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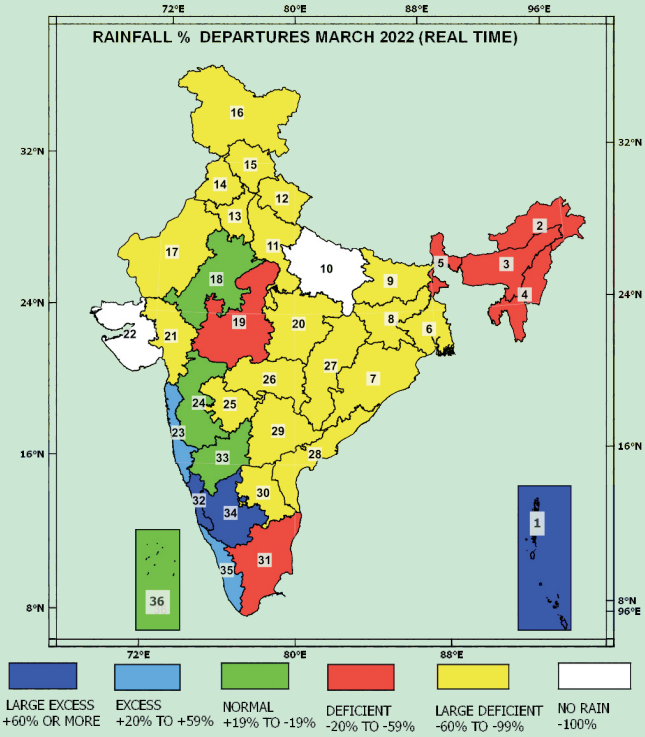
पृथ्वी विज्ञान मंत्रालय / MINISTRY OF EARTH SCIENCES
पृथ्वी प्रणाली विज्ञान संगठन / EARTH SYSTEM SCIENCE ORGANIZATION
भारत मौसम विज्ञान विभाग / INDIA METEOROLOGICAL DEPARTMENT

भारत का जलवायु नैदानिक बुलेटीन
CLIMATE DIAGNOSTICS BULLETIN OF INDIA

मार्च 2022
MARCH 2022

वास्तविक समय के आंकडो पर आधारित विश्लेषण
NEAR REAL - TIME ANALYSES



जलवायु निगरानी तथा प्रागुक्ती समूह
CLIMATE MONITORING AND PREDICTION GROUP

जलवायु अनुसंधान तथा सेवाएँ, पुणे
CLIMATE RESEARCH & SERVICES, PUNE

मार्च 2022(सारांश)
माह की मुख्य विशेषताएँ

प्रमुख बिंदु :

पूरे भारत का माध्य तापमान (26.669^{0}से) 1901 से दुसरा सबसे अधिक रहा । पूरे भारत का अधिकतम तापमान (33.1^{0}से) 1901 से सबसे अधिक रहा । पूरे भारत का न्युनतम तापमान (20.24^{0}से) 1901 से तिसरा सबसे अधिक रहा । माह का माध्य, अधिकतम, न्युनतम तापमान दक्षिण प्रायद्विप को छोड के बाकी समरुपी क्षेत्रों मे (पूर्व और उत्तर-पूर्व भारत, मध्य भारत, उत्तर-पश्चिम भारत) 1901 से पहला, दुसरा, तिसरा या चौथा सबसे अधिक रहा ।

उष्ण लहर की स्थिति :

माह मे जम्मु, पश्चिमि राजस्थान, पूर्वी राजस्थान, गुजरात, सौराष्ट्र और कच्छ, ओडिशा,हिमाचल प्रदेश, हरयाणा, चंदिगड, दिल्ली,उत्तराखंड, पश्चिमि मध्य प्रदेश, पूर्वी मध्य प्रदेश, पूर्वी उत्तर प्रदेश, पश्चिम उत्तर प्रदेश, कोंकण,विदर्भ के कुछ भाग उष्ण लहर की चपेट में थे ।

वर्षा की विशेषताएँ :

36 मौसम उप मंडलों में से 3 में अत्यधिक, 2 में अधिक, 4 में सामान्य, 6 में सामान्य से कम, 19 उप मंडलो में सामान्य से काफी कम तथा 2 उप मंडल में बिल्कुल वर्षा नहीं हुई (आकृती 1) । तालिका 1 में मार्च, 2022 के उप मंडल-वार वर्षा के आँकडे (मि. मी.) दर्शाए गए है । आकृती 2 (ए) में माह के दौरान देश के विभिन्न भागों में हुई वर्षा (मि. मी.) दर्शायी गयी है । आकृती 2 (बी) में माह के दौरान देश के विभिन्न भागों में हुई वर्षा कि विसंगति (मि. मी.) दर्शायी गयी है ।

आकृती 3 में माह के पूरे देश के साप्ताहिक क्षेत्र भारित संचित वर्षा का प्रतिशत विचलन दर्शाया गया है । संचयी साप्ताहिक वर्षा विसंगति पूरे महीने मे सामान्य से कम थी । पूरे देश में, माह के दीर्घावधी औसत मान का 29% वर्षा हुई । आकृती 4 (ए) में वर्ष 1951 से अब तक के सम्पूर्ण भारत की क्षेत्र भारित वर्षा की श्रृंखला दर्शाई गयी है । आकृती 4(बी) में वर्ष 1951 से चार समरुपी क्षेत्रों की भारित वर्षा की श्रृंखला दर्शाई गई है । माह की वर्षा भारत के दक्षिण प्रायद्विप में (एल.पी.ए. का 86 %), पूर्व और उत्तर-पूर्व भारत में (एल.पी.ए. का 45 %), मध्य भारत में (एल.पी.ए. का 13 %) तथा उत्तर-पश्चिम भारत में (एल.पी.ए. का 11 %) रही । तालिका 2 में माह के दौरान 24 घंटों में हुई भारी (64.5 से 115.5 मि. मी तक), अति भारी (115.6 से 204.4 मि. मी. तक), या अत्यधिक भारी (≥ 204.5 मि. मी. या अधिक) वर्षा वाले स्टेशनों की सूची दर्शाई गई है । आकृती 5 मे भारी वर्षा वाले स्टेशन दर्शाए गए है ।

मानकीकृत वर्षण सूचकांक (एस.पी.आई.):

मानकीकृत वर्षण सूचकांक अनावृष्टि मापने का एक सूचकांक है जो केवल वर्षा पर आधारित होता है । यह सूचकांक शुष्क स्थिति में ऋणात्मक और आर्द्र स्थिति में धनात्मक होता है । जब शुष्क या आर्द्र मौसम की स्थिति अधिक भीषण होती है, तब सूचकांक अधिक ऋणात्मक या धनात्मक होता है । आकृती 6 (ए, बी, सी) में मार्च 2022, जनवरी - मार्च 2022 (3 माह के संचित) तथा जून 2021 - मार्च 2022 (10 माह के संचित) के मानकीकृत वर्षण सूचकांक दर्शाए गए हैं ।

मार्च माह के दौरान अन्दमान और निकोबार द्वीपसमूह, पूर्वी राजस्थान, दक्षिणी आंतरिक कर्नाटक में चरम आर्द्र / प्रचंड आर्द्र स्थितियाँ रहीं, जबकी अरुणाचल प्रदेश, आसाम और मेघालय,नागालँड मणिपुर मिझोराम, त्रिपुरा, उत्तराखंड, हिमाचल प्रदेश और जम्मु कश्मीर और लदाख के कुछ भागों में चरम शुष्क / प्रचंड शुष्क स्थितियाँ रहीं ।

दाब :

आकृती 7(ए) तथा 7(बी) क्रमशः माध्य समुद्र स्तर दाब तथा इसकी विसंगति दर्शाते है । अधोरेखा द्वारा ऋणात्मक मान दर्शाए गए हैं ।

पवन :

आकृती 8(ए) तथा 8(बी), 9(ए) तथा 9(बी), 10(ए) तथा 10(बी) में क्रमशः पवन का 850, 500 और 250 एच.पी.ए. स्तरों पर माध्य परिसंचरण स्वरुप तथा इसकी विसंगति को दर्शाता है ।

वेग विभव तथा धारा कृत्य (वेलोसिटी पोटेन्शियल और स्ट्रीम फंक्शन):

आकृती 11(ए) तथा 11(बी) में 250 एच.पी.ए. स्तर पर माध्य वेग विभव तथा इसकी विसंगति को दर्शाया गया है । इसी प्रकार चित्र 12(ए) तथा 12(बी) में 850 एच.पी.ए. स्तर पर माध्य धारा कृत्य तथा इसकी विसंगति को दर्शाते हैं । अधोरेखा द्वारा ऋणात्मक मान दर्शाये गए हैं ।

बहिर्गामी दीर्घतरंग विकिरण (ओ.एल.आर.):

भारत के क्षेत्रों तथा आसपास की बहिर्गामी दीर्घतरंग विकिरण (वॉट/मी^{2}) आकृती 13 में दर्शाई गई हैं ।

तापमान :

माध्य मासिक अधिकतम तथा न्युनतम तापमान विसंगति आकृती 14(ए) तथा 14(बी) में दर्शाई गई हैं ।

उष्ण दिनों / शीत रात्रियों का प्रतिशत :

आकृती 15(ए) तथा 15(बी) में अधिकतम (न्युनतम) तापमान जब 90वें (10 वें) पर्सेंटाइल से अधिक (कम)वाले दिनों का प्रतिशत दर्शाया गया हैं । चित्र 16 में पूरे देश में मार्च माह में 1971 से अब तक के माध्य तापमान दर्शाये गए हैं । 5 वर्ष के चल औसत भी दर्शाये गए हैं । इस वर्ष के मार्च माह का माध्य तापमान 26.669^{0}से. रहा, जो सामान्य से अधिक था । आकृती 17(ए) तथा 17(बी) में चारों समरुपी क्षेत्रों के वर्ष 1971 से अब तक के मार्च माह के दौरान रहे अधिकतम और न्युनतम तापमानों की श्रृंखला दर्शाई गई हैं । तालिका 3 मे माह के दौरान की तापमान विसंगति दर्शाइ गयी है।

भारत के कुछ स्थानों जैसे कोलकता, नई दिल्ली, नागपुर, चेन्नई, एवं मुम्बई का दैनिक अधिकतम तापमान (डिग्री सें) चित्र 18 में दर्शाये गये है ।

निम्न दाब प्रणालियाँ :

इस माह बंगाल की खाडी मे दो अवदाब बने। चित्र 19 में इन निम्न दाब प्रणालियों का मार्ग दर्शाया गया हैं ।

हिन्द एवं प्रशान्त महासागरों पर समुद्री सतह तापमान विसंगति :

आकृती 20 उष्ण कटिबंधीय हिन्द एवं प्रशांत महासागरों पर समुद्री सतह तापमान विसंगति दर्शाता है।

दक्षिणी दोलन सुचकांक तथा प्रशांत समुद्री सतह तापमान सुचकांक :

दक्षिणी दोलन सुचकांक (तालिका 4) इस माह के दौरान धनात्मक (2.9) रहा ।

एम.एम.सी.एफ.एस. एन्सो पूर्वानुमान :

आकृती 21 आने वाले ऋतुओं के लिये का एम.एम.सी.एफ.एस. एन्सो पूर्वानुमान दर्शाता है ।

आपत्कालीन घटनाए :

आकृती 22 आपत्कालीन घटनाए दर्शाता है ।

MARCH-2022

MAIN FEATURES OF THE MONTH

Highlights:

In March, All India mean temperature (26.679°C with an anomaly of 1.61°C) was 2nd highest after the year 2010 (26.672°C). All India maximum temperature (33.10°C with anomaly 1.86°C) was the highest and minimum temperature (20.24°C with anomaly 1.37°C) was the 3rd highest after the years 1953 (20.26°C), 2010 (20.25°C) since 1901. Over Northwest India mean temperature (22.99°C with anomaly 3.22°C) was 2nd highest after the year 2010 (23.02°C), maximum temperature (30.73°C with anomaly 3.91°C) was the highest and minimum temperature (15.26°C with anomaly 2.53°C) was 2nd highest after the year 2010 (15.4°C) since 1901. Over East & Northeast India mean temperature (25.2°C with an anomaly of 1.8°C) was the highest, maximum temperature (32.45°C with an anomaly of 2.25°C) was 3rd highest after the years 1909 (33.03°C), 1924 (32.88°C) and minimum temperature (17.94°C with anomaly 1.36°C) were 2nd highest after the year 1953 (18.73°C) since 1901. Over central India mean temperature (28.02°C with an anomaly of 1.42°C) was 3rd highest after the years 1953 (28.12°C), 2010 (28.06°C), and the maximum temperature (35.2°C with an anomaly of 1.62°C) were 2nd highest after the year 1953 (35.3°C) and minimum temperature (20.84°C with anomaly 1.22°C) were 4th highest since 1901.

