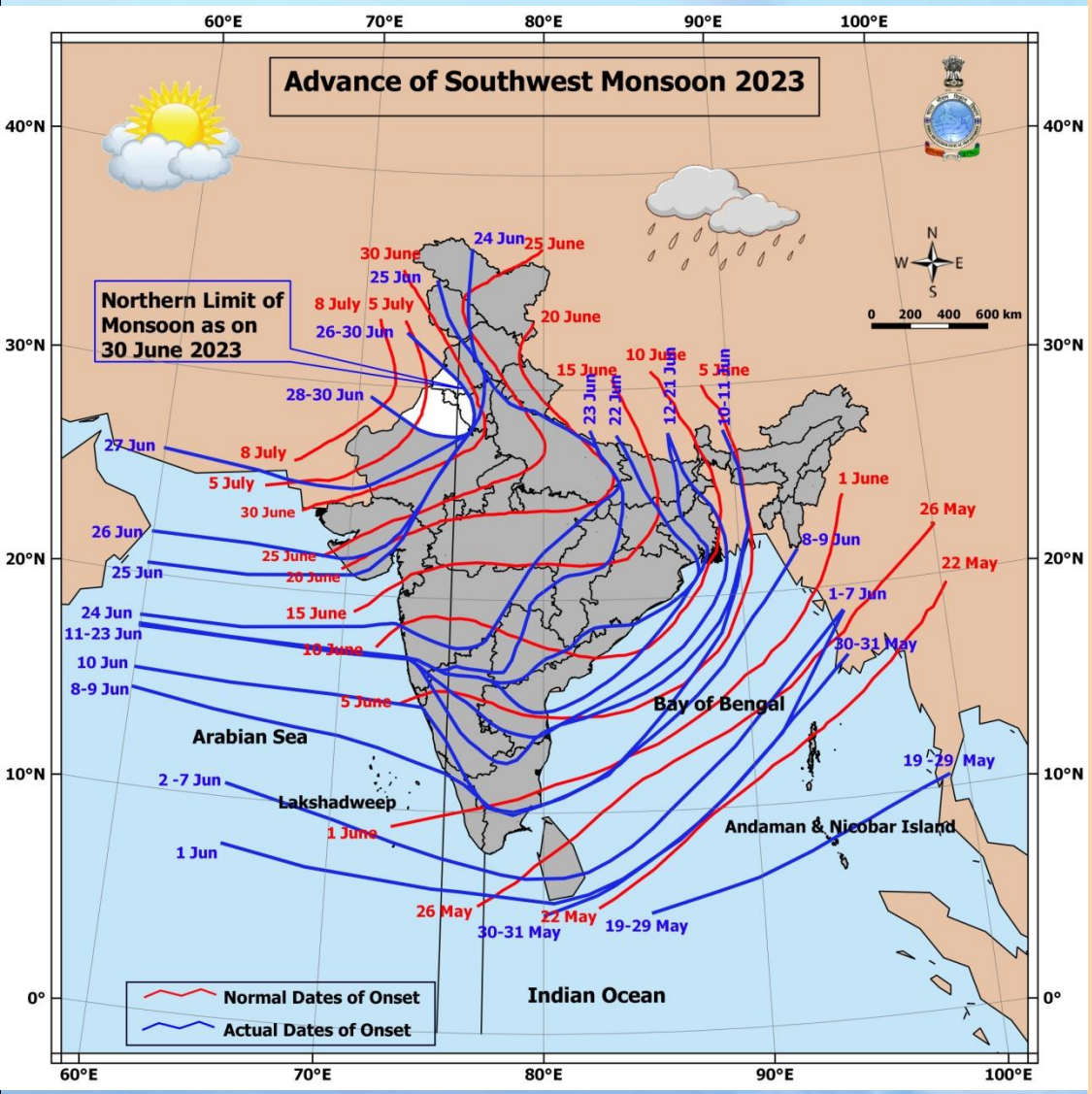
Ministry of Earth Sciences (MoES)
India Meteorological Department
Welcomes You All for the Press Release
of
Monthly Rainfall and Temperature Outlook for July, 2023

30th June 2023

भारत मौसम विज्ञान विभाग

INDIA METEOROLOGICAL DEPARTMENT

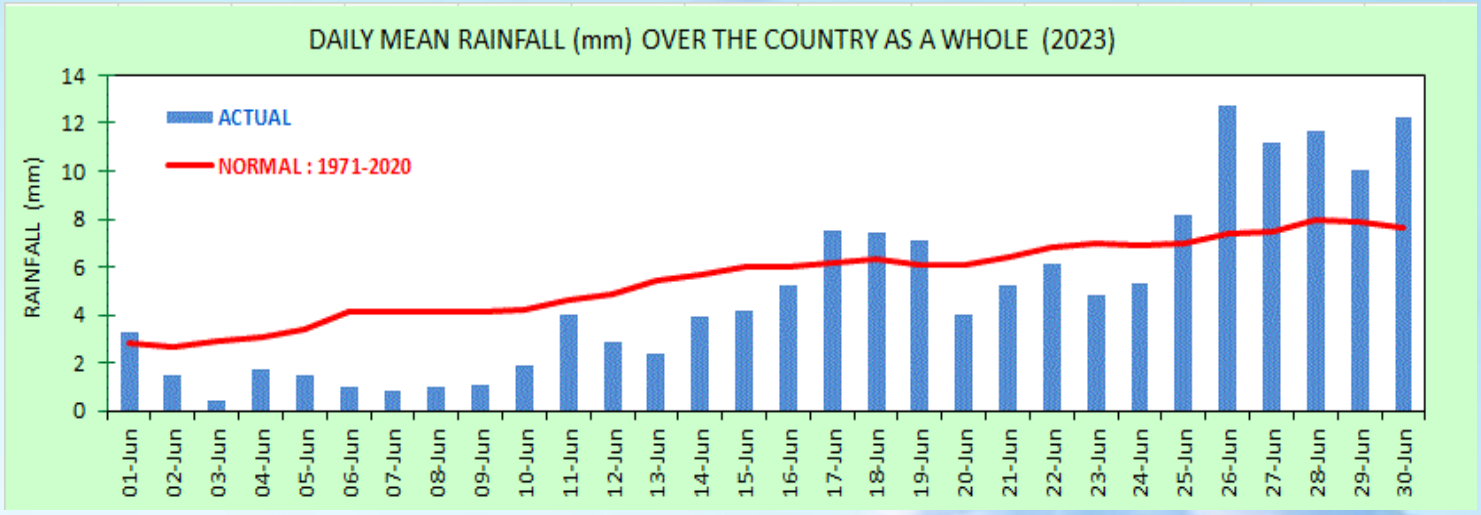
Onset of Southwest Monsoon 2023

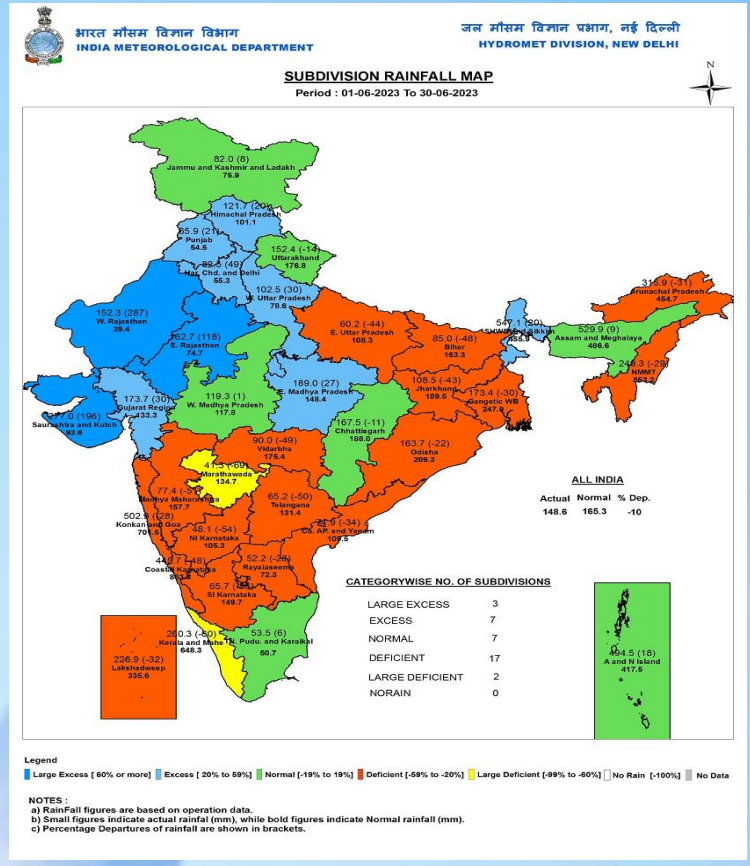


- Monsoon advanced into south and entire Andan Sea by 31 May.
- On 16th May IMD issued Monsoon onset over Kerala is likely to be on 4th June ±4days.
- 2023 southwest Monsoon onset over Kerala on 8th June 2023 against the normal date of 01st June.
- Covered most parts of the country some parts of Rajasthan and adjoining areas of Haryana and Punjab by 28th June
- Delay in advance over Peninsula and adjoining central India by 7-12 days, northeast India by 5 days and early advance over northwest India

Current Status of Monsoon 2023

All India Summer Monsoon Rainfall

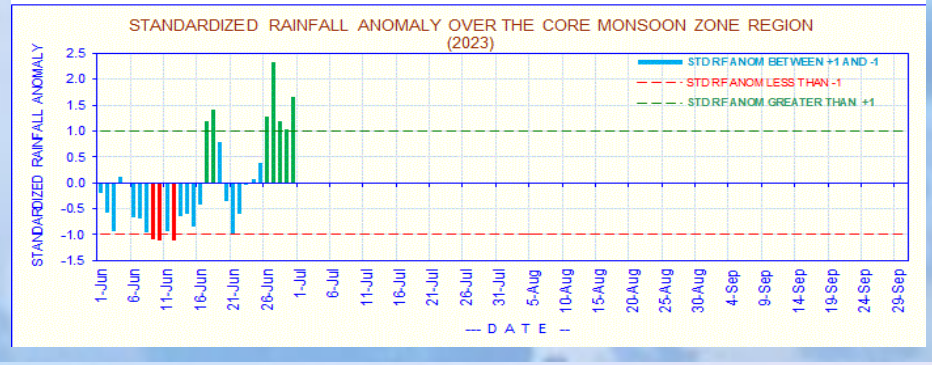




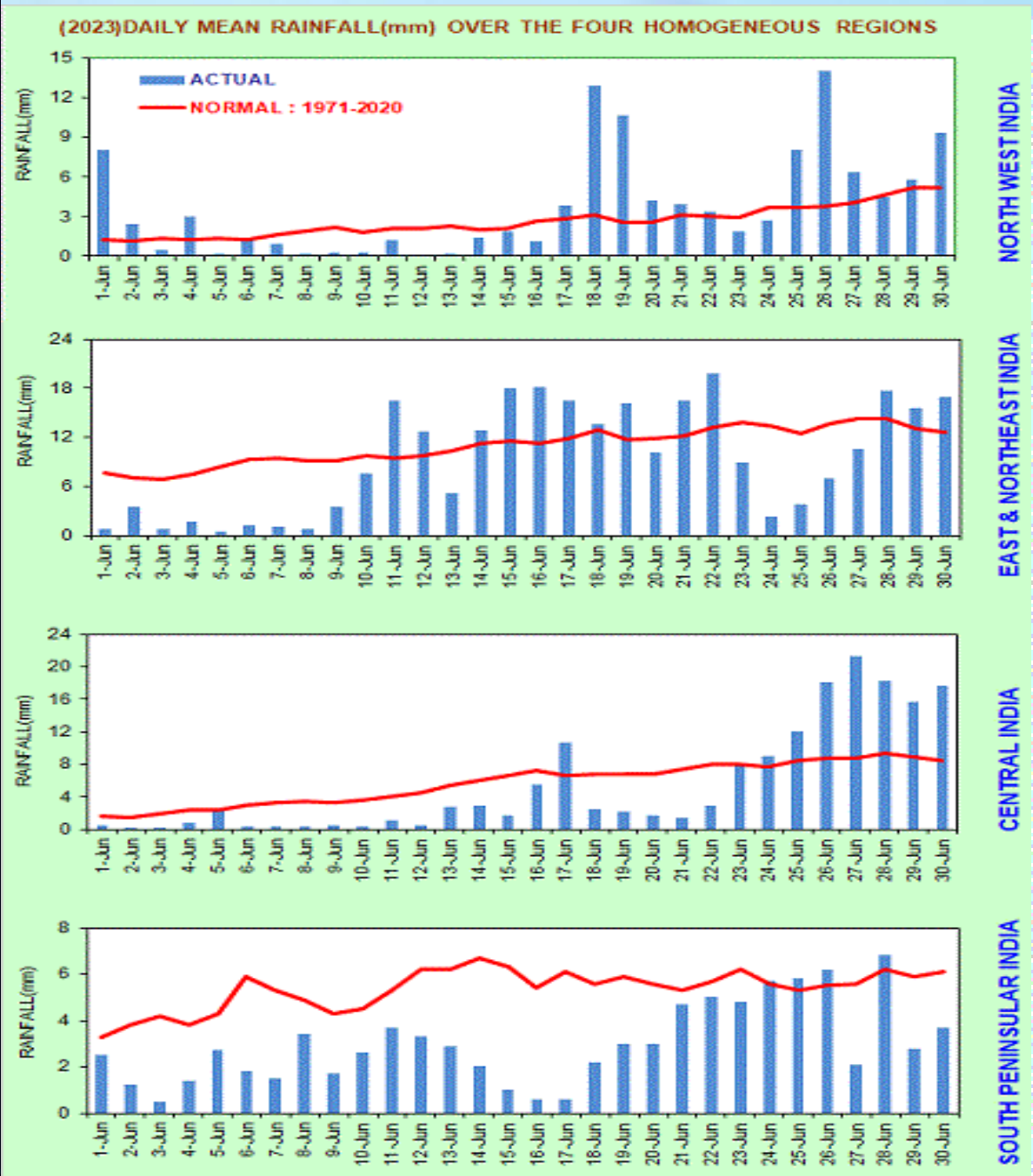
Rainfall Statistics

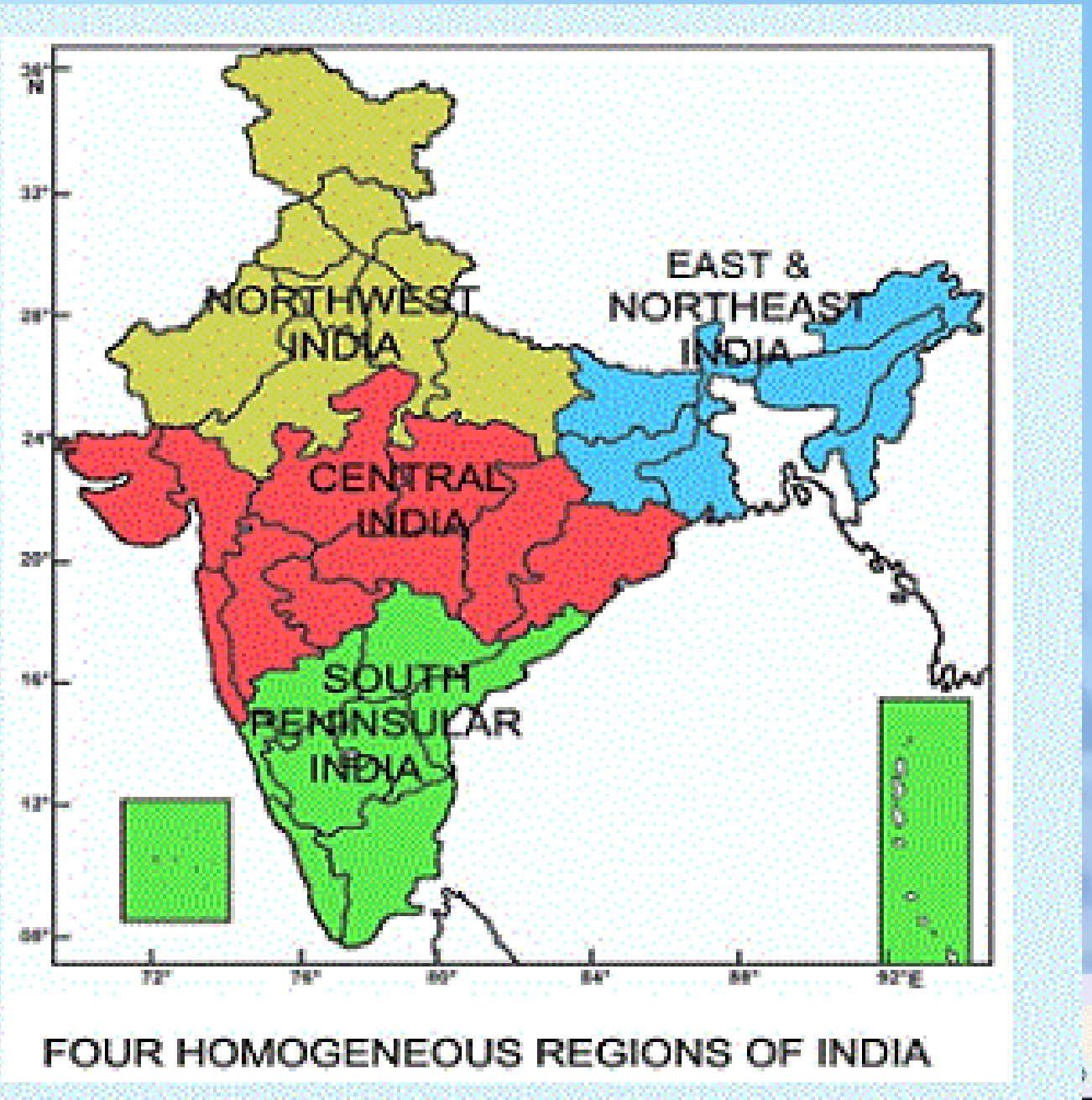
JUNE 2023	1- Jun	TO	30-Jun
REGION	ACTUAL	NORMAL	% DEP
COUNTRY AS A WHOLE	148.6	165.3	-10.0
NORTHWEST INDIA	111.1	78.1	42.0
EAST & NORTHEAST INDIA	269.9	328.4	-18.0
CENTRAL INDIA	160.4	170.3	-6.0
SOUTH PENINSULA	88.6	161.0	-45.0

