

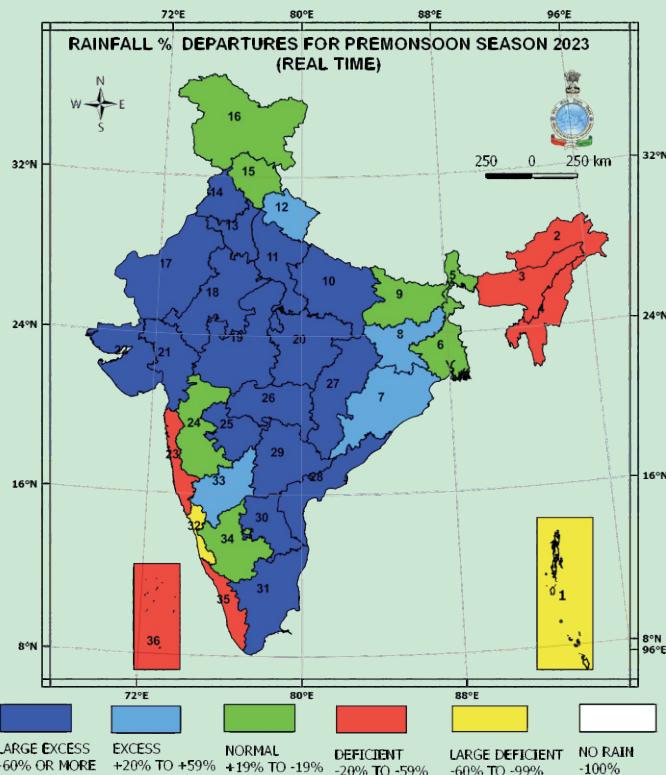


भारत सरकार / GOVERNMENT OF INDIA
पृथ्वी विज्ञान मंत्रालय / MINISTRY OF EARTH SCIENCES
पृथ्वी प्रणाली विज्ञान संगठन / EARTH SYSTEM SCIENCE ORGANIZATION
भारत मौसम विज्ञान विभाग / INDIA METEOROLOGICAL DEPARTMENT

भारत का जलवायु नैदानिक बुलेटिन CLIMATE DIAGNOSTICS BULLETIN OF INDIA

मानसुन पूर्व ऋतु (मार्च - मई 2023)
PRE MONSOON SEASON (MARCH - MAY 2023)

वास्तविक समय के निकट विश्लेषण
NEAR REAL - TIME ANALYSES



राष्ट्रीय जलवायु केन्द्र, पुणे
NATIONAL CLIMATE CENTRE, PUNE

मानसून पूर्व ऋतु (मार्च - मई), 2023 (सारांश) मानसून पूर्व ऋतु की मुख्य विशेषताएं

प्रमुख बिंदु:

मानसून पूर्व ऋतु में दक्षिण प्रायद्विप का अधिकतम तापमान (34.45°से.) 1901 से नववा सबसे अधिक रहा। ऋतु में उत्तर-पश्चिम भारत की बारिश (152.0 मि. मी) 1901 से नववी सबसे अधिक रहा। ऋतु में मध्य भारत की बारिश (84.9 मि. मी) 1901 से तिसरी सबसे अधिक रहा। ऋतु में पूर्व और उत्तर-पूर्व भारत की बारिश (242.1 मि. मी) 1901 से छठवीं सबसे कम रही।

उष्ण लहर की स्थिति :

ऋतु के दौरान भारत के मध्य भारत, उत्तर-पश्चिम भारत, पूर्व और उत्तर-पूर्व भारत और उत्तर भारत के कुछ भाग में उष्ण लहर दिखाइ दिए।

दक्षिणी-पश्चिमी मानसून की आगमन और प्रगति :

19 मई को अंदमान समुद्र में दक्षिणी-पश्चिमी मानसून का आगमन हुआ। दक्षिणी-पश्चिमी मानसून की आगमन और प्रगति आकृती 1 में दर्शायी गयी है।

वर्षा की विशेषताएं:

पूरे देश में बारिश गतिविधि ऋतु के दौरान एल.पी.ए. का 112% थी। 36 मौसम उप मंडलों में से 17 उप मंडल में सामान्य से अत्यधिक, 4 में अधिक, 7 में सामान्य, 6 में सामान्य से कम, 2 उप मंडलों में सामान्य से काफी कम वर्षा हुई (आकृती 2)। तालिका 1 में मानसून पूर्व ऋतु, 2023 के उप मंडल-वार वर्षा के आँकड़े (मि. मी.) में दर्शाएं गए हैं।

आकृती 3(ए) में मानसून पूर्व ऋतु के दौरान देश के विभिन्न भाग में हुई वर्षा (मि.मी.) दर्शायी गयी है। आकृती 3(बी) में मानसून पूर्व ऋतु के दौरान देश के विभिन्न भाग में हुई वर्षा विसंगति (मि. मी.) दर्शायी गयी है। आकृती 4 में वर्ष 1951 से अब तक के सम्पूर्ण भारत और चार समरूपी क्षेत्रों की क्षेत्र भारित वर्षा की श्रृंखला दर्शाई गयी है। मानसून पूर्व ऋतु की वर्षा भारत के मध्य भारत में (एल.पी.ए. का 236%), दक्षिण प्रायद्विप में (एल.पी.ए. का 137%), उत्तर-पश्चिम भारत (एल.पी.ए. का 133%) तथा पूर्व और उत्तर-पूर्व भारत में (एल.पी.ए. का 65%) रही।

मानकीकृत वर्षण सूचकांक (एस.पी.आई.):

मानकीकृत वर्षण सूचकांक अनावृति मापने का एक सूचकांक है जो केवल वर्षा पर आधारित होता है। यह सूचकांक शुष्क स्थिति में ऋणात्मक और आर्द्ध स्थिति में धनात्मक होता है। जब शुष्क या आर्द्ध मौसम की स्थिति अधिक भीषण होती है, तब सूचकांक अधिक ऋणात्मक या धनात्मक होता है। आकृती 5(ए, बी) में मार्च-मई, 2023 (3 माह के संचित) तथा जून 2022 - मई 2023 (12 माह के संचित) के मानकीकृत वर्षण सूचकांक दर्शाएं गए हैं।

मानसून पूर्व ऋतु के दौरान ओडिशा, बिहार, उत्तरप्रदेश राज्य, उत्तराखण्ड, हरयाणा, चंदिगढ़, दिल्ली, पंजाब, हिमाचल प्रदेश, राजस्थान राज्य, मध्यप्रदेश राज्य, गुजरात राज्य, मध्य महाराष्ट्र, मराठवाडा, विदर्भ, छत्तीसगढ़, आंध्र प्रदेश राज्य, तेलंगणा, तामिलनाडु पुदुचेरी और करायकल और उत्तरी आंतरिक कर्नाटक के कुछ भागों में चरम आर्द्ध / प्रचंड आर्द्ध स्थितियाँ रहीं, जबकि अन्दमान और निकोबार द्वीपसमूह, अरुणाचल प्रदेश,

आसाम और मेघालय, नागालैंड मणिपुर मिज़ोराम, त्रिपुरा और केरल और माहे के भाग में चरम शुष्क / प्रचंड शुष्क स्थितियाँ रहीं ।

दाबः

आकृति 6(ए) तथा 6(बी) क्रमशः माध्य समुद्र स्तर दाब तथा इसकी विसंगति दर्शाते हैं । अधोरेखा द्वारा ऋणात्मक मान दर्शाए गए हैं ।

पवनः

आकृति 7(ए) तथा 7(बी), 8(ए) तथा 8(बी), 9(ए) तथा 9(बी) में क्रमशः पवन का 850, 500 और 250 एच.पी.ए. स्तरों पर माध्य परिसंचरण स्वरूप तथा इसकी विसंगति को दर्शाता है ।

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

आकृति 10(ए) तथा 10(बी) में 250 एच.पी.ए. स्तर पर माध्य वेग विभव तथा इसकी विसंगति को दर्शाया गया है । इसी प्रकार आकृति 11(ए) तथा 11(बी) में माध्य धारा कृत्य तथा इसकी विसंगति को दर्शाते हैं । अधोरेखा द्वारा ऋणात्मक मान दर्शाये गए हैं ।

बहिर्गमी दीर्घतरंग विकिरण (ओ.एल.आर.):

भारत के क्षेत्रों तथा आसपास की बहिर्गमी दीर्घतरंग विकिरण ($\text{वॉट}/\text{मी}^2$) आकृति 12 में दर्शाई गई है ।

तापमानः

मानसून पूर्व ऋतु की अधिकतम तथा न्यूनतम माध्य तापमान विसंगति आकृति 13(ए) तथा 13(बी) में दर्शाई गई है ।

उष्ण दिनों / शीत रात्रियों का प्रतिशत :

आकृति 14(ए) तथा 14(बी) में अधिकतम (न्यूनतम) तापमान जब 90वें (10वें) पर्सेटाइल से अधिक (कम) वाले दिनों का प्रतिशत दर्शाया गया है । चित्र 15 में पूरे देश में मानसून पूर्व ऋतु में 1971 से अब तक के माध्य तापमान दर्शाये गए हैं । 5 वर्ष के चल औसत भी दर्शाये गए हैं । इस वर्ष के मानसून पूर्व ऋतु का माध्य तापमान $27.68^{\circ}\text{से. रहा}$ । आकृति 16(ए) तथा 16(बी) में चारों समस्पी क्षेत्रों के वर्ष 1971 से अब तक के मानसून पूर्व ऋतु के दौरान रहे अधिकतम और न्यूनतम तापमानों की श्रृंखला दर्शाई गई है । तालिका 2 में ऋतु के दौरान की तापमान विसंगति दर्शाई गयी है ।

निम्न दाब प्रणालियाँ:

इस ऋतु में बंगाल की खाड़ी में मई माह में एक अती तीव्र चक्रवाती तुफान “मोखा” 9 - 15 मई दरम्यान बना । चित्र 17 में अती तीव्र चक्रवाती तुफान का मार्ग दर्शाया गया है ।

आपत्कालीन मौसम घटनाएः :

आकृति 18 आपत्कालीन मौसम घटनाए दर्शाता है ।

PRE-MONSOON SEASON - 2023

MAIN FEATURES OF THE SEASON

Highlights:

During Pre-monsoon season, the maximum temperature over South Peninsular India (34.45°C) was the 9th highest since 1901.

Rainfall over homogeneous region of Central India (84.9 mm) was 3rd highest since 1901 after the years 1933 (106.1 mm) and 1990 (101.6 mm).

Rainfall over homogeneous region of Northwest India (152.0 mm) was 9th highest since 1901 after the years 1983 (236.6 mm), 2015 (216.0 mm), 1982 (213.8 mm), 1987 (176.2 mm), 1926 (163.7 mm), 1986 (159.8 mm), 1957 (157.3 mm) and 1963 (155.4 mm).

Rainfall over homogeneous region of East & northeast India (242.1 mm) was 6th lowest since 1901. Prior lowest rainfall years were 1903 (220.3 mm), 1979 (236.2 mm), 1908 (239.3 mm), 1901 (240.3 mm) and 1960 (240.7 mm).

Heat Wave Conditions:

In the month of March, the heat wave conditions were observed mainly over Coastal Karnataka, Saurashtra & Kutch and Konkan & Goa during first fortnight of the month.

In the month of April, the heat wave/severe heat wave conditions were observed mainly over parts of Bihar, Gangetic West Bengal, Sub Himalayan West Bengal & Sikkim, Coastal Andhra Pradesh, Odisha, Punjab, Haryana, Chandigarh & Delhi, Jharkhand and Uttar Pradesh during 13 - 19 April.