Rainfall realized over the country as a whole was 29% of its LPA during the month. Rainfall over all India (8.9 mm) was the third lowest since 1901 after the years 1901 (7.2 mm), and 1908 (8.7 mm).

Heatwave conditions:

The heat wave/severe heatwave conditions were observed mainly over northern, northwestern India, and central India. The following table gives subdivisions wise occurrences of no of days of heat wave/severe heat wave during March 2022.

No. of days of Heat Wave/ Severe Heat Wave during March 2022				
Part/Sub div	Most places	Many places	Few places	Isolated places
Jammu	1		2	5
West Rajasthan	5	2	3	1
East Rajasthan		1	2	
Gujarat Region			1	4
Saurashtra & Kutch		1		6
Odisha				1
Himachal Pradesh		5	2	4
Haryana, Chandigarh & Delhi			1	1
Uttarakhand				5
West Madhya Pradesh			4	7
East Madhya Pradesh			3	
West Uttar Pradesh				2
East Uttar Pradesh				1
Konkan			2	1
Vidarbha		2		

MOST PLACES (76-100%), MANY PLACES (51% to 75%), FEW PLACES (26% to 50%), ISOLATED (up to 25%)
Data Source: Weekly weather report, New Delhi

Rainfall Features:

Most of the sub-divisions of the country received deficient/large deficient rainfall except a few like both the islands, Karnataka state, Kerala & Mahe, Konkan & Goa, Madhya Maharashtra, and east Rajasthan. The magnitude of negative percentage departure was more than 90 % over Gangetic West Bengal, Odisha, Jharkhand, Bihar, Uttar Pradesh state, Uttarakhand, Haryana,

Chandigarh & Delhi, Punjab, Himachal Pradesh, East Madhya Pradesh, Gujarat state, Vidarbha and Chhattisgarh. Out of 36 meteorological subdivisions, 3 received large excess rainfall, 2 received excess rainfall, 4 received normal rainfall, 6 received deficient rainfall and 19 received largely deficient rainfall and 2 subdivisions received no rain (Fig.1). Table 1 shows the subdivision-wise rainfall statistics (mm) for March 2022.

Fig. 2(a) shows the spatial pattern of rainfall (mm) received during February month. East and Northeastern parts, Kerala & Mahe, and Andaman & Nicobar Islands received more than 50 mm rainfall. Parts of Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Assam & Meghalaya, and Andaman & Nicobar Islands received more than 150 mm of rainfall. Some parts of Arunachal Pradesh, Assam & Meghalaya, and Andaman & Nicobar Islands received more than 200 mm of rainfall.

Fig. 2(b) shows the spatial pattern of rainfall anomaly (mm) during the month. A positive rainfall anomaly of more than 50 mm was observed over parts of Arunachal Pradesh, Assam & Meghalaya Andaman & Nicobar Islands. The magnitude of the negative rainfall anomaly was more than 50 mm over parts of Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub Himalayan West Bengal & Sikkim, Jammu & Kashmir and Ladakh, Himachal Pradesh and Uttarakhand. The magnitude of the negative rainfall anomaly was more than 100 mm over parts of Arunachal Pradesh, Jammu & Kashmir and Ladakh, Himachal Pradesh, and Uttarakhand.

Fig. 3 shows the area-weighted cumulative weekly/periodically rainfall percentage departure over the country as a whole for February month. Cumulative rainfall departure was negative during all the weeks of the month. **Rainfall realized over the country as a whole was 29% of its LPA during the month. Rainfall averaged over India (8.9 mm) was the third lowest since 1901 after the years 1901 (7.2 mm), and 1908 (8.7 mm).**

Fig. 4(a) shows the all India area weighted rainfall series for February month since 1951. Fig.4 (b) shows the area-weighted rainfall series for February month over the four homogeneous regions since 1951. The rainfall realized during the month was 86% of its LPA over south peninsular India, 45% of its LPA over east & northeast India, 13 % of its LPA over central India, and 11% of its LPA over northwest India.

Table 2 gives the list of stations that received heavy (64.5 mm to 115.5 mm), very heavy (115.6 to 204.4 mm), or extremely heavy ($\geq$ 204.5mm) rainfall within 24 hours during the month. Fig. 5 depicts stations that received heavy (64.5 to 115.5 mm), very heavy (115.6 to 204.4 mm), or extremely heavy ($\geq$ 204.5 mm) rainfall.

Standardized Precipitation Index:

The Standardized Precipitation Index (SPI) is an index used for monitoring drought and is based only on precipitation. This index is negative for dry and positive for wet conditions. As the dry or wet conditions become more severe, the index becomes more negative or positive respectively. Fig 6(a, b, and c) gives the SPI values for the month of March 2022, January-March 2022 (3 months cumulative), and June 2021 - March 2022 (10 months cumulative) respectively.

During March, extremely wet/severely wet conditions were observed over parts of A & N Islands, East Rajasthan and South Interior Karnataka while, extremely dry/severely dry conditions were observed over parts of Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Uttarakhand, Himachal Pradesh, and Jammu & Kashmir.

Cumulative SPI values of the past three months show extremely wet/severely wet conditions over parts of A & N Islands, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Jharkhand, Bihar, Uttar Pradesh state, Haryana, Chandigarh & Delhi, Punjab, Himachal Pradesh, Rajasthan state, East Madhya Pradesh, Saurashtra & Kutch, Chhattisgarh, Telangana and Tamilnadu, Puducherry & Karaikal while, extremely dry/severely dry conditions were observed over parts of Jammu & Kashmir.

Cumulative SPI values of the past ten months indicate that extremely wet/severely wet conditions were observed over parts of A & N Islands, Gangetic West Bengal, Odisha, Jharkhand, Bihar, East Uttar Pradesh, Uttarakhand, Haryana, Chandigarh & Delhi, Punjab, East Rajasthan, West Madhya Pradesh, Konkan & Goa, Madhya Maharashtra, and Marathawada while, extremely dry/severely dry conditions were observed over parts of Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Jharkhand, East Uttar Pradesh, and Jammu & Kashmir.

Pressure & Wind:

Figs.7(a) & 7(b) show the mean sea level pressure & its anomalies respectively. The pressure anomaly was negative over most parts of the country except for some parts of South Interior Karnataka. The negative pressure anomaly was within the range of -0.5 to -2.0 hPa over most parts. A negative pressure anomaly exceeding -3.0 hPa was observed over parts of Sub-Himalayan West Bengal & Sikkim, West Rajasthan, and Coastal Karnataka.

Figs. 8(a) & 8(b), 9(a) & 9(b) and 10(a) & 10(b) shows the mean circulation patterns and its anomalies at 850, 500 & 250 hPa levels respectively. At 850 hPa level, an anomalous cyclonic circulation was seen over the entire Bay of Bengal. At 500 hPa level, anomalous cyclonic circulation was observed over the central, south peninsula, and adjoining Arabian sea and Bay of Bengal. At the 250 hPa level, anomalous easterlies prevailed over the entire Indian region.

Velocity Potential & Stream Function:

Figs. 11(a) & 11(b) show the 250 hPa mean Velocity Potential & its anomalies. Similarly, Figs. 12(a) & 12(b) show the mean stream function & its anomalies at 850 hPa level. Negative values are indicated by dashed lines. Anomaly in the stream function at 850 hPa level was negative over the entire country. Anomaly in the velocity potential at 250 hPa level was positive over most parts of the country except extreme northeastern parts.

Outgoing Long Wave Radiation (OLR):

OLR anomaly (W/m^2) over the Indian region and neighbourhood is shown in Fig 13. OLR anomaly was positive over the entire country except for the extreme south peninsula and adjoining Bay and Arabian sea and was within ±10 W/m^2. OLR anomaly was less than -10 W/m^2 over south-central parts of the Bay of Bengal.

Temperature:

Mean monthly maximum and minimum temperature anomalies are shown in Figs. 14(a) & 14(b) respectively. The maximum temperature was above normal over most parts of the country except for some parts of south peninsular India. The maximum temperature anomaly was more than 4°C over parts of Jammu, Kashmir & Ladakh, Himachal Pradesh, Uttarakhand, Punjab, Haryana, and Chandigarh & Delhi, West Uttar Pradesh, West Rajasthan, northern Saurashtra & Kutch, Arunachal Pradesh, Assam & Meghalaya, and Nagaland. The maximum temperature anomaly was more than 5°C over parts of Jammu, Kashmir & Ladakh, Himachal Pradesh, Uttarakhand, and West Rajasthan. The maximum temperature anomaly was less than -1°C over parts of Tamil Nadu, Puducherry & Karaikal.

The minimum temperature was above normal over most parts of the country except for some parts of central India, south peninsular India, and Lakshadweep. The minimum temperature anomaly was more than 3°C over parts of Jammu, Kashmir & Ladakh, Himachal Pradesh, Uttarakhand, Punjab, Rajasthan state, East Uttar Pradesh, Bihar, and Sikkim. The minimum temperature anomaly was more than 4°C over parts of Ladakh, Himachal Pradesh, Uttarakhand, Punjab, West Rajasthan, and Bihar. The minimum temperature anomaly was less than -1°C over parts of Andhra Pradesh state, Telangana, and South Interior Karnataka.

Some stations even recorded the highest maximum temperature for the month. A list of stations is given below with their previous record and date.

STATION NAME	NEW RECORD. (^{0}C)#	DATE (MAR 22)	PREVIOUS RECORD (^{0}C)	DD/MM/YYYY
Cherrapunji*	29.8	14	28.3	21-03-2010
Dibrugarh AP	35.2	18	34.5	19-03-2010
Passighat	34.8	19	34	27-03-1973
Agra	42.5	31	41.5	31-03-1994
Aligarh	40.6	31	40.1	16-03-1977
Deharadun	36.1	31	35.8	31-03-2017
Jhansi	42.5 @	31	42.5	22-03-2004
Ambala	37.9	29	37.6	25-03-2010
Karnal	38.4	30	37.5	26-03-1977
Ferozepur	38.9	29	35.3	28-03-1972
Patiala	38.8	30	37.6	24-03-2010
Shimla*	26.3	17	25.7	30-03-2017
Jammu AP	37.3	27	36.5	24-03-2010
Srinagar*	27.6	29	27.3	27-03-1971
Bikaner	42.5	30	42.2	29-03-2017
Ganganagar	42.2	29	41.6	22-03-2010
Jaisalmer	42.7	17	42.3	28-03-2017
Phalodi	43 @	17	43	30-03-1999
Gwalior	41.8	31	41.5	23-03-2004
Nowgong	42.6	31	42.2	28-03-1977
Panchmarhi	35.8	31	35	28-03-1971
Pendra	40.4	31	40	26-03-2010
Sagar	41.3	31	40.5	22-03-2004
Satna	42	31	41.1	23-03-2004
Umaria	41.3	31	41	31-03-1994
Akola	43.2 @	30	43.2	31-03-2007
Chandrapur	44.2	30	43.9	24-03-2010
Sholapur	42.8	30	42.7	24-03-2004
Minicoy	34.6 @	25	34.6	25-03-2018

(# based on real-time available data) @ equals previous record

Percentage of Warm days / Cold nights:

Fig 15(a) &15(b) show the percentage of days when the maximum (minimum) temperature was more (less) than the 90th (10th) percentile. Over some parts of Kerala & Mahe, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Jammu & Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Haryana, Chandigarh & Delhi, Punjab, and West Rajasthan maximum temperature was greater than 90th percentile for more than 60 % of the days of the month. For minimum temperature, no such significant distribution was observed.

Fig.16 shows the mean temperature series for the country as a whole for March since 1971. Five-year moving average values are also shown. The mean temperature for March 2022 was 26.669^{o}C with an anomaly of 1.61^{o}C and 2nd highest after the year 2010 (26.672^{o}C) since 1901. Mean temperature over East & Northeast India (25.2^{o}C) was highest, Northwest India (22.99^{o}C) was second highest after the year 2010 (23.02^{o}C), Central India (28.02^{o}C) was third highest after the

years 1953 (28.12°C), 2010 (28.06°C) since 1901 and South Peninsular India (28.8°C) was fourth highest since 1901.

Fig. 17(a) & 17(b) shows the maximum and minimum temperature series respectively for the country as a whole and the four homogeneous regions during March month since 1971. Both maximum and minimum temperatures were above normal over all the homogeneous regions. Maximum temperature over all India (33.1°C) was highest, Northwest India (30.73°C) was also highest, Central India (35.2°C) was second highest after the year 1953 (35.3°C), East & Northeast India (35.2°C) was third highest after the years 1909 (33.03°C),1924 (32.88°C) and South Peninsular India (33.56°C) was ninth highest since 1901. Minimum temperature over Northwest India (15.26°C) was second highest after the year 2010 (15.4°C), East & Northeast India (17.94°C) was also second highest after the year 1953 (18.73°C), all India (20.24°C) was third highest after the years 1953 (20.26°C), 2010 (20.25°C), Central India (20.84°C) was fourth and South Peninsular India (20.24°C) was sixth highest since 1901.