Rainfall Anomaly over Core Monsoon Zone



Current Status of Monsoon (30 June 2023)



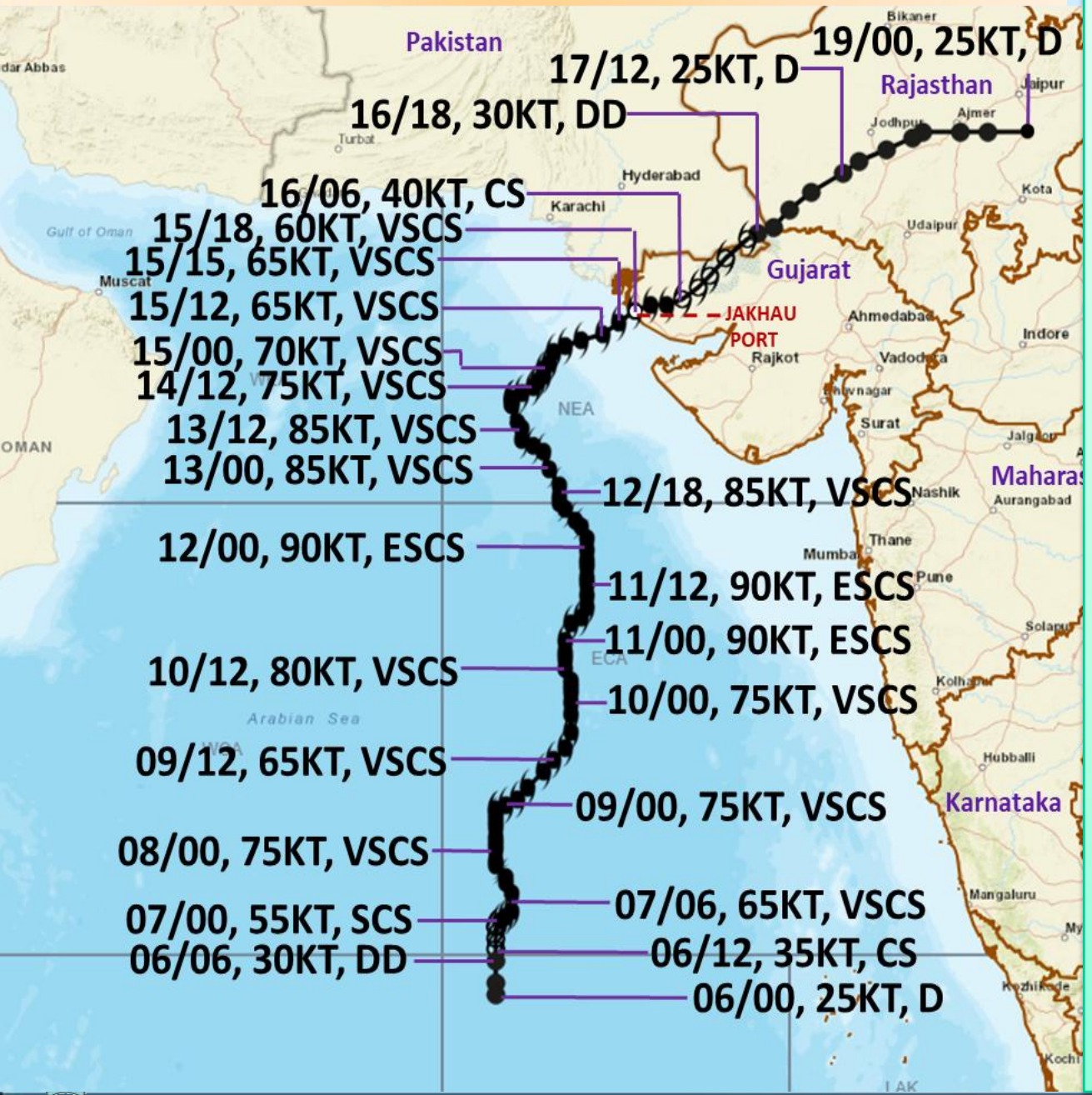


Performance of Monsoon During Years when June Rainfall is Below Normal

YEAR	JUN	JUL	AUG	SEP	JJAS	IOD events
1950	-19.1	18.9	-8.1	20.9	4.2	
1954	-14.6	4.8	-9.5	47	5.1	-ve IOD
ELNINO 1958	-26.1	12.6	26.2	37.6	14	-ve IOD
1962	-18.2	0.1	8.4	25.2	3.9	-ve IOD
ELNINO 1965	-30.1	-4	-24.6	-22.5	-18.6	-ve IOD
1967	-13.6	8.6	3.6	2	1.6	
1968	-10.5	10	-16	-23.3	-8	
1969	-21.2	14.3	8.7	3.5	3.8	-ve IOD
ELNINO1972	-26.2	-27.2	-13.8	-23.2	-22.3	+ve IOD
1974	-25.7	0	-9.3	-14.5	-10.4	-ve IOD
1979	-15.8	-15.1	-17.5	-19	-16.7	
ELNINO 1982	-17.4	-17.8	8.3	-24.9	-11.4	+ve IOD
ELNINO 1987	-21.1	-21.5	-4.6	-10.3	-14.3	
1992	-17.4	-5	11.8	0	-1.4	-ve IOD
1995	-16.5	14.2	4.8	7.3	4.3	
ELNINO 2009	-47.1	1.9	-24.1	-15.2	-18.3	
LA NINA 2010	-14.5	6.7	7.2	17.9	5	-ve IOD
2012	-26.9	-9	3.7	17.2	-3.6	+ve IOD
2014	-44.3	-5.3	-8.3	12.9	-10.1	
2016	-10.7	10	-6	1.1	-0.3	ve IOD
2019	-31.3	5.9	17.7	55	11.8	+ve IOD
ELNINO 2002	0.6	-13.4	-0.8	-26.6	-9.6	
ELNINO 2004	0.6	-13.4	-0.8	-26.6	-9.6	
ELNINO 2015	14	-14.4	-21.6	-22.6	-12.7	
ELNINO 1997	3.8	1.5	3.2	-10.2	0.2	+ve IOD

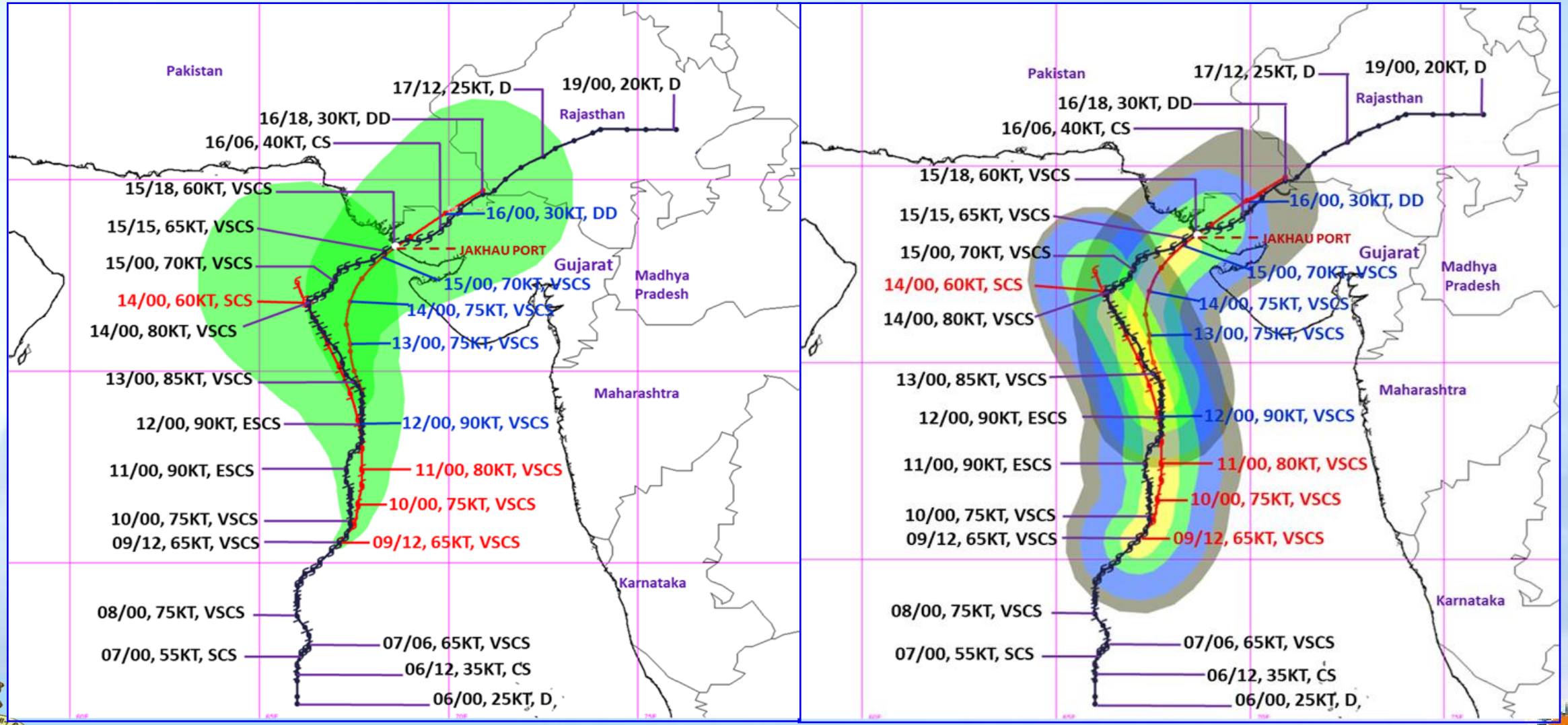
- During most of the recent El Nino years, June rainfall was normal
- In 16 of the 25 years, when June rainfall was below normal (<92% of LPA), July rainfall was normal (94-106% of LPA)

Observed track of “Biparjoy”



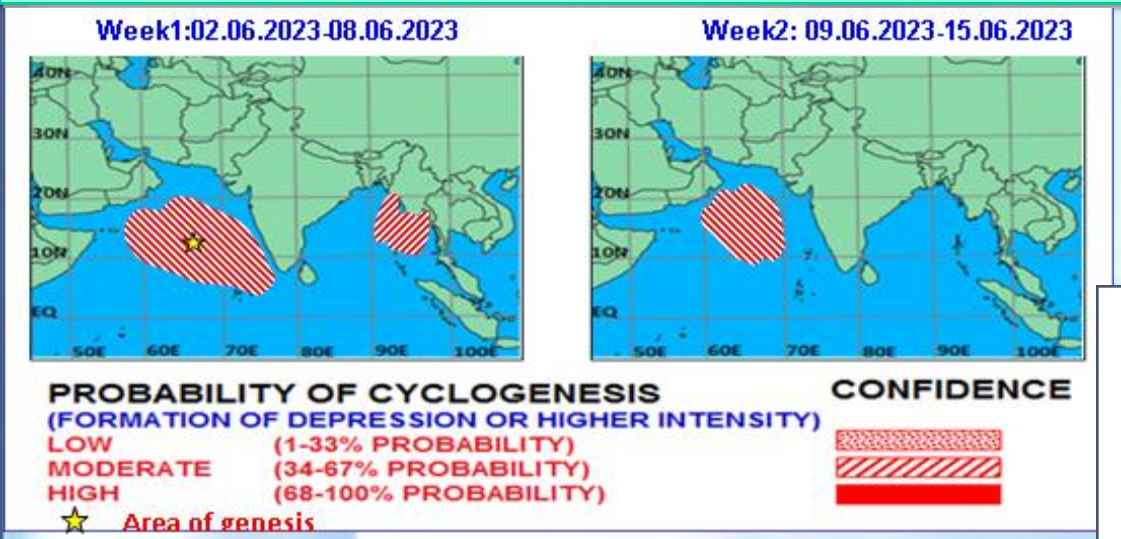
- 5th June/1730 IST: Low pressure area over southeast (SE) Arabian Sea (AS)
- 6th/0530 IST: Depression(D) over SE AS.
- 6th/1130 IST: Deep Depression(DD) over SE AS.
- 6th/1730 IST: Cyclonic Storm (CS) “BIPARJOY” over eastcentral (EC) AS.
- 7th/0530 & 1130 IST: Severe Cyclonic Storm & (SCS) Very Severe Cyclonic Storm (VSCS) over EC AS.
- 11th/0530 IST to 12th 2330 IST: Extremely Severe Cyclonic Storm (ESCS) over EC AS.
- 13th/ 0530 IST: VSCS over EC AS till landfall.
- 15th/ 2330 IST : SCS over Gujarat
- 16th/ 0830IST: CS over Gujarat
- 16th/ 2330 IST : DD over Gujarat
- 17th/ 0830 IST : D over Rajasthan

Typical track and intensity forecast issued on 9th June evening (1730 IST) 6 days ahead and 12th June morning (0530 IST) nearly 4 days ahead of landfall (demonstrating accuracy in track and landfall prediction)

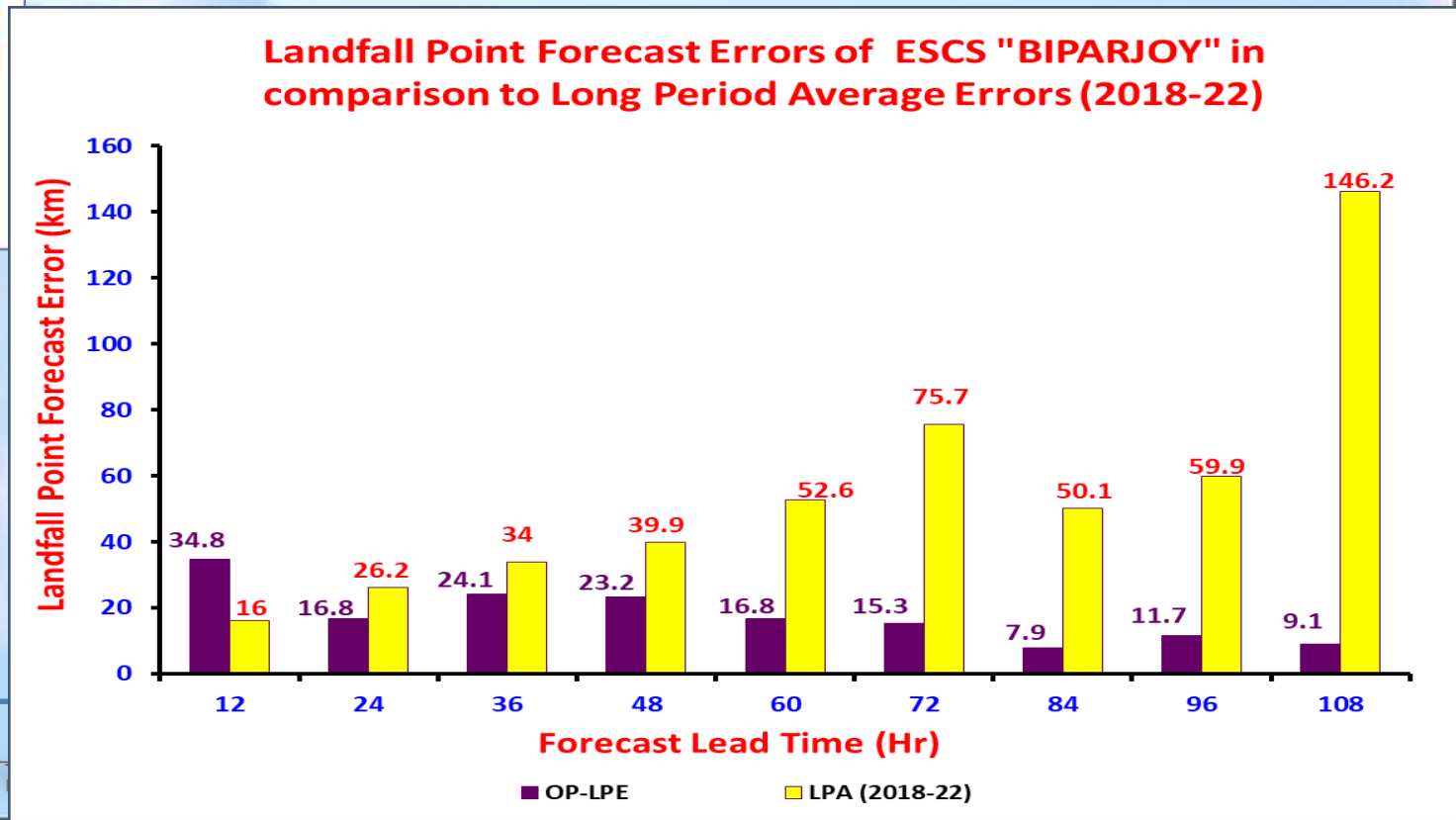


Forecast Accuracy (Genesis, Track, Landfall, Intensity)

