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INDIA METEOROLOGICAL DEPARTMENT

Rainfall Forecast for January to March, 2024
and Monthly Outlook for Rainfall and Temperature during January, 2024

Highlights

- a)** During the upcoming winter season (January to March 2024) the rainfall over the North India consisting of seven meteorological subdivisions (East Uttar Pradesh, West Uttar Pradesh, Uttarakhand, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir and Ladakh) is most likely to be normal (86-114 % of Long Period Average (LPA)). Seasonal rainfall over the country as a whole during January to March season is most likely to be above normal (>112% of the Long-Period Average (LPA)). Normal to above normal seasonal rainfall is likely over most parts of the country except parts from extreme south peninsular India, extreme northwest and northeast India where below normal rainfall is likely.
- b)** Monthly rainfall for January 2024 over the North India consisting of seven meteorological subdivisions (East Uttar Pradesh, West Uttar Pradesh, Uttarakhand, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir and Ladakh) is most likely to be above normal (>122 % of Long Period Average (LPA)). Monthly rainfall over the country as a whole during January 2024 is also most likely to be above normal (>118% of Long Period Average (LPA)). Above-normal rainfall is most likely over most parts of the country except some parts of northwest India and some pockets of the northeast India where below normal to normal rainfall is likely.
- c)** During January 2024, monthly minimum temperatures are most likely to be above-normal over many parts of the country except some parts of north India where normal to below normal minimum temperatures are likely. Below-normal cold wave days are expected over most parts of Central India during the month of January 2024.
- d)** Monthly maximum temperatures for January 2024 are likely to be below normal over many parts of the central and northwest India. Above normal maximum temperatures are likely over most parts of Peninsular and northeast India.

Rainfall Forecast for January to March, 2024 and Monthly Outlook for Rainfall and Temperature during January 2024

1. Background

North India consisting of seven meteorological subdivisions (East Uttar Pradesh, West Uttar Pradesh, Uttarakhand, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir and Ladakh) receives about 18% of its annual rainfall from January to March. Jammu & Kashmir and Ladakh in particular receive about 31% of their annual rainfall during this period. The winter rainfall is very crucial for Rabi crops over the region. It is also crucial for the water management of the region. Because of these reasons, India Meteorological Department (IMD) has been issuing long-range forecast outlooks for the winter rainfall over North India. IMD also continuously works to improve the skill of forecasting models. The forecast is based on the newly developed Multi-Model Ensemble (MME) technique introduced since monsoon season of 2021. The MME approach uses the coupled global climate models (CGCMs) from different global climate prediction and research centers including IMD/MoES Monsoon Mission Climate Forecast System (MMCFS) model.

IMD has now prepared the forecast outlook for the rainfall during the January to March (JFM) period and for January, 2024. The following forecasts are presented in section 2.

- a. Probabilistic forecasts for the winter season (January to March 2024) rainfall averaged over North India consisting of seven meteorological subdivisions and country as a whole.
- b. Probabilistic forecast for monthly rainfall during January 2024 averaged over North India and country as a whole.
- c. Spatial distribution of probabilistic rainfall forecasts over the country during January to March 2023 and January 2024.

Since 2016, the India Meteorological Department (IMD), Ministry of Earth Sciences (MoES) has been issuing seasonal forecast outlooks for temperatures over the country for both hot and cold weather seasons. On 1st December 2023 IMD issued the seasonal forecast for the temperatures for the December to February (DJF) season. As additional information, IMD has now prepared a monthly temperature outlook for January 2024 over the country and the same is presented in section 4.

2. (a) Probabilistic Forecast for the Rainfall during JFM 2024

The rainfall during January-March (JFM) 2024 averaged over North India is most likely to be normal (86-114% of the Long-Period Average (LPA)). The LPA of rainfall over North India during JFM based on data from 1971 to 2020 is about 184.3 mm. Seasonal rainfall over the country as a whole during JFM season is most likely to be above normal (>112% of LPA). The LPA of rainfall over the country as a whole during the JFM season based on data from 1971-2020 is about 69.7 mm.