Table 3 gives temperature anomalies over India and four homogeneous regions during February month. The maximum temperature was above normal by equal to or more than 7^0C over some stations of northwest India, east & northeast India, and central India for many days during the month. The minimum temperature was above normal by equal to or more than 5^0C over some stations of northwest India and east & northeast India for many days during the month. The following table gives the list of stations and the number of days (frequency) for which the maximum temperature was above normal by equal to or more than 7^0C (compared to 1981-2010 normal) for equal or more than five days while the minimum temperature was above normal by equal or more than 5^0C (compared to 1981-2010 normal) for equal or more than five days during the month.

MAXIMUM TEMPERATURE		MINIMUM TEMPERATURE	
STATION	FREQUENCY	STATION	FREQUENCY
CHERRAPUNJI	7	DARJEELING	20
DIBRUGARH	11	MOTIHARI	5
PASIGHAT	13	MUZAFFARPUR	8
MUSSOORIE	13	PURNEA	8
FEROZEPUR	14	SABOUR	8
DHARAMSHALA	18	BAHRAICH	7
BANIHAL	18	LUCKNOW	6
GULMARG	18	MUKTESWAR	12
SRINAGAR	15	AMBALA	9
BARMER	5	SHIMLA	17
BIKANER	10	GANGANAGAR	14
GANGANAGAR	14	JAIPUR	12
JAISALMER	5		
NEW KANDLA	5		

Fig. 18 shows the daily maximum temperature recorded over some major stations of the country viz. Kolkata, New Delhi, Nagpur, Chennai, and Mumbai during the month.

Low-Pressure System:

During the month, two Deep depressions formed over the Bay of Bengal. First intense low-pressure system; Deep Depression of the pre-monsoon season formed during the period 3 - 6 Mar over southwest Bay of Bengal. The second depression of the month formed during the period 20 –

22 Mar over the Bay of Bengal and adjoining the Andaman sea. Fig. 19 shows the track of these systems.

The details of the systems are given in the table below:

1. Deep depression (3 - 6 Mar, 2022)

Date/time	Intensity	(Long.°E/Lat.°N)	Area	Past Movement
		85.2/4		
03/03,00Z	D	84/5.3	over southwest Bay of Bengal and adjoining equatorial Indian Ocean	North Westward
03/03,03Z	D	83.7/5.6	over southwest Bay of Bengal and adjoining equatorial Indian Ocean	North Westward
03/03,12Z	D	83.2/7.1	over southwest Bay of Bengal	North North Westward
4/3,03Z	D	82.9/8.9	over southwest Bay of Bengal	Northward
4/3,12Z	DD	82.7/10	southwest Bay of Bengal	Northward
5/3,03Z	DD	82.6/11.4	southwest Bay of Bengal	North Westward
5/3,12Z	DD	82.5/11.7	southwest Bay of Bengal	South Westward
5/3,18Z	D	82.4/11.5	southwest Bay of Bengal	South Westward
6/3,03Z	WML	82/13	southwest Bay of Bengal	

2. Deep depression (20 - 22 Mar, 2022)

Date/time	Intensity	(Long.° E/Lat. °N)	Area	Past Movement
		92.3/9		
20/3,00Z	D	92.5/9.8	southeast Bay of Bengal and adjoining south Andaman Sea	Northward
20/3,03Z	D	92.6/10.1	southeast Bay of Bengal and adjoining south Andaman Sea	north north eastward
20/3,12Z	D	93.2/10.9	southeast Bay of Bengal and adjoining south Andaman Sea	north north eastward
21/3,00Z	DD	93.7/11.9	southeast Bay of Bengal and adjoining south Andaman Sea	Northward
21/3,03Z	DD	93.8/12.3	southeast Bay of Bengal and adjoining south Andaman Sea	Northward
21/3,12Z	DD	94/13.3	north Andaman sea and adjoining southeast and east central Bay of Bengal	Northward
22/3,03Z	DD	94.2/15.2	north Andaman sea and adjoining east central Bay of Bengal	north north eastward
22/3,12Z	D	94.4/16.6	coastal Myanmar and adjoining east central Bay of Bengal	north north eastward
23/3,03Z	WML	94.6/17.4	coastal Myanmar and adjoining east central Bay of Bengal	

DD: Deep Depression, D: Depression, WML: Well Marked Low

SST anomaly over the Indian & Pacific Oceans:

Fig. 20 shows the anomaly in sea surface temperature over the tropical Indian and Pacific Oceans. In March 2022 negative SSTs were observed across the central, eastern, and southeastern tropical Pacific Ocean, and positive SSTs were observed over the western tropical Pacific Ocean. In the north Indian Ocean, positive SSTs anomalies were observed over the north Arabian Sea and the north Bay of Bengal.

SOI and Pacific SST Index:

SOI (Table 4) was positive (2.9) during February month. Sea surface temperature was below normal over all the NINO regions by about 0.6° C.

Fig. 21 shows Monsoon Mission Coupled Forecast System (MMCFS) model forecast for ENSO conditions for the coming seasons. Currently, La Niña conditions are prevailing over the equatorial Pacific region. The latest MMCFS forecast indicates that the La Niña conditions are likely to continue throughout the forecast period. Other climate models are also indicating enhanced probability for La Niña conditions during the upcoming season.

Significant Weather Events during March 2022:

Fig. 22 shows significant weather events during the month (based on real-time media reports).

From 1st March to 31st March, a total of 3 persons were reportedly claimed dead & 4 livestock perished. The details of causalities are given below, which are based on real-time media reports.

Lightning: A total of 2 persons were reportedly claimed dead & 4 livestock perished, from 1st March to 31st March, because of Lightning. The details of the area affected by the events are summarized and given in the table below;

DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
7, 8, 9 Mar.	2			4	Dhule, Nashik (Maharashtra)

Heat Wave: A total of 1 person reportedly claimed dead, from 1st March to 31st March, because of Heat Wave. The details of the area affected by the events are summarized and given in the table below;

DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
31 Mar.	1				Jalgaon (Maharashtra)

Also, damage to crops was reported on the 8th & 9th of March in Dhule, Jalgaon, Nandurbar, and Nashik districts of Maharashtra due to Hailstorm & Heavy Rains.

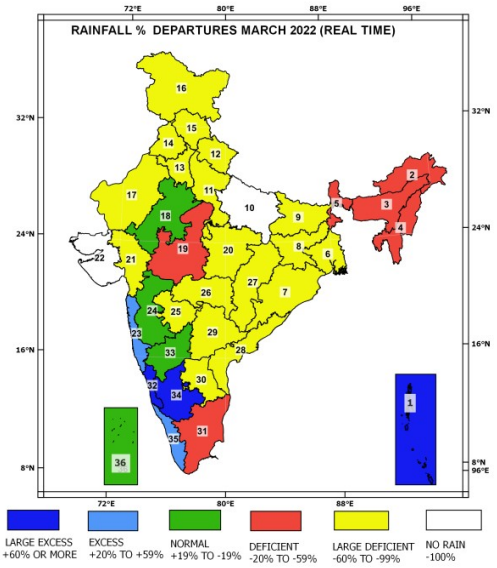


FIG. 1: SUBDIVISIONWISE RAINFALL PERCENTAGE DEPARTURE: MARCH 2022

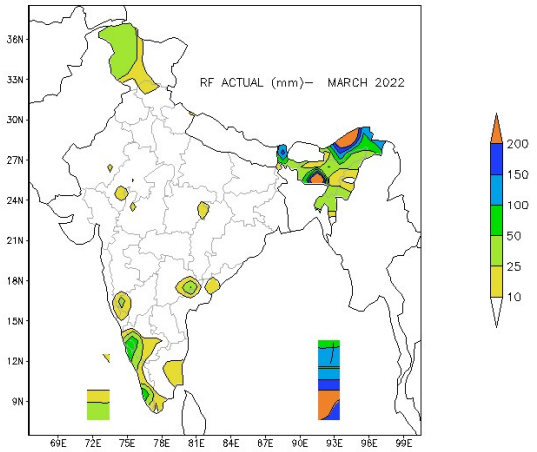


FIG. 2(a): MONTHLY RAINFALL (mm)

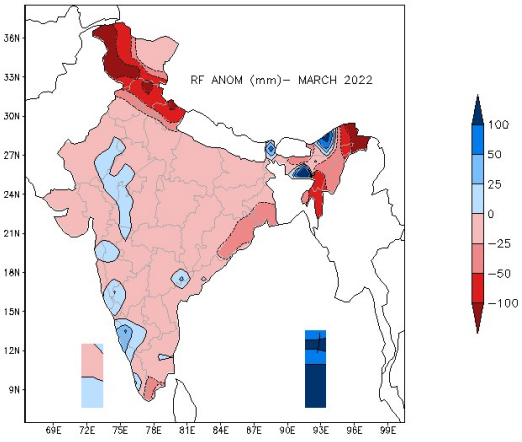


FIG2. (b): MONTHLY RAINFALL ANOMALY (mm)

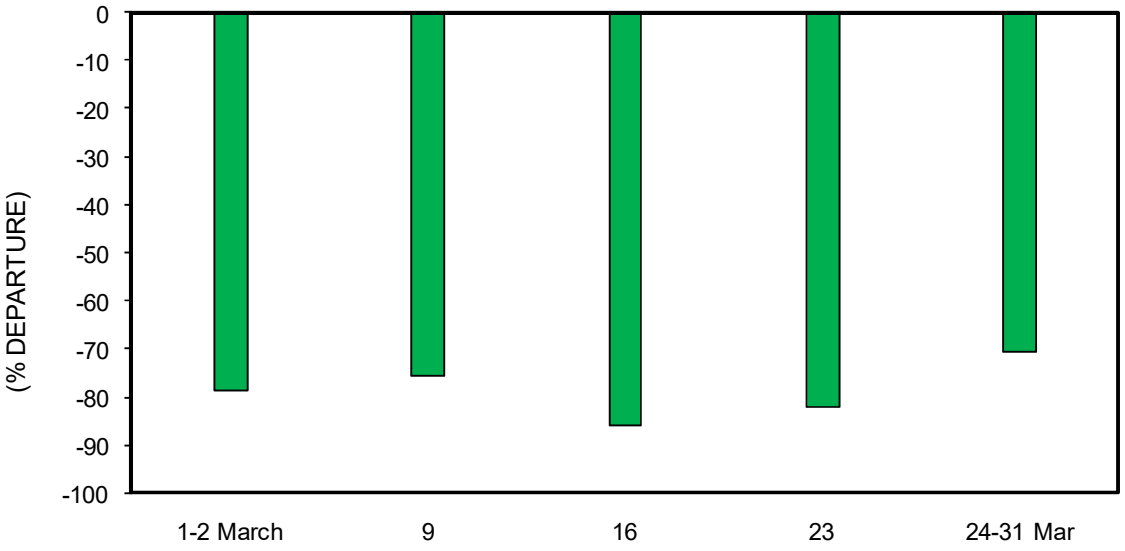


FIG. 3: ACCUMULATED PERCENTAGE DEPARTURE OF AREA-WEIGHTED WEEKLY RAINFALL OVER THE COUNTRY AS A WHOLE DURING MARCH 2022

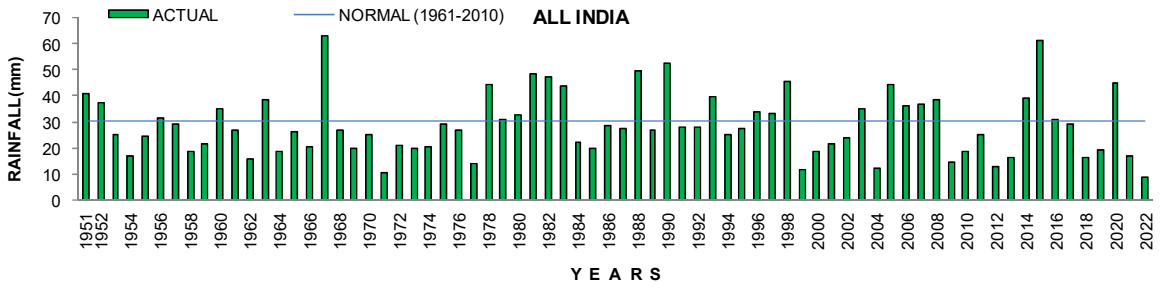


FIG. 4(a): TIME SERIES OF AREA WEIGHTED RAINFALL OVER THE COUNTRY AS A WHOLE FOR THE MONTH OF MARCH (1951-2022)