- Extended Range Outlook issued on 1st June:
- 5 days prior to depression & 14 days prior to landfall

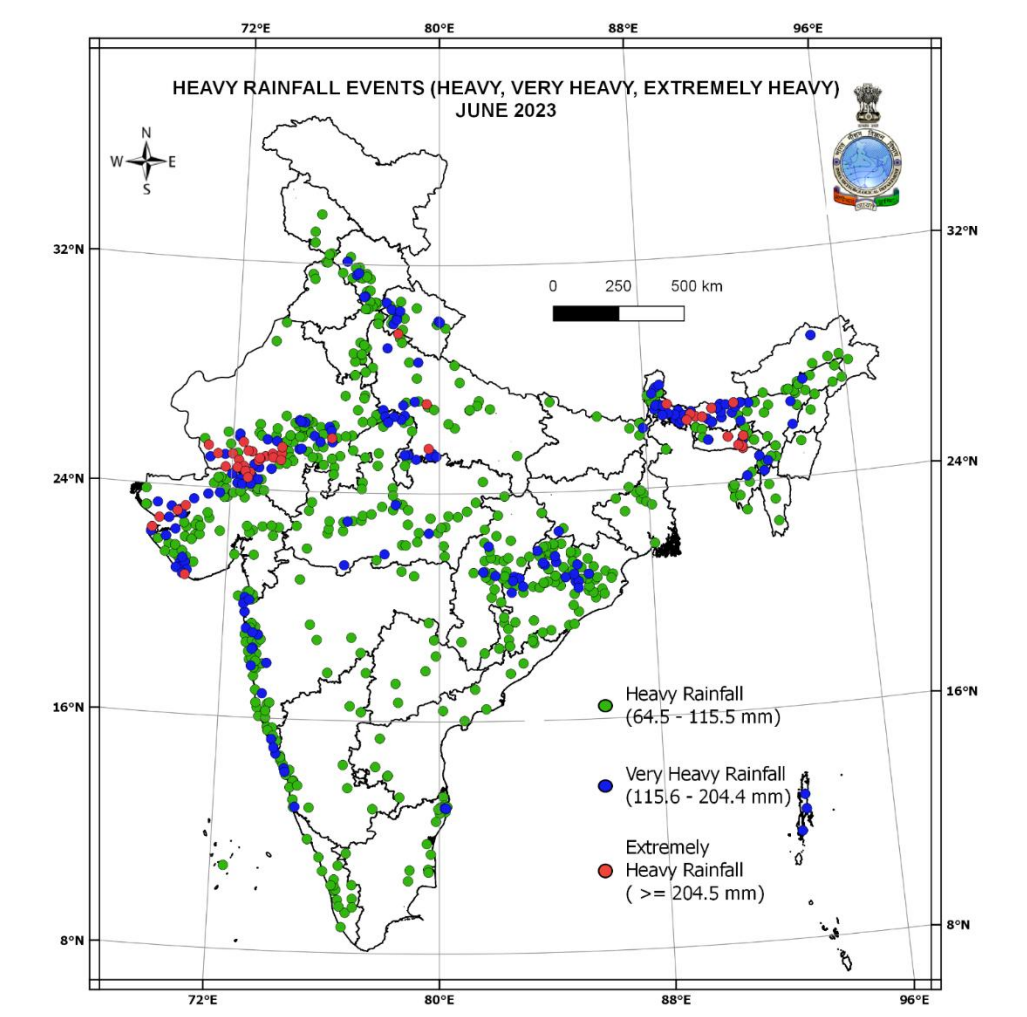


- **There was almost zero landfall point error about five days ahead.**
- **It enabled disaster managers to ensure minimum loss of lives and properties**



Heavy Rainfall Events occurred in June 2023

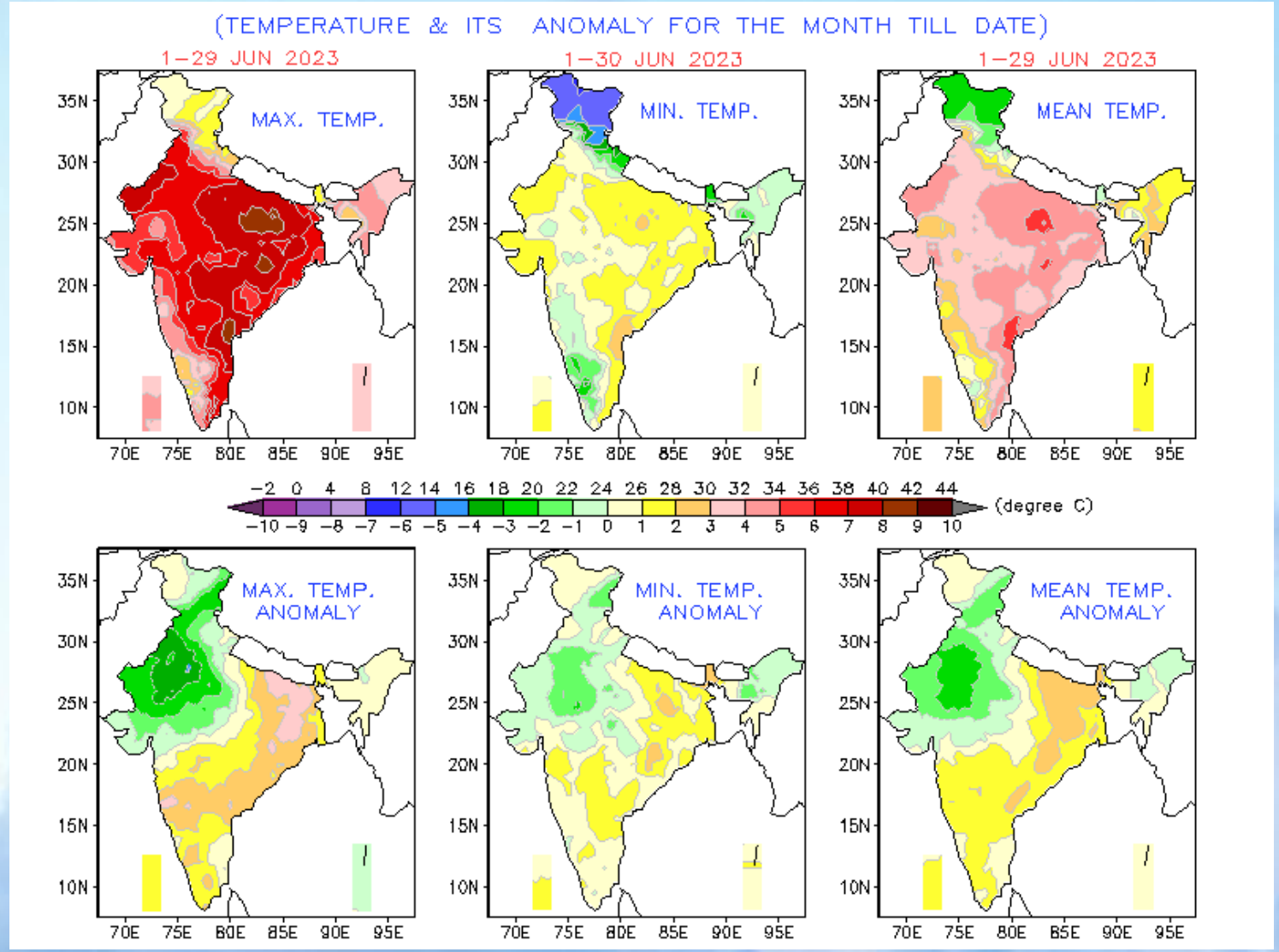
Location of Heavy Rainfall events occurred in JUNE 2023



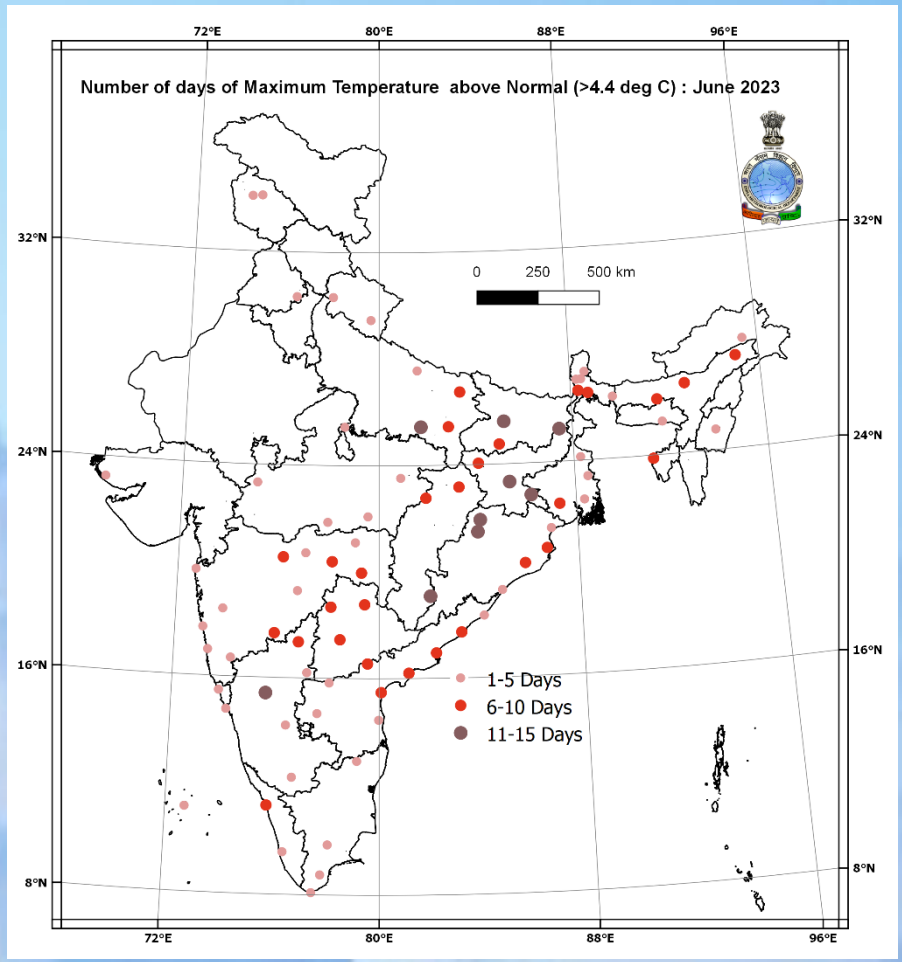
Number of Very Heavy/Ext. Heavy Rainfall events occurred in the month of June during last 5 years.

YEAR	Rainfall Category	Number of stations reported Events
2019	V. Heavy (115.6 to 204.5)	211
	Ext Heavy (more than 204.5)	52
2020	V. Heavy (115.6 to 204.5)	262
	Ext Heavy (more than 204.5)	36
2021	V. Heavy (115.6 to 204.5)	277
	Ext Heavy (more than 204.5)	35
2022	V. Heavy (115.6 to 204.5)	178
	Ext Heavy (more than 204.5)	72
2023	V. Heavy (115.6 to 204.5)	377
	Ext Heavy (more than 204.5)	62

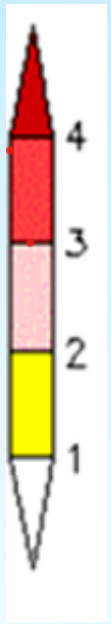
Observed Temperature for Jun 2023

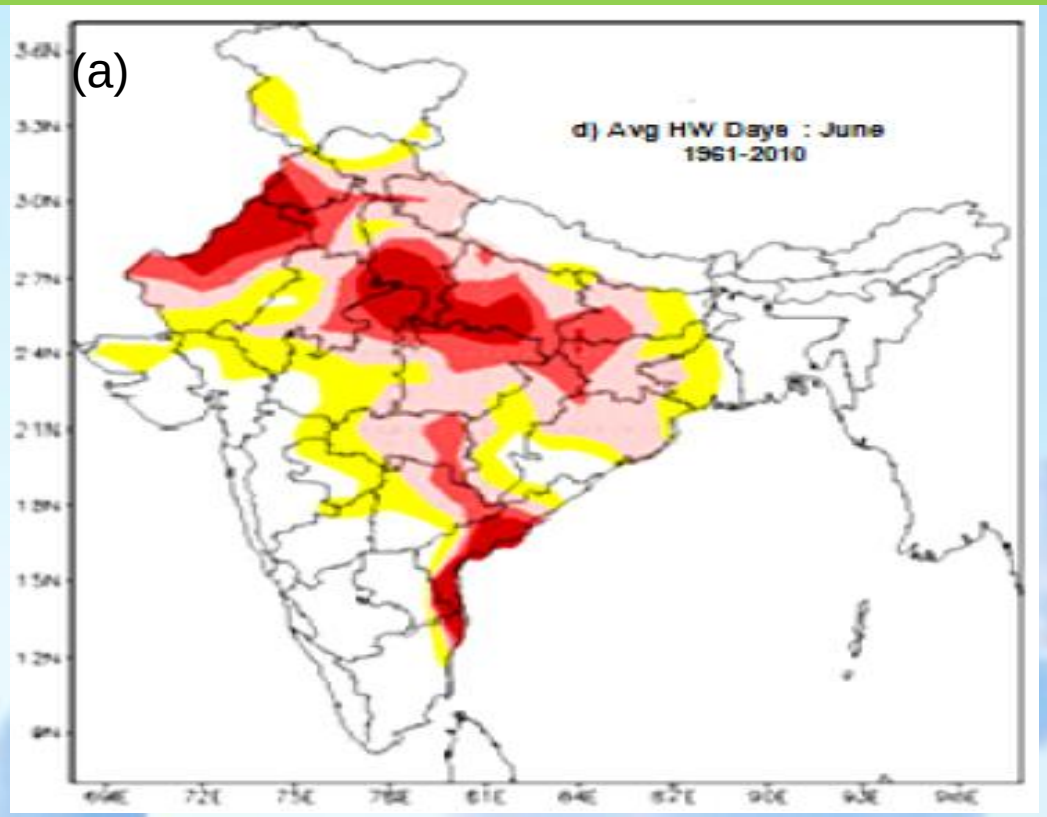


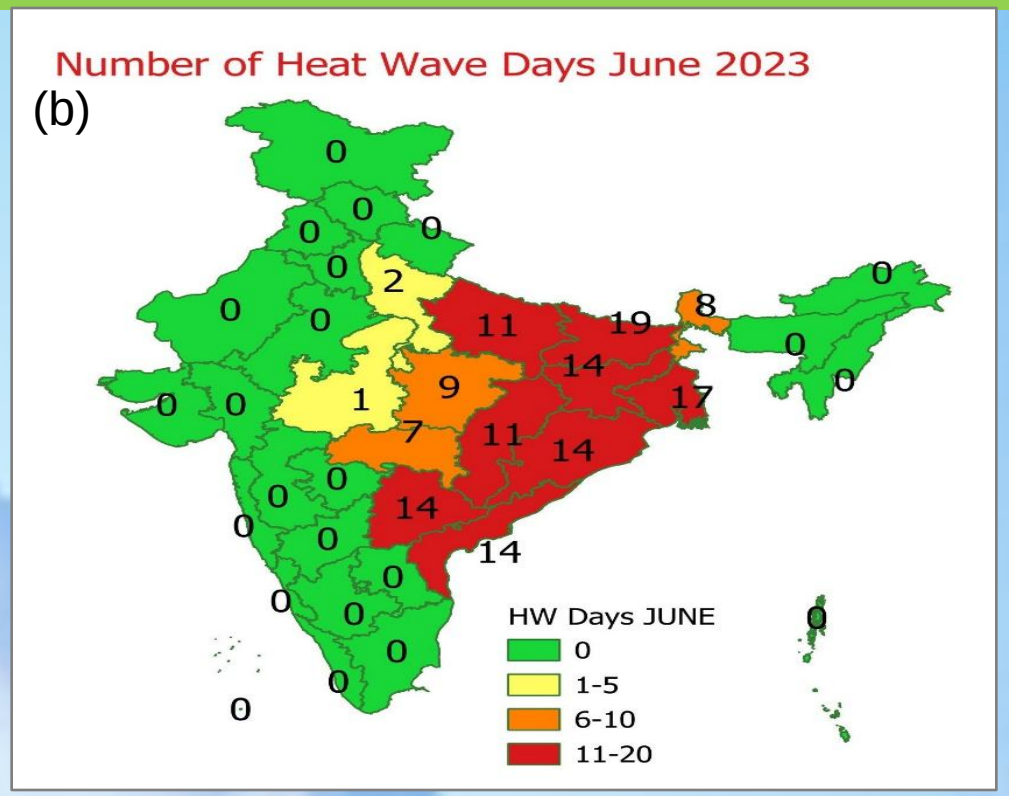
Number of days TMAX above normal (>4.4 ºC)