In the month of May, the heat wave/severe heat wave conditions were observed mainly over Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, Gujarat, Gangetic West Bengal, Haryana, Chandigarh & Delhi, Vidarbha, Sub Himalayan West Bengal & Sikkim, Coastal Andhra Pradesh, Madhya Maharashtra and Jharkhand at isolated places.

Advance of Southwest Monsoon:

Southwest Monsoon advanced into some parts of southeast Bay of Bengal, Nicobar Islands and south Andaman sea on 19th May, 2023. The Northern Limit of Southwest Monsoon passed through Lat. 5°N / Long. 85°E, Lat. 6.5°N/Long. 90°E, Nancowry and Lat. 10°N/Long. 98°E. It remained at this position till 29th May. It advanced into some parts of southwest Bay of Bengal, some more parts of southeast Bay of Bengal, entire Andaman, Nicobar Islands, Andaman Sea and some parts of eastcentral Bay of Bengal on 30th May, 2023. The Northern Limit of Southwest Monsoon passed through Lat. 5°N/ Long. 80°E, Lat. 6.5°N/ Long. 83°E, Lat. 10°N/ Long. 88°E, Lat. 14°N/ Long. 92°E and Lat. 17°N/ Long. 95°E. It remained at this position till 31st May.

Fig. 1 depicts the isochrones of advance of southwest monsoon.

Rainfall Features:

Rainfall realized during the season was 112% of its LPA. It was 126% of its LPA during March, 105% of its LPA during April and was 110% of its LPA during May. During the season, most of the sub divisions received large excess/excess/normal rainfall, except sub divisions from northeast, Konkan & Goa, Coastal Karnataka, Kerala & Mahe and both the islands.

During the season, out of 36 meteorological subdivisions, 17 received large excess rainfall, 4 received excess rainfall, 7 subdivision received normal rainfall, 6 received deficient rainfall and 2 received large deficient rainfall (Fig 2). Table 1 shows the subdivision wise rainfall statistics (mm) for the season.

Fig. 3(a) shows the spatial pattern of rainfall (mm) received during the season. Parts of Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub Himalayan West Bengal & Sikkim, Jammu & Kashmir & Ladakh and Himachal Pradesh received more than 400 mm rainfall.

Fig. 3(b) shows the spatial pattern of rainfall anomaly (mm) during the season. Rainfall anomaly was generally positive over most parts of the country, except east & northeastern parts, Jammu & Kashmir & Ladakh, Konkan & Goa, Karnataka state, Kerala & Mahe and both the islands. Rainfall anomaly was more than 100 mm over parts of Sub Himalayan West Bengal & Sikkim, Uttarakhand, Himachal Pradesh, East and west Rajasthan, Haryana, Chandigarh & Delhi, Punjab, Odisha, Chhattisgarh, East and west Madhya Pradesh, Coastal Andhra Pradesh, Telangana, Rayalseema, Tamilnadu, Puducherry & Karaikal. Magnitude of negative rainfall anomaly was more than 100 mm over parts of Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Bihar, Jammu & Kashmir & Ladakh, Coastal Karnataka, Kerala & Mahe and both the islands.

Fig. 4 shows area weight averaged rainfall series for season over all India and four homogeneous regions since 1951. Seasonal rainfall realized over all India was 112 % of its LPA.

Considering homogeneous region wise it was 236% of its LPA over Central India, 137% of its LPA over south peninsula, 65% of its LPA over East & North East India and 133% of its LPA over Northwest India.

Rainfall over homogeneous region of Central India (84.9 mm) was 3rd highest since 1901 after the years 1933 (106.1 mm) and 1990 (101.6 mm)

Rainfall over homogeneous region of Northwest India (152.0 mm) was 9th highest since 1901 after the years 1983 (236.6 mm), 2015 (216.0 mm), 1982 (213.8 mm), 1987 (176.2 mm), 1926 (163.7 mm), 1986 (159.8 mm), 1957 (157.3 mm) and 1963 (155.4 mm).

Rainfall over homogeneous region of East & northeast India (242.1 mm) was 6th lowest since 1901. Prior lowest rainfall years were 1903 (220.3 mm), 1979 (236.2 mm), 1908 (239.3 mm), 1901 (240.3 mm) and 1960 (240.7 mm).

Standardized Precipitation Index:

The Standardized Precipitation Index (SPI) is an index used for monitoring drought and is based on only 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. Fig 5 (a & b) give the SPI values for the Pre-monsoon season this year and for the period from past monsoon season i.e. June 2022-May 2023 (12 months cumulative) respectively.

Cumulative SPI values of the past three months show extremely wet/severely wet conditions over parts of Odisha, Bihar, Uttar Pradesh state, Uttarakhand, Haryana, Chandigarh & Delhi, Punjab, Himachal Pradesh, Rajasthan state, Madhya Pradesh state, Gujarat state, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Andhra Pradesh state, Telangana, Tamilnadu, Puducherry & Karaikal and North Interior Karnataka while, extremely dry/severely dry conditions were observed over parts of A & N Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura and Kerala & Mahe.

Cumulative SPI values of the past twelve months indicate that extremely wet/severely wet conditions were observed over parts of Sub Himalayan West Bengal & Sikkim, Odisha, Uttar Pradesh state, Haryana, Chandigarh & Delhi, Jammu & Kashmir, Rajasthan state, Madhya Pradesh state, Gujarat Region, Madhya Maharashtra, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Tamilnadu, Puducherry & Karaikal, North Interior Karnataka and South Interior Karnataka while, extremely dry/severely dry conditions were observed over parts of A & N Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub Himalayan

West Bengal & Sikkim, Gangetic West Bengal, Jharkhand, Bihar, East Uttar Pradesh, Haryana, Chandigarh & Delhi and Chhattisgarh.

Pressure & Wind:

Figs. 6(a) & 6(b) show the mean sea level pressure & its anomaly respectively. The pressure anomaly was positive over almost all parts of the country. The pressure anomaly was more than +1.5 hPa over most parts of the country. The pressure anomaly was more than +3.0 hPa over east central India and northern India.

Figs. 7(a) & 7(b), 8(a) & 8(b) and 9(a) & 9(b) shows the mean circulation pattern and its anomaly at 850, 500 & 250 hPa levels respectively. At 850 hPa level, an anomalous anti cyclonic circulation was seen over central parts of Bay of Bengal and adjoining central India. At 500 hpa level, an anomalous trough was seen over entire country and adjoining Arabian sea. This pattern persisted at 250 hPa level also.

Velocity Potential & Stream Function:

Figs. 10(a) & 10(b) show the 250 hPa mean Velocity Potential & its anomalies. Similarly, Figs. 11(a) & 11(b) show the mean stream function & its anomalies at 850 hPa level. Negative values are indicated by dashed lines. Anomaly in the velocity potential at 250 hPa level was positive over most parts of the country except northwest and westcentral region, while anomaly in the stream function at 850 hPa level was positive over entire country.

Outgoing Longwave Radiation (OLR):

OLR anomaly (W/m^2) over the Indian region and neighbourhood is shown in Fig. 12. OLR anomaly was negative over most parts of the country. OLR anomaly was within 0 to -10 W/m^2 .

Temperature:

Mean seasonal maximum and minimum temperature anomalies are shown in Figs. 13(a) & 13(b) respectively. Maximum temperature was below normal over most parts of the country, except some parts of east & northeast India, coastal parts of India and both the Islands. Maximum temperature anomaly was more than 1°C over parts of Bihar, Sub Himalayan West Bengal, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram, Tripura, Odisha, Coastal Andhra Pradesh & Yanam, Kerala & Mahe, Coastal Karnataka, South Interior Karnataka and both the Islands. Maximum temperature anomaly was less than -2°C over parts of West Rajasthan, Uttar Pradesh state, Madhya Pradesh state, Chhattisgarh, Vidarbha, Marathwada and Telangana.

Minimum temperature was below normal over most parts of the country, except some parts of east & northeast India, northwest India, west central India, coastal south peninsular India and Andman & Nicobar Island. Minimum temperature anomaly was more than 2°C over parts of Bihar and Andman & Nicobar Island. Minimum temperature anomaly was less than -3°C over parts of Madhya Pradesh state and Vidarbha.

Percentage of Warm Days/Cold Nights:

Fig 14(a) & 14(b) show the percentage of days when maximum (minimum) temperature was more (less) than 90th (10th) percentile. Over parts of Kerala & Mahe maximum temperature was greater than 90th percentile for more than 50% of the days of the season. Minimum temperature was less than 10th percentile for more than 50% of the days of the month over parts of North Interior Karnataka and West Madhya Pradesh.

Fig.15 shows the mean temperature for the country as a whole for the season since 1971. Five year moving average values are also shown. The mean temperature for the season this year was 27.68°C with an anomaly of 0.06°C .

Fig. 16(a) & 16(b) shows the maximum and minimum temperature series respectively for the country as a whole and the four homogeneous regions during the season since 1971. Both maximum and minimum temperatures were below normal over all the homogeneous regions except over East & Northeast India and South Peninsular India. Over the country as a whole both maximum and minimum temperature were normal during this season. Maximum temperature over South Peninsular India (34.45°C) was the 9th highest since 1901.

Table 2 gives temperature anomalies over India and four homogeneous regions during the season.

Low Pressure Systems:

During the season an Extremely Severe Cyclonic storm "Mocha" formed over Bay of Bengal during 9th – 15th May. Fig 17 shows track of this system.

Significant Weather Events for Pre-Monsoon Season (March-May) 2023:

During Pre Monsoon Season, total 310 persons reportedly claimed dead, more than 320 persons injured, more than 10 persons missing & more than 1270 livestock perished. The details of causalities given below, which are based on real time media reports.

Fig.18 shows deaths due to significant weather events during Pre Monsoon Season (March-April-May)_2023. (Based on real time media reports)

Lightning: Total 219 persons reportedly claimed dead, more than 120 persons injured & about 750 livestock perished, during Pre Monsoon Season, 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, 16, 17, 19, 20, 25 Mar.; 7, 8, 9, 19, 21, 23, 25, 26, 27, 28 Apr.; 9, 18, 23, 28 May	45	20		229	Ahmednagar, Amravati, Aurangabad/Chhatrapati Sambajinagar, Beed, Bhandara, Buldhana, Chandrapur, Dhule, Gadchiroli, Gondia, Hingoli, Jalgaon, Jalna, Kolhapur, Latur, Nagpur, Nanded, Nandurbar, Osmanabad/Dharashiv, Parbhani, Pune, Ratnagiri, Wardha, Yavatmal (Maharashtra)
10, 11, 17, 18 Mar.; 22, 23, 24, 25, 26, 29, 30 Apr.; 25, 26, 27 May	32	16			Bokaro, Chatra, Dhanbad, East Singhbhum, Godda, Gumla, Hazaribag, Khunti, Lohardagga, Palamu, Ramgarh, Ranchi, Saraikela Kharsawan, Sahibganj (Jharkhand)
6, 9, 14, 17, 18, 19 Mar.; 20 Apr.	32	11		81	Ashoknagar, Betul, Damoh, Dewas, Dhar, Hoshangabad / Narmadapuram, Indore, Khandwa / East Nimar, Raisen, Ratlam, Sagar, Satna, Shajapur, Sheopur, Ujjain (Madhya Pradesh)

DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
27, 30 Apr.; 15, 22 May	22	45			Bankura, Howrah, Kolkata, Malda, Murshidabad, North 24 Parganas, Paschim Midnapore, Purba Bardhaman & parts of southern districts of West Bengal
18 to 20, 25 Mar.; 22 Apr.	16	5			Bemetara, Durg, Kabirdham, Kondagaon, Manendragarh- Chirmiri-Bharatpur [MCB], Raipur, Surajpur, Surguja (Chhattisgarh)
16, 31 Mar.; 1, 2, 20, 21, 22, 23, 25, 29 Apr.; 4, 21 May.	12	1		16	Cachar, Chirang, Darrang, Dhemaji, Dhubri, Goalpara, Hojai, Kamrup Metro, Kokrajhar, Majuli, Nagaon (Assam)
29 Mar.; 8 Apr.; 9, 27 May	11	8			Bhadrak, Jagatsinghpur, Mayurbhanj, Nayagarh (Odisha)
28 Mar.; 22 to 24 Apr.	11	1			Anakapalli, Guntur, Nellore, Parvathipuram Manyam, Vizianagaram (Andhra Pradesh)
11, 21, 30 May	8	2			Belagavi, Koppal, Mandya, Mysore, Vijayapura (Karnataka)
23 May	6				Begusarai, Darbhanga, Vaishali (Bihar)
17 Mar.; 17, 24 May	5	10			Dholpur, Hanumangarh, Pali (Rajasthan)
17 Mar.	4	3		Several	Dahod, Dangs, Vadodara (Gujarat)
15 & 16 Mar.	4			40	Jogulamba Gadwal, Nagarkurnool, Nalgonda, Wanaparthy(Telangana)
18 Mar.; 29 Apr.; 1 May	3	3			Jaunpur, Kanpur, Lakhimpur Kheri (Uttar Pradesh)
29 Mar.; 30 May	3	1			Kottayam, Kozhikode (Kerala)
2, 27, 28, 29 Apr.; 9 May	3			8	Erode, Salem, Tiruchirappalli, Virudhunagar (Tamil Nadu)
6 May	2				Badgam (Jammu & Kashmir)
25 Mar.; 24 May.				376	Uttarkashi (Utrakhand)

Thunderstorm: Total 47 persons reportedly claimed dead, 81 persons injured & 79 livestock perished during Pre Monsoon season, because of Thunderstorm. 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
25, 26 May	15	40			Alwar, Bikaner, Jaipur, Tonk (Rajasthan)
19 Mar.; 9, 21, 23 to 30 Apr.; 4, 7, 28 May	12	21		73	Akola, Amravati, Bhandara, Chandrapur, Gadchiroli, Hingoli, Jalgaon, Nanded, Wardha, Yavatmal (Maharashtra)
2, 18, 19, 21, 22 Apr.; 2 May	7	1		6	Charaideo, Dhemaji, Dibrugarh, Golaghat, Hojai, Karbi Anglong, Karimganj, Tinsukia (Assam)
20, 27 Mar.; 28 May	5	3			Balaghat, Damoh, Shahdol, Ujjain (Madhya Pradesh)
23 May	4	4			Haridwar, Nainital, Pauri Garhwal (Uttarakhand)
11, 21 May	4				Chikmagalur, Mandya, Mysore (Karnataka)
24 Mar.		12			Fazilka (Punjab)

Heavy Rains, Floods & Landslide: Total 23 persons reportedly claimed dead, 69 persons injured, 11 persons missing & 87 livestock perished, during Pre Monsoon season, because of heavy rains, floods & Landslide. 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
6 May	8	25	11		Aizawl (Mizoram)
17 & 18 Mar., 1 May	5	2			Gautam Buddha Nagar, Sonbhadra (Uttar Pradesh)
7 Mar.; 3, 27 Apr.; 6, 23 May	4	8		15	Ramban, Poonch, Pulwama (Jammu & Kashmir)
14 to 17 Mar.; 9, 10, 28 Apr.	2	34		36	Aurangabad/Sambhajinagar, Jalgaon, Latur, Nashik, Nanded, Parbhani, Pune (Maharashtra)
21 May	2				Bengaluru (Karnataka)
17 Mar.	1				Dohad (Gujarat)
27 Mar.	1				Tawang (Arunachal Pradesh)
19 & 20 Mar.				36	Bemetara, Durg, Kabirdham, Raipur (Chhattisgarh)

Snowfall: Total 8 persons reportedly claimed dead & 11 persons injured, during Pre Monsoon season, because of Snowfall. The details of the area effected by the events are summarized and given in the table below;

DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
4 Apr.	7	11			East Sikkim (Sikkim)
28 Mar.	1				Anantnag (Jammu & Kashmir)

Gale: Total 6 persons reportedly claimed dead, 17 persons injured & 2 livestock perished, because of Gale. The details of the area affected by the events are summarized and given in the table below;

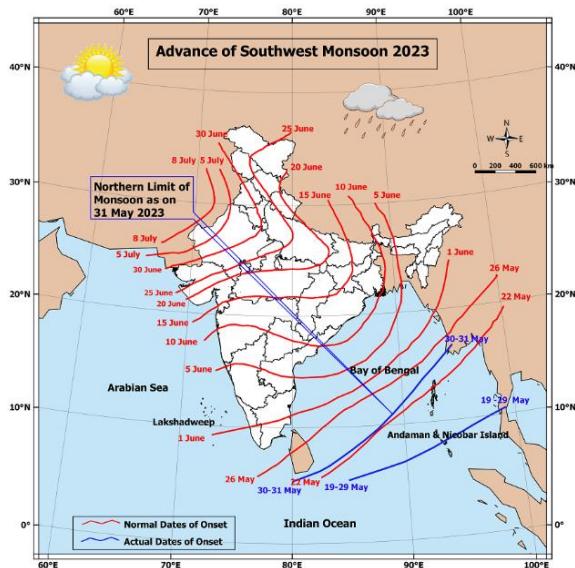
DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
17, 27 Apr.	5	3		2	Buldhana, Pune (Maharashtra)
17 Mar.	1				East Singhbhum (Jharkhand)
19 & 20 Mar.		14			Agar-Malwa, Alirajpur, Betul, Damoh, Khandwa/East Nimar, Jhabua, Mandsaur, Neemuch, Raisen, Rajgarh, Sehore, Khargone/West Nimar (Madhya Pradesh)

Heat Wave: Total 5 persons reportedly claimed dead because of Heat Wave from Nagpur, Nashik & Parbhani districts of Maharashtra on 12th & 21st May.

Hailstorm: Total 2 persons reportedly claimed dead, 4 persons injured & more than 350 livestock perished during Pre Monsoon season. The details are summarized and given in the table below;

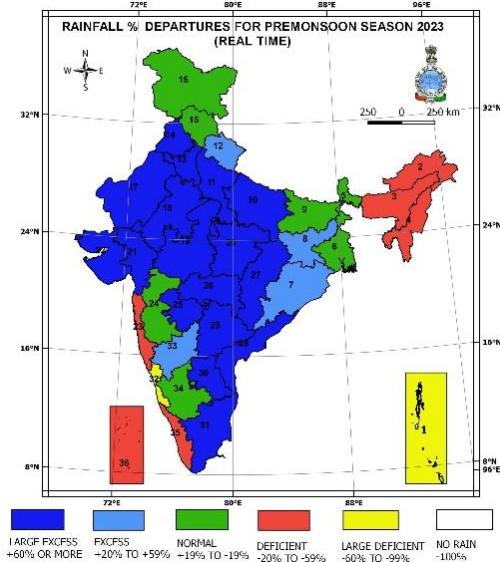
DATE	DEATH	INJURED	MISSING	LIVESTOCK	DISTRICT (STATE) AFFECTED
19 & 20 Mar.	1				Parts of Chhattisgarh
19 Apr.	1				Chirang (Assam)
11 Mar.		3		41	Ranchi (Jharkhand)
18, 19 Mar.; 7, 25 to 28, 30 Apr.		1		313	Akola, Amravati, Dhule, Jalgaon, Washim (Maharashtra)

Squall: 16 persons injured due to Squall in Aizawl, the state capital of Mizoram on 5th May.



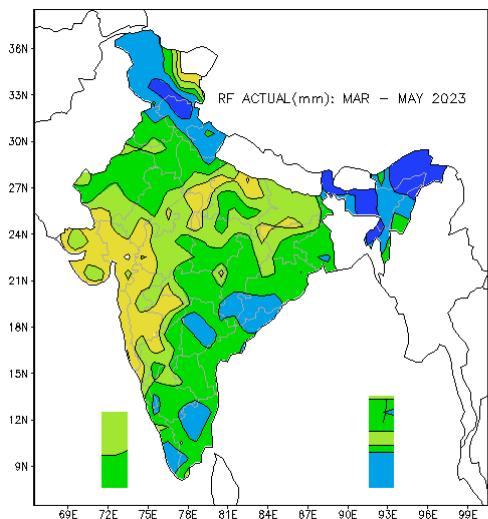
आकृती १: दक्षिण-पश्चिम मानसून का आगमन और प्रगति

FIG. 1: ADVANCE OF SOUTHWEST MONSOON



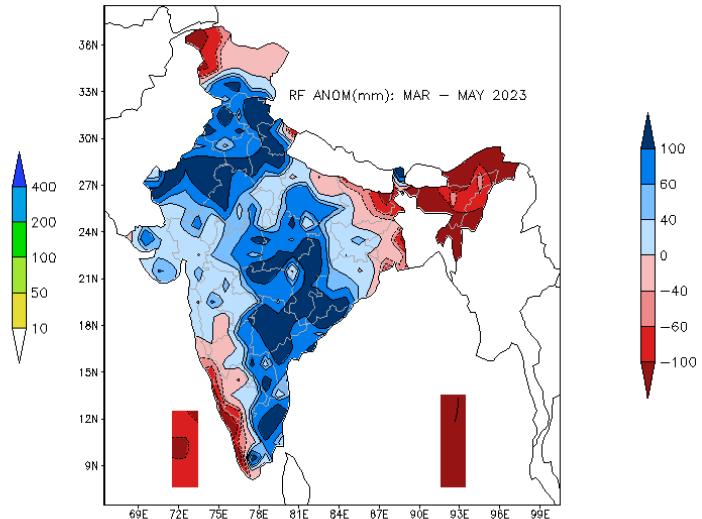
आकृती २: मानसून पूर्व ऋतु २०२३ के लिए वर्षा का उपमंडल वार प्रतिशत विचलन

FIG. 2: SUB-DIVISIONWISE RAINFALL PERCENTAGE DEPARTURES FOR PRE-MONSOON (MARCH-MAY) 2023



आकृती ३(ए): मानसून पूर्व ऋतु २०२३ वर्षा (मिमी)