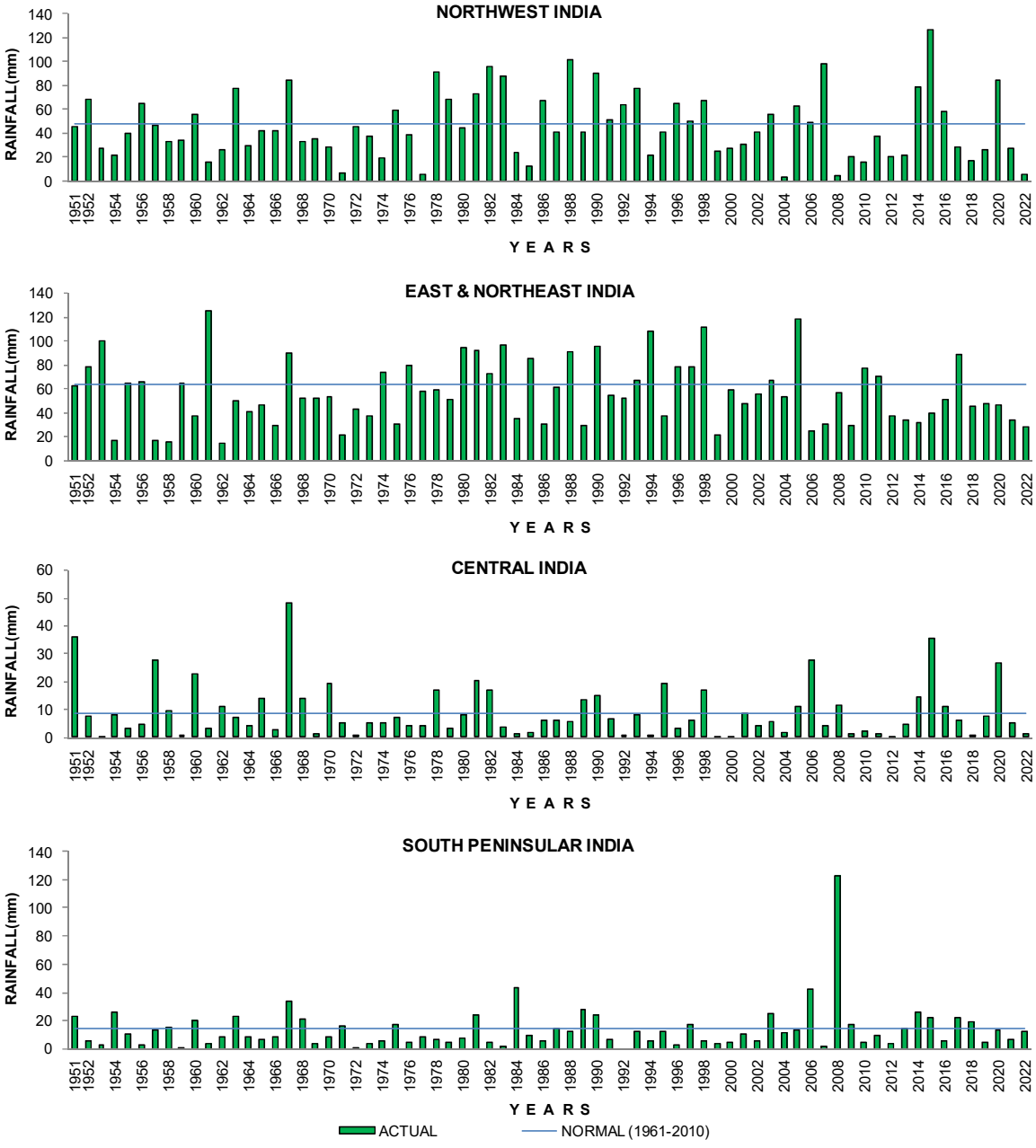


FIG.4 (b): TIME SERIES OF AREA WEIGHTED RAINFALL OVER THE FOUR HOMOGENEOUS REGIONS FOR THE MONTH OF MARCH (1951 - 2022)

(a)

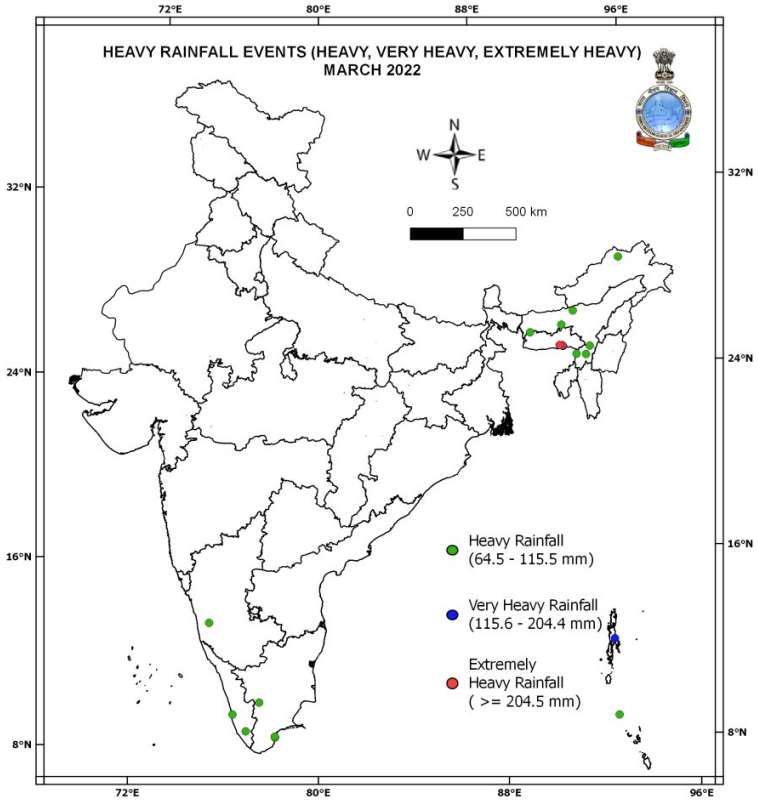
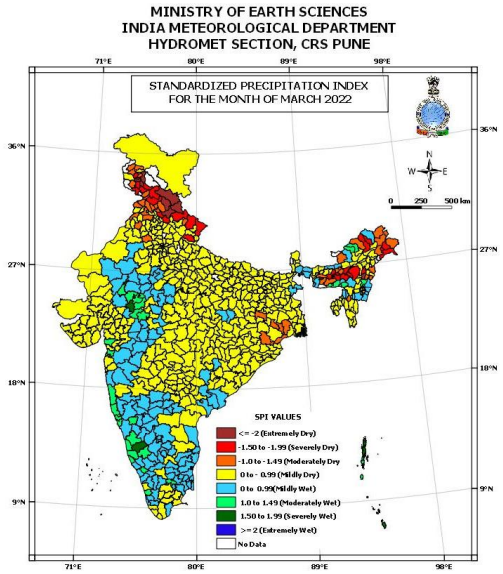
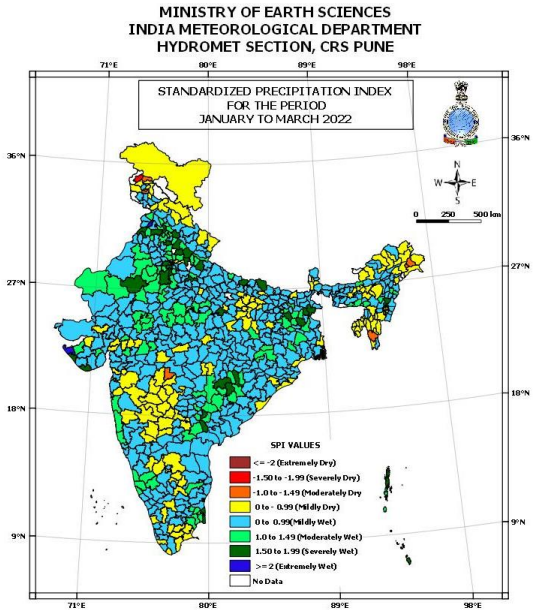


FIG. 5: STATIONS THAT RECEIVED HEAVY RAINFALL DURING MARCH 2022

(a) MARCH 2022



(b) JANUARY- MARCH 2022



(C) JUNE 2021 – MARCH 2022

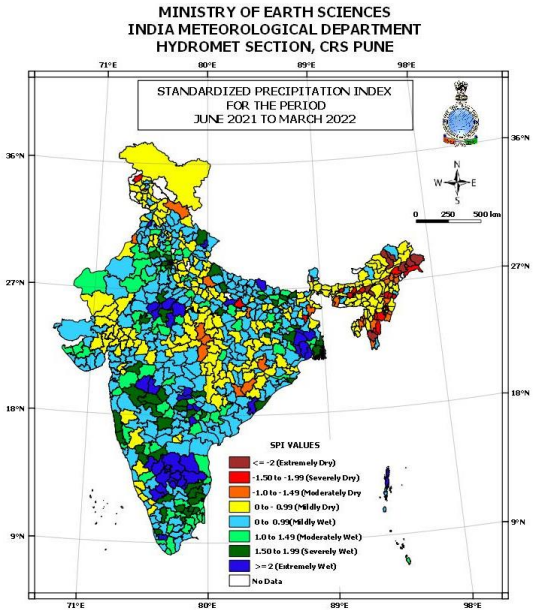
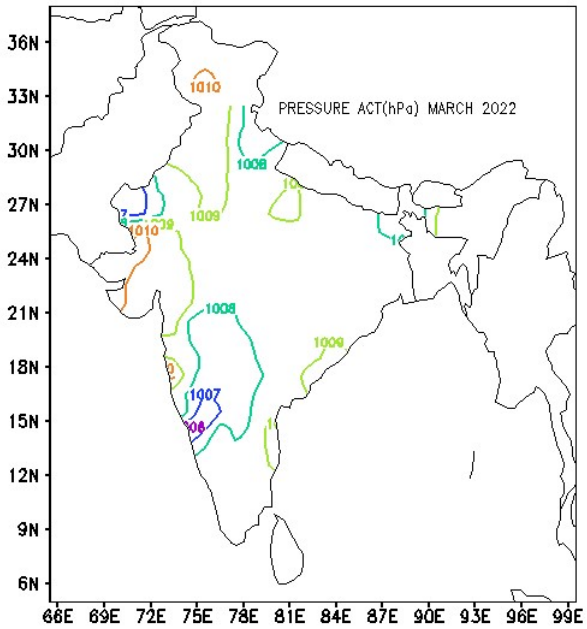


FIG. 6: STANDARDIZED PRECIPITATION INDEX (SPI) FOR (a) ONE MONTH (b) THREE MONTHS (c) TEN MONTHS

(a) MEAN SEA LEVEL PRESSURE (MSLP)



(b) MSLP Anomaly

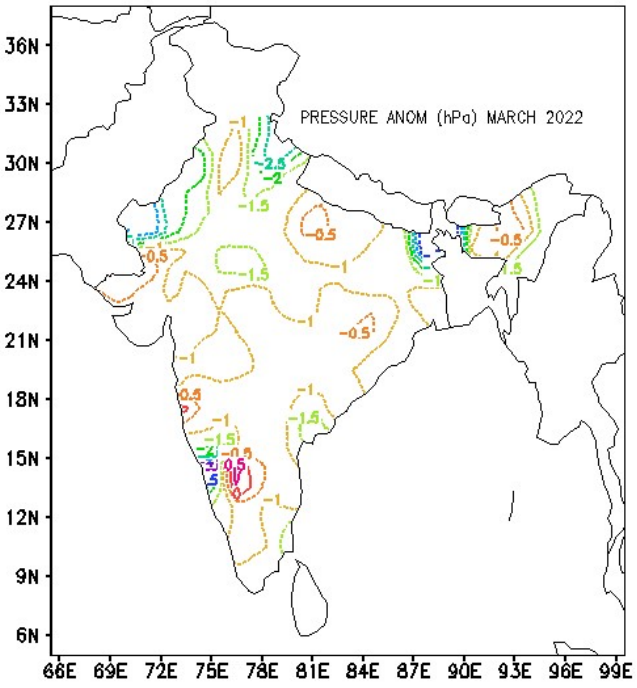
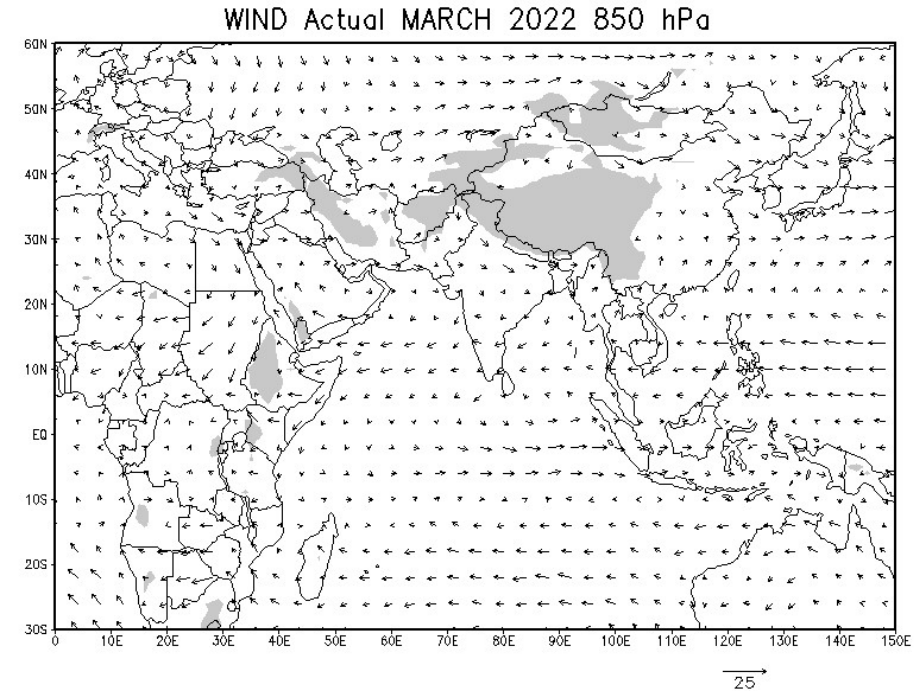