Heat Wave Days in June (a) Climatology (1961-2010) (b) Year 2023

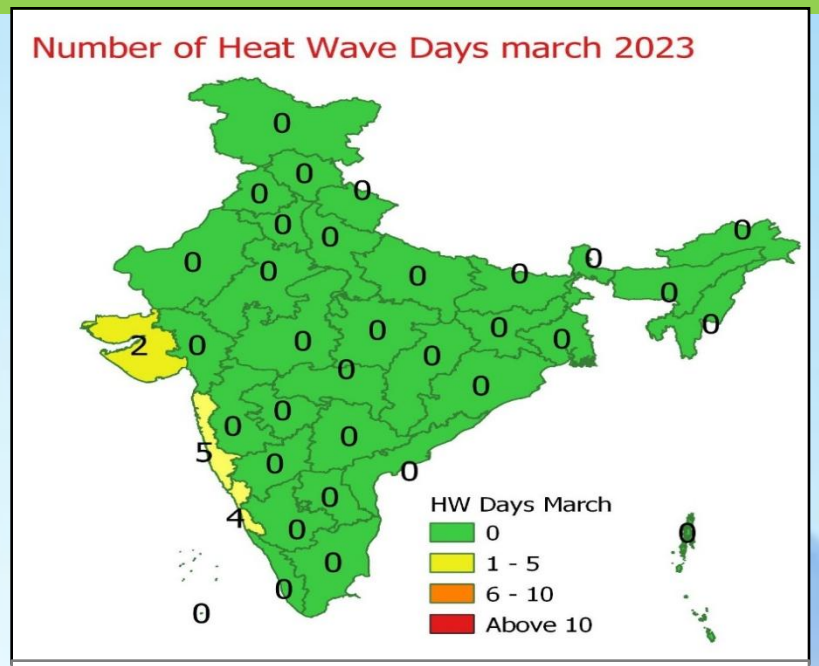


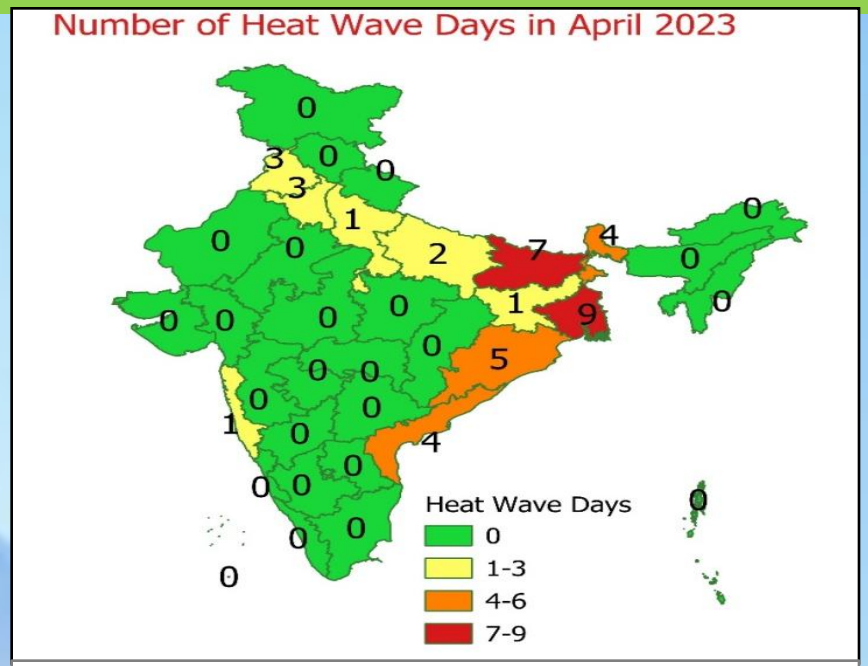


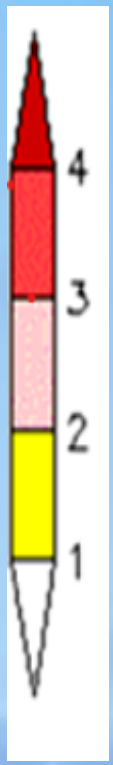


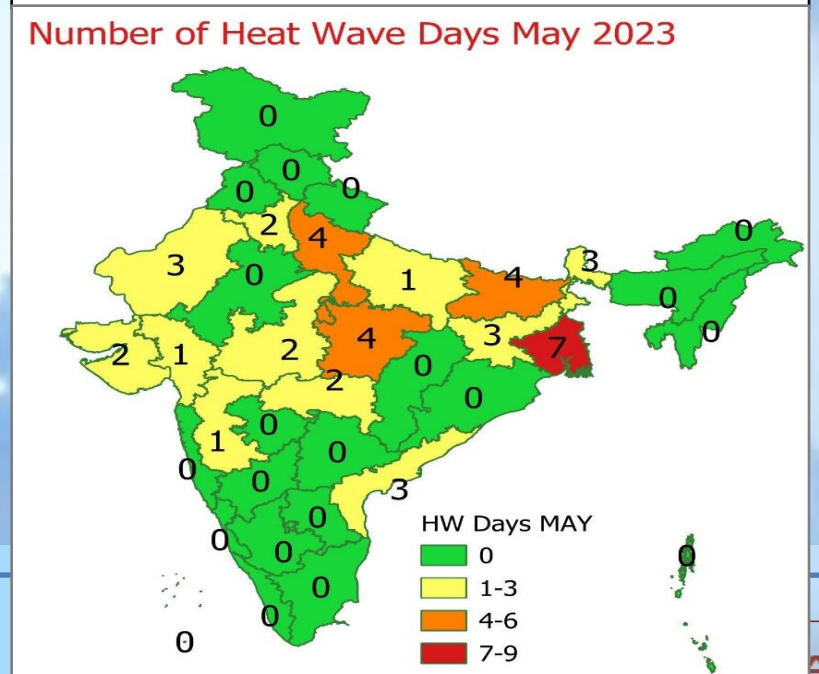
- **Above Normal Heat Wave Days** were observed Eastern parts (West Bengal, Odisha, Coastal Andhra Pradesh, Bihar, Jharkhand, Chhattisgarh) and adjoining central parts (East Madhya Pradesh, Vidarbha & Telangana) of the country.
- **Below normal Heat Wave days** were observed over Northwestern parts (Punjab, Rajasthan, Haryana, Chandigarh, Delhi, Uttarakhand, West Uttar Pradesh, West Madhya Pradesh & Gujarat) of the country. Most of the parts of Northwest India mentioned above didn't experience any heat wave days in the month of June 2023.

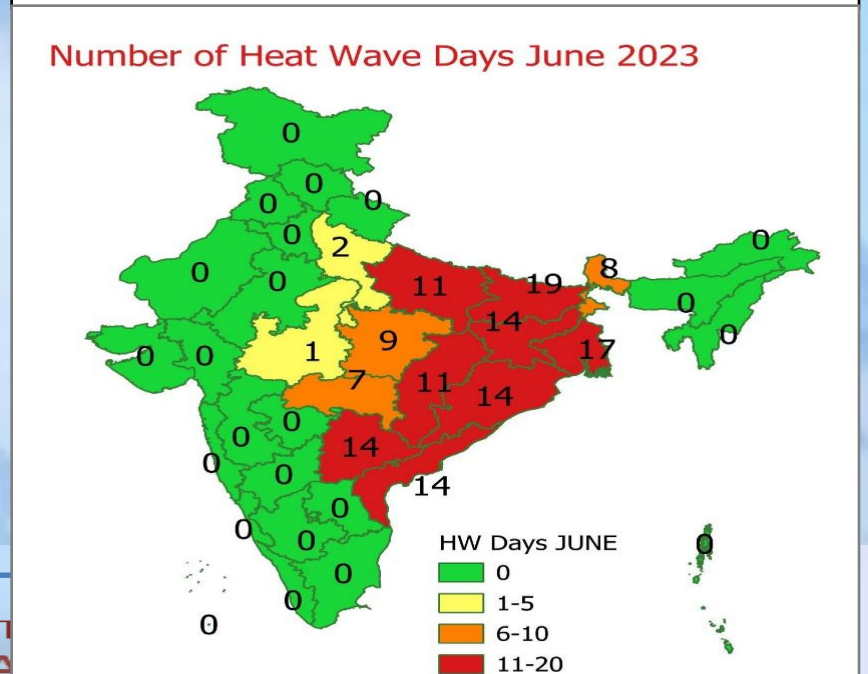
Heat Wave Days in Marc-June, 2023

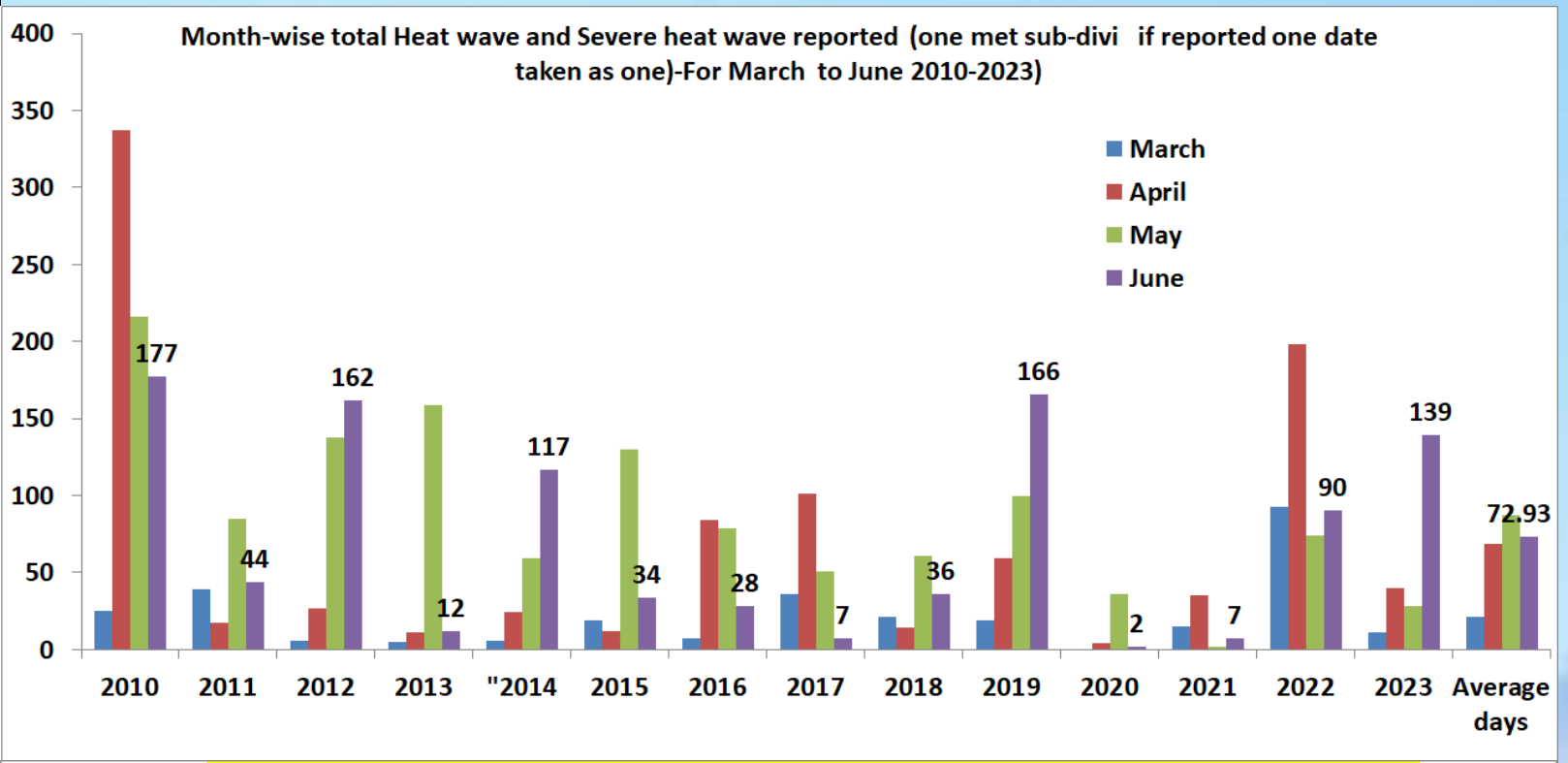


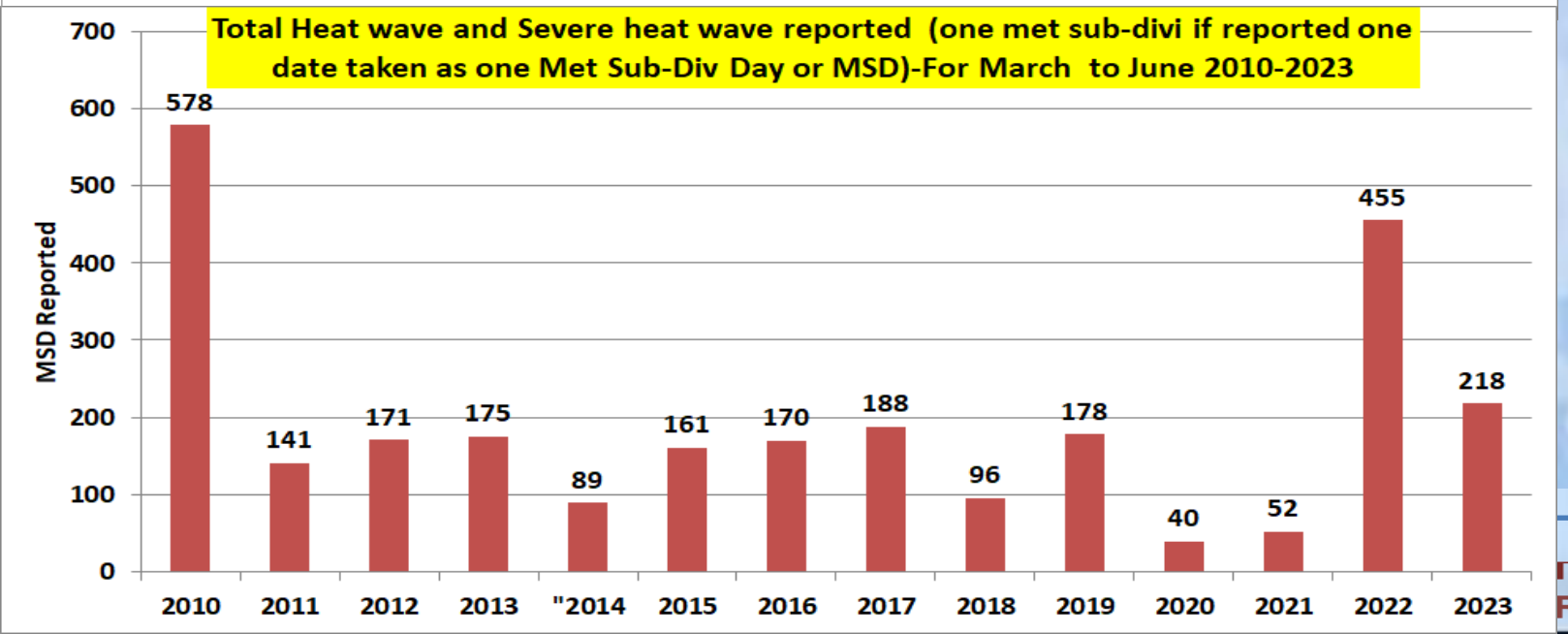












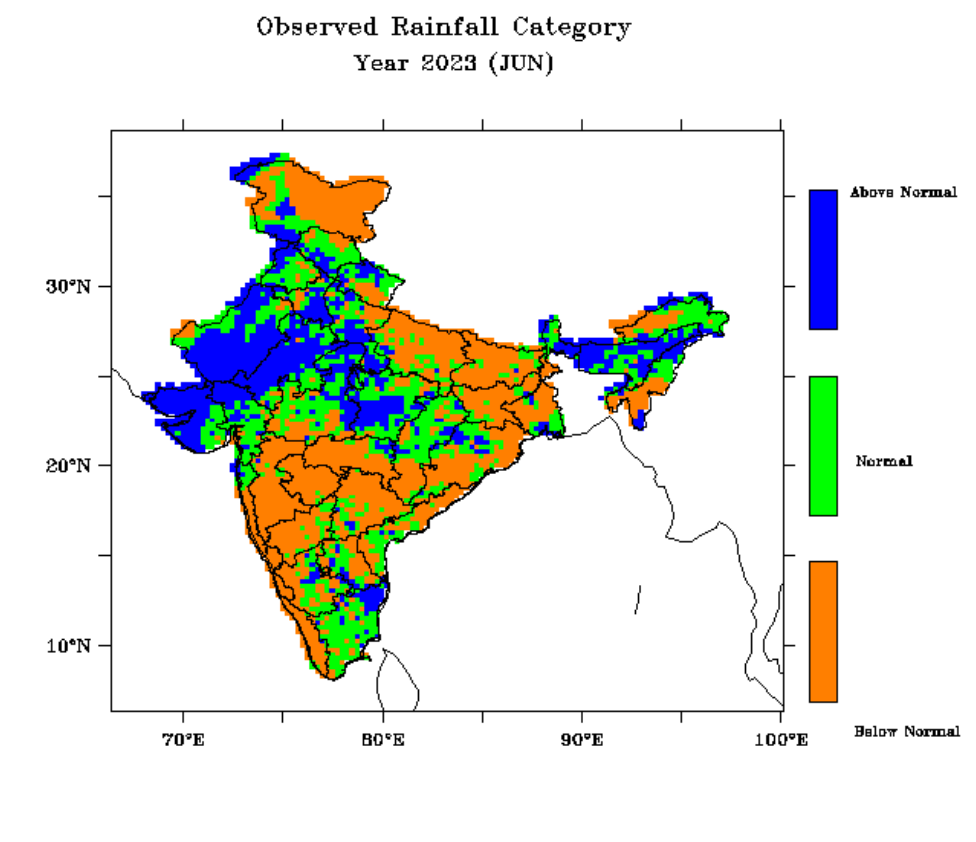
Hate wave to Severe heat wave in Summer 2023

