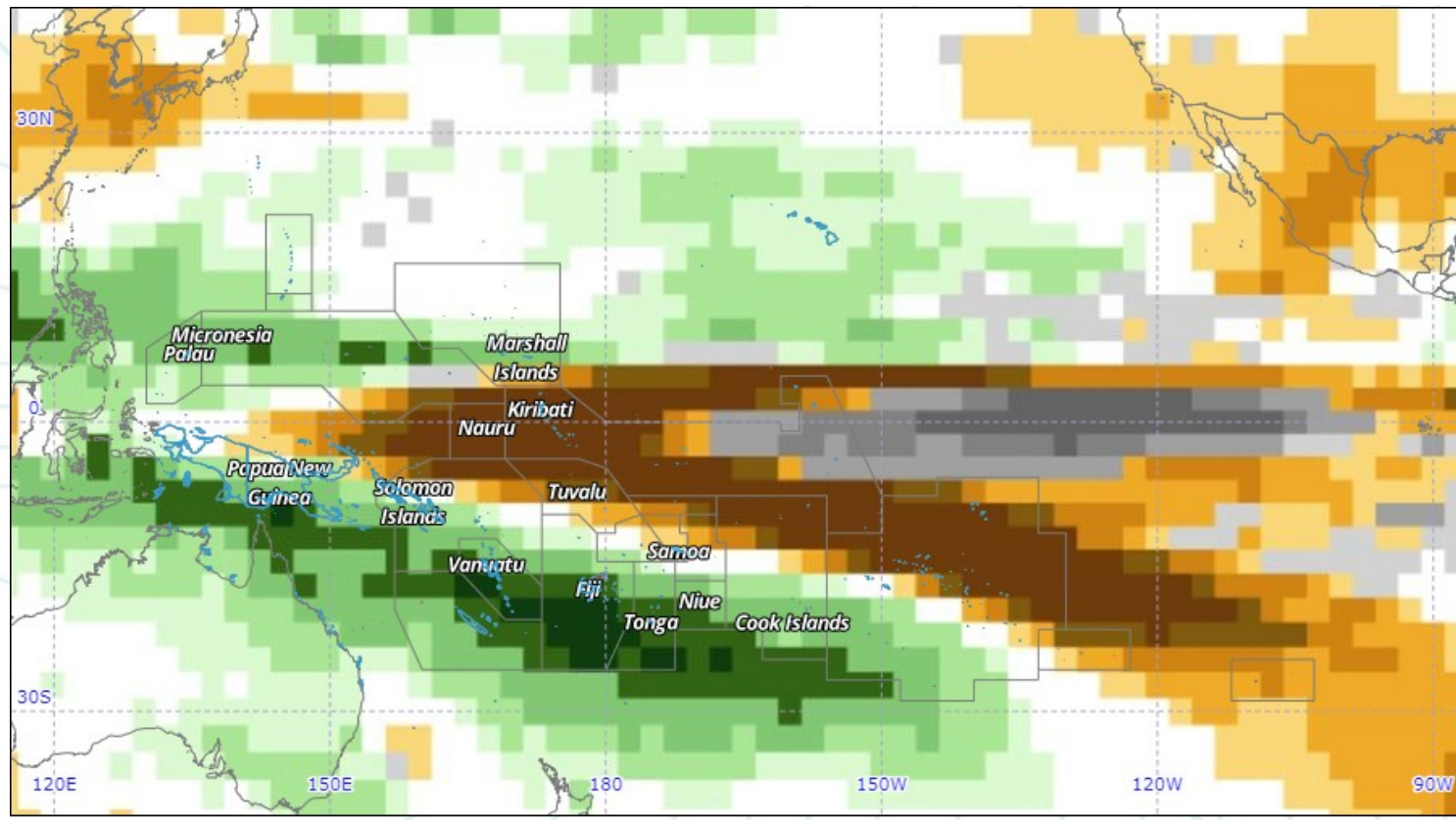
NOAA  
NMME

APCC  
PMME

CLIK-<sup>®</sup>

PICASO

SCOPIC



Year: 2022, Season: NDJ, Lead Month: 3, Method: GAUS  
Model: APCC, BOM, CMCC, CWB, MSC, NASA, NCEP  
Generated using CLIK<sup>®</sup> (2022-10-20)

Year: 2022, Season: NDJ, Lead Month: 3, Method: GAUS  
Model: APCC, BOM, CMCC, MSC, NASA, NCEP  
Generated using CLIK<sup>®</sup> (2022-10-20) © APEC Climate Center



# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

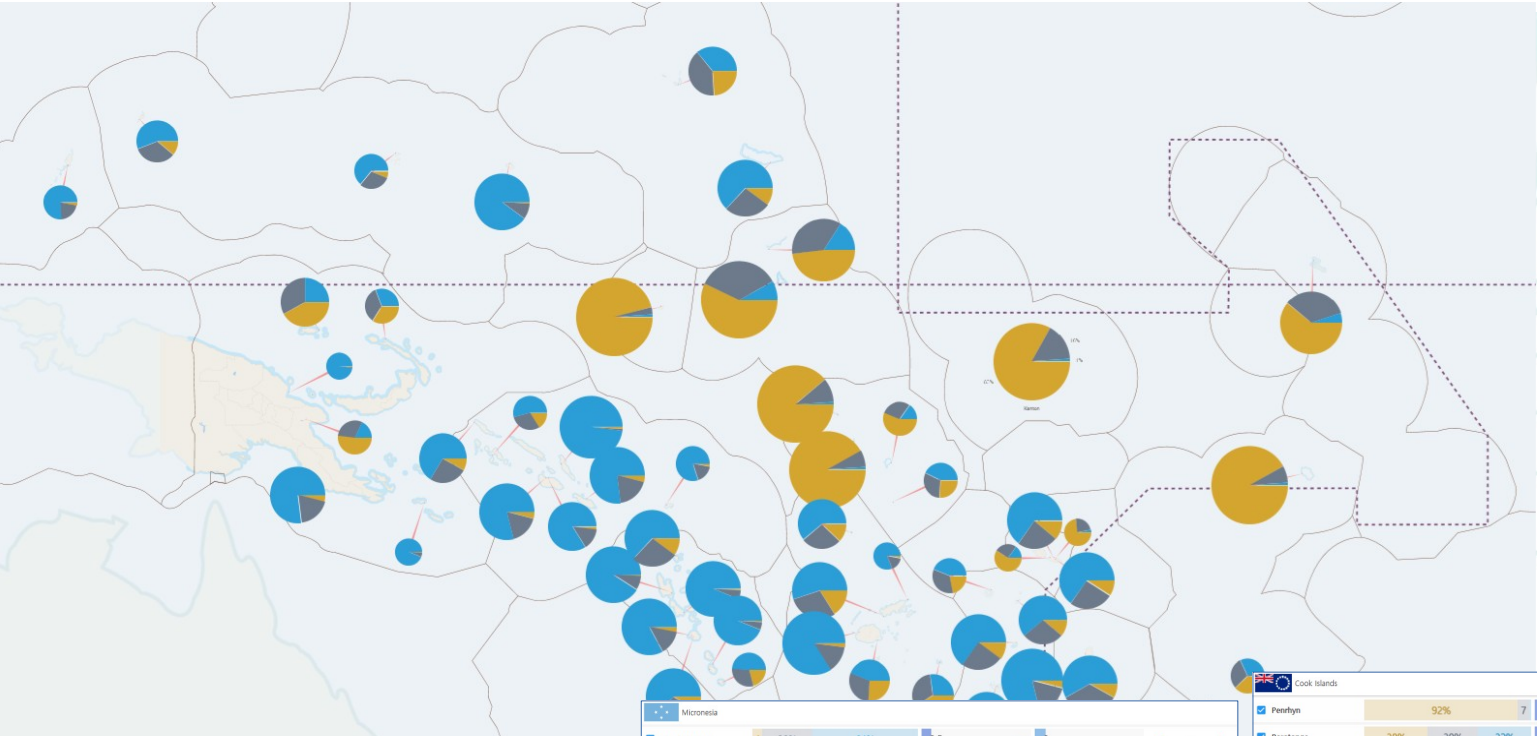
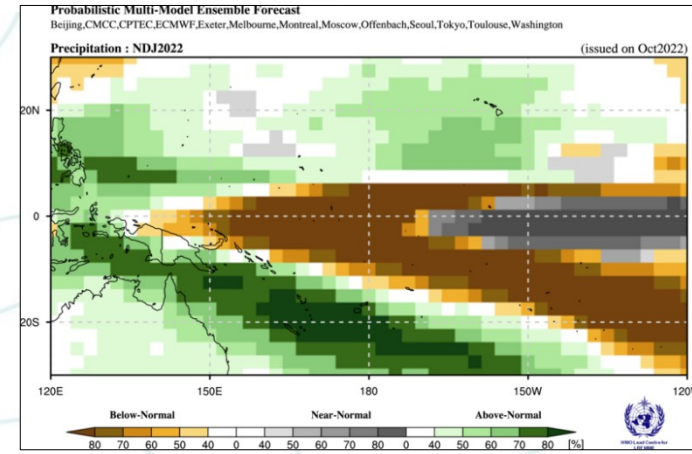
NOAA  
NMME

APCC  
PMME

CLIK-P

PICASO

SCOPIC



Kanton, Kiribati 2022 NDJ  
created by PICASO (2022-10-24)

Station	90%	75%	60%	45%	30%	15%	0%	15%	30%	45%	60%	75%	90%	Verification Score (LEPS)	Verification Score (HSS)	Hit/Near/Miss/Miss
<b>Torvalu</b>																
Nanumea	89%	10	39.1	Excellent	30			8	6	1						
Nui	92%	7	42.5	Excellent	40			9	6	0						
Funafuti	56%	29%	15%	3.4	Low	5		4	6	5						
Niulakita	26%	31%	43%	2.2	Low	15		6	5	4						
<b>Vanuatu</b>																
Sola (Vanua Lava)	10	27%	63%	22	High	0		4	7	1						
Pekoa Airport (Santo)	8'	91%	22.7	High	50			10	2	3						
Lamap (Malekula)	!	94%	19.5	High	45			9	4	2						
Bauerfield (Efaté)	14%	83%	24	High	30			8	5	2						
Port Vila	8'	29%	63%	20.8	High	30		8	6	1						
White Grass Airport	!	94%	13.5	Good	0			5	8	2						
Aneityum	21%	30%	49%	3	Low	15		6	5	4						

Station	90%	75%	60%	45%	30%	15%	0%	15%	30%	45%	60%	75%	90%	Verification Score (LEPS)	Verification Score (HSS)	Hit/Near/Miss/Miss
<b>Micronesia</b>																
Chuuk WSO AP	30%	64%	0.5	Low	0			5	4	6						
Pohnpei	9%	90%	16.7	High	20			7	6	2						
Yap Island WSO Airport	11'	33%	56%	8.1	Moderate	30		8	2	5						
<b>Nauru</b>																
Nauru	96%	56.9	Excellent	57.1				5	2	0						
<b>Niue</b>																
Hanan Airport	8'	34%	58%	23.3	High	45		8	6	1						
<b>Palau</b>																
Koror	21%	76%	1.4	Low	5			5	8	2						
<b>Papua New Guinea</b>																
Madang	98%	-44.9	Very Low	-30				2	8	5						
Port Moresby	19%	77%	23.7	High	40			9	4	2						
Momote	42%	33%	25%	10.4	Good	30		8	3	4						
Nadzab	52%	30%	18%	3.8	Low	0		5	7	3						
Kavlang	34%	35%	31%	3.7	Low	5		4	9	2						
Misima	!	94%	-15.2	Very Low	-25			1	12	2						

Station	90%	75%	60%	45%	30%	15%	0%	15%	30%	45%	60%	75%	90%	Verification Score (LEPS)	Verification Score (HSS)	Hit/Near/Miss/Miss
<b>Cook Islands</b>																
Penryn	92%	7	35.4	Excellent	50			10	3	2						
Rarotonga	38%	30%	32%	0.8	Low	10		6	4	5						
<b>Fiji</b>																
Rotuma	12%	27%	61%	11.5	Good	5		4	10	1						
Udu Point	16%	81%	-24.3	Very Low	6.2			4	3	5						
Nabouwalu	16%	29%	55%	16.5	High	79.5		8	2	1						
Nadi Airport	14%	84%	31.3	Very High	40			9	5	1						
Suva	26%	30%	44%	7.6	Moderate	60		11	1	3						
Ono I Lailu	41%	32%	27%	6.9	Moderate	57.1		10	1	3						
<b>Fidjiti</b>																
Kiritimati	61%	34%	31.8	Very High	10			6	8	1						
Butaritari	48%	36%	16%	30.7	Very High	30		8	6	1						
Tarawa	57%	35%	8'	41.8	Excellent	55		9	4	2						
Kanton	83%	16%	44.4	Excellent	50			8	2	2						
<b>Marshall Islands</b>																
Kwajalein Bucholz Aaf	24%	40%	36%	10.8	Good	10		6	8	1						
Majuro	10	27%	63%	24.7	High	45		9	5	1						

Station	90%	75%	60%	45%	30%	15%	0%	15%	30%	45%	60%	75%	90%	Verification Score (LEPS)	Verification Score (HSS)	Hit/Near/Miss/Miss
<b>Solomon Islands</b>																
Taro Island	8'	26%	66%	13.9	Good	20		7	6	2						
Munda	16%	30%	54%	4.1	Low	10		6	4	5						
Auki		98%	30	Very High	20			7	7	1						
Honiara	17%	79%	24.8	High	40			9	2	4						
Honiara Henderson	14%	84%	11.3	Good	40			9	2	4						
Kira Kira	19%	77%	21.2	High	20			7	6	2						
Santa Cruz	17%	80%	2.4	Low	-10			4	6	5						
<b>Tonga</b>																
Niuafoou	22%	34%	44%	3.3	Low	-10		4	6	5						
Keppel/Mata'aho Airport	11'	28%	61%	10	Good	3.6		5	6	3						
Lupepau'u	10	25%	65%	22.7	High	65		11	1	3						
Haapai	17%	79%	30.3	Very High	50			10	3	2						
Nuku'alofa	23%	71%	12.3	Good	30			8	3	4						

# Precipitation Outlook for NDJ 2022

NIWA  
ICU

BoM  
ACCESS-S

NOAA  
NMME

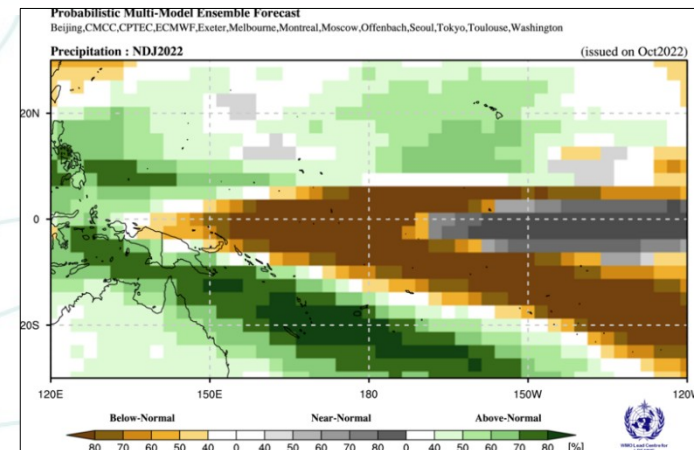
APCC  
PMME

CLIK-<sup>(P)</sup>

PICASO

SCOPIC

SCOPIC is not available!