Fig. 3(a): SEASONAL RAINFALL PRE-MONSOON (MAR-MAY) 2023



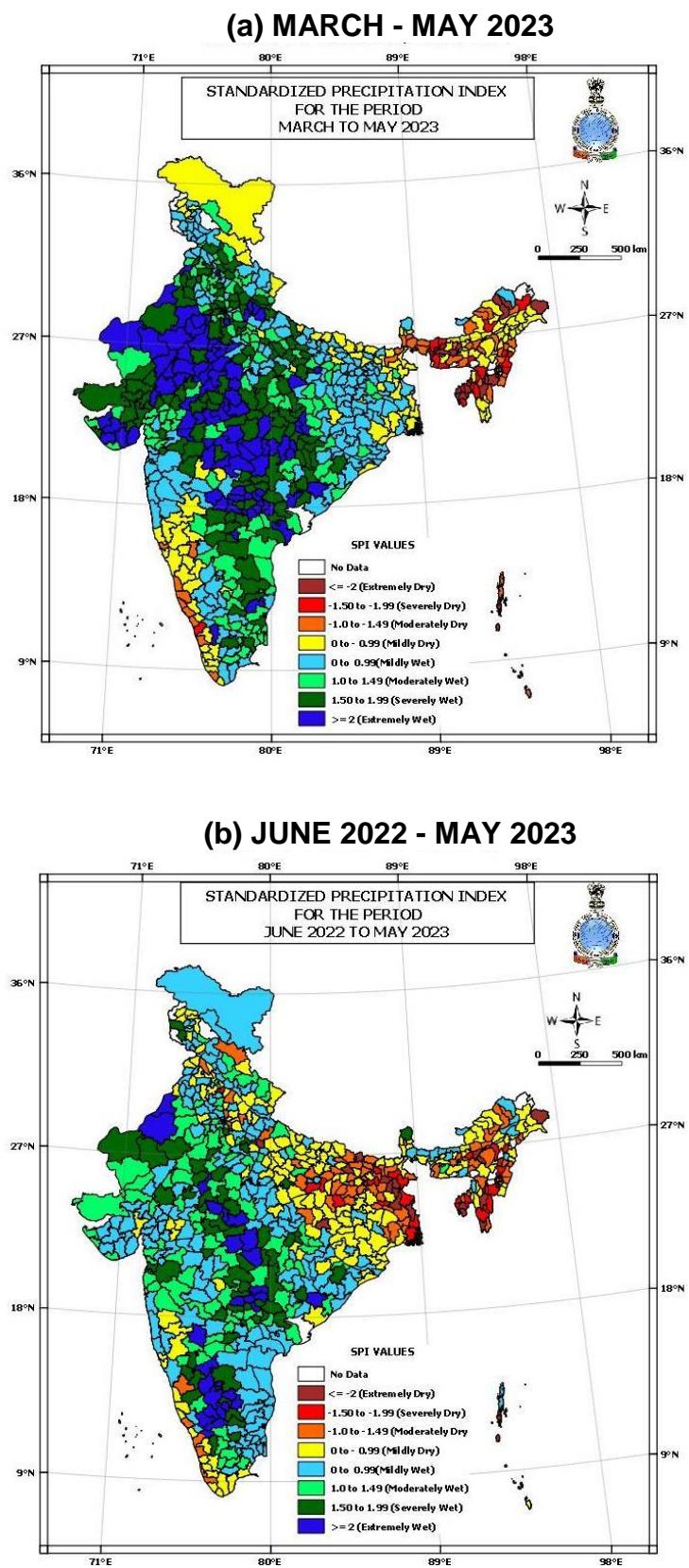
आकृती ३(बी): मानसून पूर्व ऋतु २०२३ वर्षा विसंगति (मिमी)

**Fig. 3(b): SEASONAL RAINFALL ANOMALY (mm) PRE-MONSOON (MAR-MAY) 2023
(BASED ON 1971-2020 NOR)**



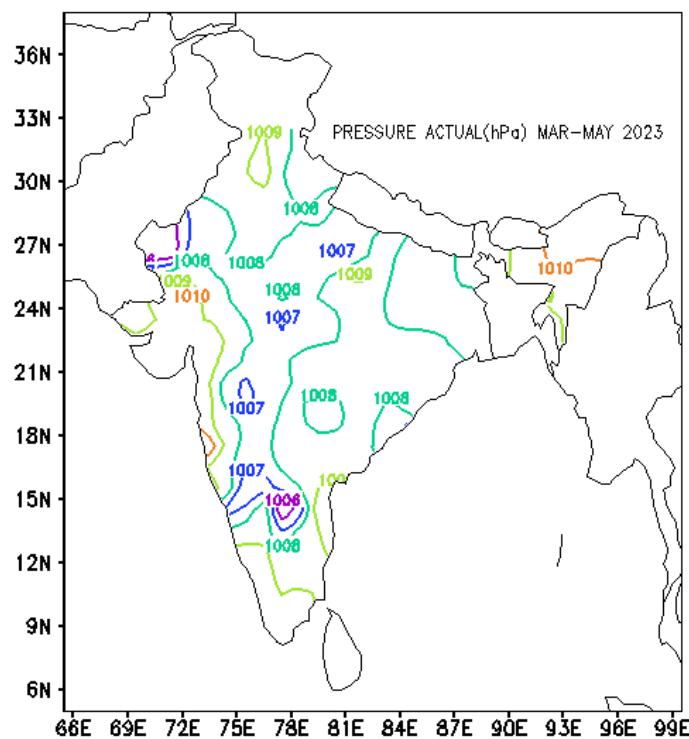
आकृति ४: १९५१-२०२३ की अवधि के दौरान मानसून पूर्व ऋतु के लिए चार समरूप क्षेत्रों में क्षेत्र भारित वर्षा की समय श्रृंखला

FIG. 4: TIME SERIES OF AREA WEIGHT AVERAGED RAINFALL OVER ALL INDIA AND FOUR HOMOGENEOUS REGIONS FOR PREMONSOON (1951 - 2023)

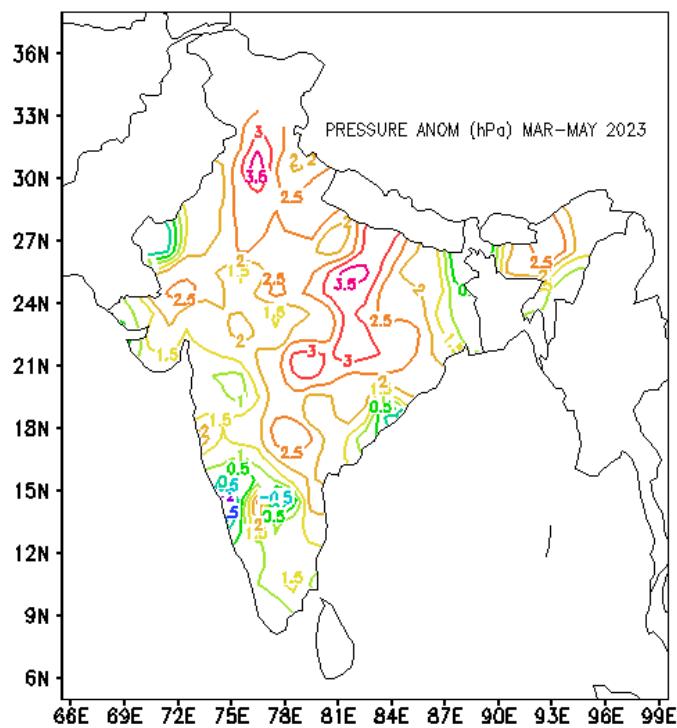


आकृति ५: मानकीकृत वर्षण सूचकांक (एसपीआई)
 (ए) मार्च से मई (तीन महीना) (बी) जुन से मई (बारह महीने)
FIG. 5: STANDARDIZED PRECIPITATION INDEX (SPI) FOR
(a) THREE MONTHS (b) TWELVE MONTHS

(a) MEAN SEA LEVEL PRESSURE (MSLP)



(b) MSLP Anomaly

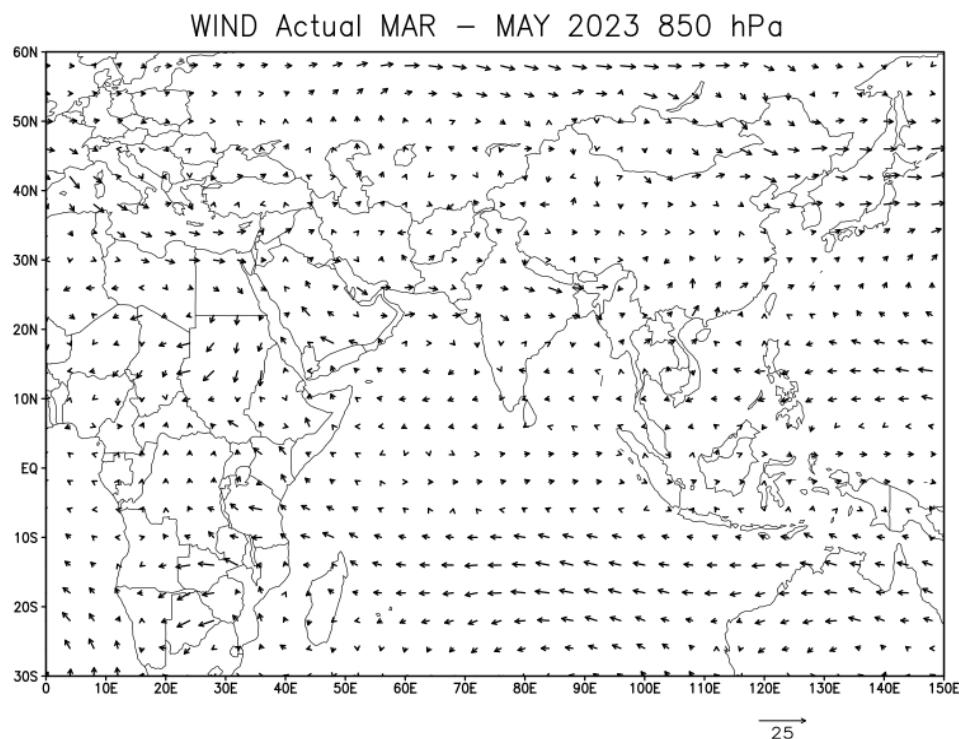


आकृती ६: मानसून पूर्व ऋतु २०२३ के लिए मासिक औसत समुद्र स्तर दबाव (एचपीए)

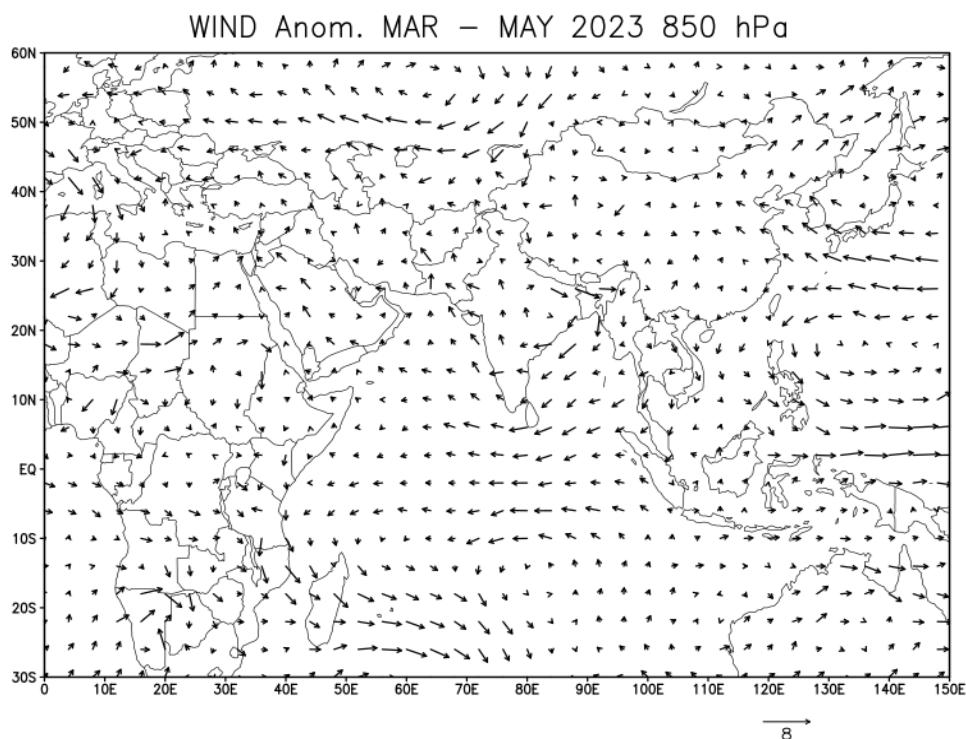
(ए) माध्य (बी) विसंगति (१९८१-२०१० सामान्य पर आधारित)