- Total Heat wave and Severe heat wave reported in summer of March-June 2023 was 218 met-subdivisiondays (MSD)
- it was 3rd highest during last 23-years after 2019 with 578 MSD and 2022 with 455 MSD
- June had very higher MSD reported

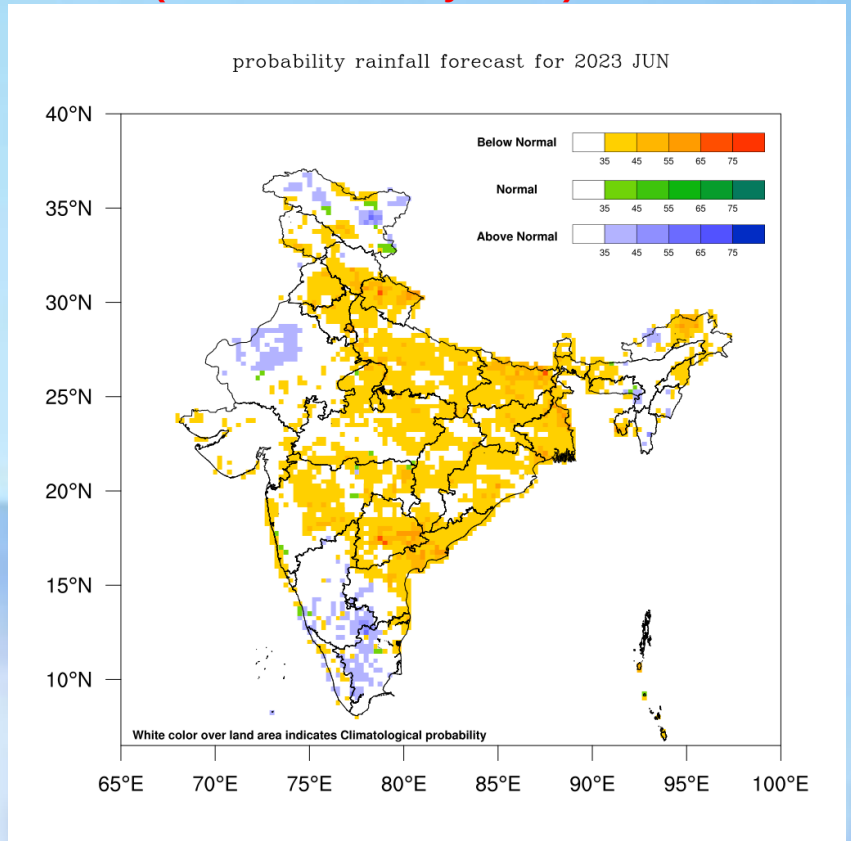
RTMENT

Verification of JUN 2023 rainfall forecast

Observed Rainfall Category (Jun 2023)



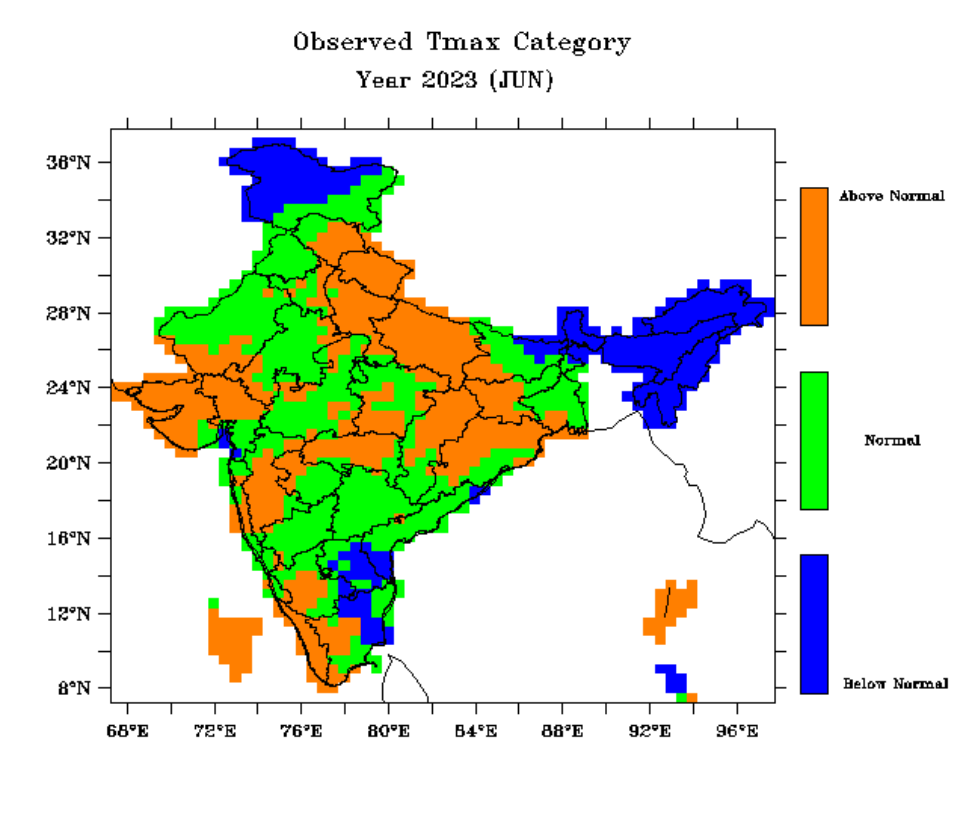
Rainfall forecast for Jun Month (issued on 26 May 2023)



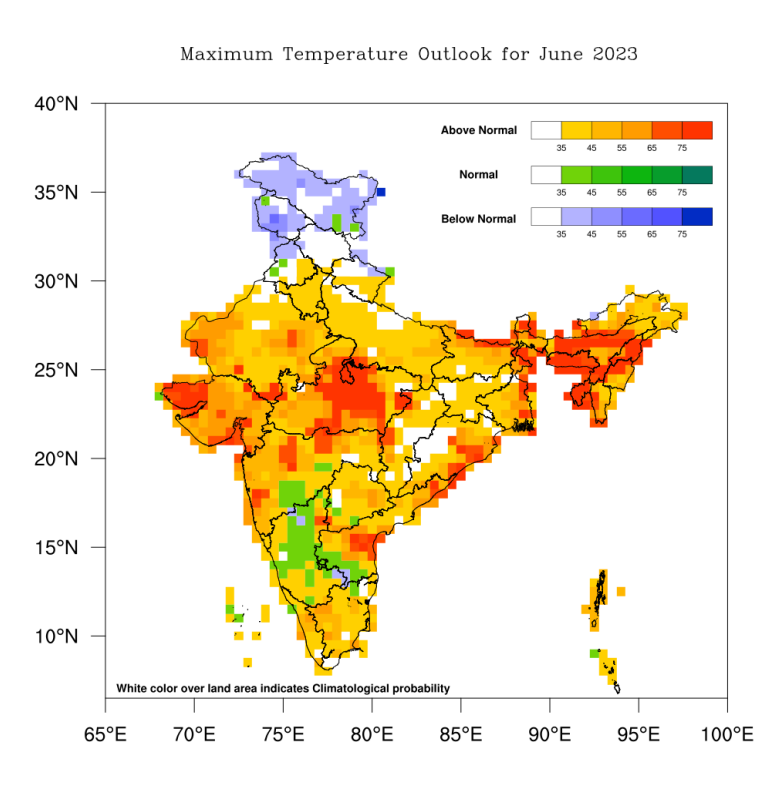
- **Above normal rainfall over many parts of Northwest and Northeast India and some areas of South Peninsular India were correctly predicted.**
- **Below normal rainfall over many regions of the Country also correctly predicted.**

Verification of Jun 2023 Maximum Temperature

Observed Temperature (Tmax) Category (Jun2023)



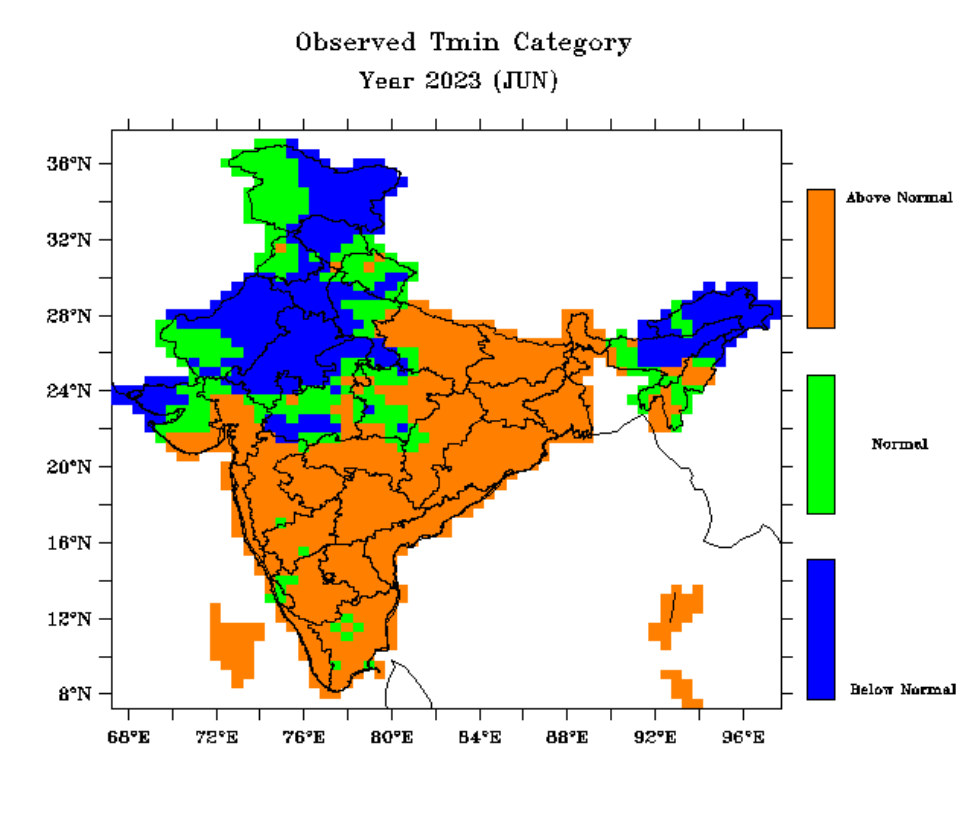
Maximum Temperature forecast for Jun Month (issued on 26 May 2023)



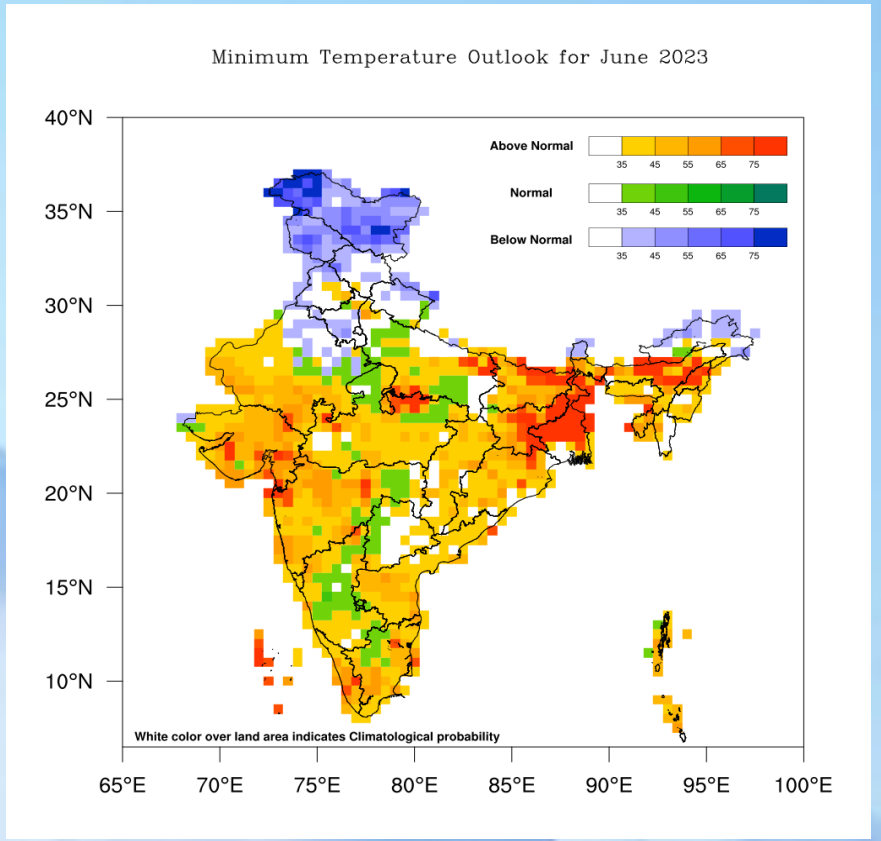
- **Above normal Maximum Temperature over many parts of Gangetic Plains and some parts of central India were correctly predicted.**

Verification of Jun 2023 Minimum Temperature

Observed Temperature (Tmin) Category (Jun 2023)



Minimum Temperature forecast for Jun Month (issued on 26 May 2023)

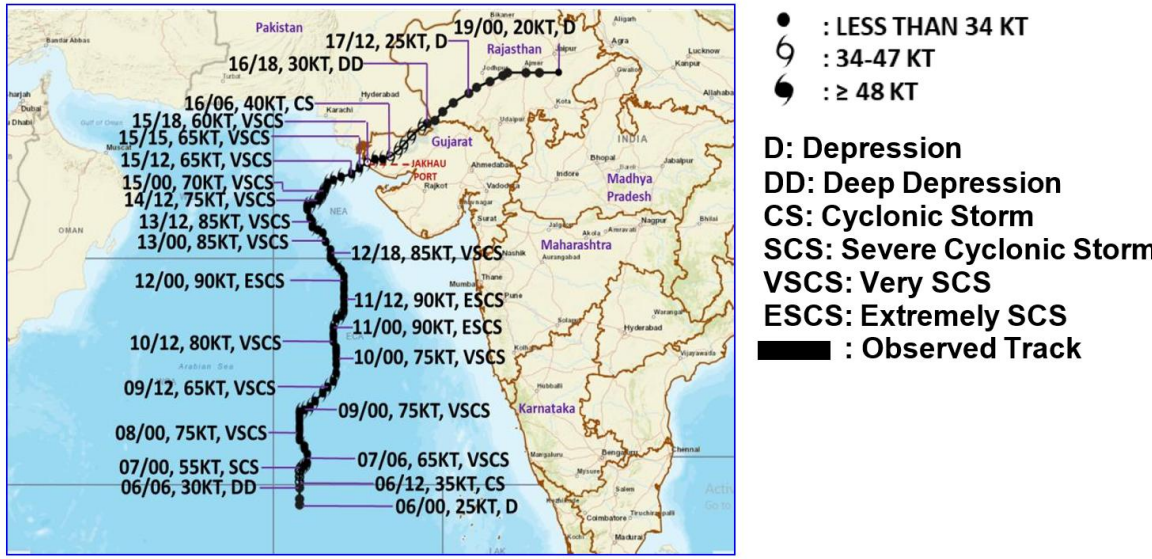


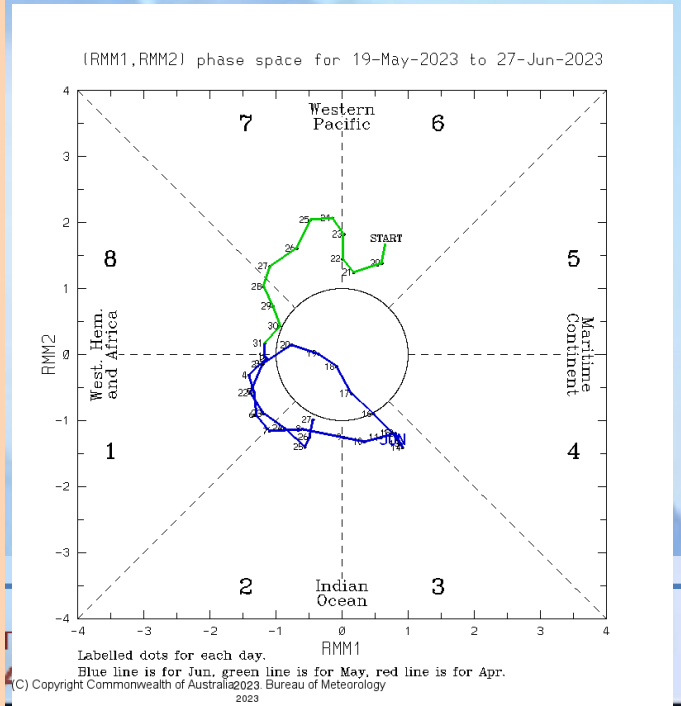
- **Normal to above normal Minimum Temperatures observed over south India, east and eastcentral India were correctly predicted alongwith below normal temperature over northwest India**

Factors which influence June rainfall activity

- The extremely severe cyclonic storm "BIPARJOY" (6-19th June 2023) formed over Arabian Sea.
- It helped in advance of monsoon in initial stage
- It caused heavy rainfall over Gujarat, Rajasthan, MP and adjoining UP
- The MJO was in unfavourable phase during initial days of the June and later helped for the formation of Cyclonic storm over Arabian Sea. However, the MJO was weak during later period.
- The formation of two low pressure system (LPS) over north Bay of Bengal, i.e. 9th June and 25th June 2023 helped in advance of monsoon and good rainfall activty