# Precipitation Outlook for FMA 2023

NIWA  
ICU

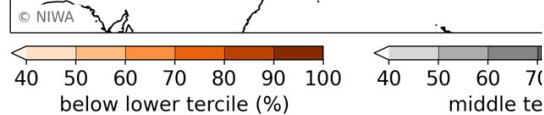
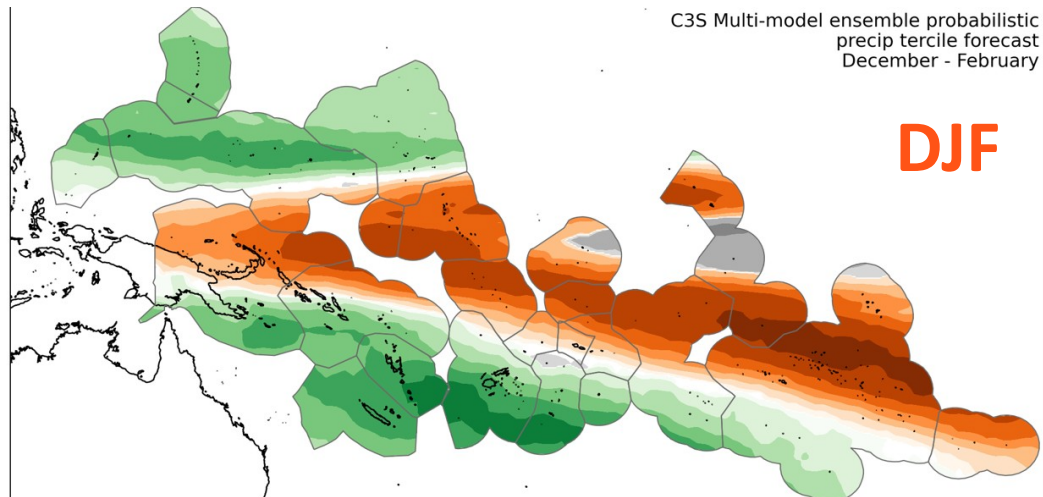
BoM  
ACCESS-S

NOAA  
NMME

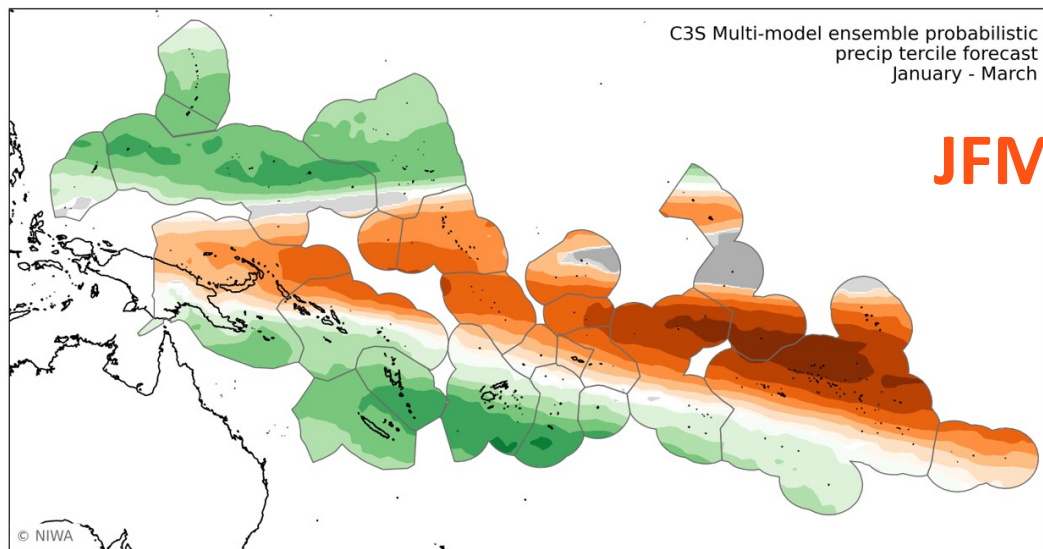
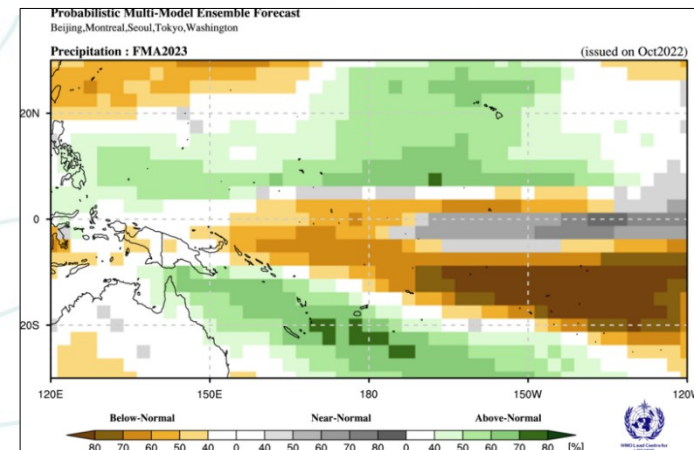
APCC  
PMME

SCOPIC

C3S Multi-model ensemble probabilistic precip tercile forecast  
December - February



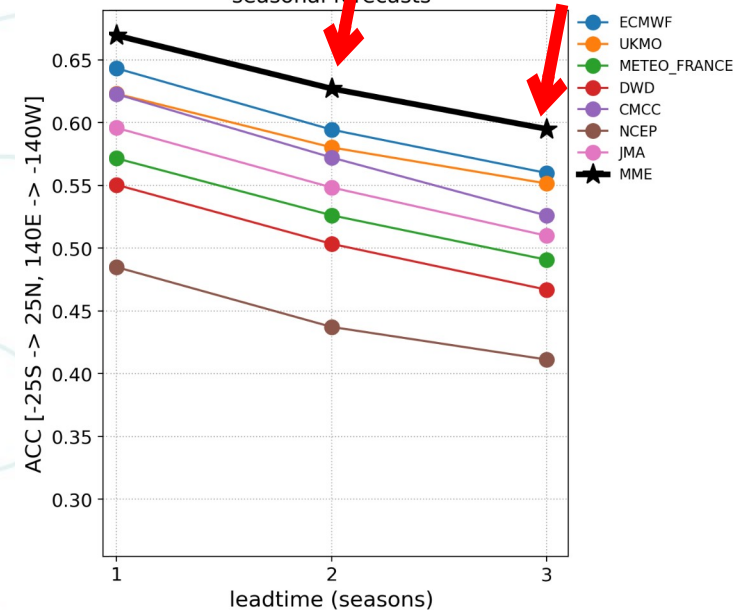
FMA is not available!



C3S Multi-model ensemble probabilistic precip tercile forecast  
January - March



C3S MME ACC, Tropical Pacific seasonal forecasts





# Precipitation Outlook for FMA 2023

NIWA  
ICU

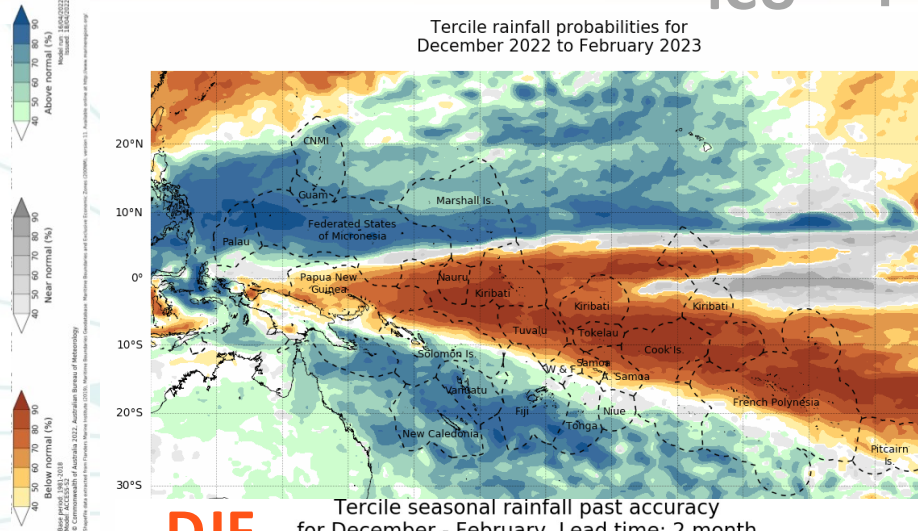
BoM  
ACCESS-S

NOAA  
NMME

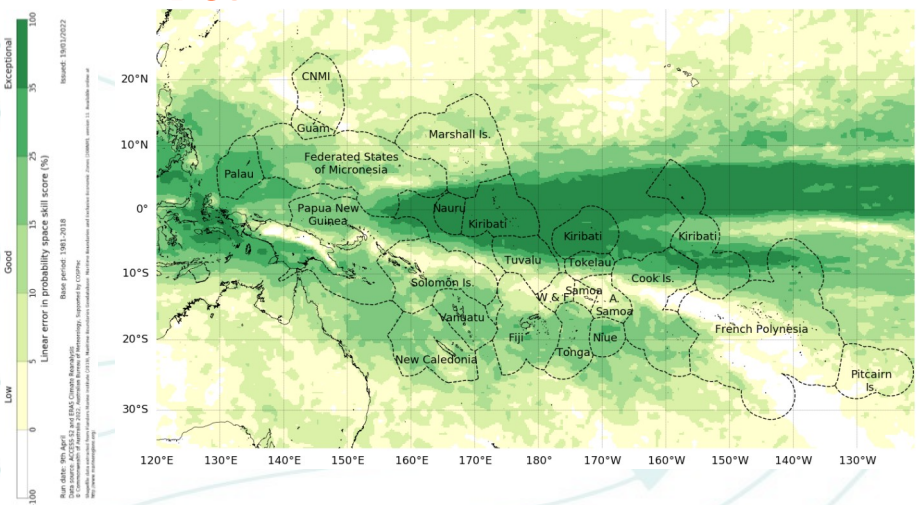
APCC  
PMME

SCOPIC

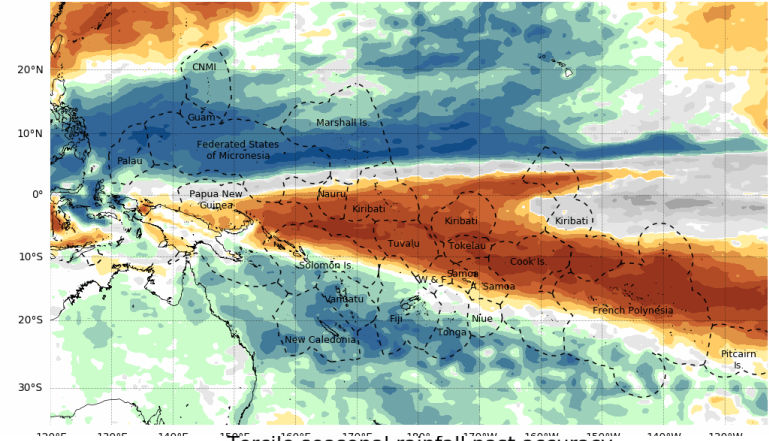
Tercile rainfall probabilities for December 2022 to February 2023



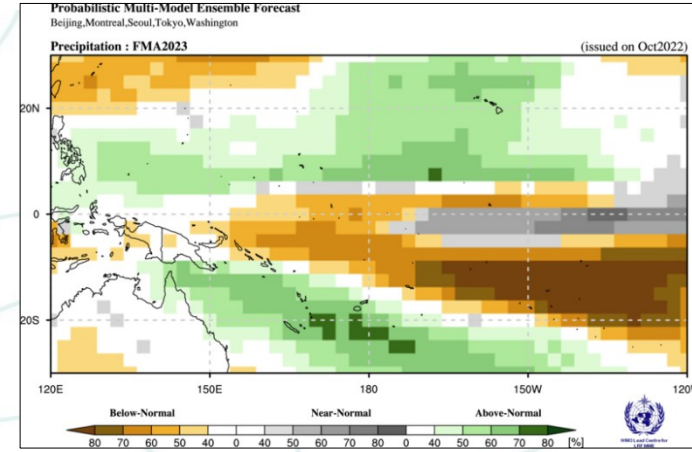
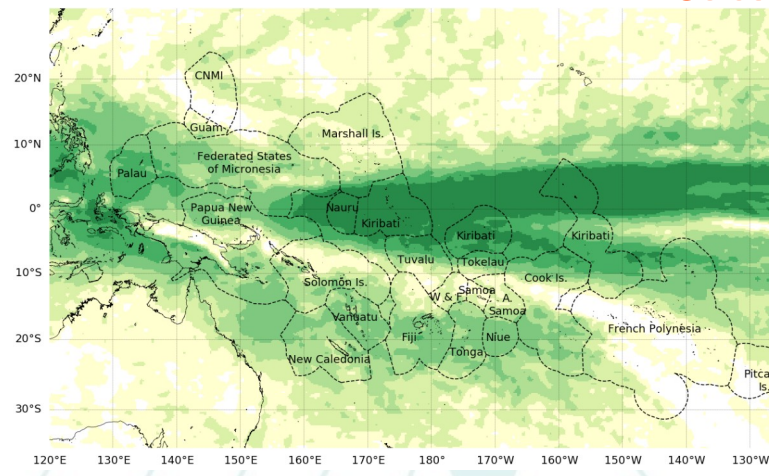
**DJF** Tercile seasonal rainfall past accuracy for December - February. Lead time: 2 month