**FIG. 6: SEASONAL MEAN SEA LEVEL PRESSURE (hPa) (a) MEAN (b) ANOMALY
(BASED ON 1981 - 2010 NORMALS)**

(a) MEAN WIND: 850 hPa



(b) WIND ANOMALY: 850 hPa

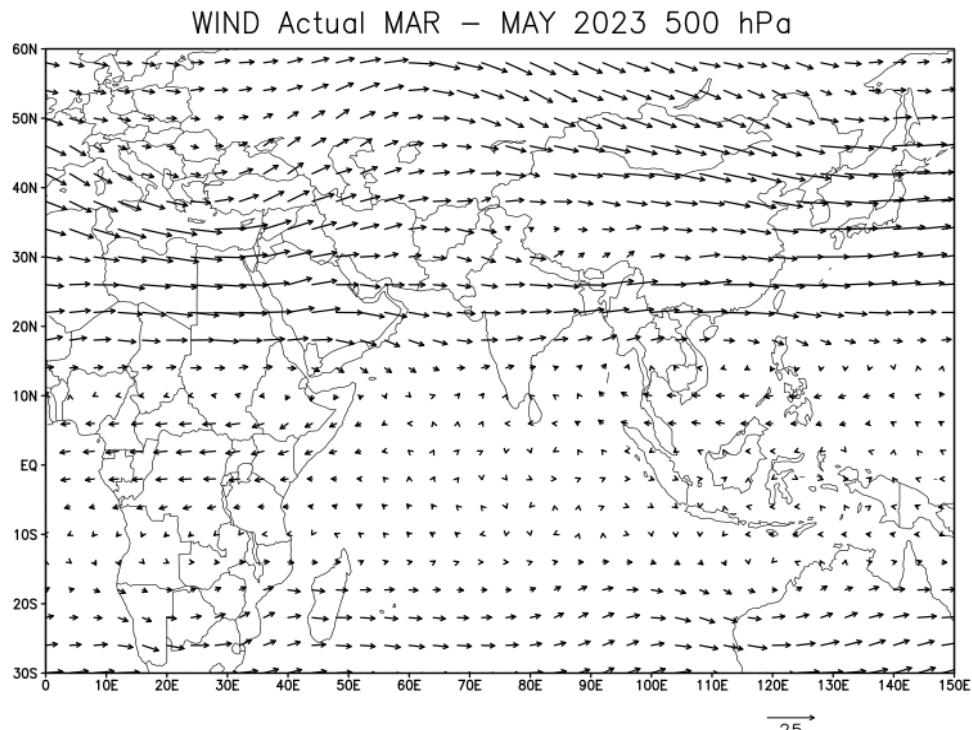


आकृति ७: मानसून पूर्व ऋतु २०२३ के लिए मासिक पवन (मि /से)

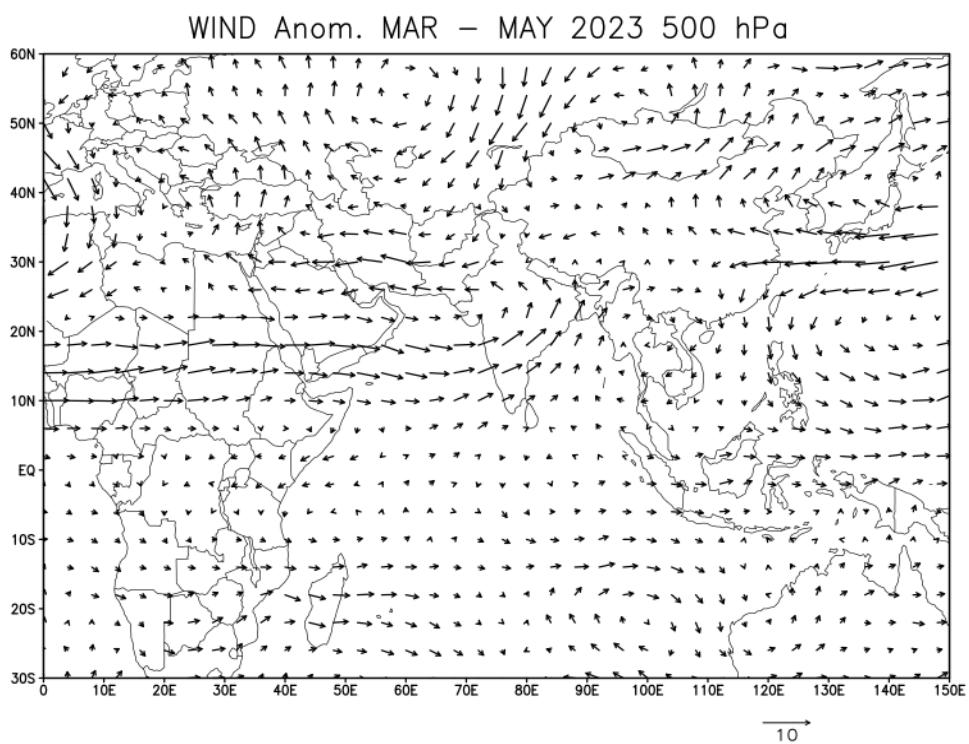
(ए) माध्य (बी) विसंगति ८५० एचपीए स्तरपर

FIG. 7: SEASONAL 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, Source: NCMRWF)

(a) MEAN WIND : 500 hPa



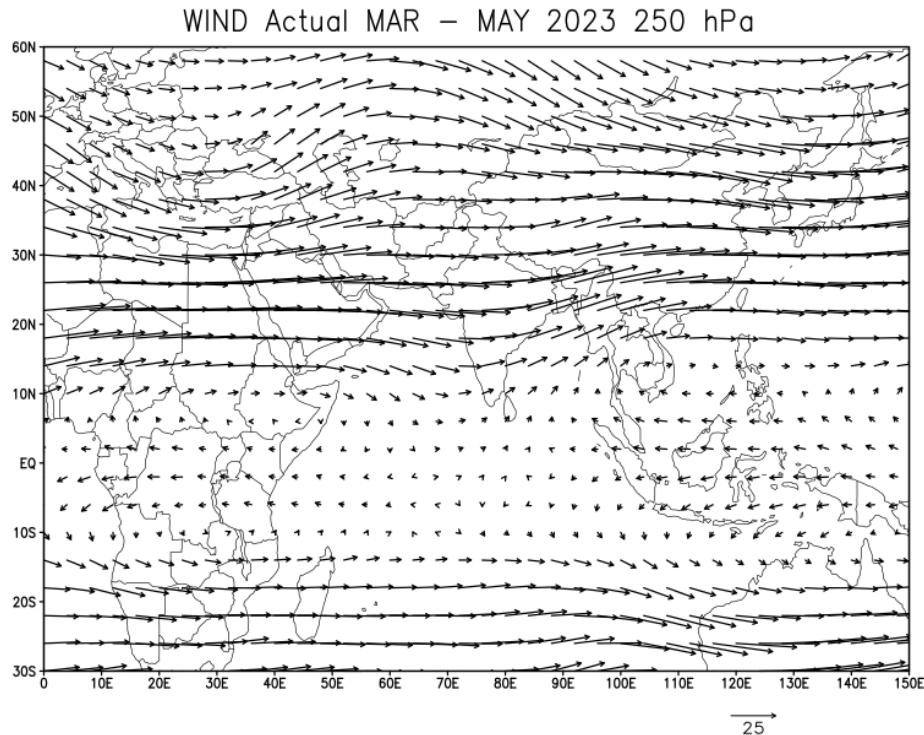
(b) WIND ANOMALY : 500 hPa



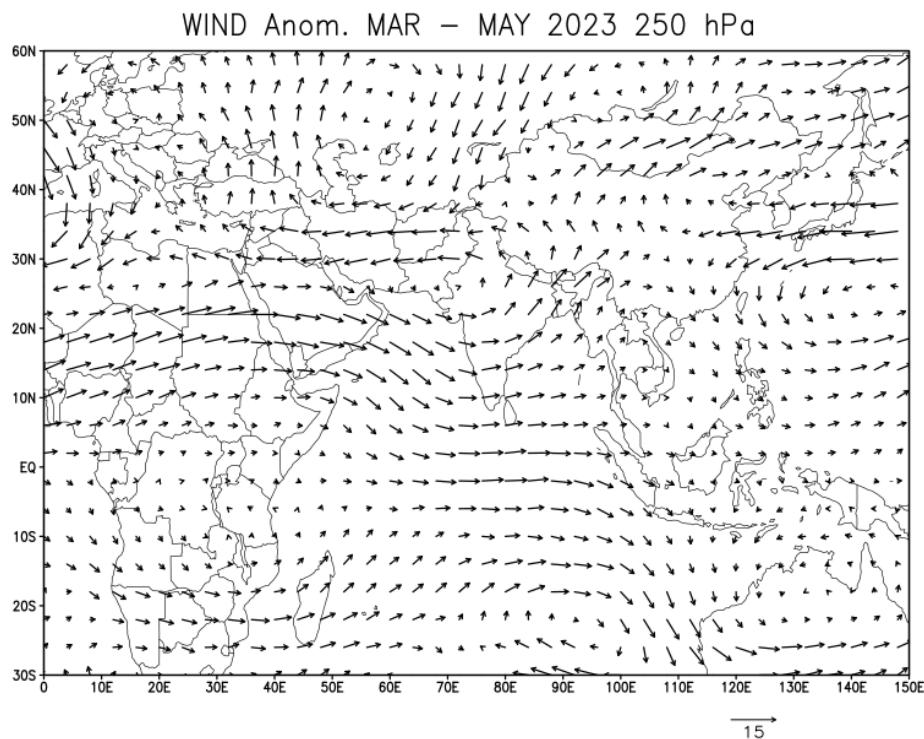
आकृति ८: मानसून पूर्व ऋतु २०२३ के लिए मासिक पवन (मि /से)
 (ए) माध्य (बी) विसंगति ५०० एचपीए स्तरपर

FIG. 8: SEASONAL 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, Source: NCMRWF)