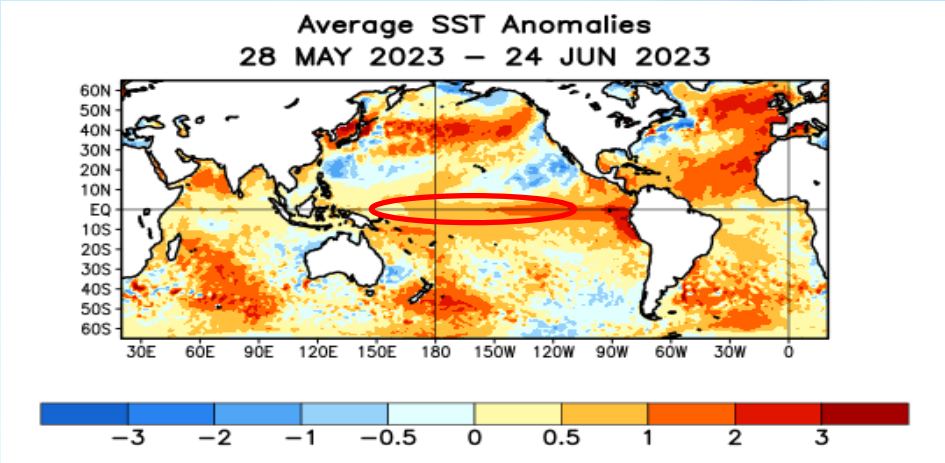
Tracks of BIPARJOY





MJO Phase June 2023

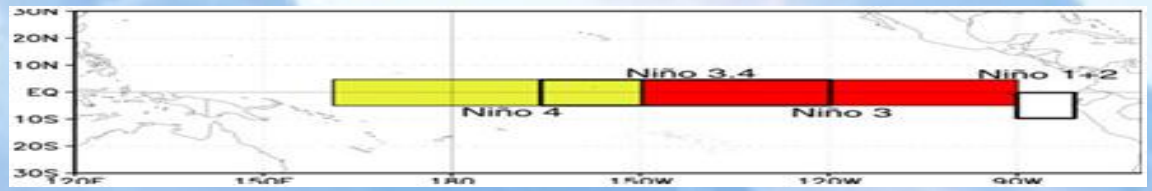
Latest Global SST Departures (ºC) and ENSO Conditions over Pacific



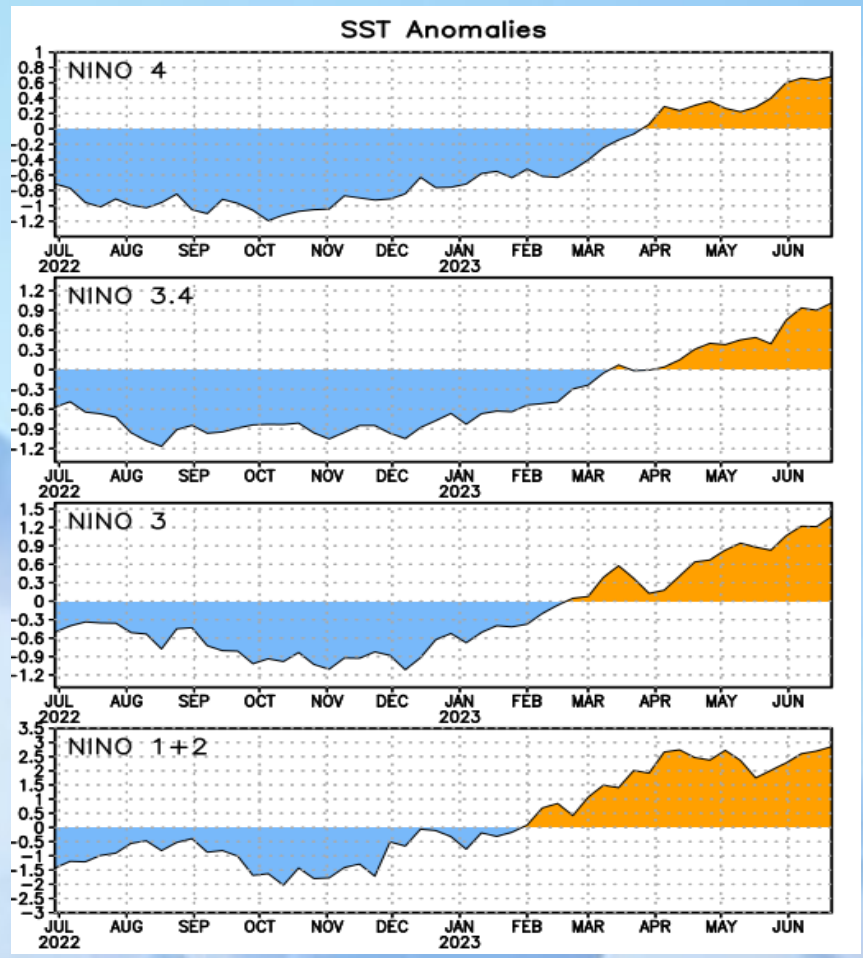
Data source **CPC, USA**

The latest weekly SST departures are:

Niño 4	0.7ºC
Niño 3.4	1.0ºC
Niño 3	1.4C
Niño 1+2	2.9ºC



Recent evolution of NINO SSTs



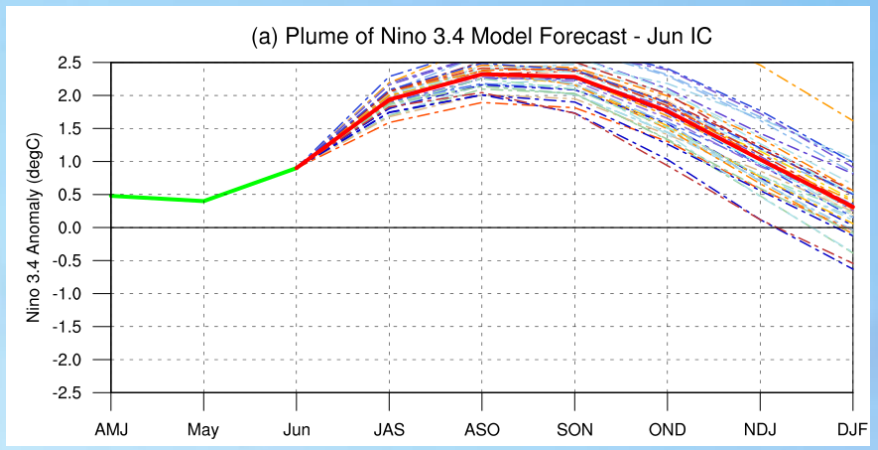
Data source **CPC, USA**

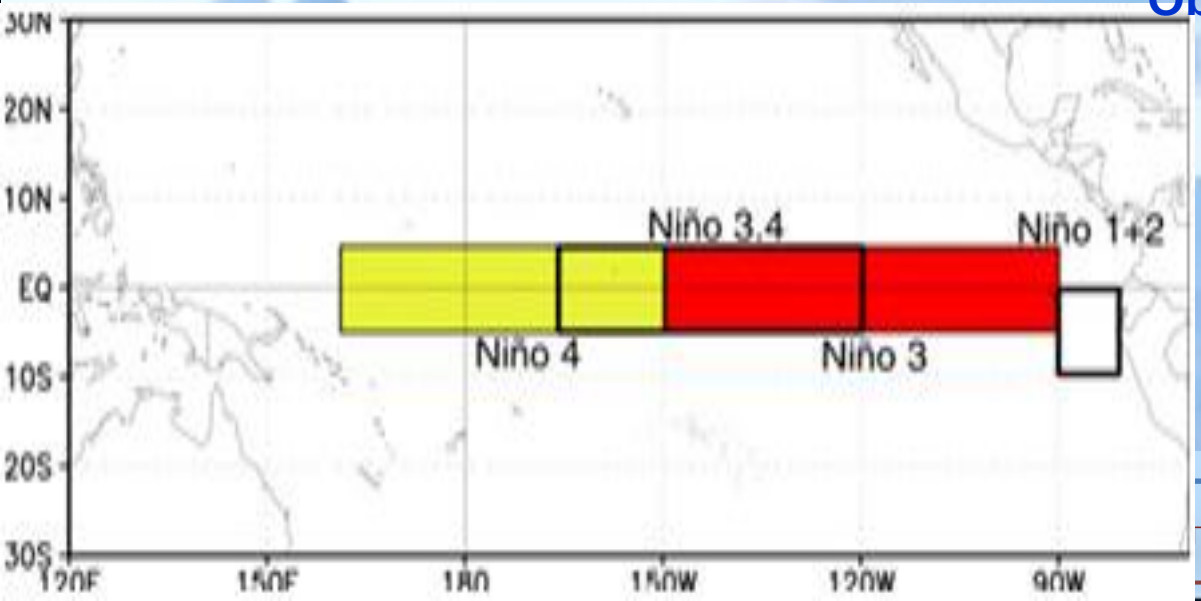
Equatorial SSTs were above average across most of the Pacific Ocean, most of the Atlantic Ocean, and the western and central Indian Ocean.

Observed and forecast SST

El Niño/La Niña event defined when the Oceanic Niño Index (ONI) [3 month running mean of ERSST.v5 SST anomalies in the Niño 3.4 region (5°N-5°S, 120-170°W)], threshold of +/- 0.5°C is met for a minimum of 5 consecutive overlapping seasons(3 months).

The ONI is one measure of the El Niño-Southern Oscillation, and other indices like SOI can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods.





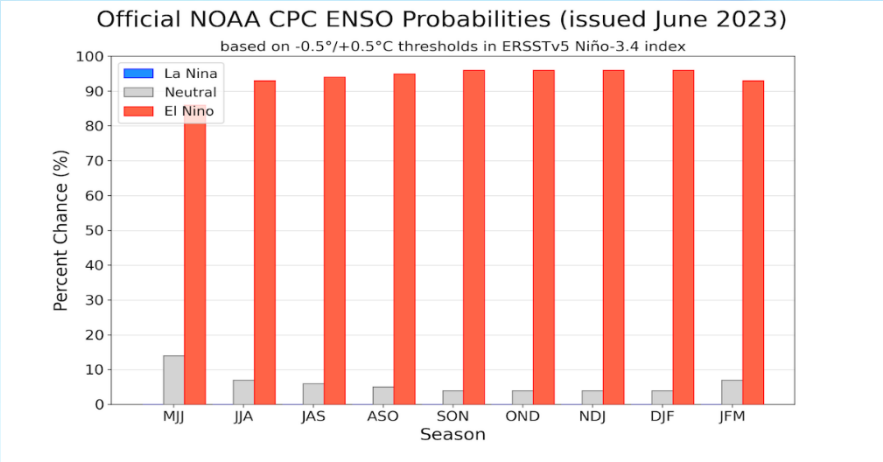
Observation

Forecast

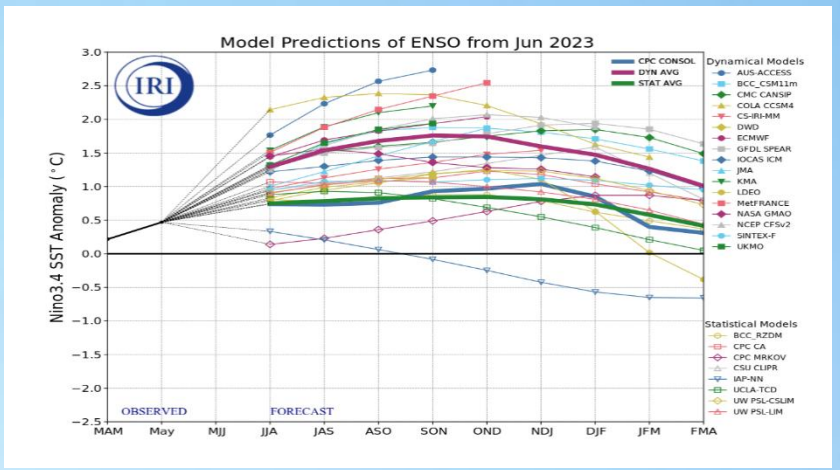
Monthly	Nino3.4	3-month mean	Nino3.4
Jan	-0.71	NDJ	-0.82
Feb	-0.46	DJF	-0.68
Mar	-0.11	JFM	-0.43
Apr	0.13	FMA	-0.15
May	0.39	MAM	0.14
Jun	0.9	AMJ	0.47
Jul	1.15	MJJ	0.81
Aug	2.01	JJA	1.35
Sep	2.65	JAS	1.94
Oct	2.3	ASO	2.32
Nov	1.89	SON	2.28

El Niño threshold likely to cross 0.5 ° C

Latest ENSO & IOD Forecast : June 2023

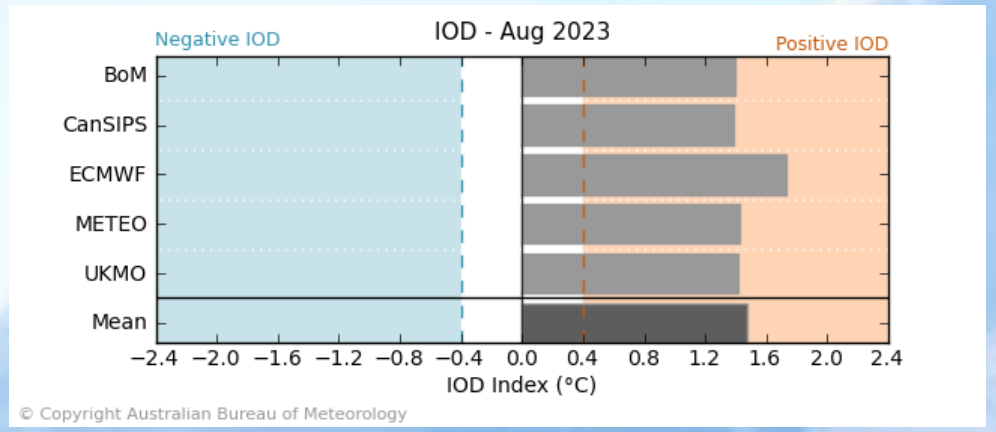


ENSO

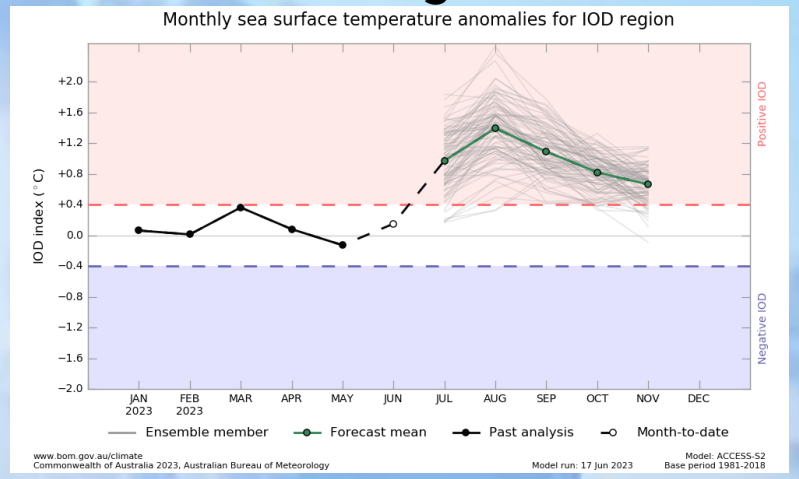


El Niño conditions are most likely to develop during 2023 southwest monsoon season

Dynamical and statistical model averages predict El Niñ0 to continue during monsoon season.



IOD



Many models indicate development of positive IOD during 2023 southwest monsoon season

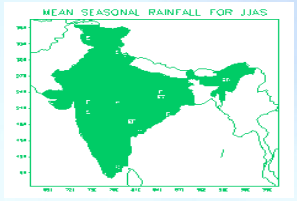
Bureau of Meteorology model also indicate development of positive IOD during monsoon season.