FIG. 7: MONTHLY MEAN SEA LEVEL PRESSURE (hPa) (a) MEAN (b) ANOMALY DURING MARCH 2022 (BASED ON 1981 - 2010 NORMAL)

(a) MEAN WIND: 850 hPa



(b) WIND ANOMALY: 850 hPa

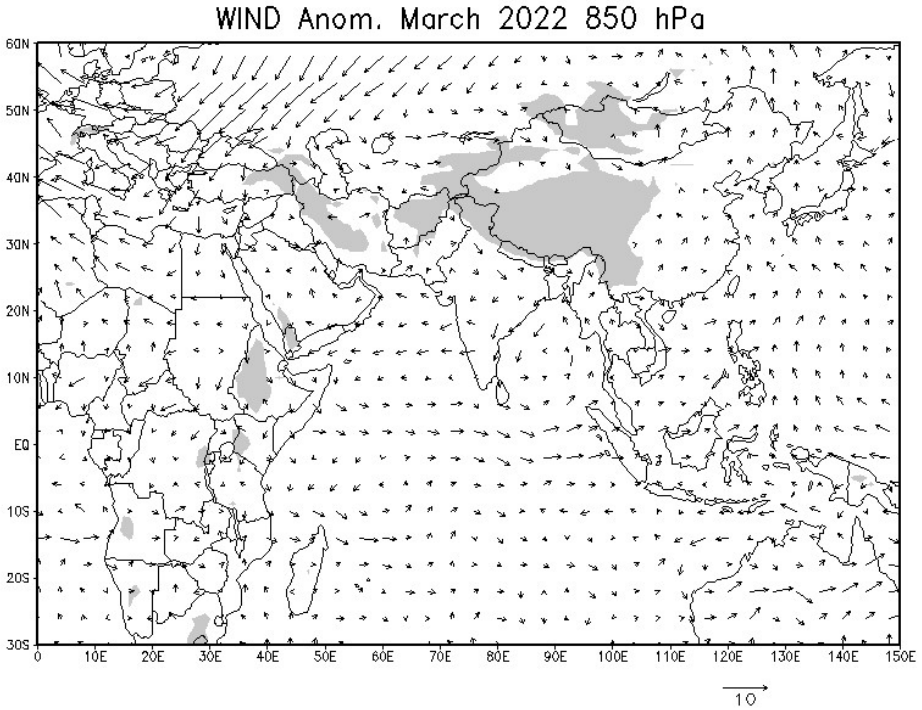
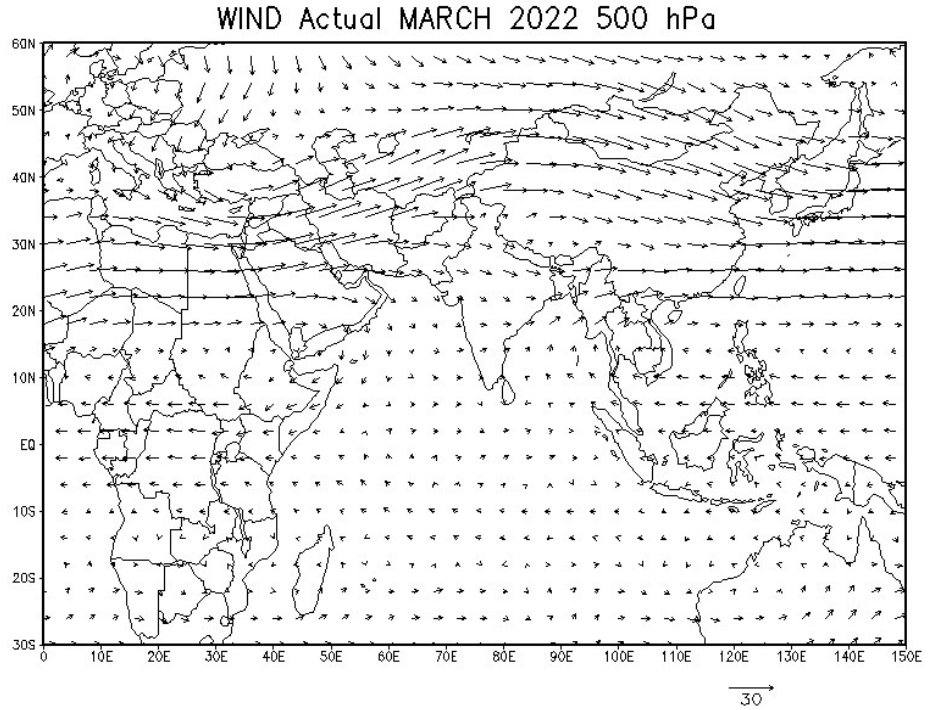


FIG. 8: MONTHLY WIND (m/s) (a) MEAN (b) ANOMALY AT 850 hPa
(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574
(ANOMALY IS BASED ON 2000-2018 Climatology, Data Source: NCMRWF)

(a) MEAN WIND: 500 hPa



(b) WIND ANOMALY: 500 hPa

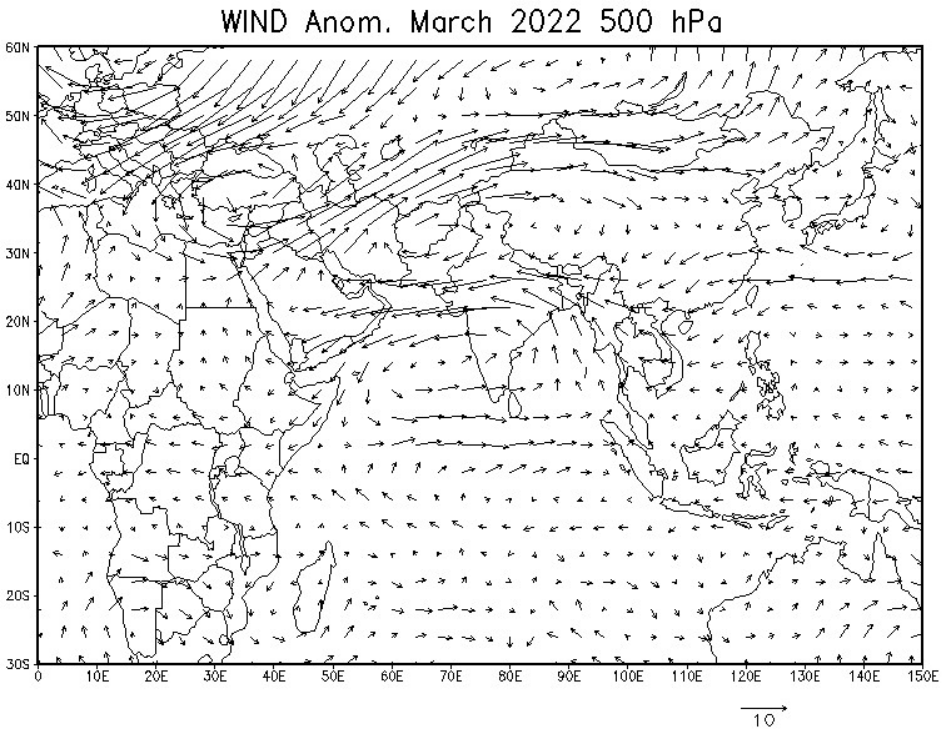
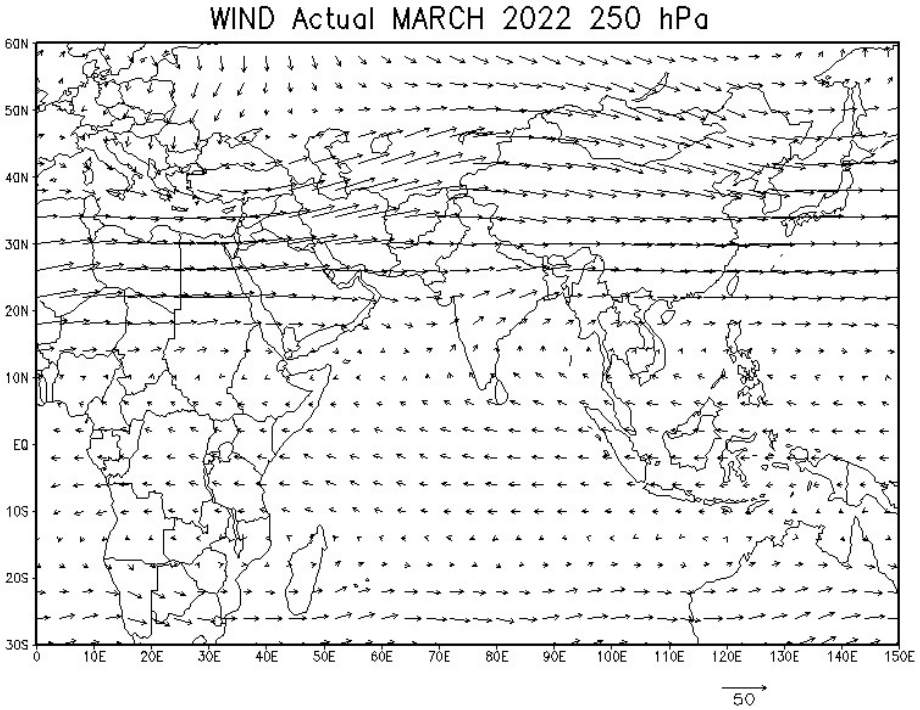


FIG. 9: MONTHLY WIND (m/s) (a) MEAN (b) ANOMALY AT 500 hPa
(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574
(ANOMALY IS BASED ON 2000-2018 Climatology, Data Source: NCMRWF)

(a) MEAN WIND: 250 hPa



(b) WIND ANOMALY: 250 hPa

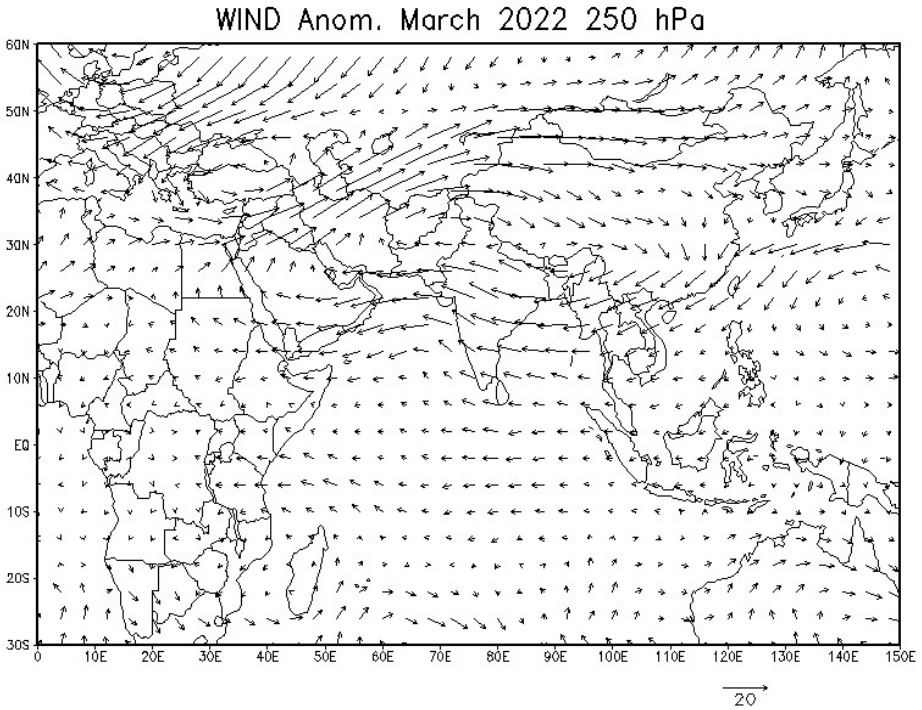
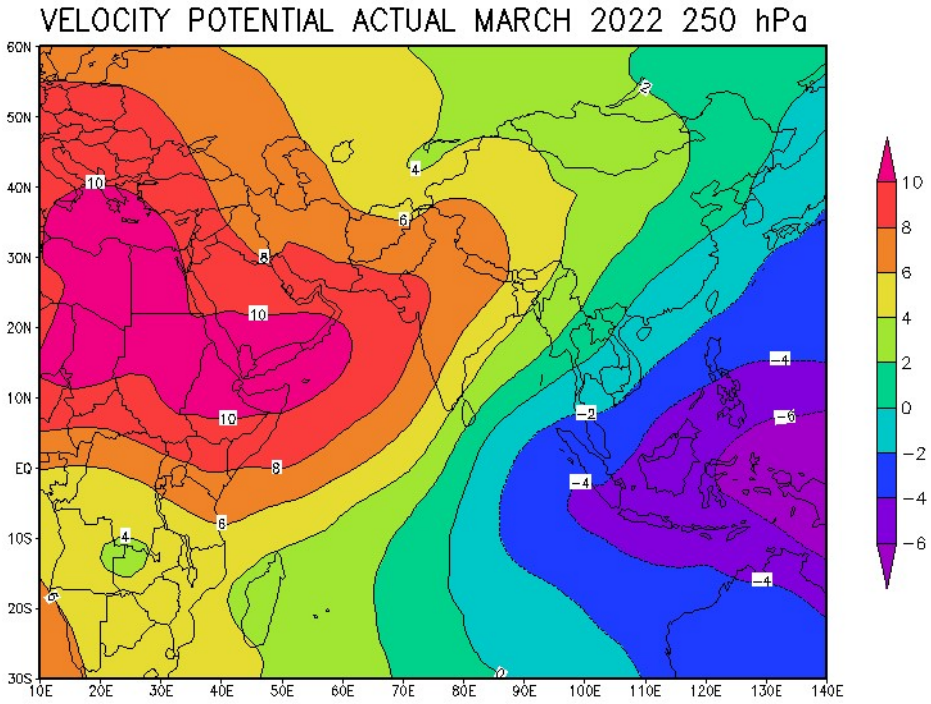