(a) MEAN WIND : 250 hPa



(b) WIND ANOMALY: 250 hPa

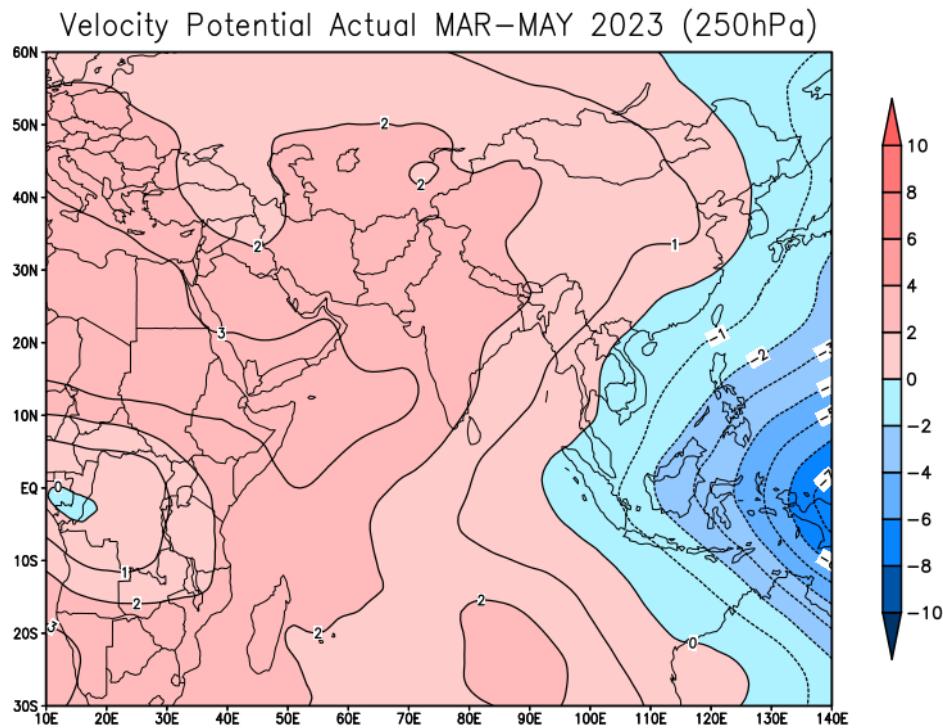


आकृति ९: मानसून पूर्व क्रतु २०२३ के लिए मासिक पवन (मि /से)

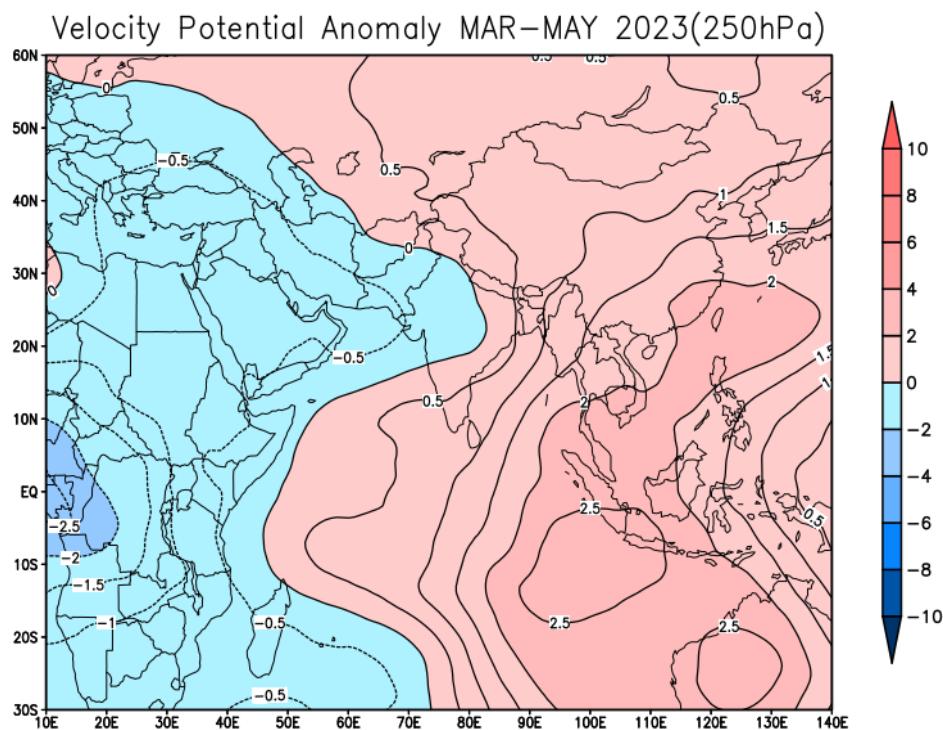
(ए) माध्य (बी) विसंगति २५० एचपीए स्तरपर

FIG. 9: SEASONAL 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, Source: NCMRWF)

(a) VELOCITY POTENTIAL: 250 hPa



(b) VELOCITY POTENTIAL ANOMALY: 250 hPa

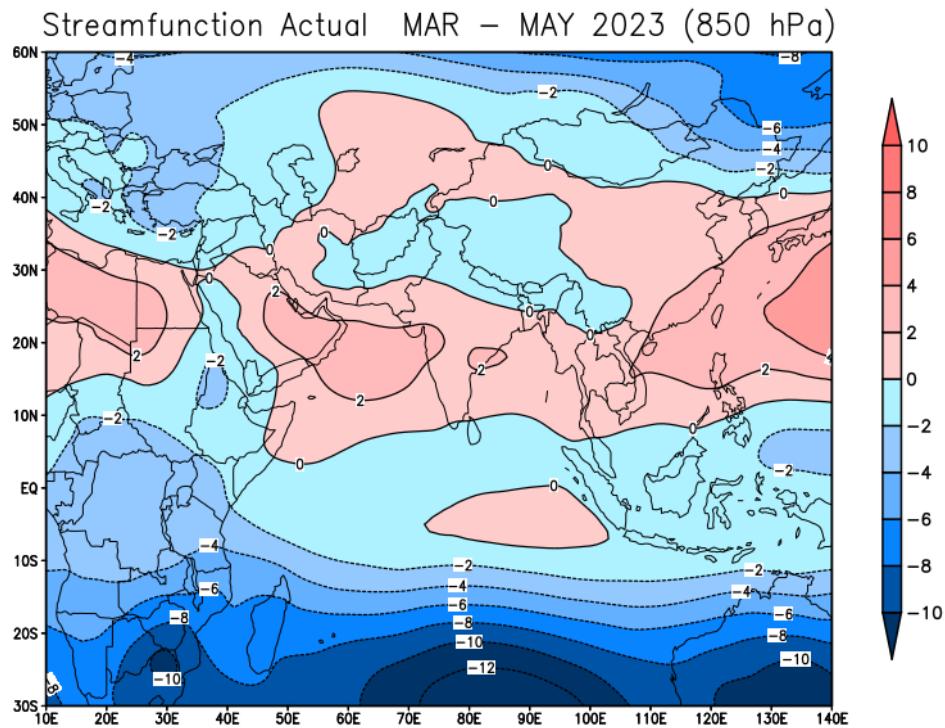


आकृती १०: मानसून पूर्व ऋतु २०२३ के लिए वेग विभव ($10^6 \text{मीटर}^2/\text{सेकंड}$)

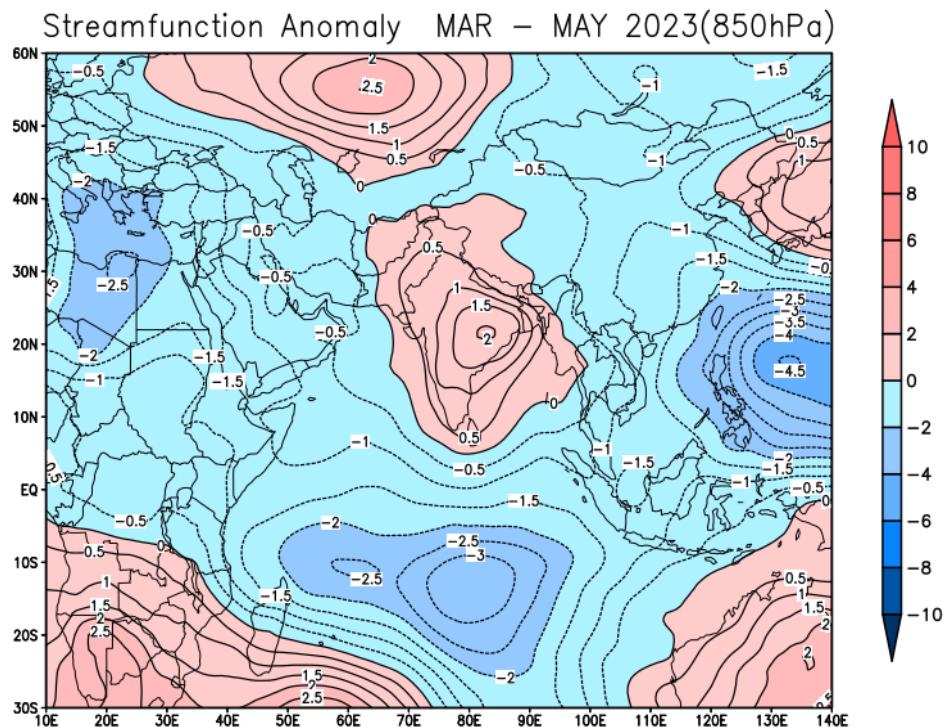
(ए) माध्य (बी) विसंगति २५० एचपीए स्तरपर

FIG. 10: VELOCITY POTENTIAL ($10^6 \text{m}^2/\text{s}$) (a) MEAN (b) ANOMALY AT 250 hPa
 (OPERATIONAL NWP ANALYSIS OF IMD GFS T-574)
 (ANOMALY IS BASED ON 2000-2018 Climatology, Source: NCMRWF)

(a) STREAM FUNCTION: 850 hPa



(b) STREAM FUNCTION ANOMALY: 850 hPa



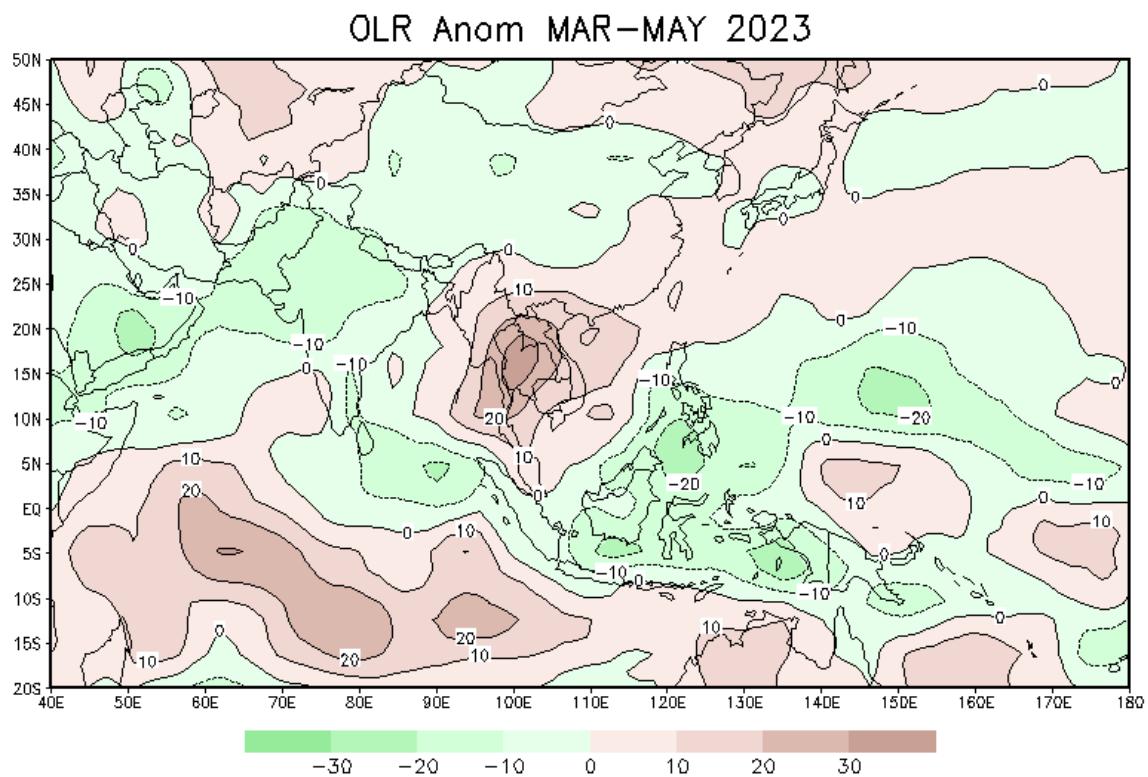
आकृती ११: मानसून पूर्व क्रतु २०२३ के लिए धारा कृत्य ($10^6 \text{ मीटर}^2/\text{सेकंड}$)