Tercile rainfall probabilities for January to March 2023



Tercile seasonal rainfall past accuracy for January - March. Lead time: 3 months **JFM**



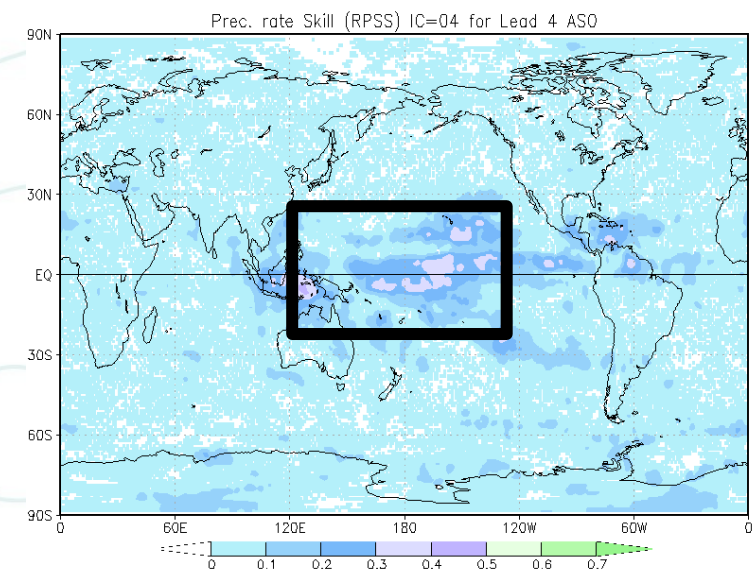
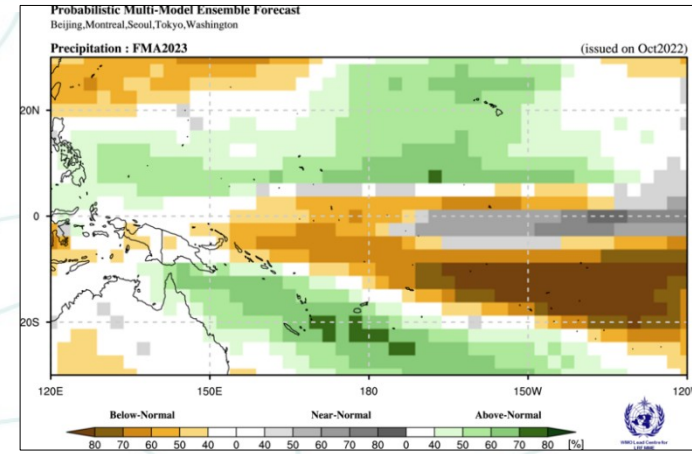
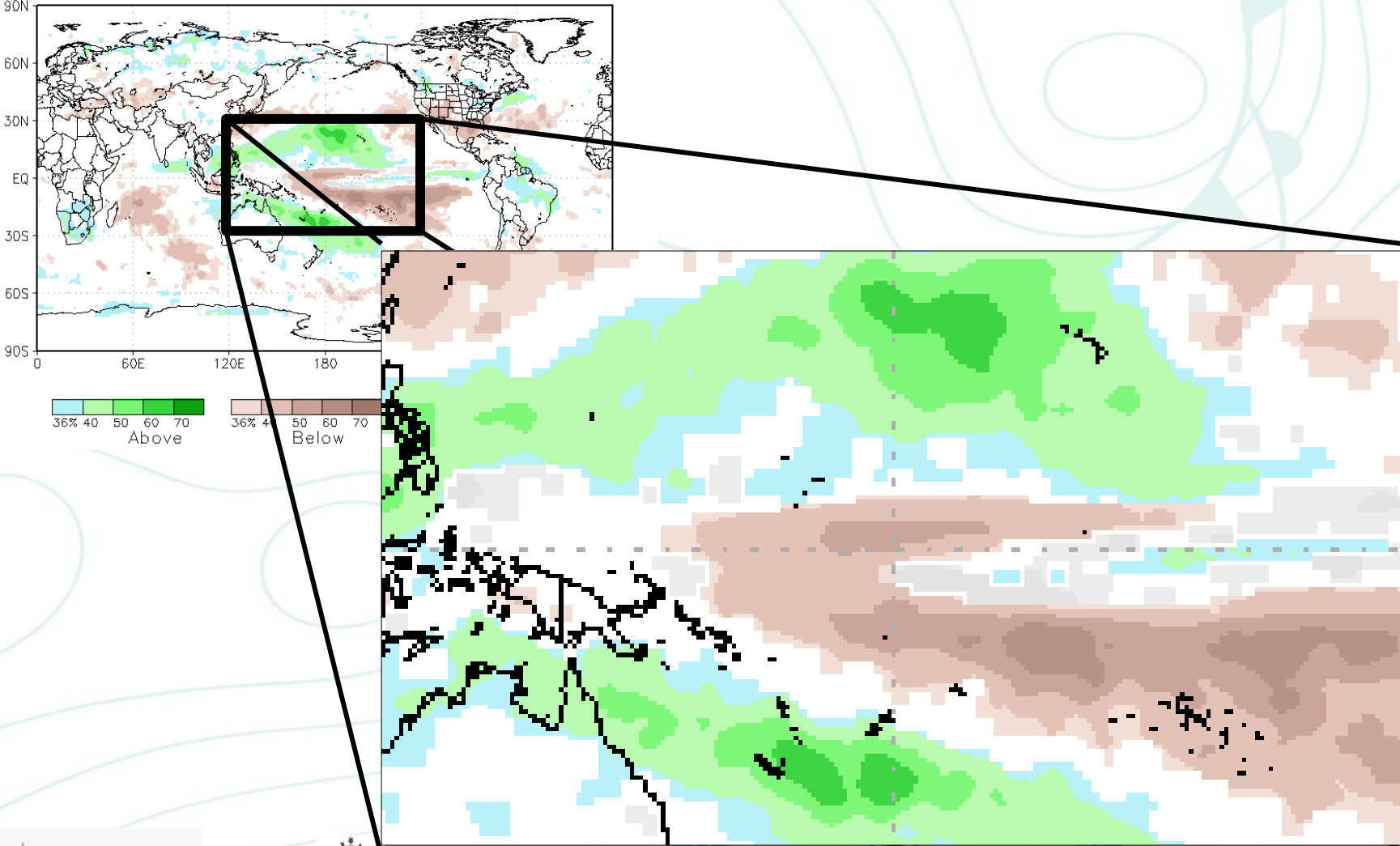
FMA is not available!



# Precipitation Outlook for FMA 2023

NIWA | BoM | NOAA | APCC | SCOPIC  
 ICU | ACCESS-S | NMME | PMME

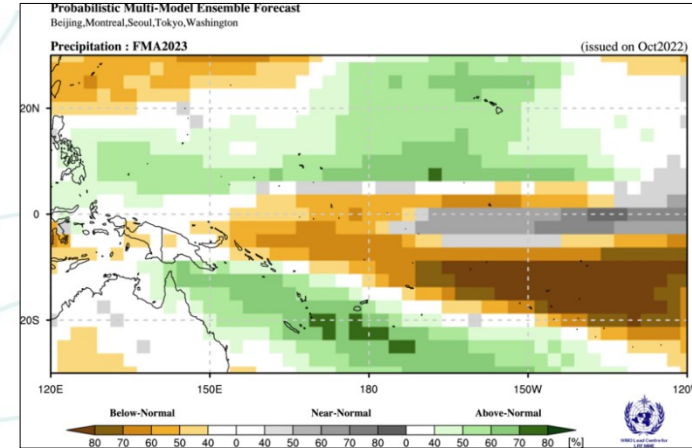
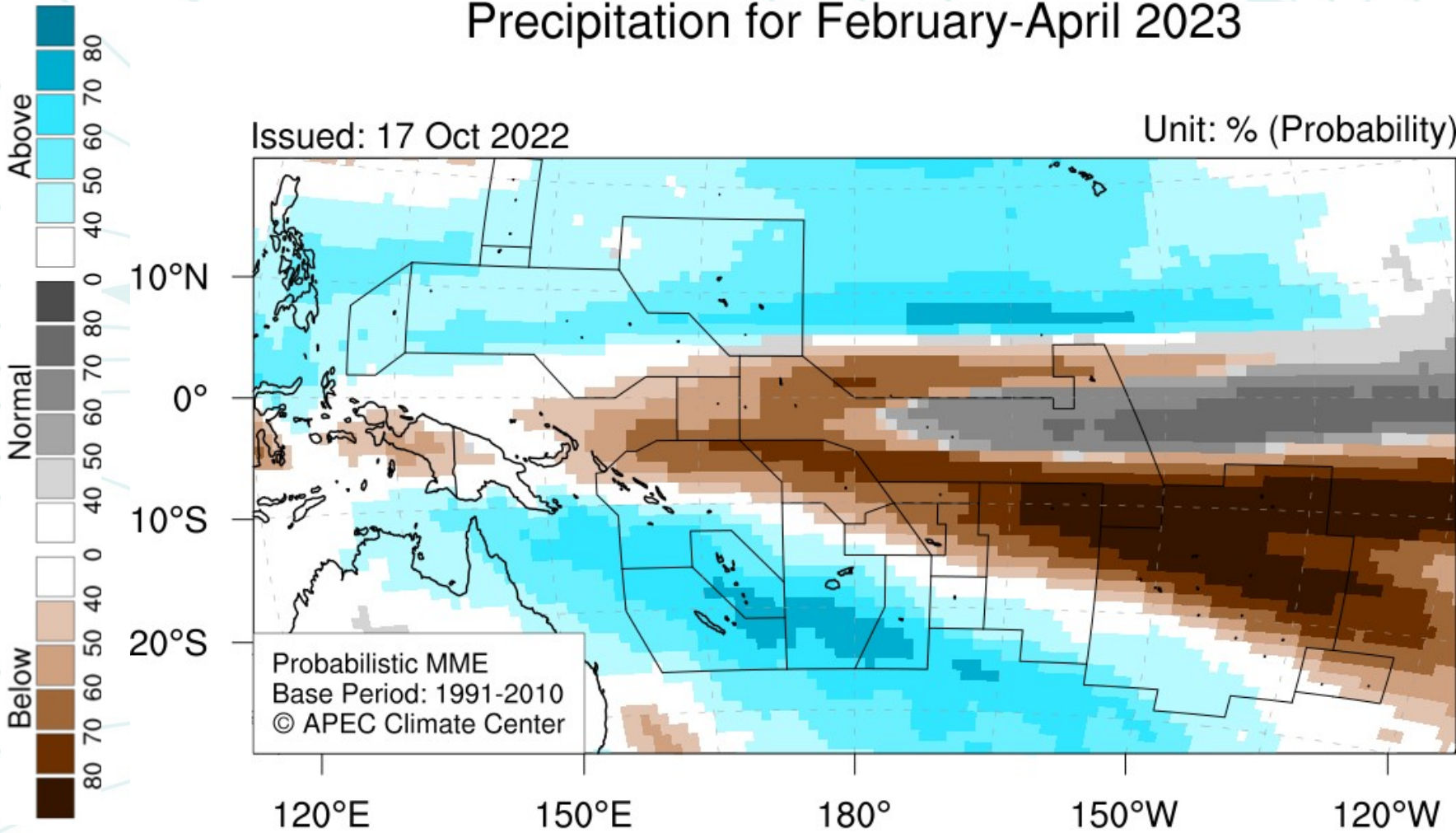
NMME prob fcst Prate IC=202210 for lead 4 2023 FMA



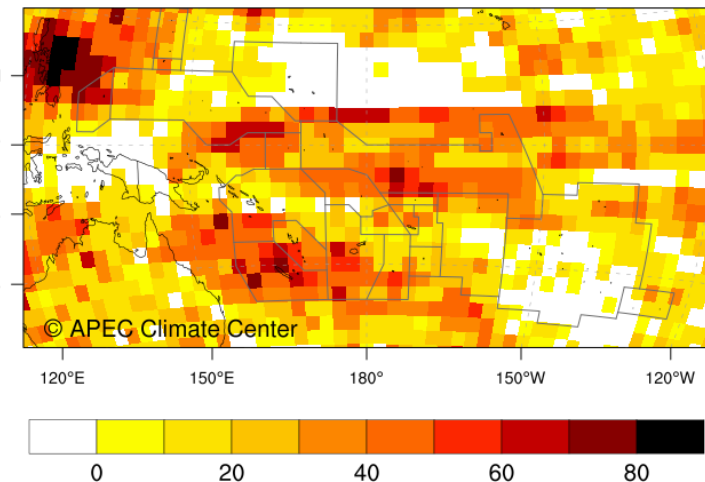
# Precipitation Outlook for FMA 2023

NIWA | BoM | NOAA | APCC | SCOPIC  
 ICU | ACCESS-S | NMME | PMME

## Precipitation for February-April 2023



Heidke Skill Score : PREC, FMA (1991-2010)