FIG. 10: MONTHLY WIND (m/s) (a) MEAN (b) ANOMALY AT 250 hPa
(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574
(ANOMALY IS BASED ON 2000-2018 Climatology, Data Source: NCMRWF)

(a) VELOCITY POTENTIAL: 250 hPa



(b) VELOCITY POTENTIAL ANOMALY: 250 hPa

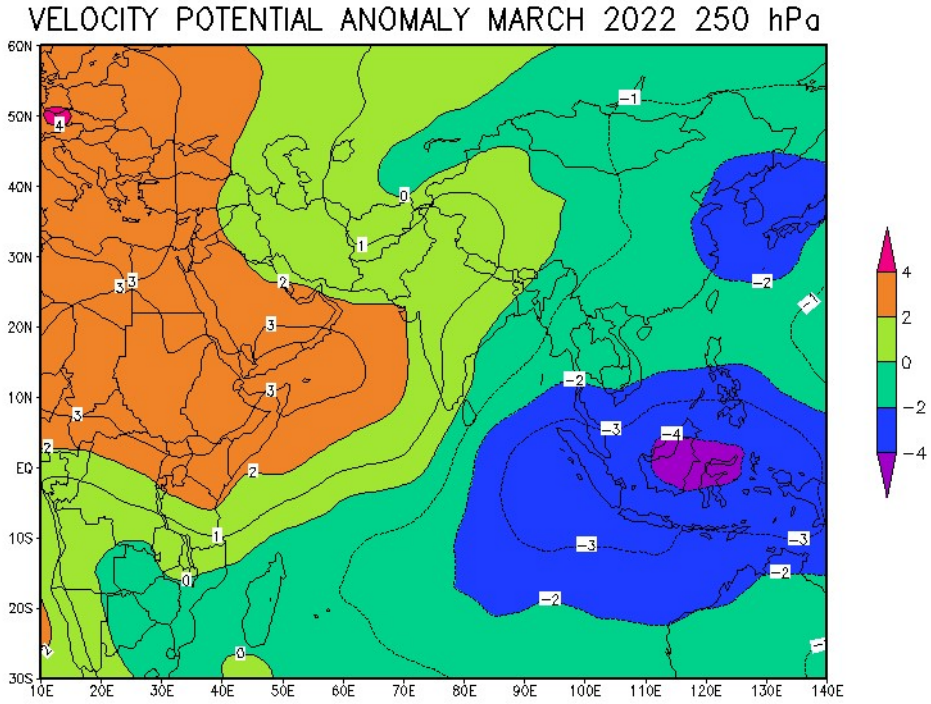
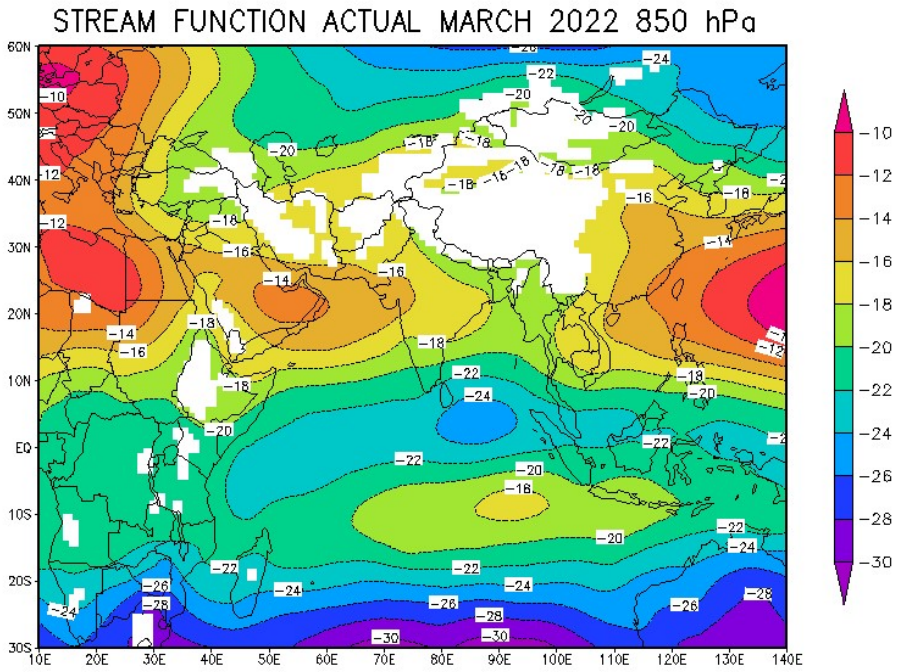


FIG. 11: VELOCITY POTENTIAL ($10^6 m^2/s$) (a) MEAN (b) ANOMALY AT 250 hPa
(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574
(ANOMALY IS BASED ON 1959-88 CLIMATOLOGY)

(a) STREAM FUNCTION: 850 hPa



(b) STREAM FUNCTION ANOMALY: 850 hPa

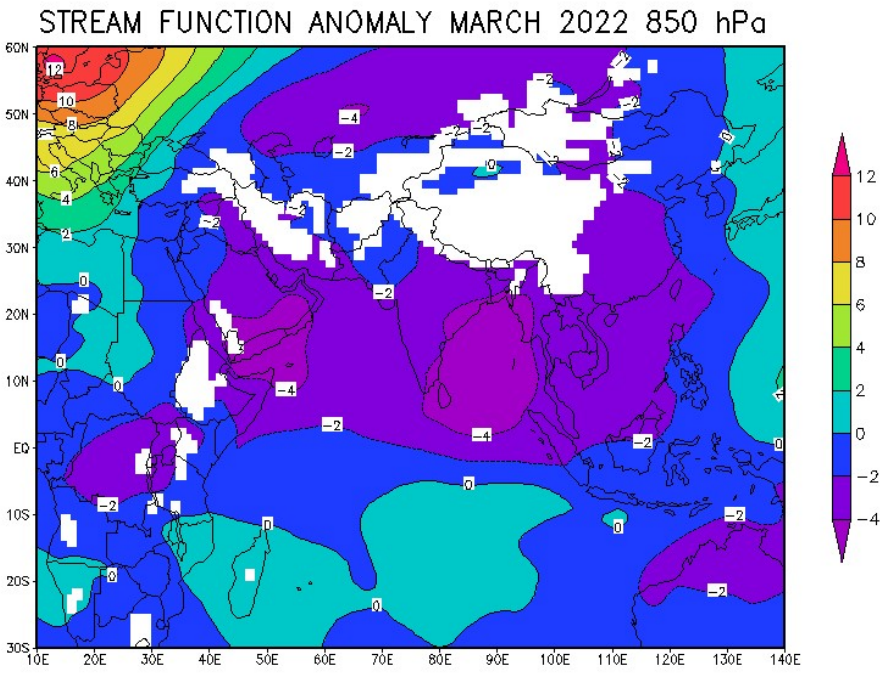


FIG. 12: STREAM FUNCTION ($10^6 m^2/s$) (a) MEAN (b) ANOMALY AT 850 hPa
(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574
(ANOMALY IS BASED ON 1959-88 CLIMATOLOGY)

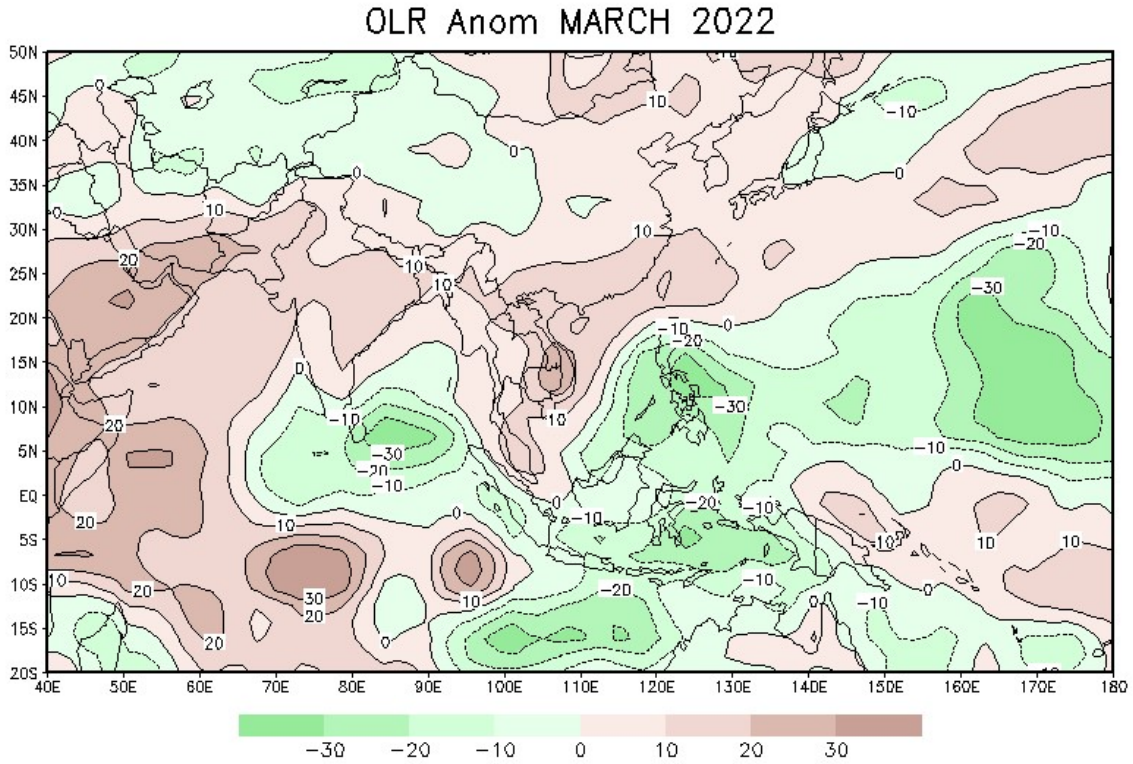


FIG. 13: OLR ANOMALY (W/m^2) FOR MARCH 2022
(DATA SOURCE: CDC / NOAA, USA)
(BASED ON 1981 - 2010 CLIMATOLOGY)