The probabilistic forecast for the spatial distribution of tercile rainfall categories (above normal, normal, and below normal) over the country for the JFM period is shown in Fig.1. The forecast suggests that normal to above normal seasonal rainfall is likely over most parts of the country except parts from extreme south peninsular India,

extreme northwest and northeast India where below normal rainfall is likely. Climatological rainfall probability is likely elsewhere. The dotted areas in the map climatologically receive very less rainfall during the month and the white-shaded areas within the land areas represent climatological probabilities.

3. (b). Probabilistic Forecast for the rainfall during January 2024

The 2024 January rainfall averaged over North India is most likely to be above normal (> 122 % of LPA). The LPA of rainfall over North India during January based on the data of 1971-2020 is about 49.0 mm. Monthly rainfall over the country as a whole during January 2024 is most likely to be above normal (>118 % of LPA). The LPA of rainfall over the country as a whole during January based on data from 1971-2020 is about 17.1 mm

The probabilistic forecast for the spatial distribution of tercile rainfall categories (above normal, normal, and below normal) over the country for January 2024 is shown in Fig.2. The forecast suggests that Above-normal rainfall is most likely over most parts of the country except some parts of northwest India and some pockets of the northeast India where below normal to normal rainfall is likely. Climatological probabilities are likely over the remaining areas of India. The dotted areas in the map climatologically receive very less rainfall during the month and the white-shaded areas within the land areas represent climatological probabilities.

4. Probabilistic Temperature Forecast for January 2024

Fig.3 and Fig.4 show forecast probabilities of the minimum and maximum temperatures respectively for January 2024. The probability forecast for the minimum temperatures indicates that during January 2024, monthly minimum temperatures are most likely to be above-normal over many parts of the country except some parts of north India where normal to below normal minimum temperatures are likely. Climatological probabilities (indicated by white-shaded areas) are predicted over the remaining areas of the country.

- a) The maximum temperature is likely to be below normal over many parts of the central and northwest India (Fig.4). Above normal maximum temperatures are likely over most parts of Peninsular and northeast India. Climatological probabilities (indicated by white-shaded areas) are predicted over the remaining areas of the country.

5. Outlook for Cold Wave events during January 2024

The anomaly forecast for the number of coldwave days in the country for the month of January 2024 is presented in Fig. 5. Below-normal cold wave days are expected over most parts of Central India during the month of January 2024.

6. SST conditions in the Pacific and the Indian Oceans

Currently, the moderate to strong El Niño conditions are prevailing over equatorial Pacific and the sea surface temperatures (SSTs) are above average over most parts of the central and eastern equatorial Pacific Ocean. The latest MMCFS

forecast indicates that moderate to strong El Niño conditions are likely to continue during the upcoming season.

In addition to El Niño-Southern Oscillation (ENSO) conditions over the Pacific, other factors such as the Indian Ocean SSTs also influence on Indian climate. At present, strong positive Indian Ocean Dipole (IOD) conditions are observed over the Indian Ocean and the latest MMCFS forecast indicates positive IOD conditions are likely to weaken and turn to neutral condition by early part the next year.

7. Extended Range Forecast and short to medium-range forecasting services

IMD also provides extended-range forecasts (7–day averaged forecasts for the next four weeks) of rainfall and maximum & minimum temperatures over the country updated every week on Thursday. This is based on the Multi-model ensemble dynamical Extended Range Forecasting System currently operational at IMD. The forecasts are available through the IMD website (https://mausam.imd.gov.in/imd_latest/contents/extendedrangeforecast.php). The extended-range forecast is followed by the short to medium-range forecast issued daily by IMD.