# Precipitation Outlook for FMA 2023

NIWA  
ICU

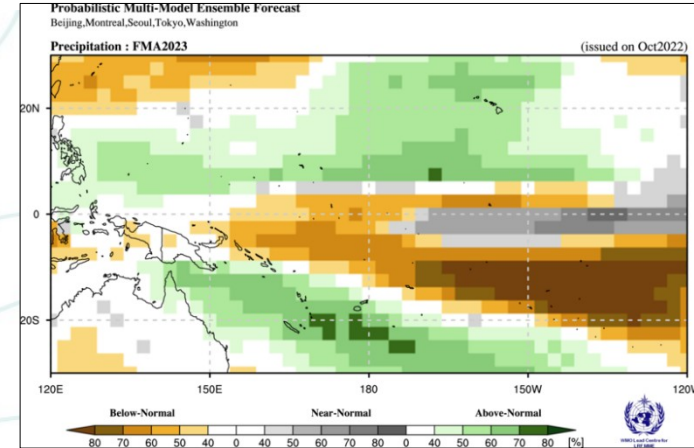
BoM  
ACCESS-S

NOAA  
NMME

APCC  
PMME

**SCOPIC**

**SCOPIC is not available!**



# Temperature Outlook



# Temperature Outlook for NDJ 2022 to FMA 2023

## WMO LC LRF MME

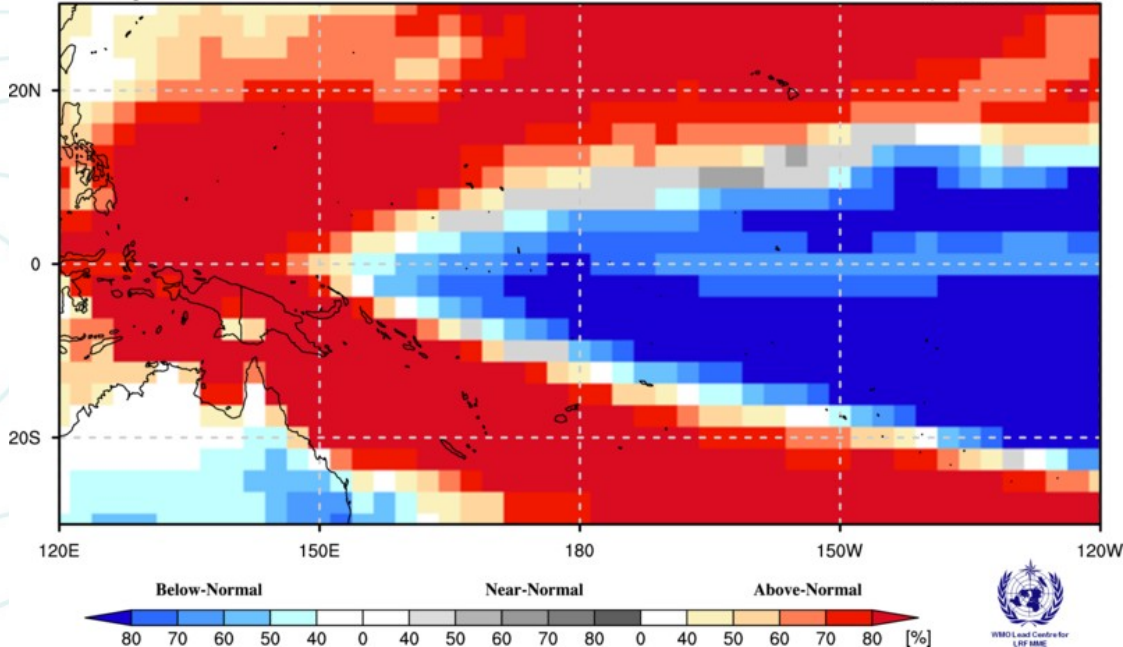
**2022NDJ:** Cooler than normal conditions with more than 80% chances along the equator near and east of the Dateline and the central and eastern off-equatorial; Warmer than normal conditions (>80%) for Melanesia

**2023FMA:** Weakening chances for cooler than normal conditions and back to normal conditions; Persisting probability (>80%) for warmer than normal conditions for the south-western off-equatorial regions

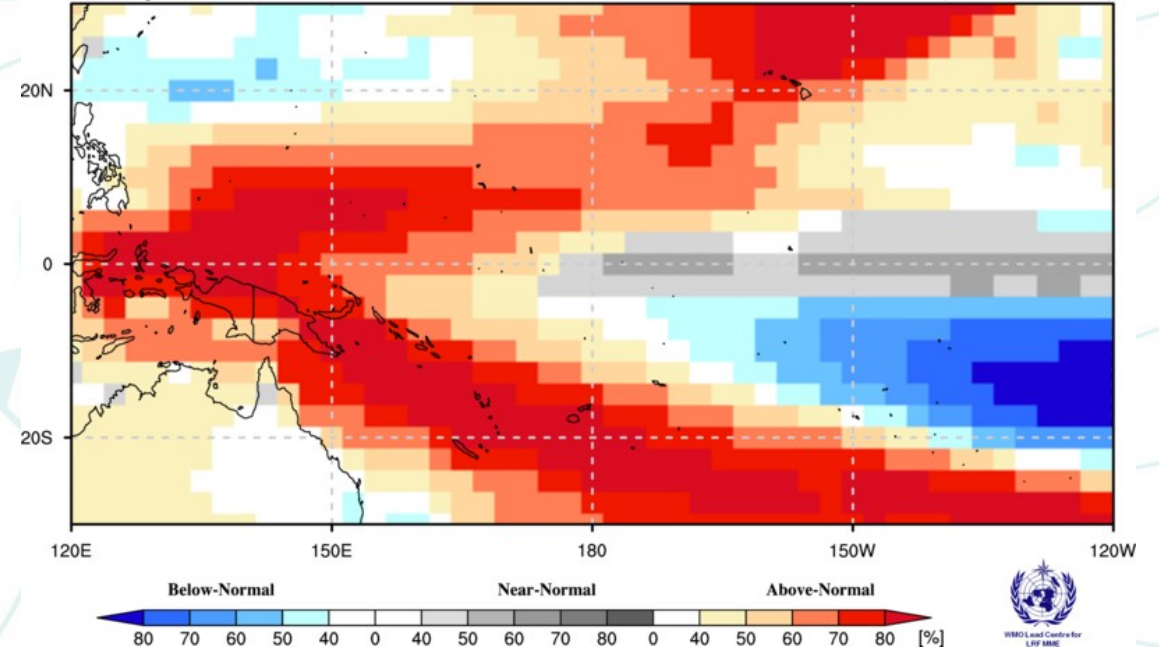
**Probabilistic Multi-Model Ensemble Forecast**

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington

**2m Temperature : NDJ2022** (issued on Oct2022)



**2m Temperature : FMA2023** (issued on Oct2022)

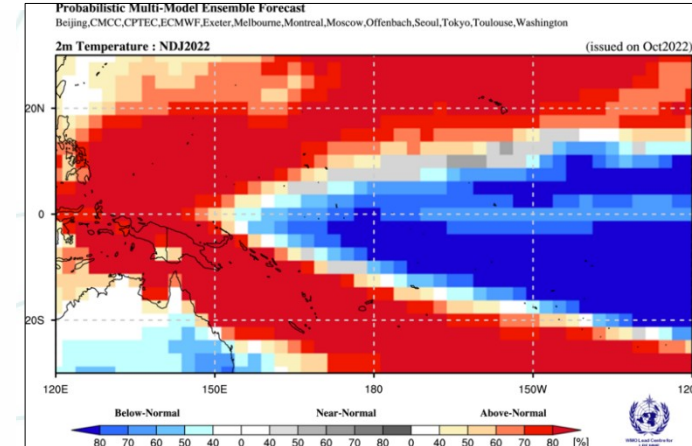
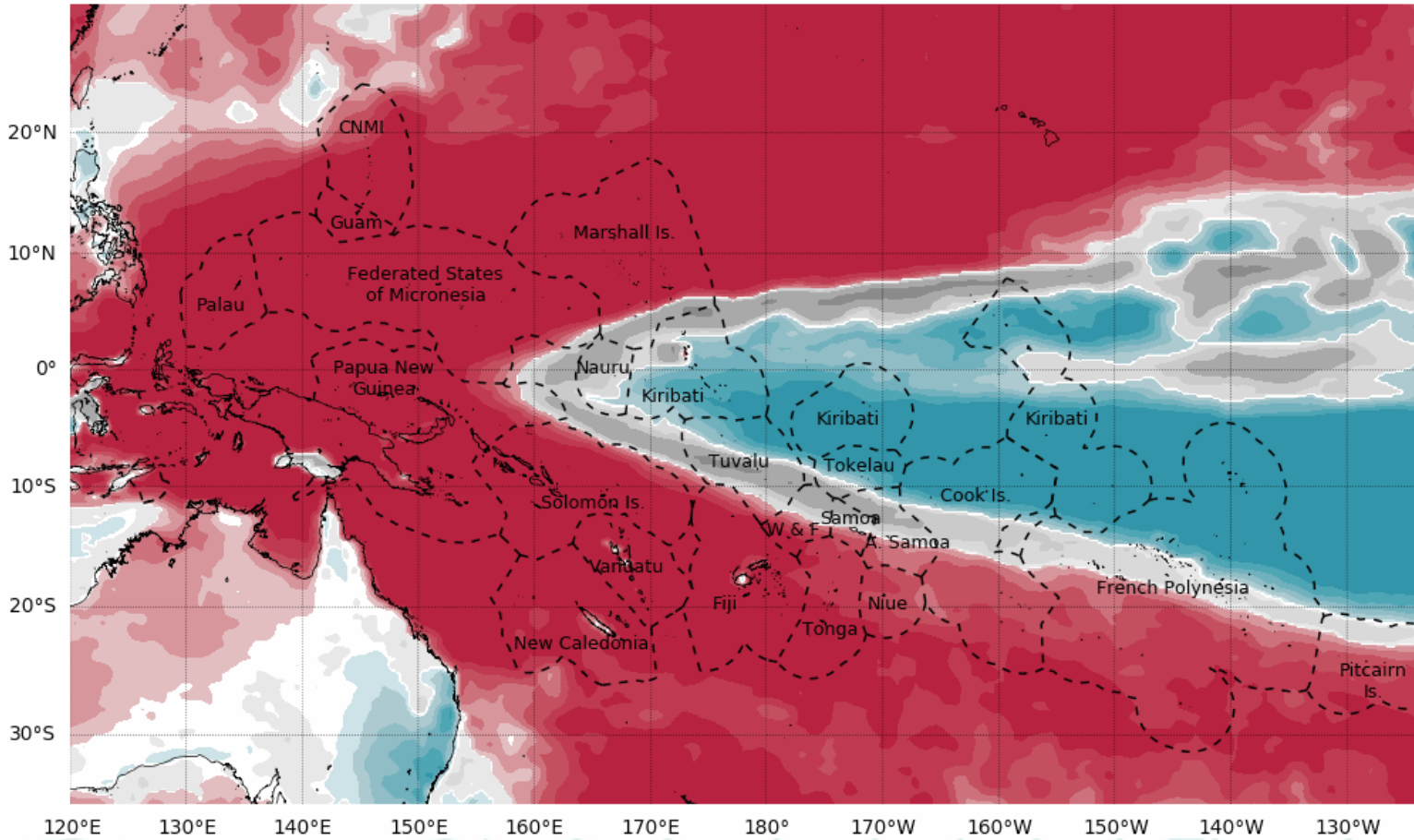


# Temperature Outlook for NDJ 2022

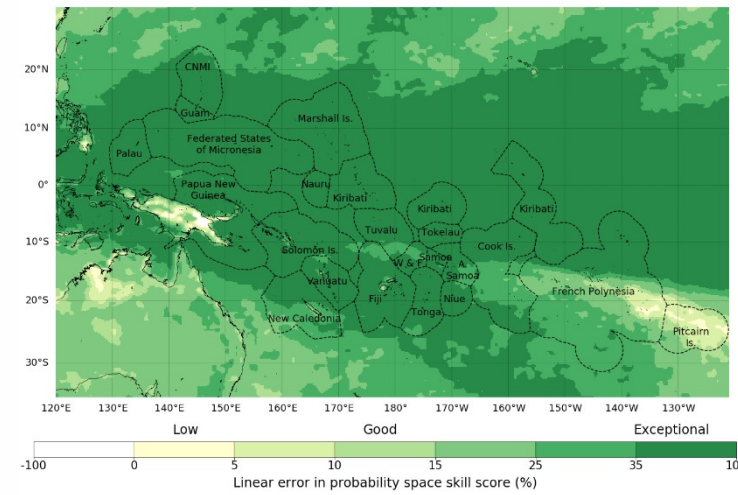
BoM | NOAA | APCC | CLiK-<sup>Ⓟ</sup>  
ACCESS-S | NMME | PMME | PMME

## T max

Tercile maximum temperature probabilities for November 2022 to January 2023



Tercile seasonal maximum temperature past accuracy for November - January. Lead time: 1 months



Run date: 17th October  
Data source: ACCESS-S2 and ERA5 Climate Reanalysis  
© Commonwealth of Australia 2022, Australian Bureau of Meteorology, Supported by COSPAR  
Shapfile data extracted from Flanders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at: <http://www.marinegovernance.org/>