(a) MAXIMUM TEMPERATURE ANOMALY **(b) MINIMUM TEMPERATURE ANOMALY**

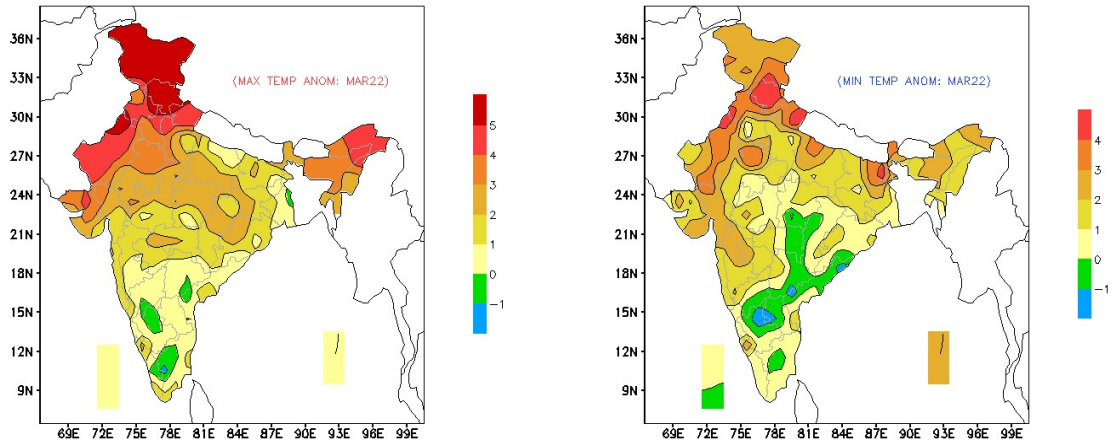


FIG. 14: MEAN MONTHLY TEMPERATURE ANOMALIES (°C) FOR MARCH 2022
(a) MAXIMUM (b) MINIMUM
(BASED ON 1981-2010 NORMAL)

(a) WARM DAYS **(b) COLD NIGHTS**

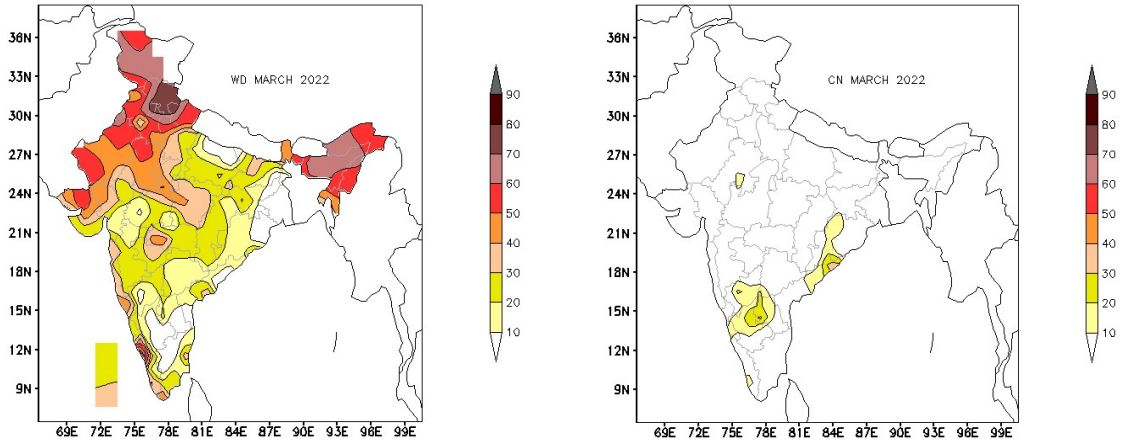


FIG.15: (a) PERCENTAGE OF DAYS WHEN MAXIMUM TEMPERATURE > 90TH PERCENTILE
(b) PERCENTAGE OF DAYS WHEN MINIMUM TEMPERATURE < 10TH PERCENTILE

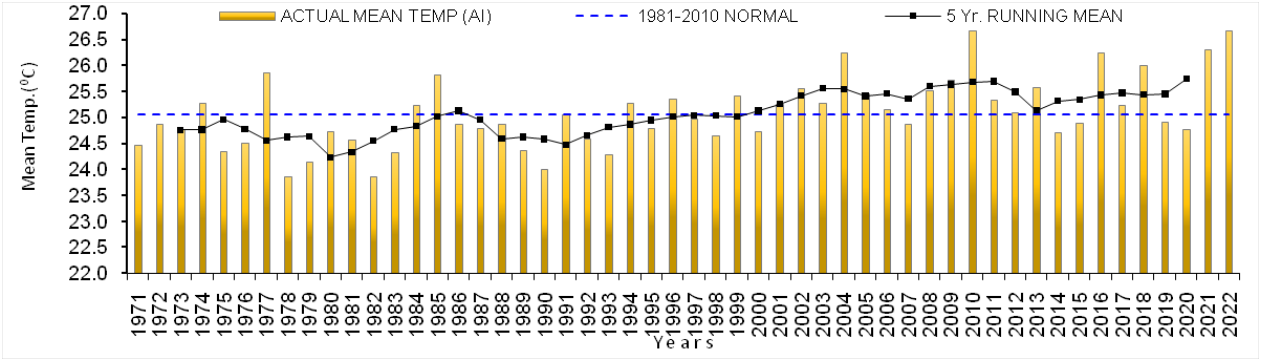


FIG.16: TIME SERIES OF MEAN TEMPERATURE AVERAGED OVER INDIA (VERTICAL BARS) AND FIVE-YEAR RUNNING MEAN (CONTINUOUS LINE) FOR THE MONTH OF MARCH (1971-2022)

(a) MAXIMUM **(b) MINIMUM**

FIG. 17: TIME SERIES OF TEMPERATURE FOR THE COUNTRY AS A WHOLE AND THE FOUR HOMOGENEOUS REGIONS FOR THE MONTH OF MARCH (1971 - 2022)
(a) MAXIMUM (b) MINIMUM

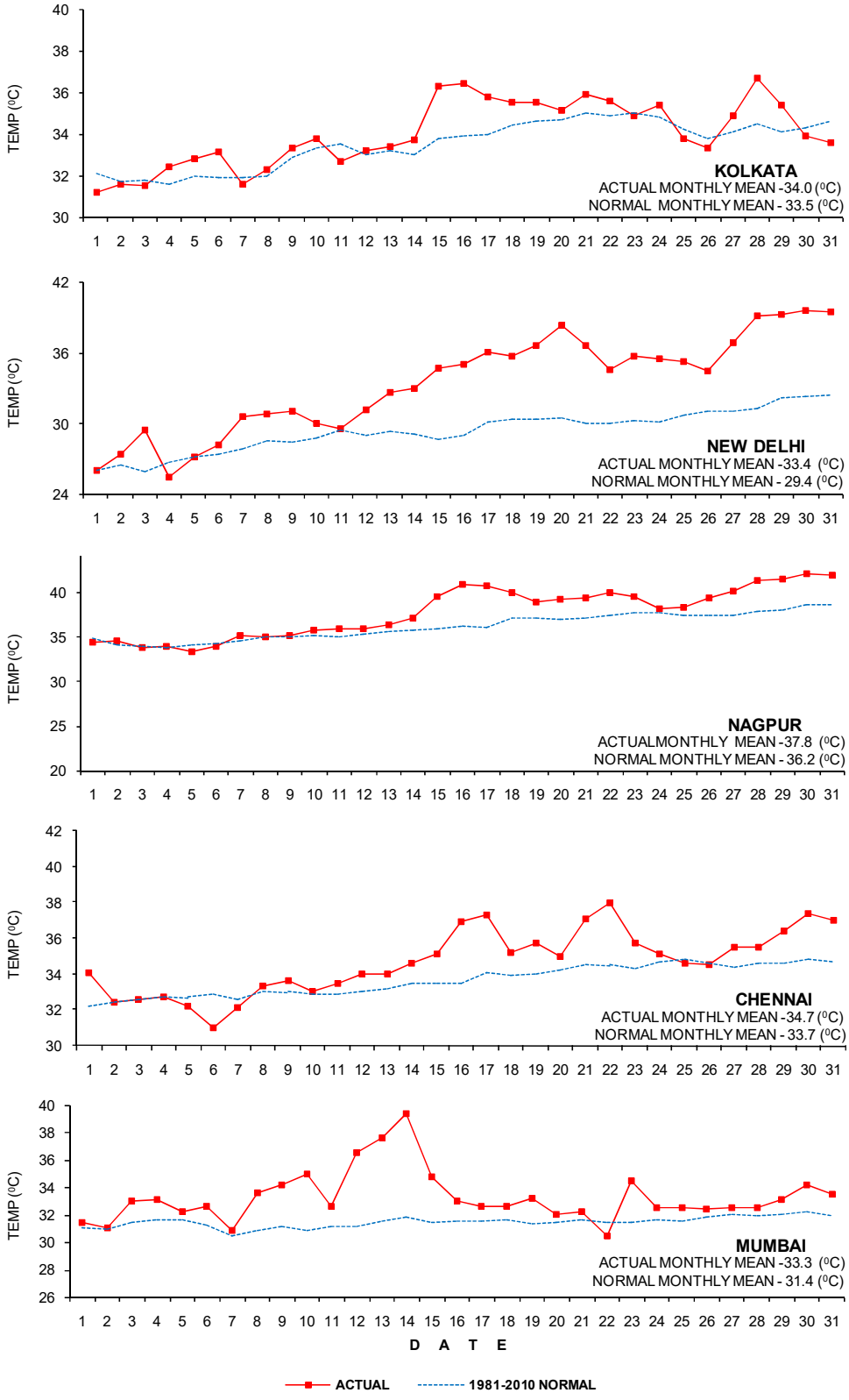


FIG. 18: DAILY MAXIMUM TEMPERATURE FOR FIVE STATIONS IN INDIA

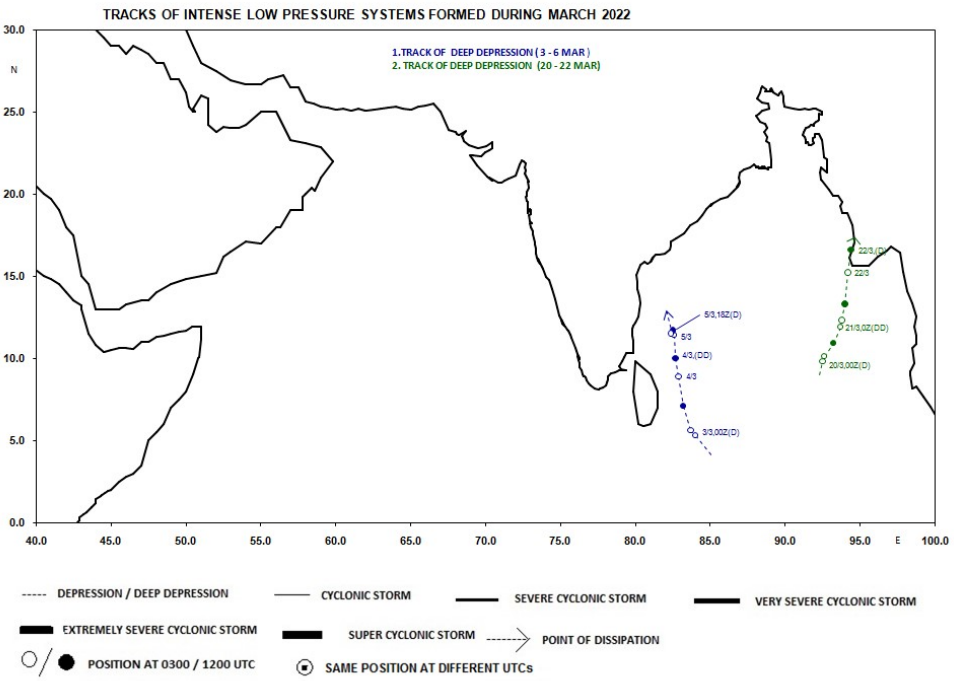


FIG. 19: TRACKS OF INTENSE LOW-PRESSURE SYSTEMS FORMED DURING MARCH 2022

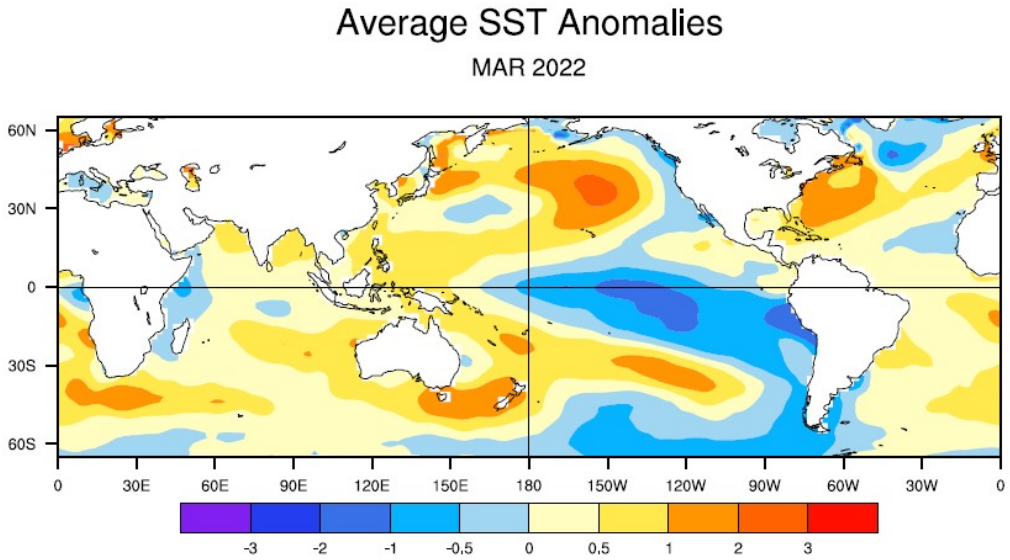


FIG. 20: SEA SURFACE TEMPERATURE ANOMALY (°C)
(Data Source - ERSST V5, NoAA)