probability rainfall forecast for 2024 JFM

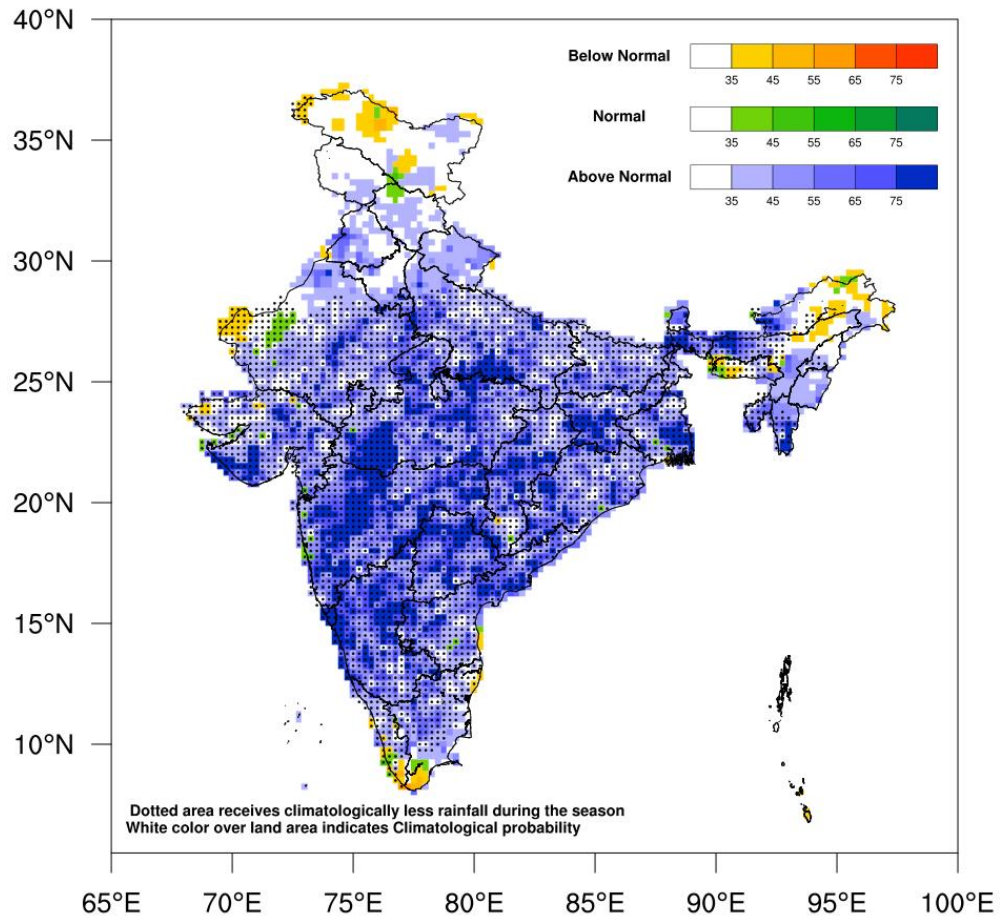


Fig.1. Probability forecast of tercile categories* (below normal, normal, and above normal) for the rainfall over India during JFM 2024. The figure illustrates the most likely categories as well as their probabilities. The dotted area shown in the map climatologically receives very less rainfall during this period and the white-shaded areas within the land areas represent climatological probabilities (*Tercile categories have equal climatological probabilities, of 33.33% each).