Base period: 1981-2018  
Issued: 22/12/2021

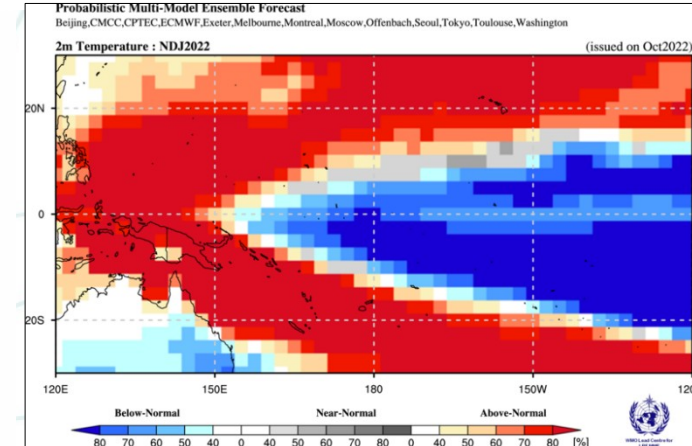
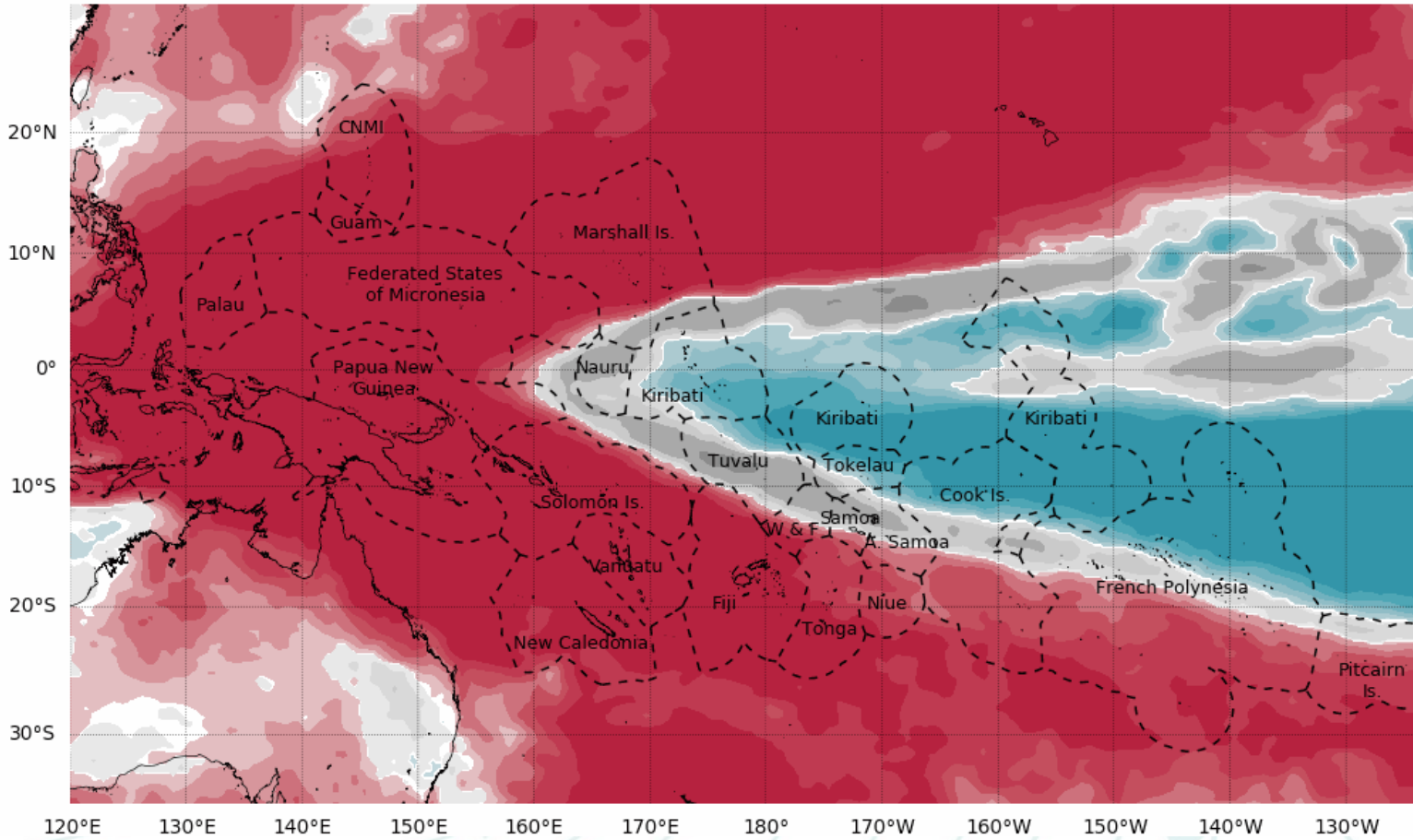


# Temperature Outlook for NDJ 2022

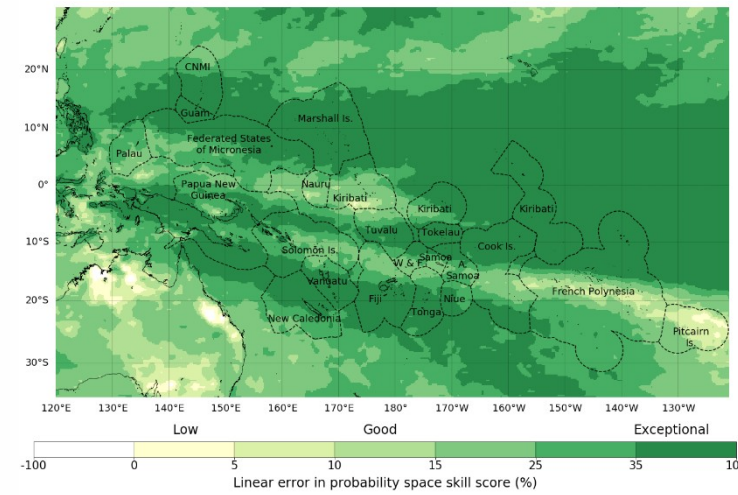
BoM | NOAA | APCC | CLiK-<sup>®</sup>  
 ACCESS-S | NMME | PMME | PMME

## T min

Tercile minimum temperature probabilities for November 2022 to January 2023



Tercile seasonal minimum temperature past accuracy for November - January. Lead time: 1 months

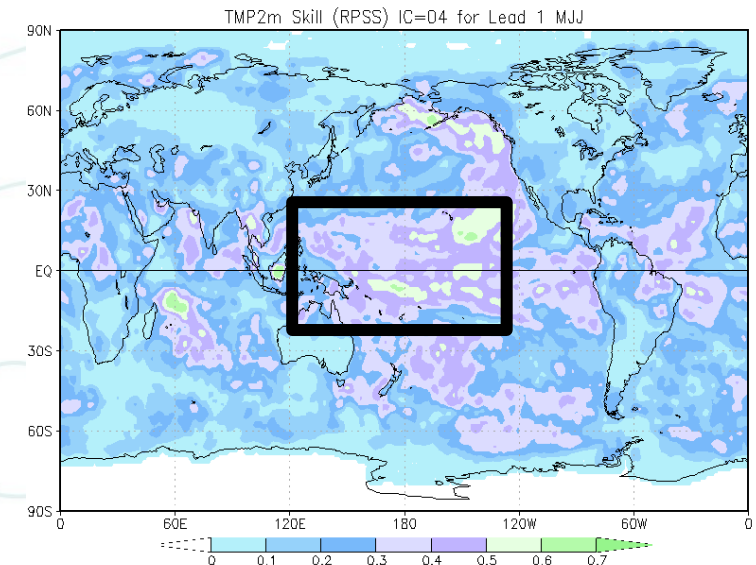
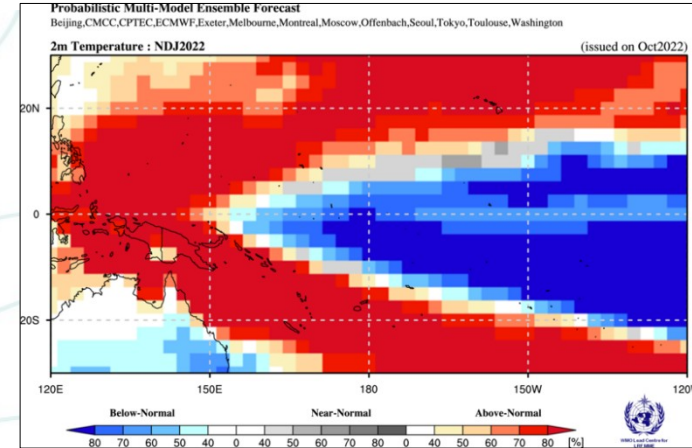
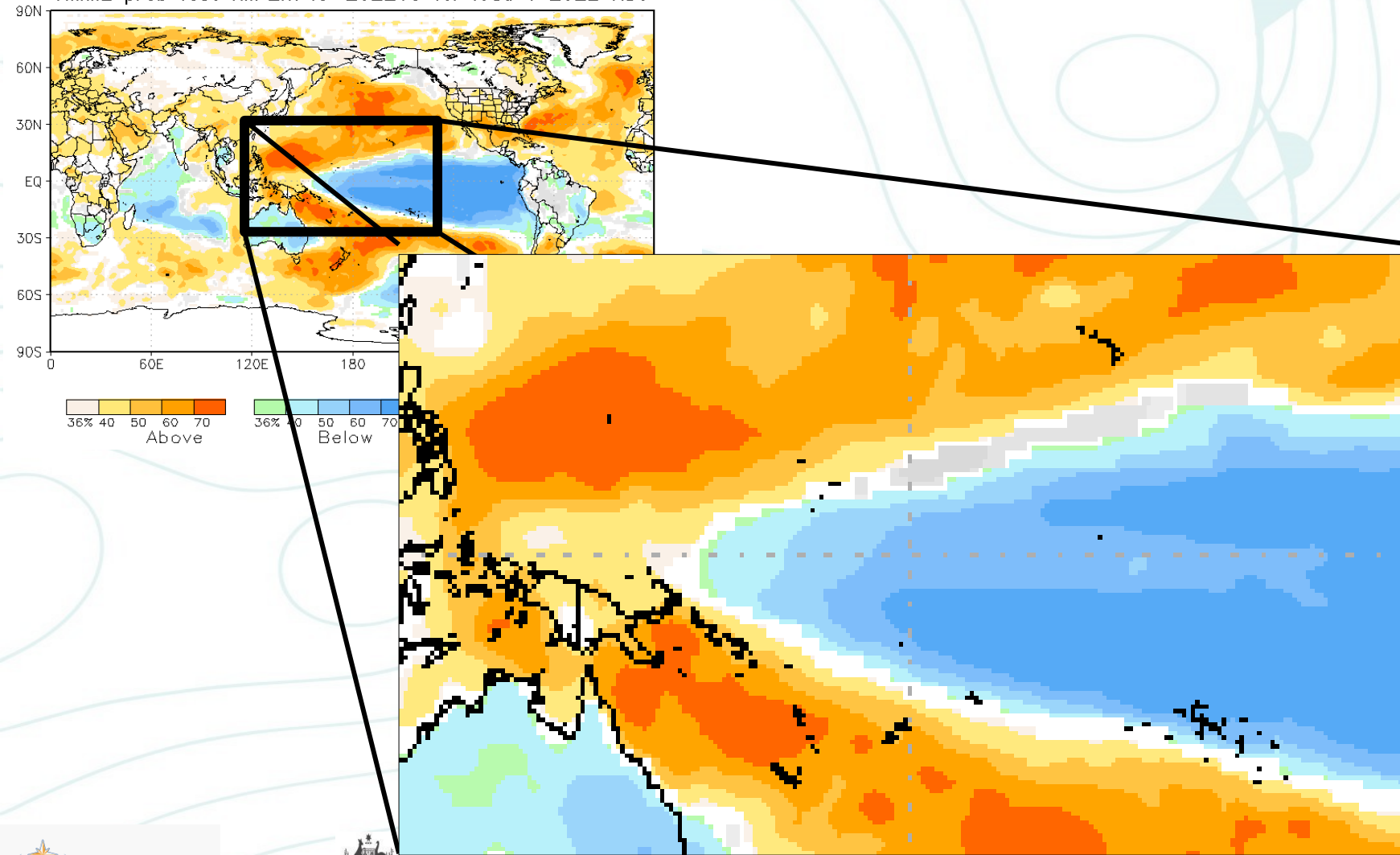


Run date: 17th October  
 Data source: ACCESS-S2 and ERA5 Climate Reanalysis  
 © Commonwealth of Australia 2021, Australian Bureau of Meteorology, Supported by COSPAR  
 Shapefile data extracted from Flanders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at: <http://www.marinerregions.org/>  
 Base period: 1981-2018  
 Issued: 21/12/2021