New Strategy for Long Range Forecast

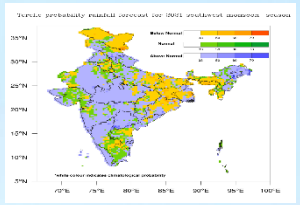
1st Stage Forecast

April

All India averaged Season (June – September) Rainfall



Spatial pattern of probability forecast for the Season Rainfall over the country

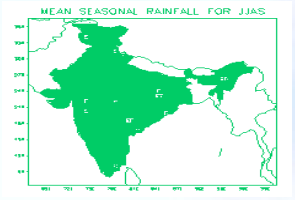


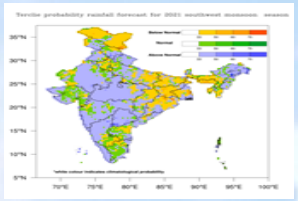
Based on Statistical and MME

2nd Stage Forecast

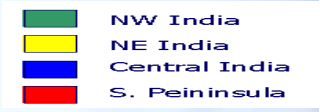
May

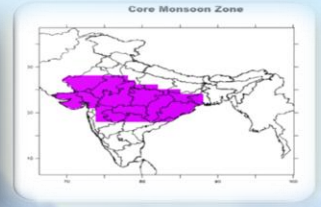
Update for the April forecast for the All India averaged Season Rainfall and spatial pattern of probabilistic forecast over the country





Forecast for Season Rainfall: for the Four Homogeneous Regions & Monsoon Convergence Zone (MCZ)





Based on Statistical and MME

Monthly Forecast

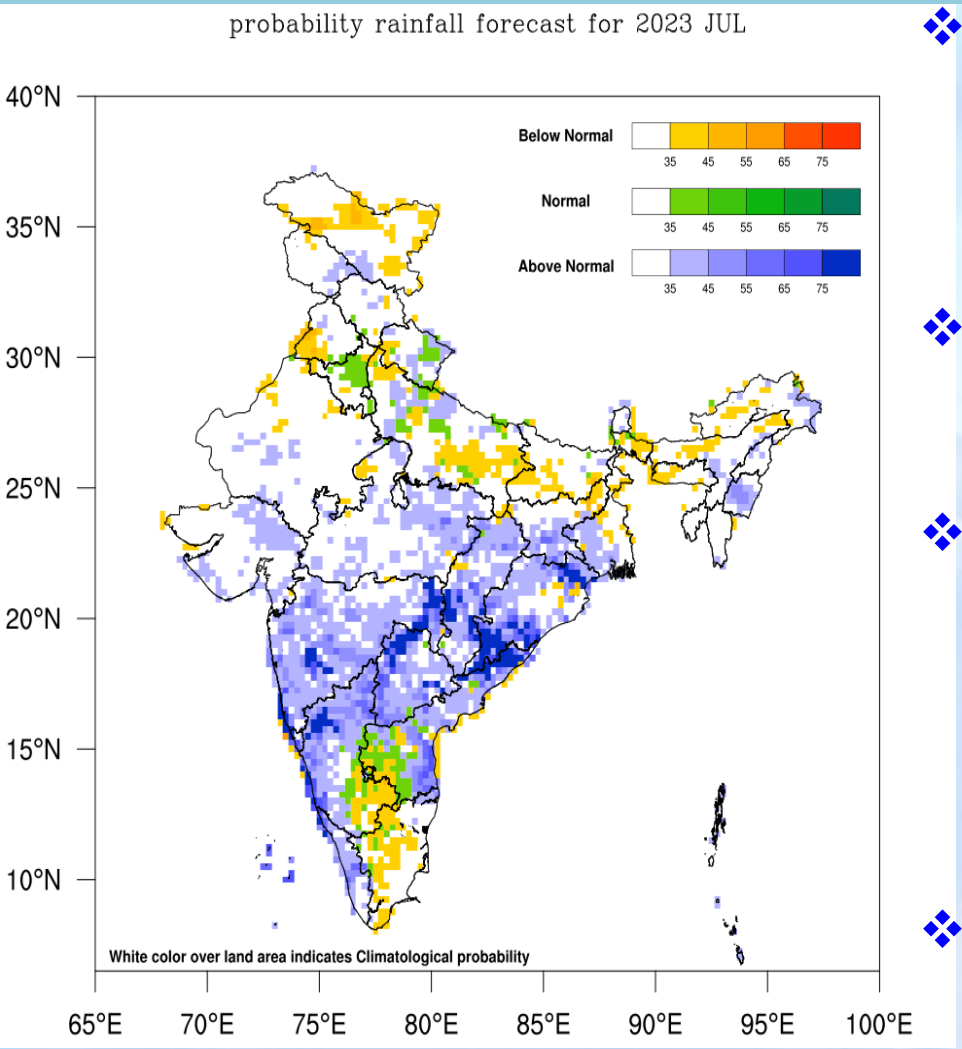
End of May, June, July & August for subsequent one month

Probabilistic Forecast for Monthly rainfall

Based on MME of Dynamical models

In addition, Forecast for Date of Monsoon Onset over Kerala in May

Probabilistic Forecast for the 2023 July Rainfall over the Country Based on the Multi Model Ensemble Forecasting System.



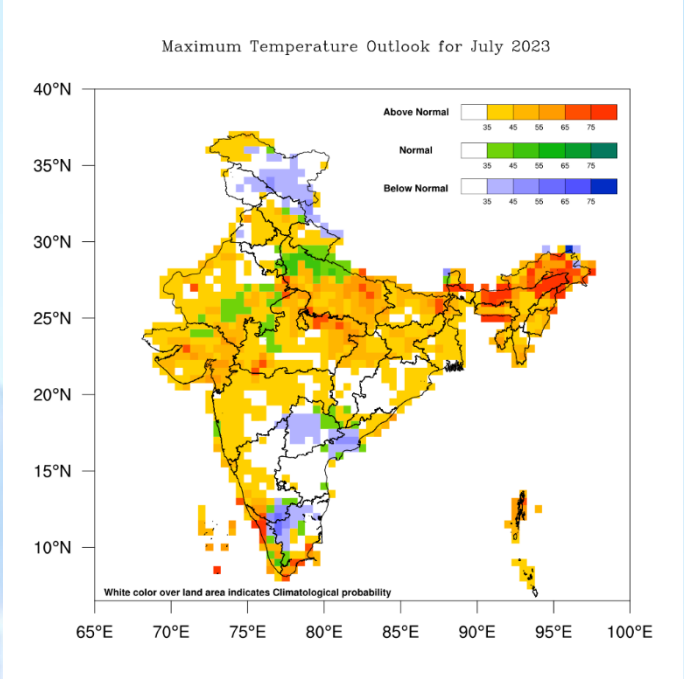
- The monthly rainfall averaged over the country as a whole during July 2023 is most likely to be normal (94 to 106 % of LPA) and most probably within positive side of the normal.
- The LPA of rainfall over the country during July based on the data of 1971-2020 is about 280.4 mm.
- Normal to above normal rainfall is most likely over most parts of central India and adjoining south peninsular and east India and some areas of Northeast and Northwest India.
- Below normal rainfall is most likely over many parts of northwest, northeast and southeast peninsular India.

Probabilistic Forecast of Temperatures over the Country during July 2023

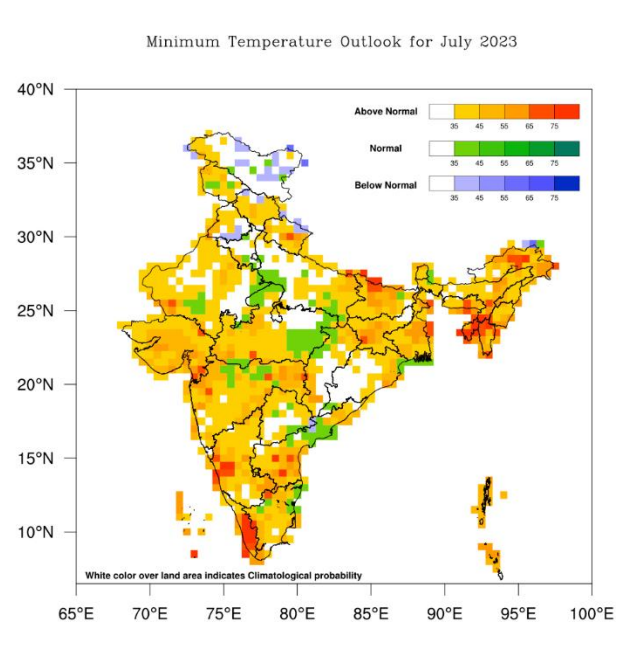
Maximum Temperature: During July 2023, normal to above normal maximum temperatures are likely over most parts of the country except some areas of northwest and peninsular India where below normal maximum temperatures are likely.

Minimum Temperature : Normal to above normal minimum temperatures are likely over most parts of the country except some areas of northwest India where below normal minimum temperatures are likely

Maximum Temperature

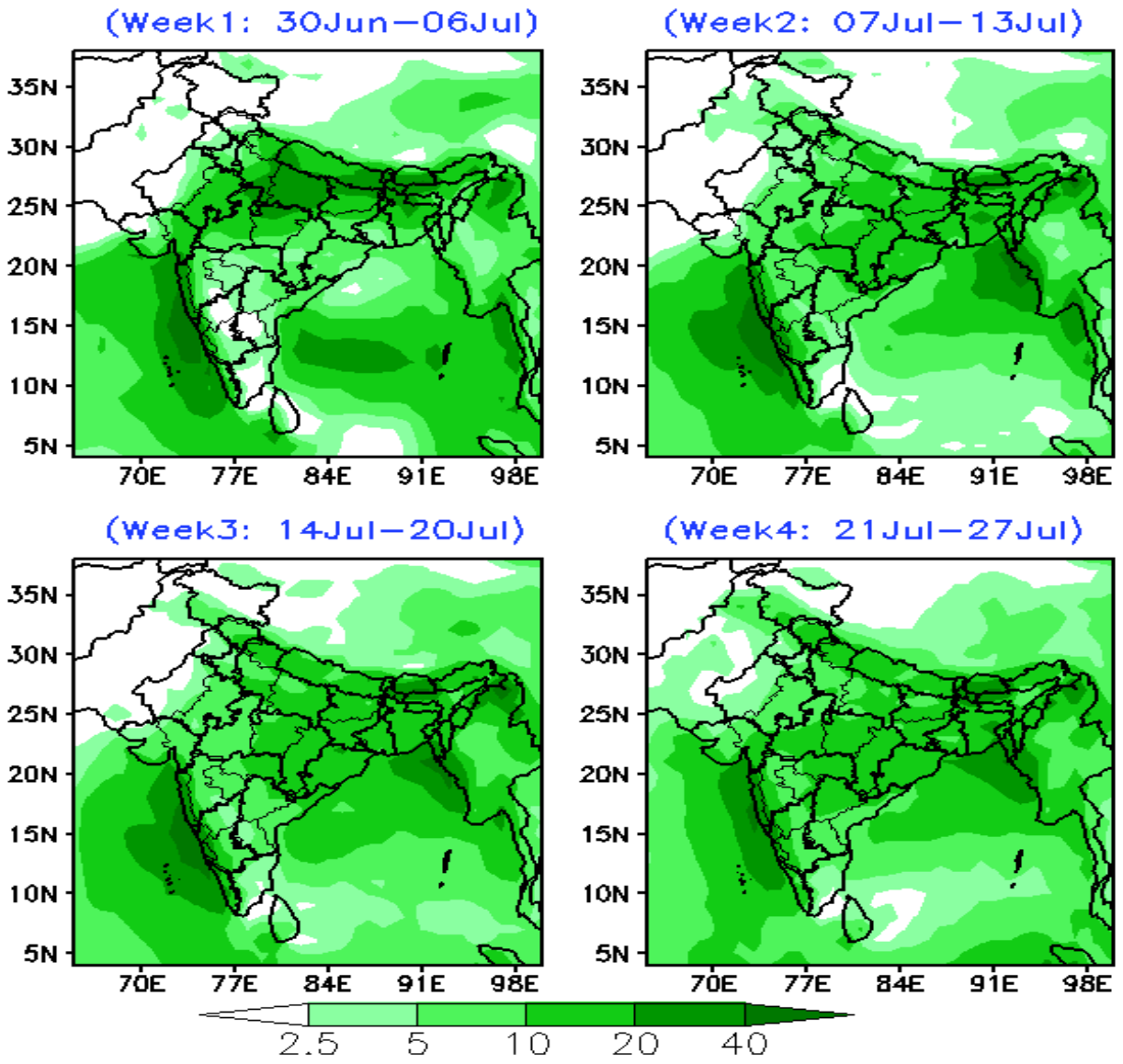


Minimum Temperature

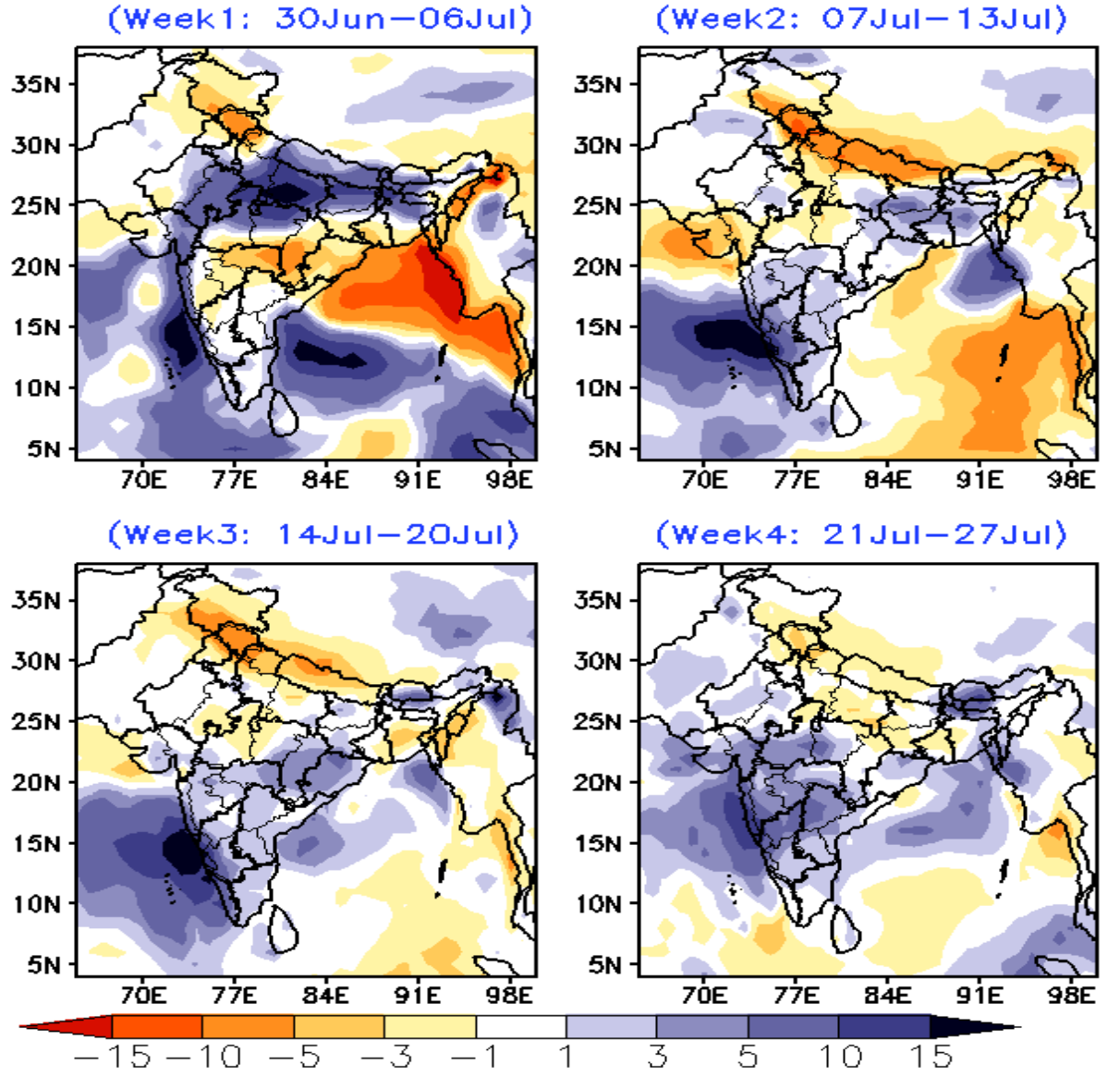


IMD ERF System (CFSv2 coupled model based) : IC 29 June 2023

Forecast Rainfall (mm/day)