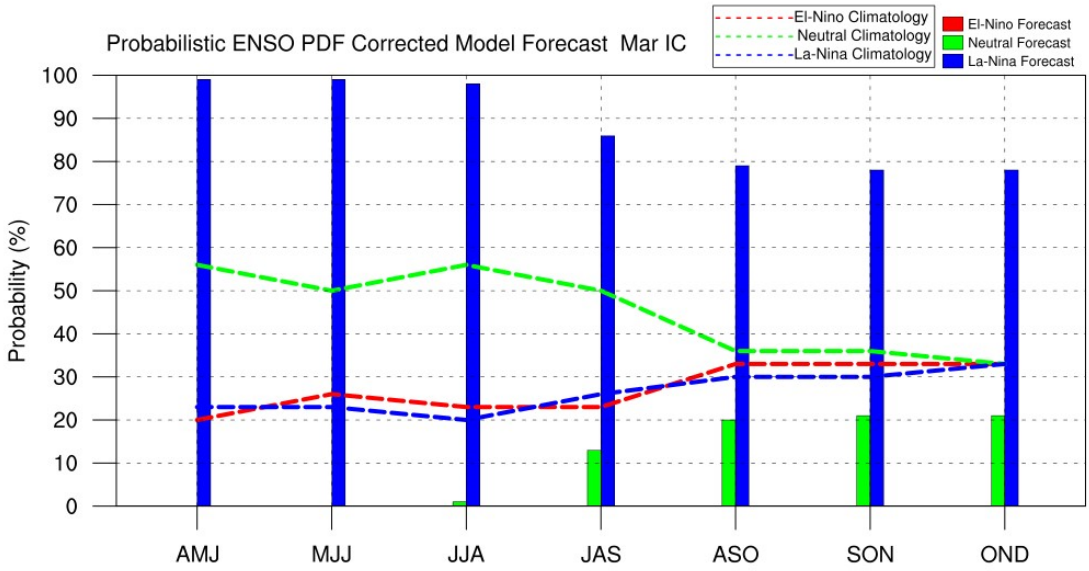


FIG. 21: Probability forecast along with climatological probabilities of Niño 3.4 Index from high-resolution Monsoon Mission Coupled Forecast System (MMCFS).
The data source for Climatology probabilities: NOAA Extended Reconstructed SST V5.
Criteria used for Probabilistic ENSO Forecast:
i.e., -0.5 La Nina, in between +0.5 & -0.5 neutral, g.e.0.5 El Nino.

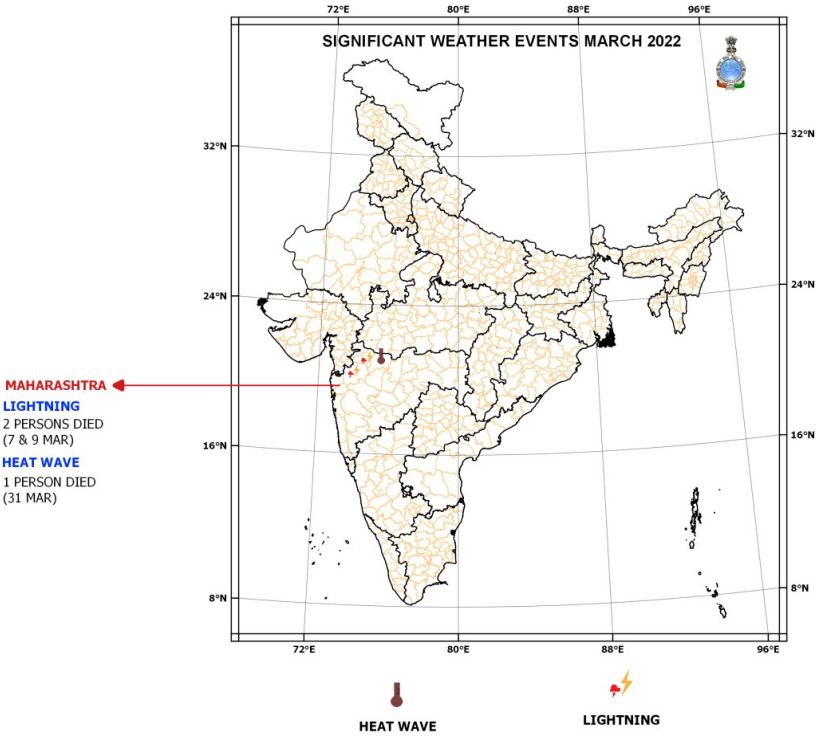


Fig. 22: SIGNIFICANT WEATHER EVENTS DURING MARCH 2022
(BASED ON REAL TIME MEDIA REPORT)

TABLE 1
METEOROLOGICAL SUBDIVISION-WISE RAINFALL STATISTICS
FOR THE MONTH OF MARCH 2022 BASED ON OPERATIONAL DATA

MET. SUBDIVISION		ACTUAL (mm)	NORMAL (mm)	% DEP
1	A & N ISLANDS	132.7	27.90	376
2	ARUNACHAL PRADESH	77.4	182.00	-57
3	ASSAM &MEGHALAYA	47.1	77.30	-39
4	NAG.,MANI.,MIZO.,TRIP	30.0	66.20	-55
5	S.H.W.B.&SIKKIM	44.4	55.60	-20
6	GANGATIC W.B.	0.7	30.10	-98
7	ODISHA	0.9	23.50	-96
8	JHARKHAND	1.5	15.10	-90
9	BIHAR	0.1	8.10	-99
10	EAST U.P.	0.0	6.70	-100
11	WEST U.P.	0.03	9.20	-99.7
12	UTTARAKHAND	2.2	54.90	-96
13	HAR., CHANDI., DELHI	0.2	12.10	-99
14	PUNJAB	0.4	23.70	-98
15	HIMACHAL PRADESH	5.4	110.90	-95
16	JAMMU & KASHMIR	18.3	152.30	-88
17	WEST RAJASTHAN	1.3	4.50	-72
18	EAST RAJASTHAN	3.1	3.50	-10
19	WEST M.P.	2.7	4.40	-39
20	EAST M.P.	0.7	10.80	-93
21	GUJARAT REGION	0.0	1.00	-99
22	SAURASHTRA & KUTCH	0.0	1.00	-100
23	KONKAN & GOA	1.3	1.00	26
24	MADHYA MAHARASHTRA	2.8	2.90	-3
25	MARATHAWADA	1.0	6.00	-84
26	VIDARBHA	0.04	10.40	-99.6
27	CHATTISGARH	0.9	10.60	-92
28	COASTAL A.P. & YANAM	3.5	13.50	-74
29	TELANGANA	1.7	12.30	-86
30	RAYALASEEMA	3.3	9.30	-64
31	TAMILNADU, PUDUCHERRY & KARAIKAL	12.1	21.40	-43
32	COASTAL KARNATAKA	19.6	7.80	151
33	N.I.KARNATAKA	7.3	7.40	-1
34	S.I.KARNATAKA	18.9	11.30	67
35	KERALA & MAHE	47.5	32.70	45
36	LAKSHADWEEP	10.6	10.70	-1

TABLE 2

STATIONS WHICH RECEIVED HEAVY (64.5 to 115.5 mm), VERY HEAVY (115.6 to 204.4 mm) OR EXTREMELY HEAVY (g.e.204.5 mm) RAINFALL IN 24 HOURS DURING MARCH 2022

(Only the stations which received the highest rainfall in the subdivision on the given date are mentioned in the table)

DATE	STATION NAME	NAME OF SUBDIVISION	RAINFALL (mm)
1	IAF CARNICOBAR	A & N ISLAND	78
8	TUTICORIN	TAMIL NADU, PUDUCHERRY AND KAR	102.6
16	CHERTHALA	KERALA & MAHE	80
17	PUNALUR	KERALA & MAHE	69.4
19	IAF CARNICOBAR	A & N ISLAND	86.2
21	LONG ISLAND	A & N ISLAND	131
	TUTING	ARUNACHALPRADESH	70
24	KAMMARDI	S. I. KARNATAKA	90.2
	KODAIKANAL	TAMIL NADU, PUDUCHERRY AND KAR	77.4
25	MAWSYNRAM	ASSAM & MEGHALAYA	98.2
26	CHERRAPUNJI(RKM)	ASSAM & MEGHALAYA	405.8
27	CHERRAPUNJI	ASSAM & MEGHALAYA	146.8
31	TIKRIKILLA	ASSAM & MEGHALAYA	80.4

EXTREMELY HEAVY RAINFALL

TABLE 3

TEMPERATURE ANOMALIES OVER INDIA AND FOUR HOMOGENEOUS REGIONS DURING MARCH 2022

MAR 2022		Max Temp (^{0}C)	Min Temp (^{0}C)	Mean Temp (^{0}C)
ALL INDIA	**ACTUAL**	**33.10**	**20.24**	**26.67**
	NORMAL	31.24	18.87	25.06
	ANOMALY	1.86	1.37	1.61
NORTHWEST INDIA	**ACTUAL**	**30.73**	**15.26**	**22.99**
	NORMAL	26.82	12.73	19.77
	ANOMALY	3.91	2.53	3.22
EAST & NORTHEAST INDIA	**ACTUAL**	**32.45**	**17.94**	**25.20**
	NORMAL	30.21	16.58	23.39
	ANOMALY	2.25	1.36	1.80
CENTRAL INDIA	**ACTUAL**	**35.20**	**20.84**	**28.02**
	NORMAL	33.58	19.62	26.60
	ANOMALY	1.62	1.22	1.42
SOUTH PENNINSULAR INDIA	**ACTUAL**	**33.56**	**24.03**	**28.80**
	NORMAL	33.08	23.34	28.21
	ANOMALY	0.48	0.69	0.59

TABLE – 4

ATMOSPHERIC AND SST INDEX VALUES FOR THE RECENT 12 MONTHS. ATMOSPHERIC INDICES ARE STANDARDIZED BY MEAN ANNUAL STANDARD DEVIATION EXCEPT FOR THE TAHITI AND DARWIN SLP ANOMALIES WHICH ARE IN hPa. SST INDICES (ANOMALIES AND MEAN) ARE IN DEGREE CELSIUS

SLP ANOMALIES			Tahiti SLP minus Darwin SLP	PACIFIC SST							
				NINO 1+2 0^0 - 10^0S 90^0W - 80^0W		NINO 3 5^0N - 5^0S 150^0W - 90^0W		NINO 3.4 5^0N - 5^0S 170^0W - 120^0W		NINO 4 5^0N - 5^0S 160^0E - 150^0W	
Month	Tahiti	Darwin	SOI	Anomaly	Mean	Anomaly	Mean	Anomaly	Mean	Anomaly	Mean
MAR 22	2.40	-0.80	2.90	-0.64	25.84	-0.76	26.44	-1.00	26.28	-0.7	27.62
FEB 22	2.10	0.10	1.80	-1.55	24.55	-1.18	25.22	-0.89	25.86	-0.37	27.83
JAN 22	0.80	-0.20	0.80	-1.14	23.43	-1.31	24.35	-0.95	25.59	-0.41	27.91
DEC 21	1.90	-0.90	2.50	-1.63	21.18	-1.22	24.01	-1.06	25.54	-0.79	27.75
NOV 21	1.20	-0.60	1.60	-0.98	20.67	-0.93	24.17	-0.89	25.81	-0.68	28.01
OCT 21	0.20	-1.1	1.20	-0.79	20.23	-0.75	24.23	-0.95	25.77	-0.73	28.03
SEP 21	1.30	-0.2	1.30	0.12	20.45	-0.27	24.57	-0.29	26.44	-0.40	28.38
AUG 21	1.10	-0.10	1.00	-0.28	20.72	-0.44	24.67	-0.45	26.40	-0.17	28.62
JUL 21	1.50	-1.10	2.30	-0.16	21.80	-0.24	25.56	-0.33	26.97	-0.22	28.68
JUN 21	0.90	0.20	0.70	-0.36	22.76	-0.29	26.33	-0.25	27.48	-0.14	28.83
MAY 21	0.70	-0.20	0.80	-0.79	23.63	-0.57	26.68	-0.49	27.44	-0.24	28.67
APR 21	0.50	-0.20	0.60	-0.94	24.59	-0.81	26.77	-0.75	27.07	-0.47	28.16

(Data Source: CPC/NCEP, USA)

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भारत का जलवायु नैदानिक बुलेटीन

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