# Temperature Outlook for NDJ 2022

BoM | NOAA | APCC | CLIK-p  
 ACCESS-S | NMME | PMME

NMME prob fcst TMP2m IC=202210 for lead 1 2022 NDJ

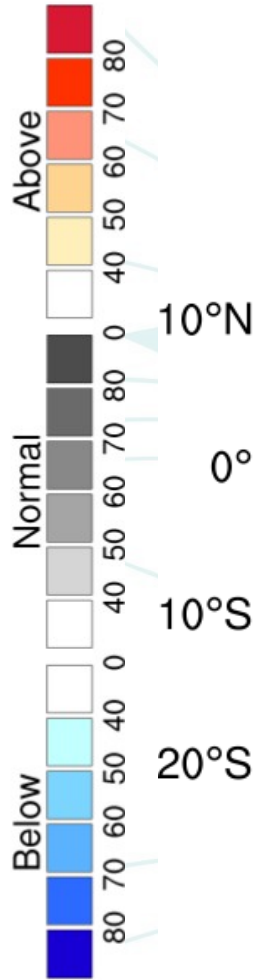




# Temperature Outlook for NDJ 2022

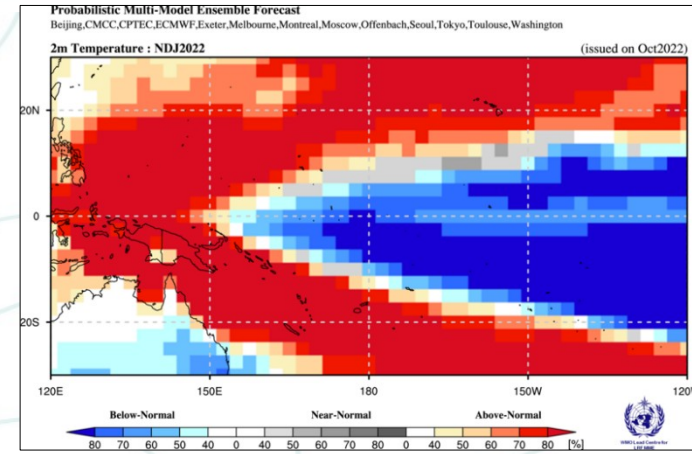
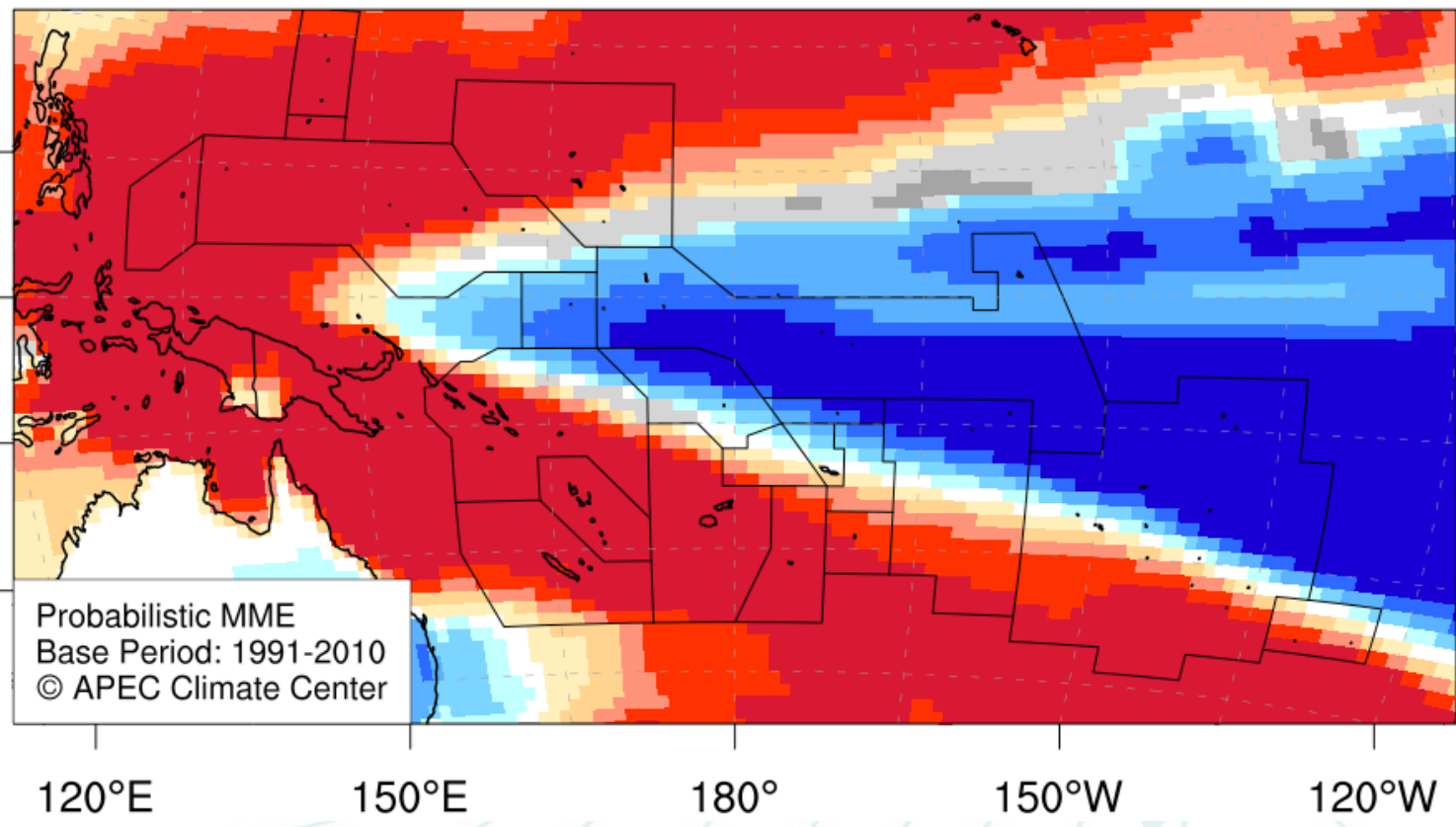
BoM | NOAA | APCC | CLIK-p  
 ACCESS-S | NMME | PMME

## Temperature at 2m for November 2022-January 2023

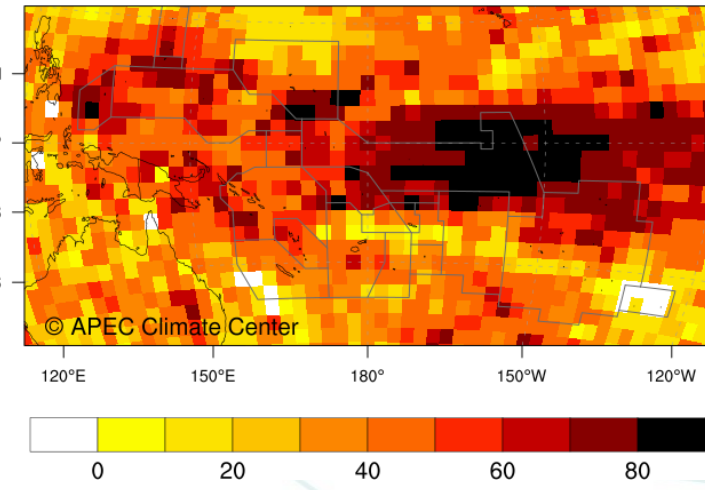


Issued: 17 Oct 2022

Unit: % (Probability)



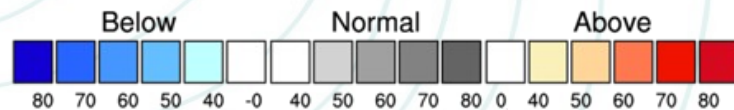
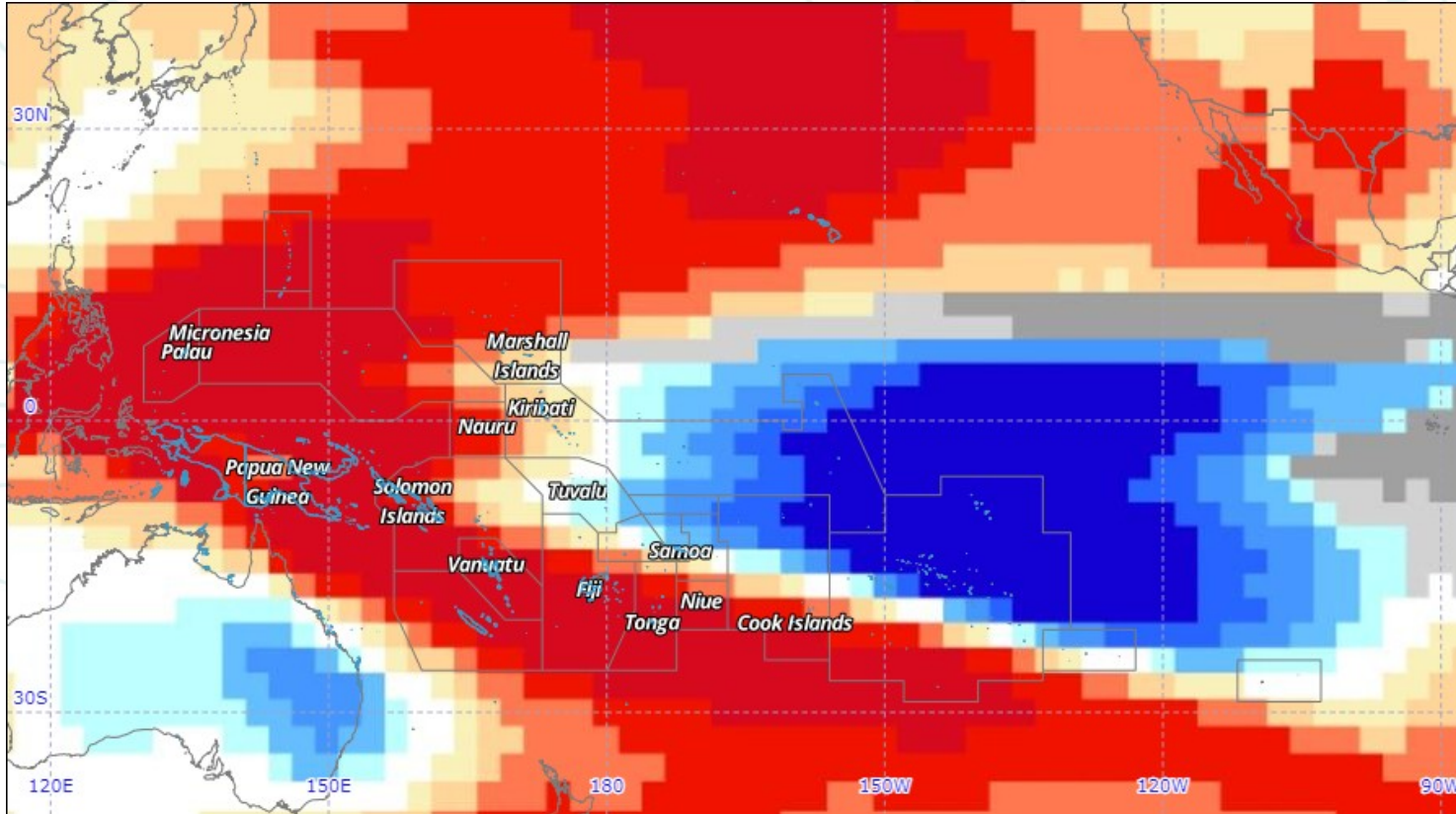
Heidke Skill Score : T2M, NDJ (1991-2010)



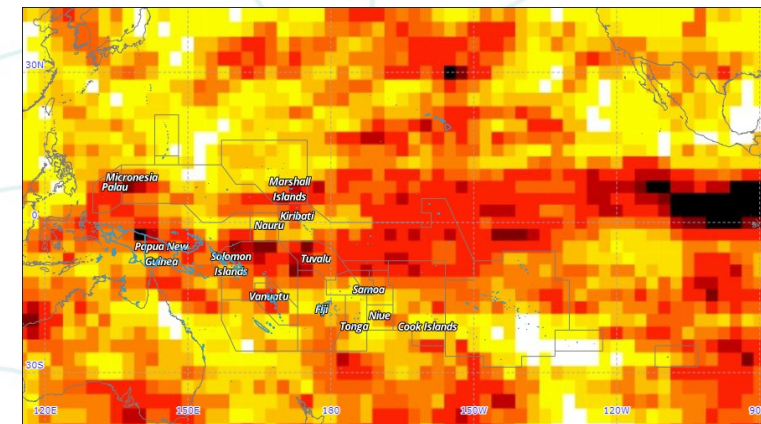
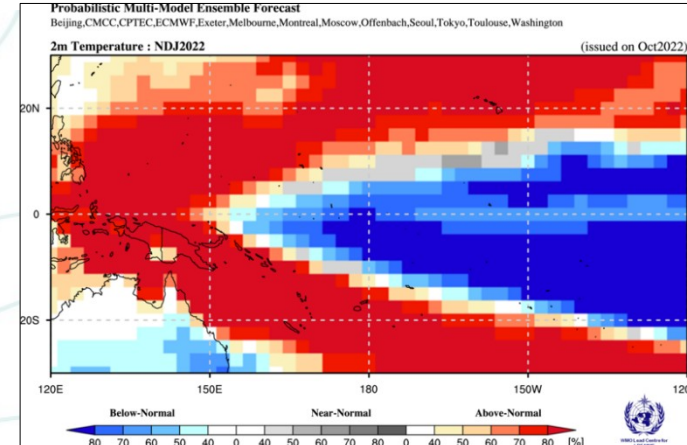


# Temperature Outlook for NDJ 2022

BoM | NOAA | APCC | CLIK-<sup>p</sup>  
 ACCESS-S | NMME | PMME



Year: 2022, Season: NDJ, Lead Month: 3, Method: GAUS  
 Model: APCC, BOM, CMCC, CWB, MSC, NASA, NCEP  
 Generated using CLIK<sup>®</sup> (2022-10-20)



Year: 2022, Season: NDJ, Lead Month: 3, Method: GAUS  
 Model: APCC, BOM, CMCC, CWB, MSC, NASA, NCEP  
 Generated using CLIK<sup>®</sup> (2022-10-20)

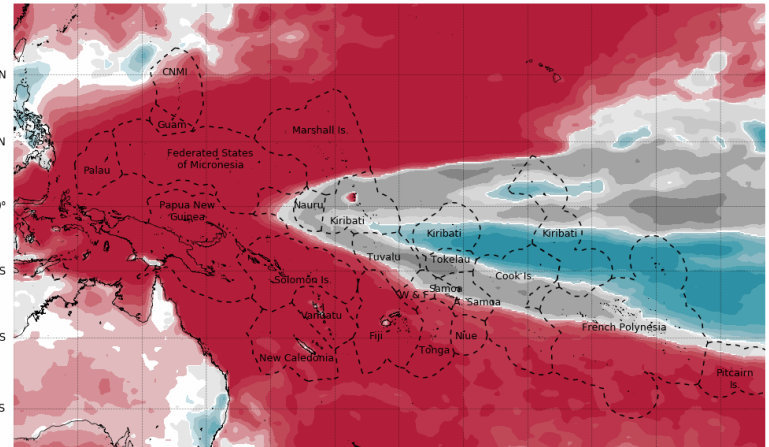
© APEC Climate Center



# Temperature Outlook for FMA 2023

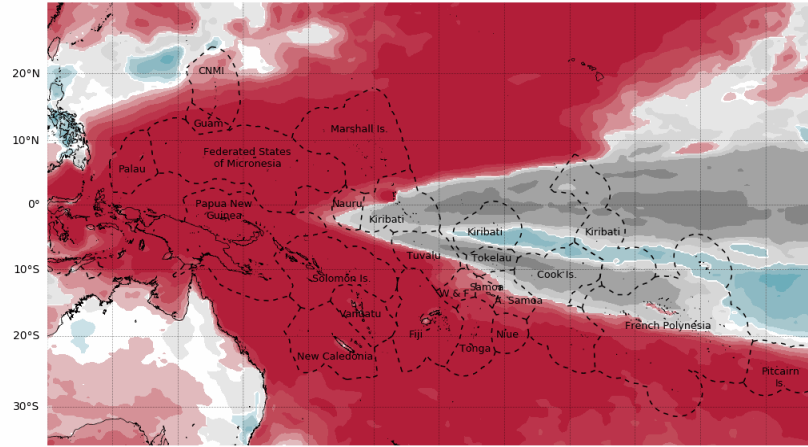
BoM | NOAA | APCC  
ACCESS-S | NMME | PMME