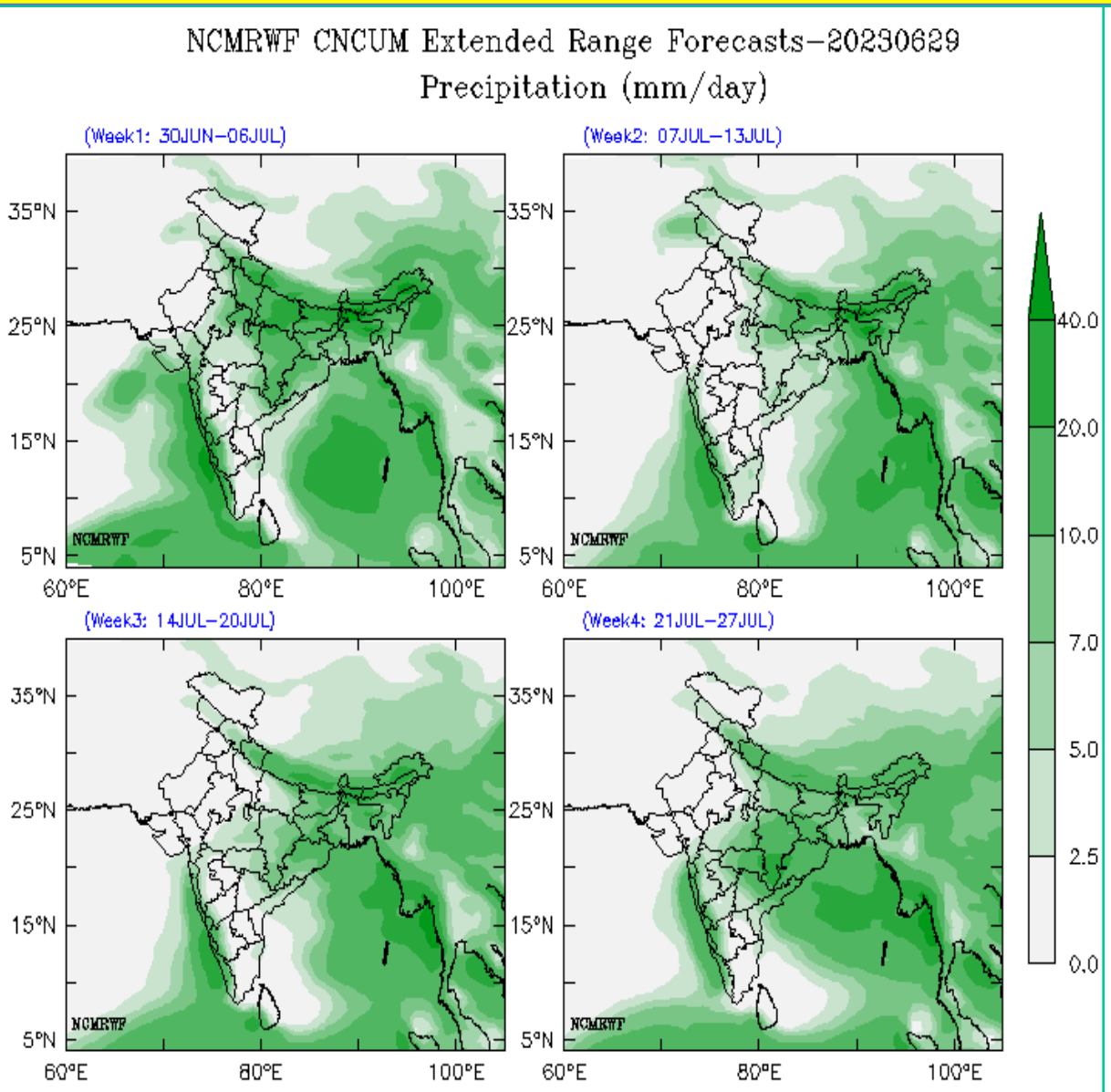


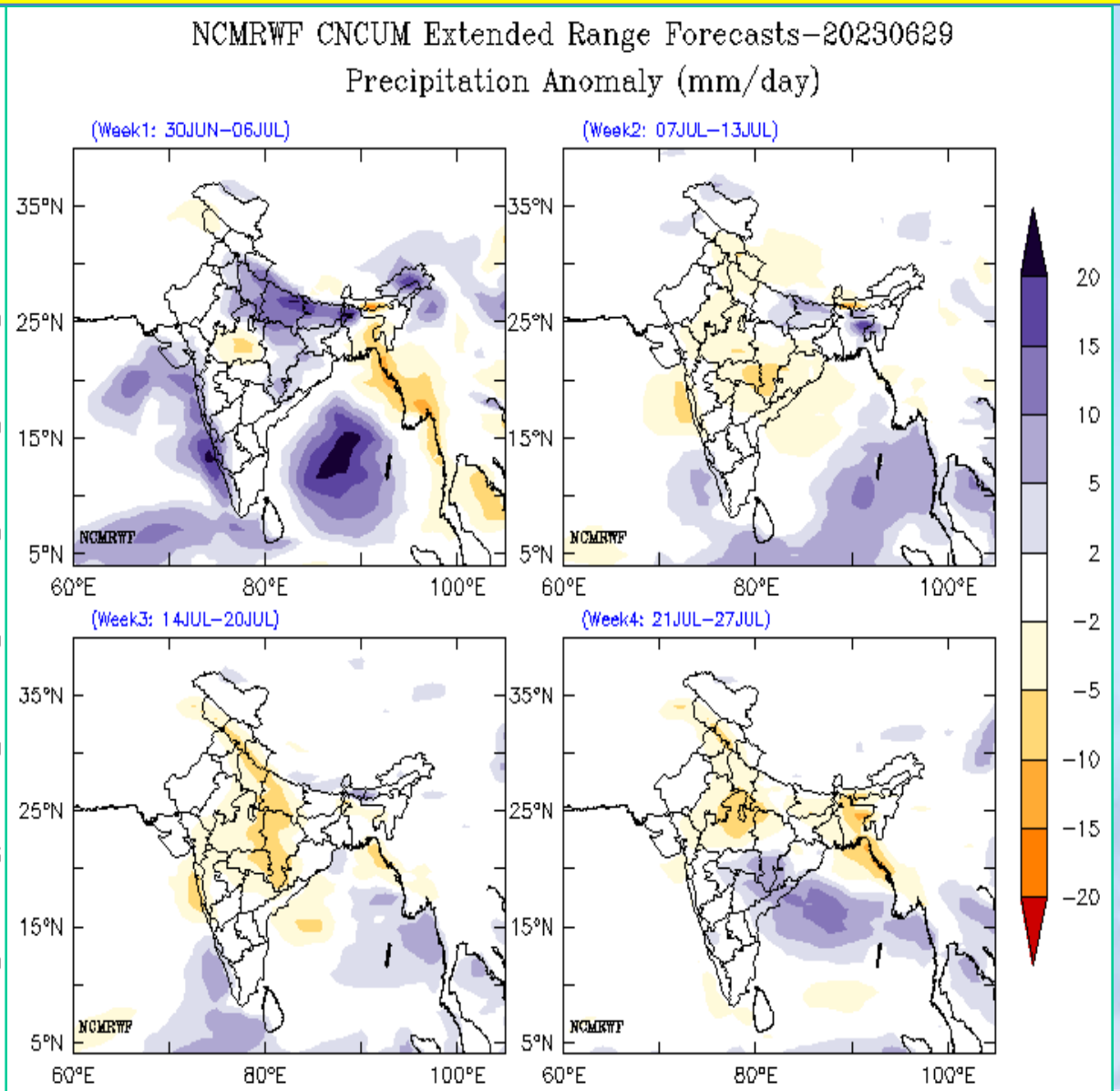
Forecast Rainfall Anomaly (mm/day)



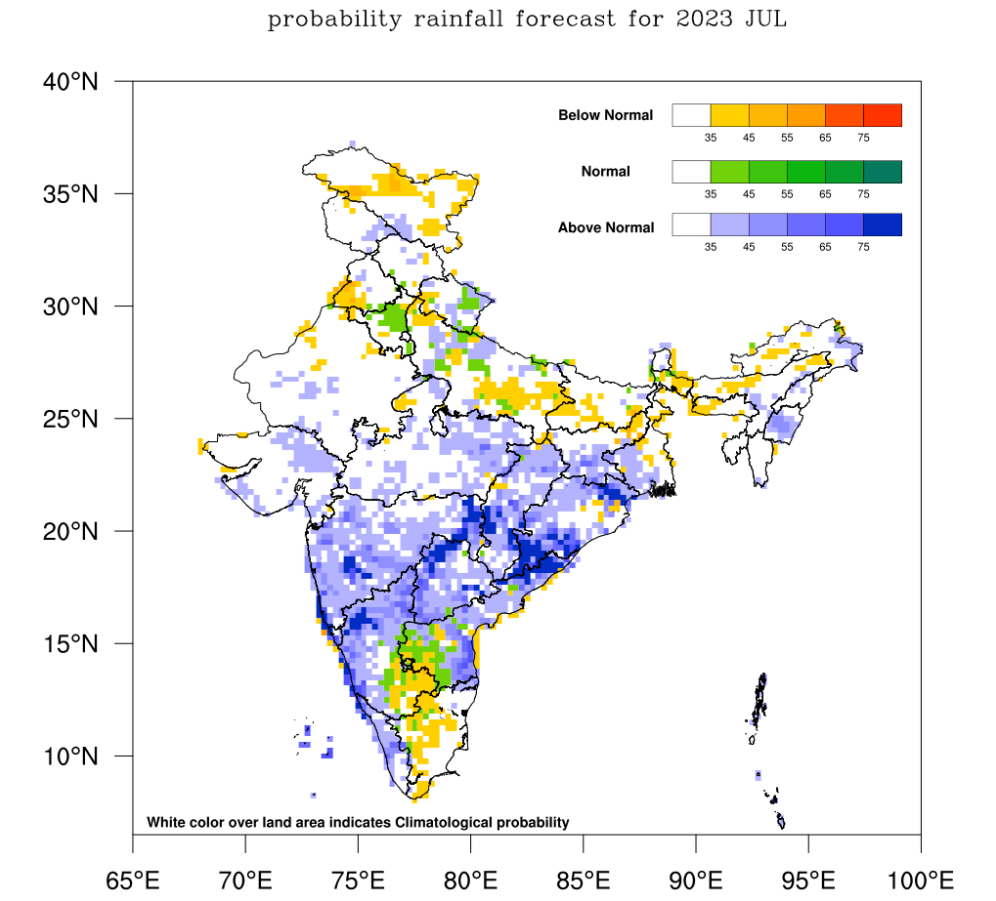
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

ERF based on UM coupled model : IC 29 June 2023





जुलाई 2023 के मासिक वर्षा वितरण का संभाव्य पूर्वानुमान



जुलाई 2023 के दौरान पूरे देश में औसत मासिक वर्षा सामान्य (एलपीए का 94 से 106%) और संभवतः सामान्य के सकारात्मक पक्ष के भीतर होने की संभावना है। 1971-2020 के आंकड़ों के आधार पर जुलाई के दौरान देश भर में वर्षा का एलपीए लगभग 280.4 मिमी है।

जुलाई 2023 के दौरान मध्य भारत के अधिकांश हिस्सों और आसपास के दक्षिण प्रायद्वीपीय और पूर्वी भारत और पूर्वोत्तर और उत्तर-पश्चिम भारत के कुछ क्षेत्रों में सामान्य से लेकर सामान्य से अधिक वर्षा होने की संभावना है। उत्तर-पश्चिम, उत्तर-पूर्व और दक्षिण-पूर्व प्रायद्वीपीय भारत के कई हिस्सों में सामान्य से नीचे वर्षा होने की संभावना है। भूमि क्षेत्र के भीतर सफेद छायांकित क्षेत्र जलवायु संबंधी संभावनाओं का प्रतिनिधित्व करते हैं।

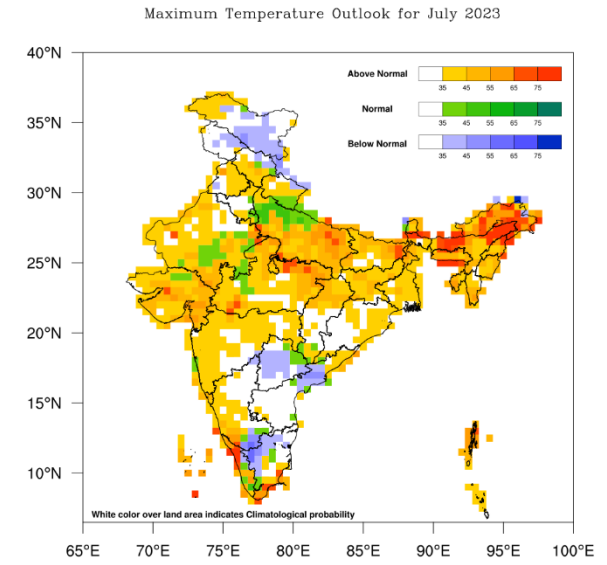
जुलाई 2023 के दौरान भारत में वर्षा की टर्साइल श्रेणियों* (सामान्य से नीचे, सामान्य और सामान्य से अधिक) की संभावना का पूर्वानुमान। यह आंकड़ा सबसे संभावित श्रेणियों के साथ-साथ उनकी संभावनाओं को भी दर्शाता है। भूमि क्षेत्र के भीतर सफेद छायांकित क्षेत्र जलवायु संबंधी संभावनाओं का प्रतिनिधित्व करते हैं। *टर्साइल श्रेणियों में प्रत्येक की समान जलवायु संबंधी संभावनाएँ 33.33% हैं।

जुलाई 2023 के दौरान देश भर में तापमान का संभावित पूर्वानुमान

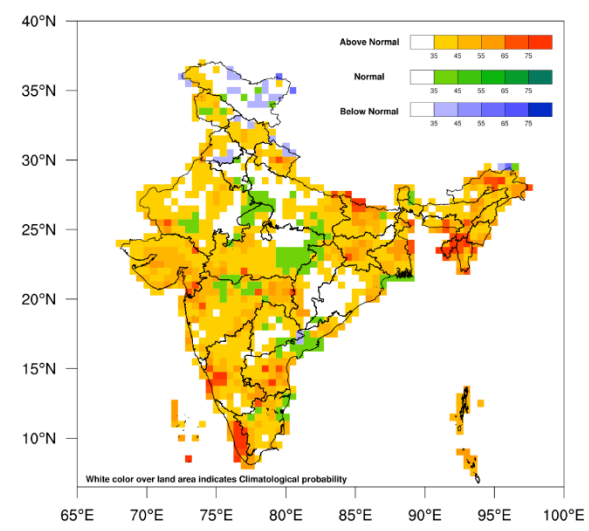
अधिकतम तापमान : जुलाई 2023 के दौरान, देश के अधिकांश हिस्सों में सामान्य से सामान्य से अधिक अधिकतम तापमान होने की संभावना है केवल उत्तर पश्चिम और प्रायद्वीपीय भारत के कुछ क्षेत्रों को छोड़कर, जहां अधिकतम तापमान सामान्य से नीचे रहने की संभावना है।

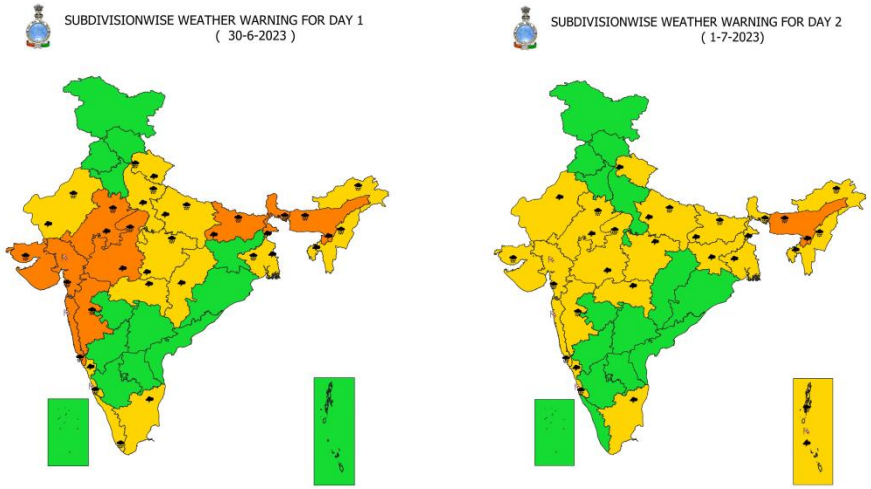
न्यूनतम तापमान : देश के अधिकांश हिस्सों में सामान्य से लेकर सामान्य से अधिक न्यूनतम तापमान होने की संभावना है केवल उत्तर-पश्चिम भारत के कुछ क्षेत्रों को छोड़कर, जहां सामान्य से नीचे न्यूनतम तापमान होने की संभावना है

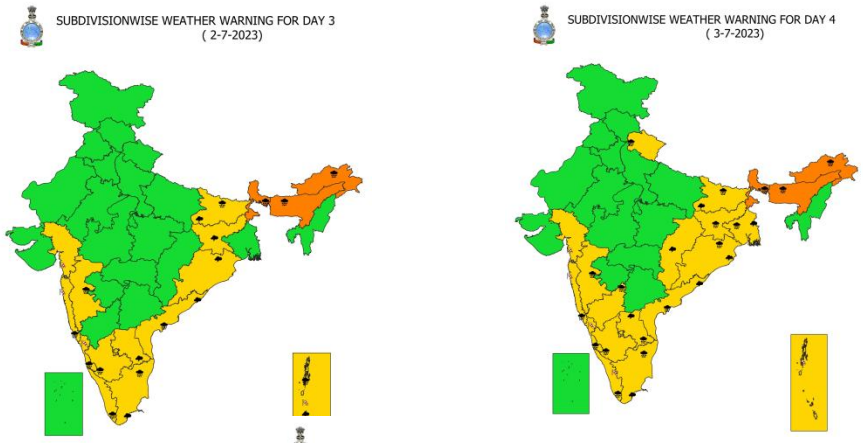
Maximum Temperature

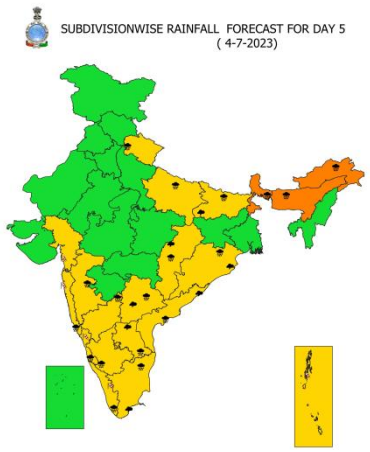


Minimum Temperature









Weather warning for next 5-days 30 June-4 July 2023

Northwest India: Isolated **Heavy rainfall** very likely over Uttarakhand on 30th June, 03rd & 04th July; West Rajasthan, West Uttar Pradesh on 30th June, East Uttar Pradesh and East Rajasthan on 30th June & 01st July. **Isolated Heavy to very Heavy rainfall** is very likely over East Uttar Pradesh and East Rajasthan on 30th June.

Central India: Isolated **heavy falls very likely** over Madhya Pradesh during next 2 days.

West India: **Isolated Heavy to very Heavy rainfall** is very likely over Konkan & Goa and Ghat areas of Madhya Maharashtra during next 5 days and Gujarat State during next 2 days.

East & adjoining Northeast India: Isolated **Heavy to Very Heavy falls** very likely over Sub-Himalayan West Bengal & Sikkim, Bihar, Assam & Meghalaya, Arunachal Pradesh during next 5 days. Isolated **heavy rainfall** also likely over Gangetic West Bengal on 30th June & 03rd July; Jharkhand on 03rd and Odisha on 03rd & 04th July.

South India: **Isolated heavy rainfall** also likely over Coastal Karnataka & Kerala during next 5 days; South Interior Karnataka & Tamil Nadu during 02nd-04th July; Coastal Andhra Pradesh & Rayalaseema on 03rd & 04th July; Telangana on 04th July. Isolated **very heavy rainfall** also likely over Coastal Karnataka, Kerala and Tamil Nadu on 03rd & 04th July.

Thank you
धन्यवाद