(ए) माध्य (बी) विसंगति ८५० एचपीए स्तरपर

FIG. 11: STREAM FUNCTION ($10^6 \text{ m}^2/\text{s}$) (a) MEAN (b) ANOMALY AT 850 hPa

(OPERATIONAL NWP ANALYSIS OF IMD GFS T-574)

(ANOMALY IS BASED ON 2000-2018 Climatology, Source: NCMRWF)



आकृति १२: मानसून पूर्व ऋतु २०२३ के लिए ओ एल आर विसंगति (वॉट/मी²)

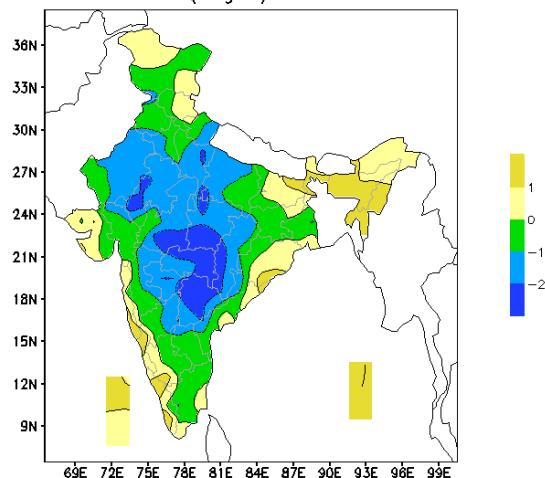
FIG. 12: OLR ANOMALY (W/m²) FOR PRE MONSOON (MARCH-MAY) 2023

(SOURCE: CDC / NOAA, USA)

(BASED ON 1991 - 2020 CLIMATOLOGY)

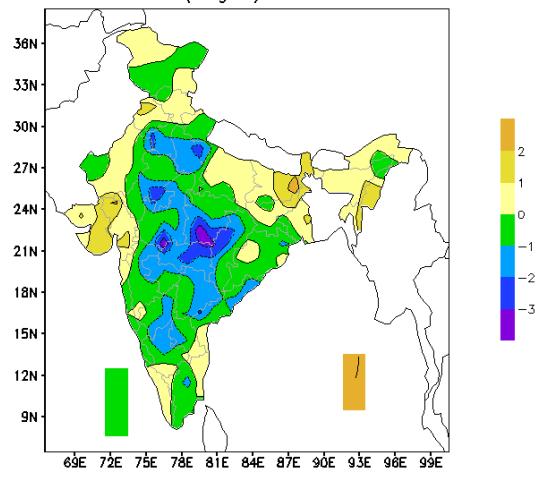
(a) MAXIMUM TEMPERATURE ANOMALY

MAX TEMP ANOMALY (deg C) : PRE-MONSOON 2023



(b) MINIMUM TEMPERATURE ANOMALY

MIN TEMP ANOMALY (deg C) : PRE-MONSOON 2023



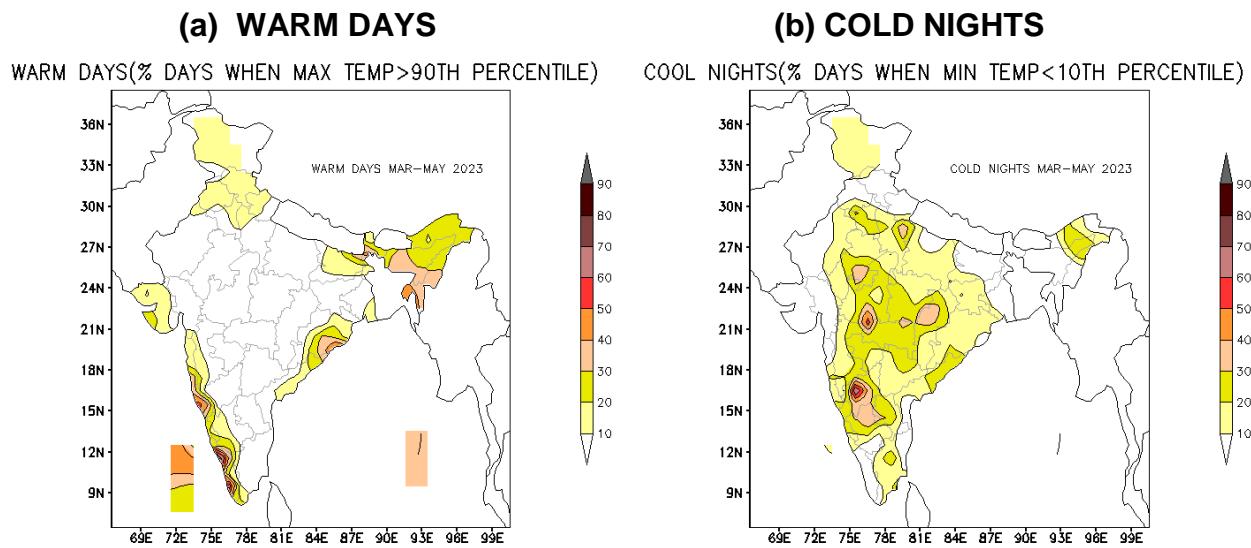
आकृति १३: मानसून पूर्व ऋतु २०२३ के लिए औसत मासिक तापमान विसंगतियां (डिग्री सेल्सियस)

(ए) अधिकतम (बी) न्यूनतम

FIG. 13: MEAN MONTHLY TEMPERATURE ANOMALIES (°C)

(a) MAXIMUM (b) MINIMUM

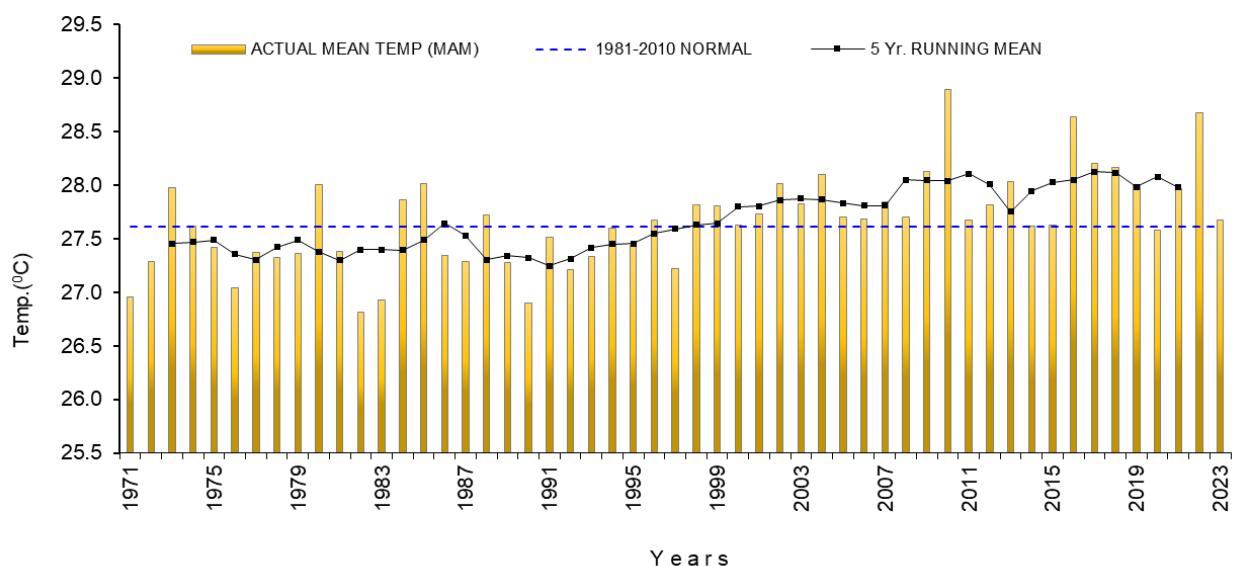
(BASED ON 1981-2010 NORMALS)



आकृती १४: (ए) उन दिनों का प्रतिशत जब अधिकतम तापमान > 90 वें प्रतिशत

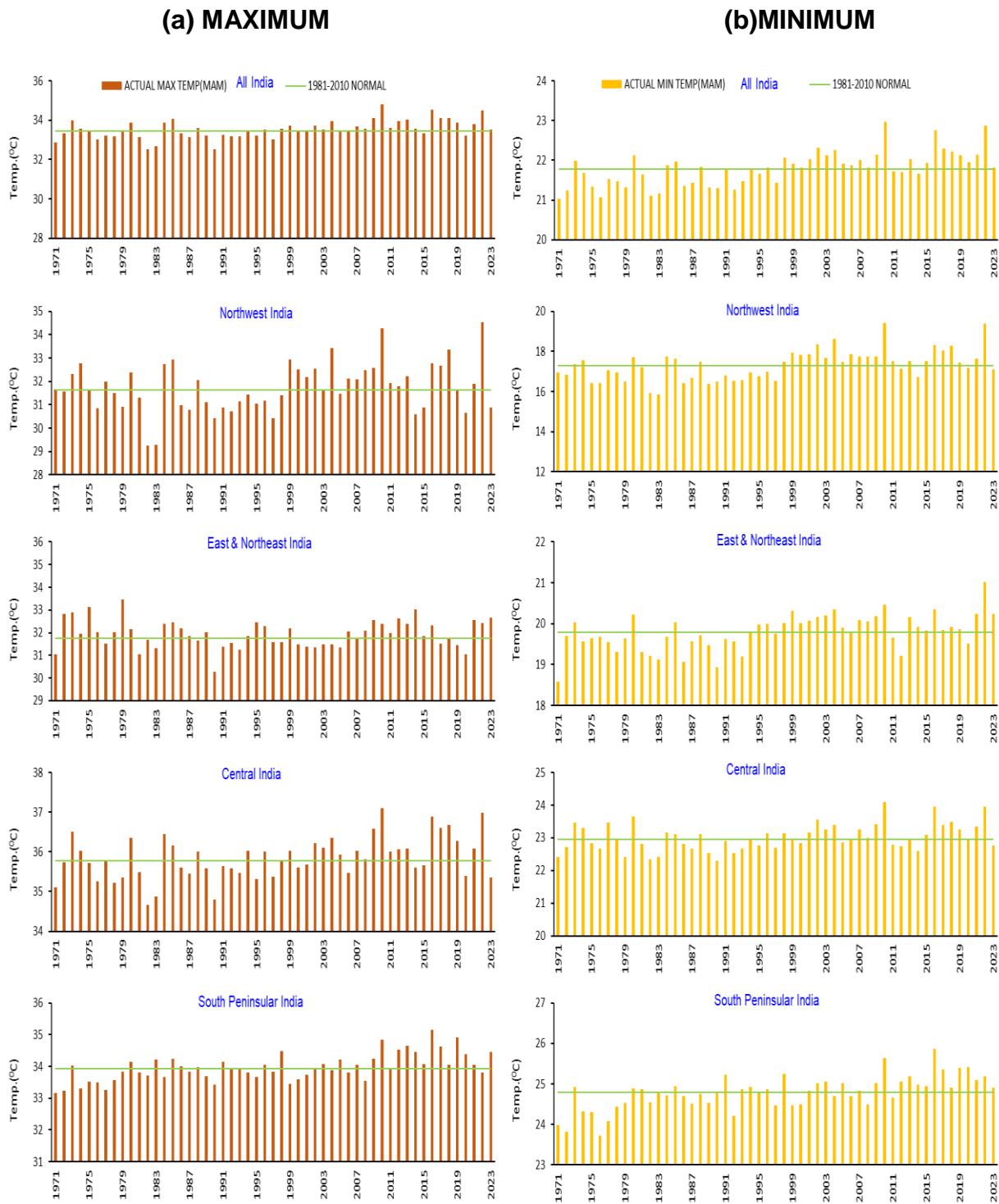
(बी) उन दिनों का प्रतिशत जब न्यूनतम तापमान < 10 वें प्रतिशत