Tercile maximum temperature probabilities for December 2022 to February 2023

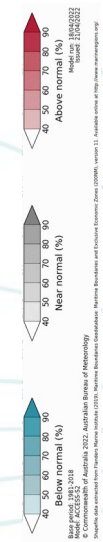
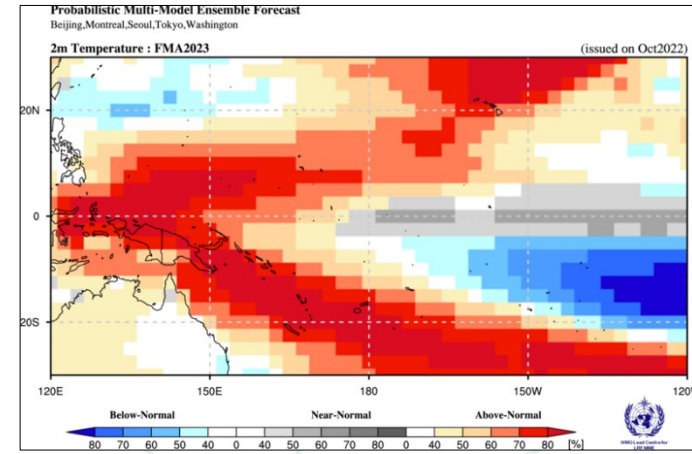


**DJF** Tercile seasonal maximum temperature past accuracy for December - February. Lead time: 2 month

Tercile maximum temperature probabilities for January to March 2023



Tercile seasonal maximum temperature past accuracy for January - March. Lead time: 3 months **JFM**



**T max**

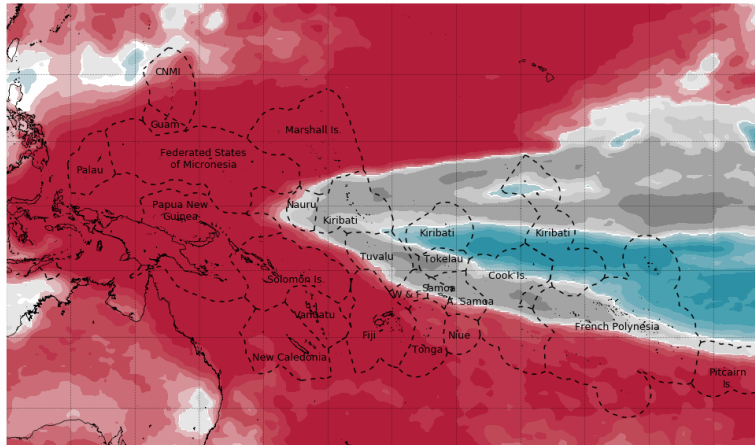
FMA is not available!



# Temperature Outlook for FMA 2023

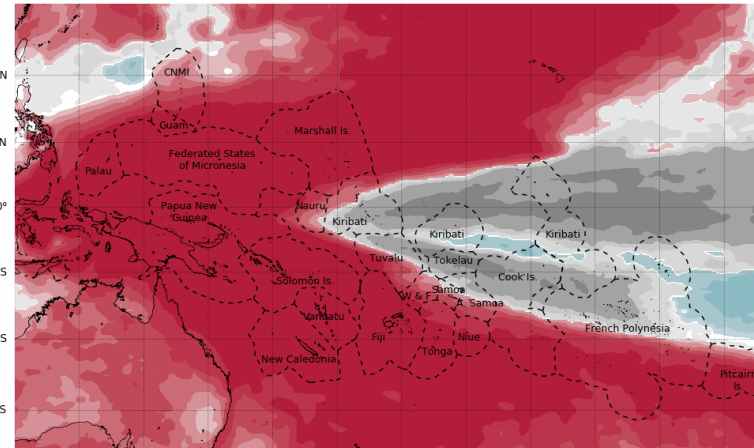
BoM | NOAA | APCC  
ACCESS-S | NMME | PMME

Tercile minimum temperature probabilities for December 2022 to February 2023

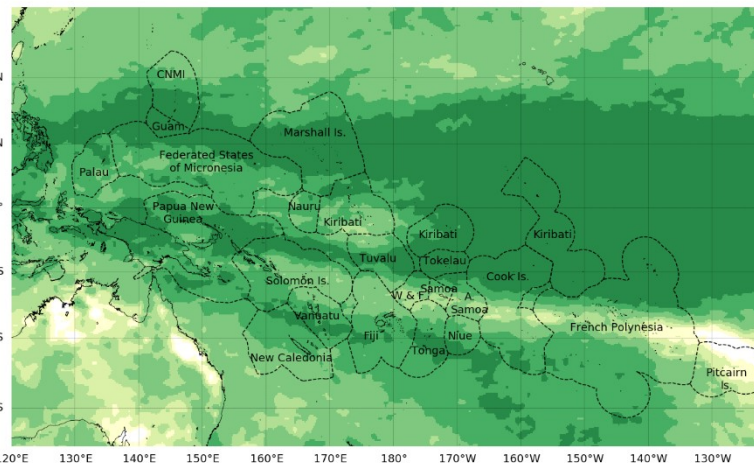
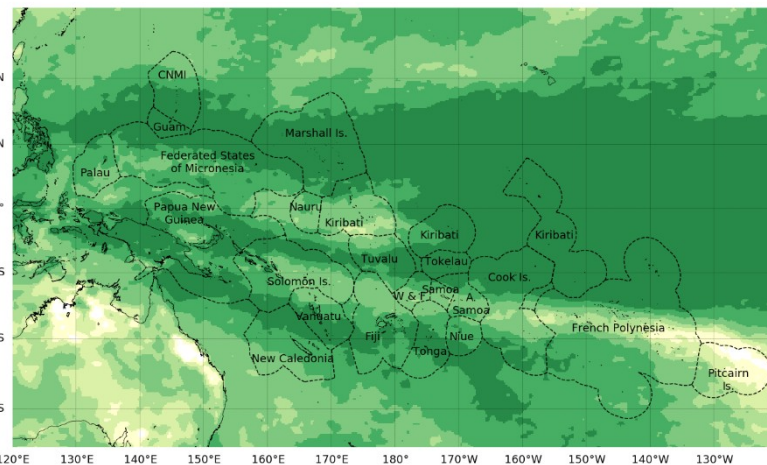
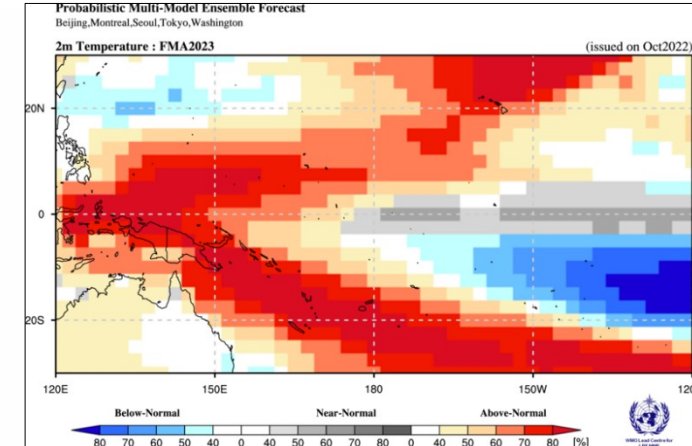


**DJF** Tercile seasonal minimum temperature past accuracy for December - February. Lead time: 2 month

Tercile minimum temperature probabilities for January to March 2023



Tercile seasonal minimum temperature past accuracy for January - March. Lead time: 3 months **JFM**



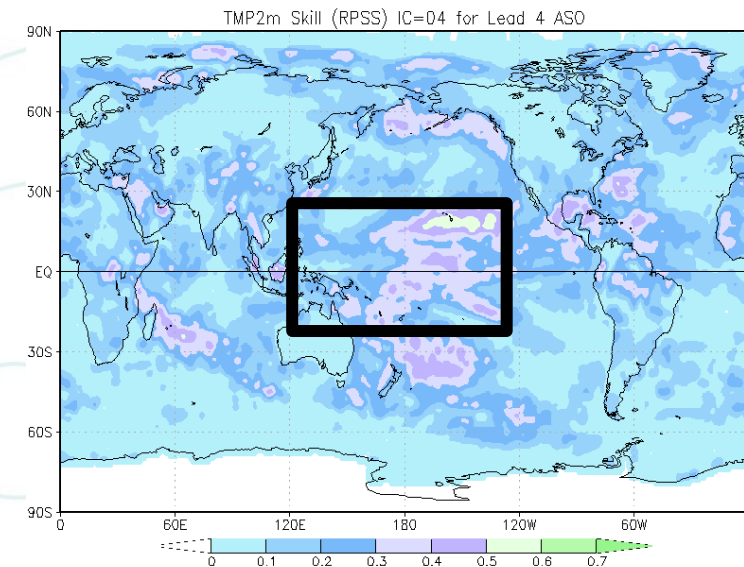
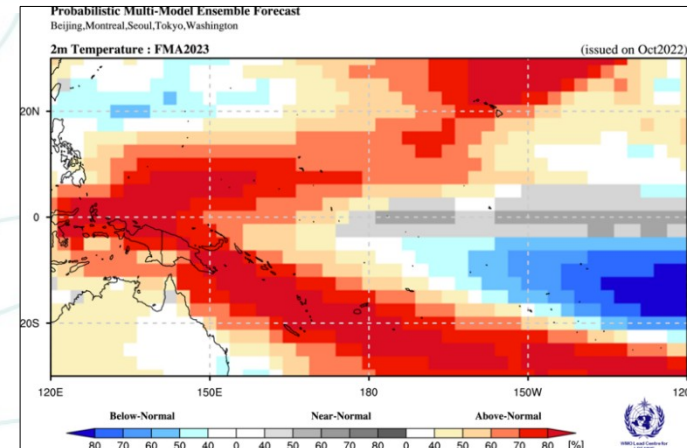
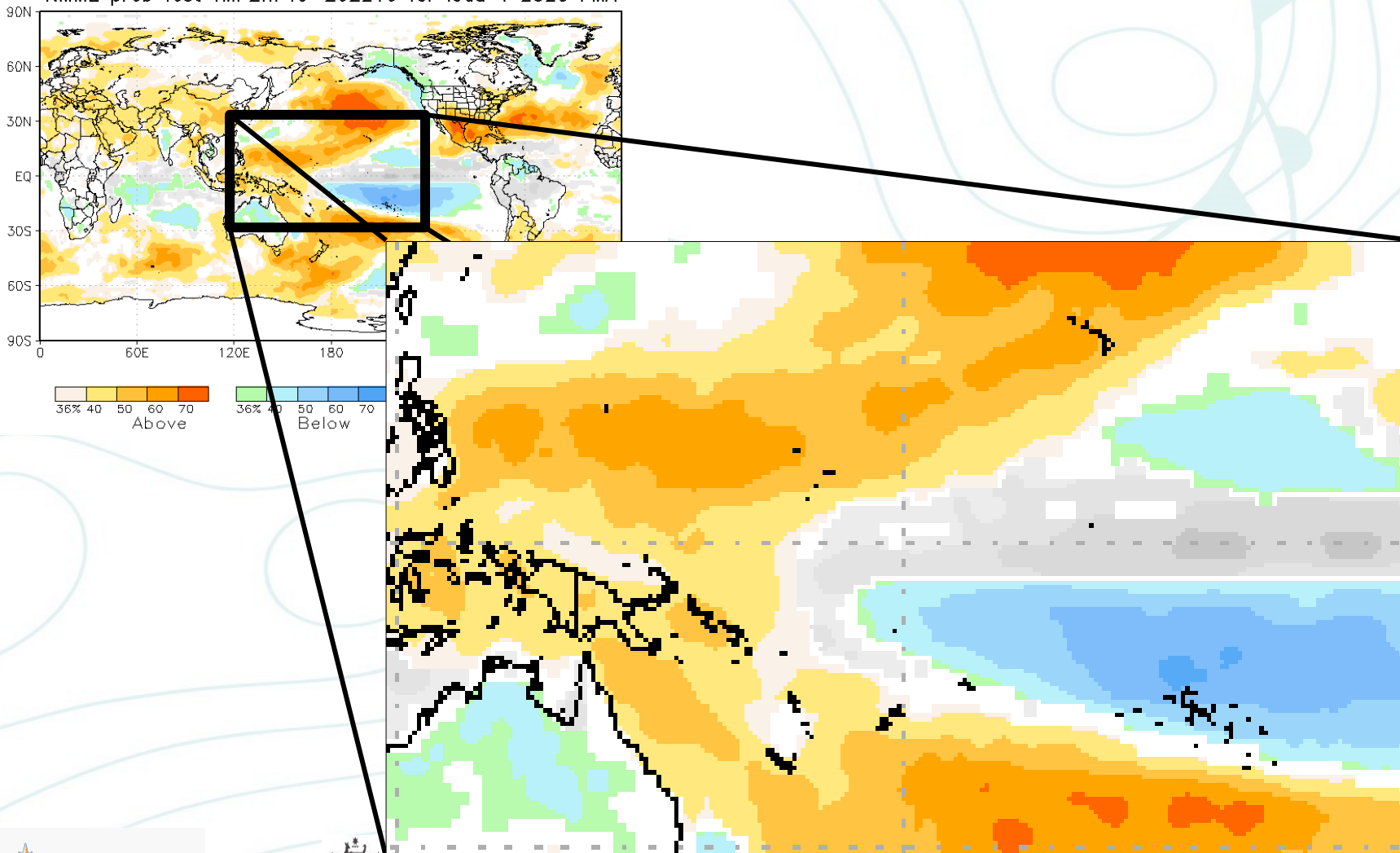
**T min**  
FMA is not available!