FIG:14 (a) PERCENTAGE OF DAYS WHEN MAXIMUM TEMPERATURE > 90 TH PERCENTILE
(b) PERCENTAGE OF DAYS WHEN MINIMUM TEMPERATURE < 10 TH PERCENTILE



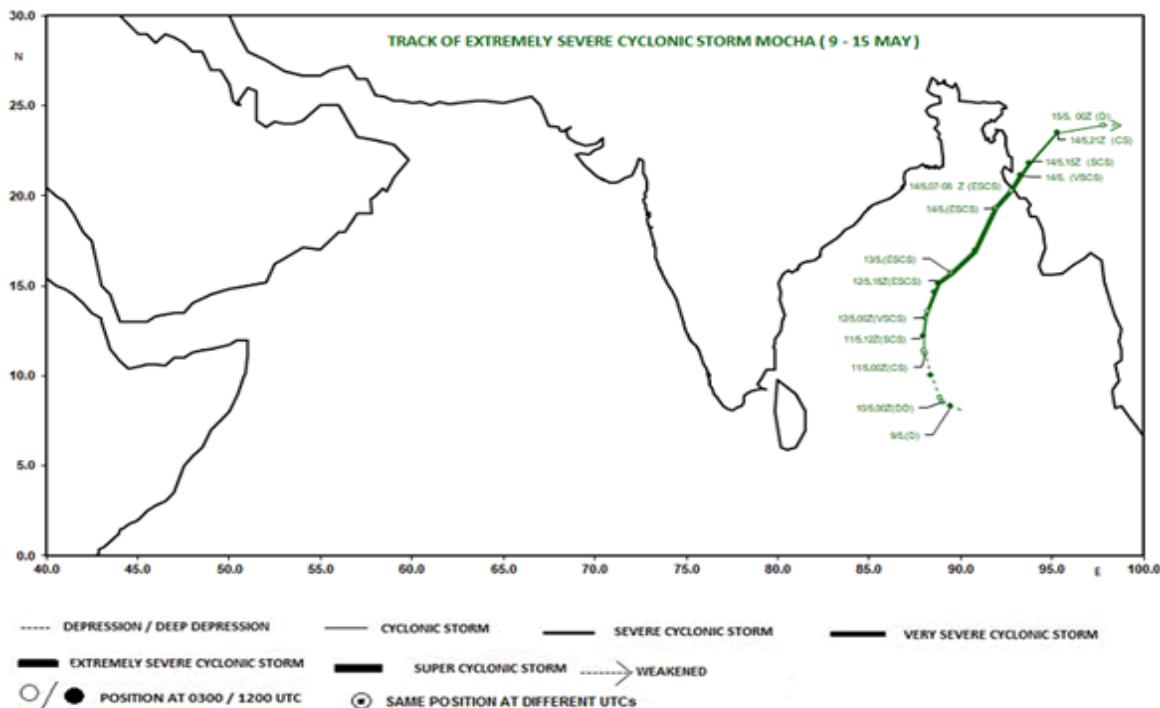
आकृती १५: मानसून पूर्व ऋतु १९७१-२०२३ की अवधि के दौरान भारत में औसत तापमान की समय शृंखला और महीने के लिए पांच साल चलने वाला औसत तापमान

FIG. 15: TIME SERIES OF MEAN TEMPERATURE AVERAGED OVER INDIA (VERTICAL BARS AND FIVE YEAR RUNNING MEAN (CONTINUOUS LINE) FOR MAR-MAY (1971-2023)

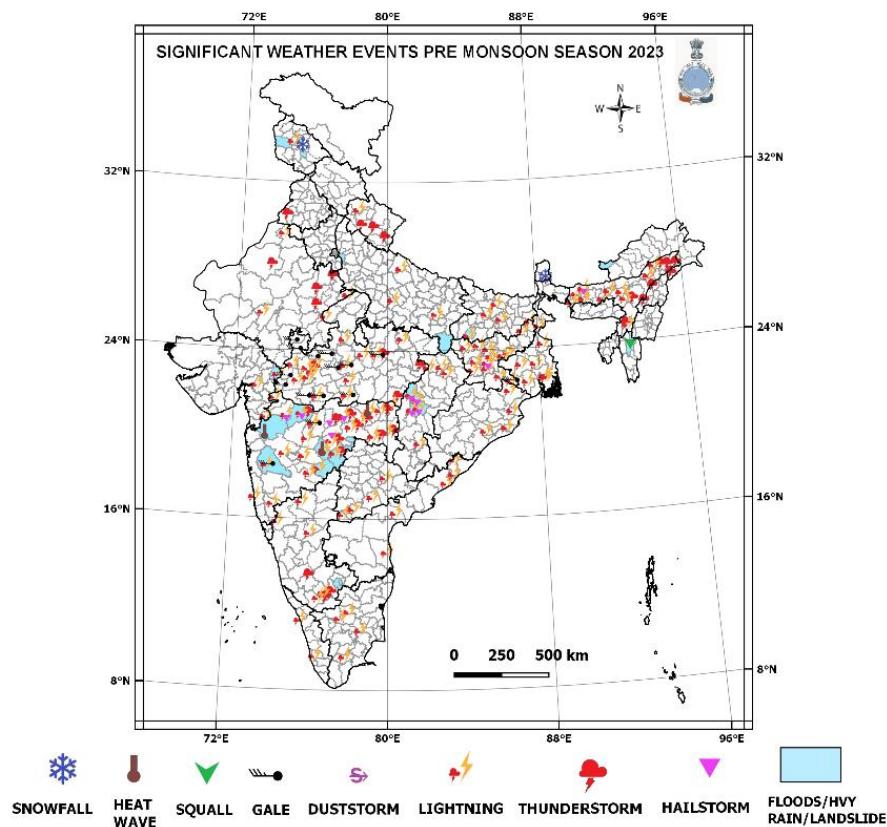


आकृति १६: मानसून पूर्व ऋतु के लिए १९७१-२०२३ अवधि के दौरान (ए) अधिकतम (बी) न्यूनतम तापमान की समय श्रृंखला पूरे देश और चार सजातीय क्षेत्र के लिए

FIG. 16: TIME SERIES OF TEMPERATURE FOR THE COUNTRY AS A WHOLE AND THE FOUR HOMOGENEOUS REGIONS FOR MAR- MAY (1971- 2023)
(a) MAXIMUM (b) MINIMUM



आकृति १७: मानसून पूर्व ऋतु २०२३ के दौरान गठित तीव्र निम्न दबाव प्रणाली का ट्रैक
FIG. 17: TRACK OF INTENSE LOW PRESSURE SYSTEM FORMED DURING PREMONSOON 2023



आकृति १८: मानसून पूर्व ऋतु २०२३ के दौरान महत्वपूर्ण मौसम की घटनाएं
(वास्तविक समय मीडिया रिपोर्ट के आधार पर)

**Fig. 18: SIGNIFICANT WEATHER EVENTS DURING PREMONSSON (MAR- MAY) 2023
(BASED ON REAL TIME MEDIA REPORT)**

तालिका १ / TABLE 1

मानसून पूर्व ऋतु २०२३ महीने के लिए उपमंडल वार वर्षा के आकड़े

**METEOROLOGICAL SUBDIVISION WISE RAINFALL STATISTICS FOR THE PREMONSOON
SEASON (MAR-MAY) 2023 BASED ON OPERATIONAL DATA**

	MET. SUBDIVISION	ACTUAL	NORMAL	%
		(mm)	(mm)	DEP
1	A & N ISLAND	161.3	455.9	-64.6
2	ARUNACHAL PRADESH	446.2	757.3	-41.1
3	ASSAM & MEGHALAYA	346.3	582.6	-40.6
4	N M M T	224.7	477.0	-52.9
5	SHWB & SIKKIM	374.8	438.4	-14.5
6	GANGETIC WEST BENGAL	190.9	187.9	1.6
7	ODISHA	177.3	128.6	37.9
8	JHARKHAND	103.4	83.3	24.1
9	BIHAR	74.6	85.3	-12.5
10	EAST U.P.	63.6	33.6	89.3
11	WEST U.P.	87.4	32.7	167.3
12	UTTARAKHAND	225.6	158.2	42.6
13	HAR. CHD & DELHI	109.9	45.0	144.2
14	PUNJAB	127.9	54.2	136.0
15	HIMACHAL PRADESH	287.0	240.7	19.2
16	JAMMU & KASHMIR & LADAKH	288.7	330.0	-12.5
17	WEST RAJASTHAN	100.7	24.7	307.7
18	EAST RAJASTHAN	89.0	21.2	319.8
19	WEST MADHYA PRADESH	68.2	13.5	405.2
20	EAST MADHYA PRADESH	92.4	23.7	289.9
21	GUJARAT REGION	28.9	5.5	425.5
22	SAURASHTRA & KUTCH	45.8	3.1	1377.4
23	KONKAN & GOA	18.0	29.4	-38.8
24	MADHYA MAHARASHTRA	30.6	26.4	15.9
25	MARATHWADA	45.2	25.6	76.6
26	VIDARBHA	130.0	27.0	381.5
27	CHHATTISGARH	108.3	37.0	192.7
28	COASTAL A. P.& YANAM	191.6	96.2	99.2
29	TELANGANA	158.6	63.8	148.6
30	RAYALASEEMA	147.8	79.5	85.9
31	TAMIL., PUDU. & KARAikal	202.5	124.9	62.1
32	COASTAL KARNATAKA	58.8	155.2	-62.1
33	N. I. KARNATAKA	104.8	79.6	31.7
34	S. I. KARNATAKA	157.6	142.8	10.4
35	KERALA & MAHE	236.4	359.0	-34.2
36	LAKSHADWEEP	100.3	197.0	-49.1

तालिका 2 / TABLE 2
मानसून पुर्व ऋतु २०२३ महीने के दौरान की तापमान विसंगति
TEMP ANOMALIES OVER INDIA AND FOUR HOMOGENEOUS REGIONS DURING
PRE-MONSOON (MARCH-MAY) 2023

PRE-MONSOON 2023		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	33.53	21.82	27.68
	NORMAL	33.45	21.78	27.61
	ANOMALY	0.08	0.04	0.06
NORTHWEST INDIA	ACTUAL	30.87	17.12	24.00
	NORMAL	31.65	17.29	24.47
	ANOMALY	-0.78	-0.17	-0.48
EAST & NORTHEAST INDIA	ACTUAL	32.66	20.24	26.45
	NORMAL	31.74	19.79	25.76
	ANOMALY	0.92	0.45	0.69
CENTRAL INDIA	ACTUAL	35.35	22.76	29.05
	NORMAL	35.77	22.96	29.36
	ANOMALY	-0.42	-0.20	-0.31
SOUTH PENINSULAR INDIA	ACTUAL	34.45	24.91	29.68
	NORMAL	33.93	24.80	29.37
	ANOMALY	0.52	0.11	0.32

NOTE: VALUES ARE ROUNDED OFF TO NEAREST TWO DECIMAL

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