# Temperature Outlook for FMA 2023

BoM | NOAA | APCC  
 ACCESS-S | NMME | PMME

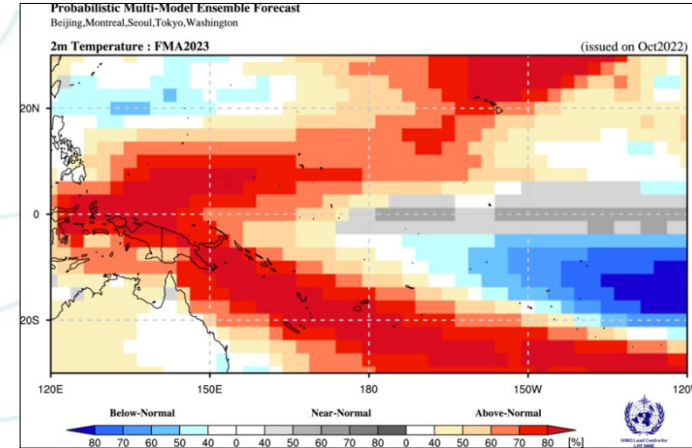
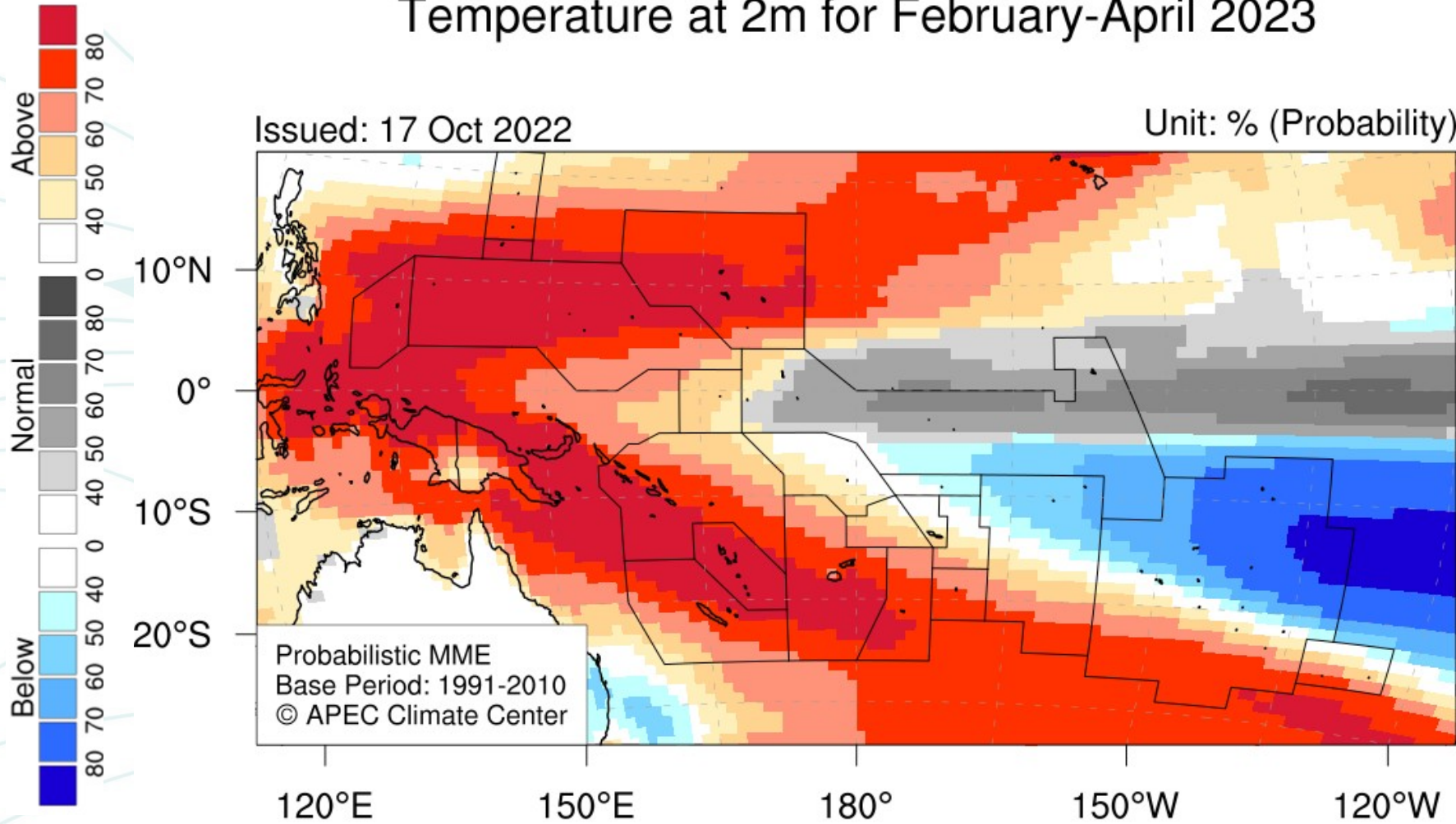
NMME prob fcst TMP2m IC=202210 for lead 4 2023 FMA



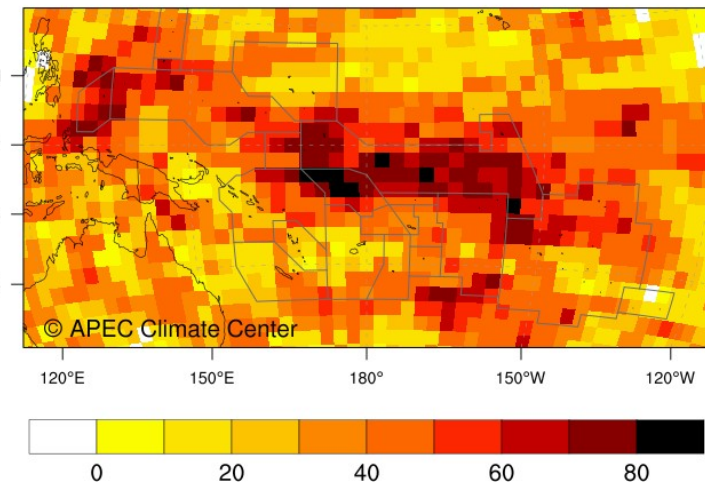
# Temperature Outlook for FMA 2023

BoM | NOAA | APCC  
 ACCESS-S | NMME | PMME

## Temperature at 2m for February-April 2023



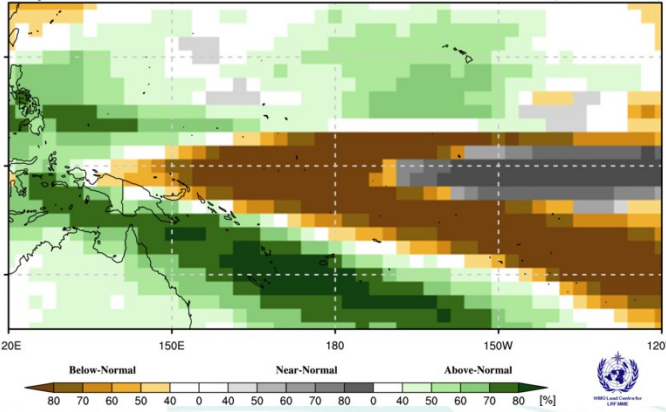
Heidke Skill Score : T2M, FMA (1991-2010)



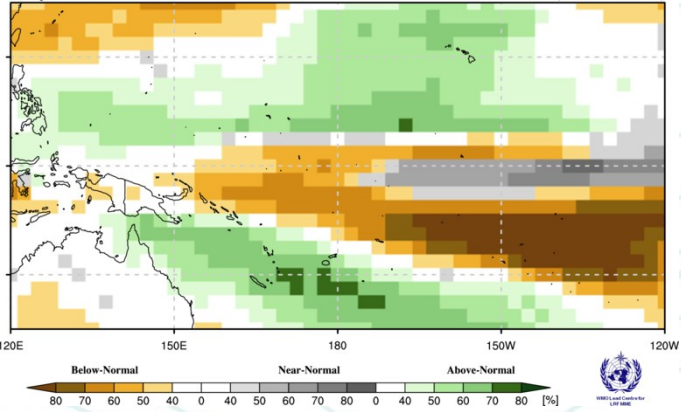


# Summary

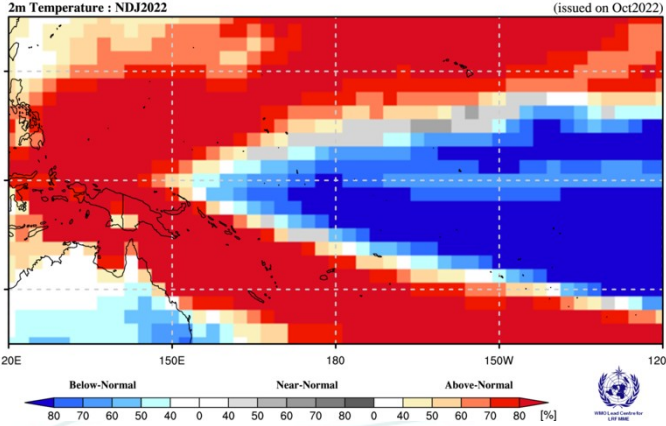
Probabilistic Multi-Model Ensemble Forecast  
Beijing, CMCC, CPTec, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington  
Precipitation : NDJ2022 (issued on Oct2022)



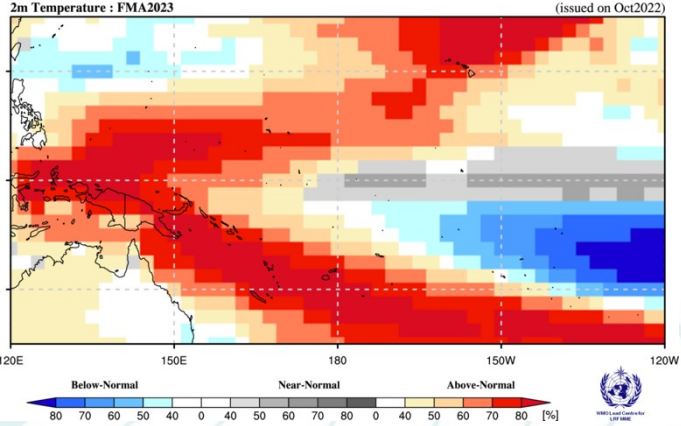
Probabilistic Multi-Model Ensemble Forecast  
Beijing, Montreal, Seoul, Tokyo, Washington  
Precipitation : FMA2023 (issued on Oct2022)



Probabilistic Multi-Model Ensemble Forecast  
Beijing, CMCC, CPTec, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington  
2m Temperature : NDJ2022 (issued on Oct2022)



Probabilistic Multi-Model Ensemble Forecast  
Beijing, Montreal, Seoul, Tokyo, Washington  
2m Temperature : FMA2023 (issued on Oct2022)



## Precipitation

- During NDJ 2022, dry conditions are expected for the Islands along the equator and for the central and eastern off-equatorial South Pacific, wet conditions (>70%) for southern Melanesia and normal conditions for the eastern equatorial Pacific..
- During FMA 2023, the probabilities are expected to weaken, whereas the chances for near normal conditions are expected to be enhanced.

## Temperature

- During NDJ 2022, cooler than normal conditions are expected along the equator near and east of the Dateline and for the central and eastern off-equatorial South Pacific, and warmer than normal conditions for region extending northeast and southeast towards the subtropics.
- During FMA 2023, the probability for below normal temperatures is expected to decrease, whereas the chances (>80%) for above normal conditions are expected to persist for southern Melanesia.

# Mean Sea Level Pressure Outlook



# Pressure (MSLP) Outlook for NDJ 2022 to FMA 2023

## WMO LC LRF MME

**2022NDJ:** A typical La Niña pattern with Pressure higher (>80%) than normal conditions for the east of the Dateline and with Pressure lower (>80%) than normal conditions for Melanesia

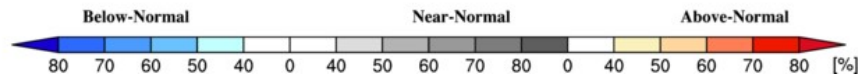
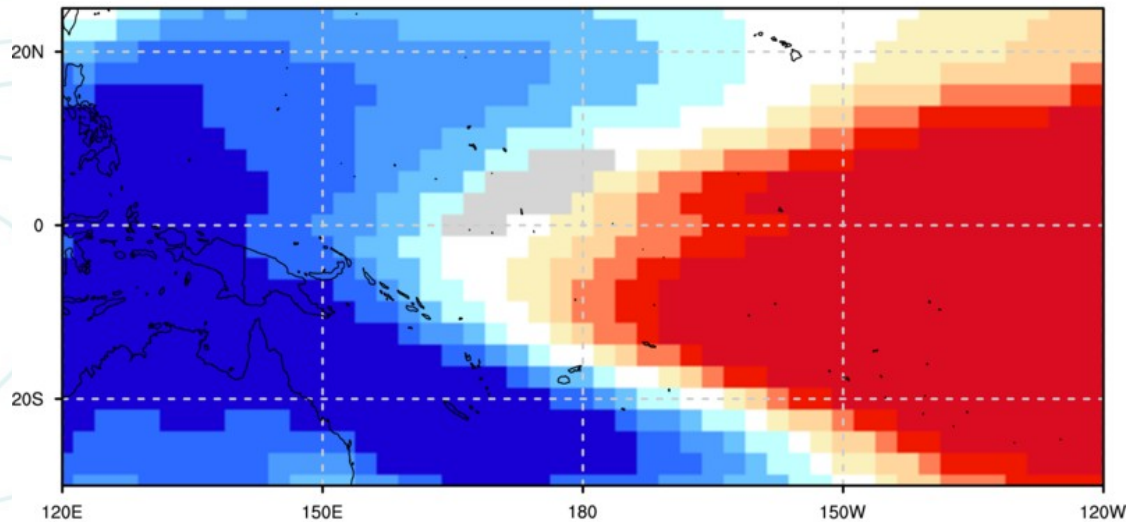
**2023FMA:** Weakening chances for higher and lower Pressure conditions.

**Probabilistic Multi-Model Ensemble Forecast**

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington

**Mean Sea Level Pressure : NDJ2022**

(issued on Oct2022)



**Probabilistic Multi-Model Ensemble Forecast**

Beijing,Montreal,Seoul,Tokyo,Washington

**Mean Sea Level Pressure : FMA2023**

(issued on Oct2022)