probability rainfall forecast for 2024 January

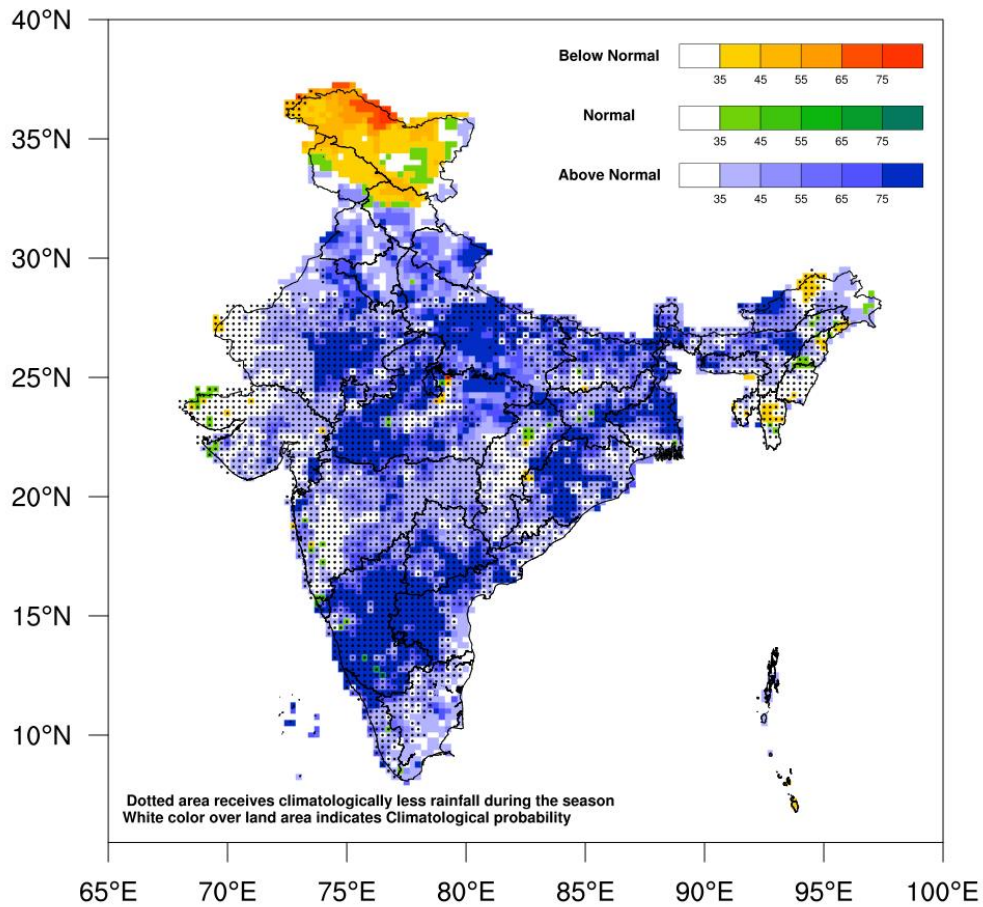


Fig.2. Probability forecast of tercile categories* (below normal, normal, and above normal) for the rainfall over India during January 2024. The figure illustrates the most likely categories as well as their probabilities. The dotted area shown in the map climatologically receives very less rainfall during January and the white-shaded areas within the land areas represent climatological probabilities (*Tercile categories have equal climatological probabilities, of 33.33% each).

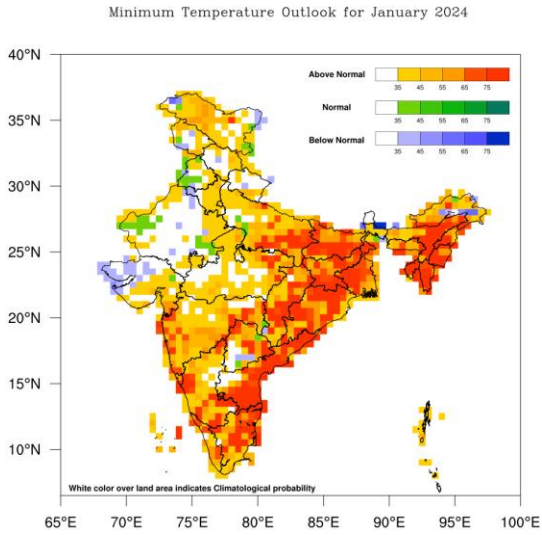


Fig.3. Probability forecast of Minimum Temperature for January 2024.

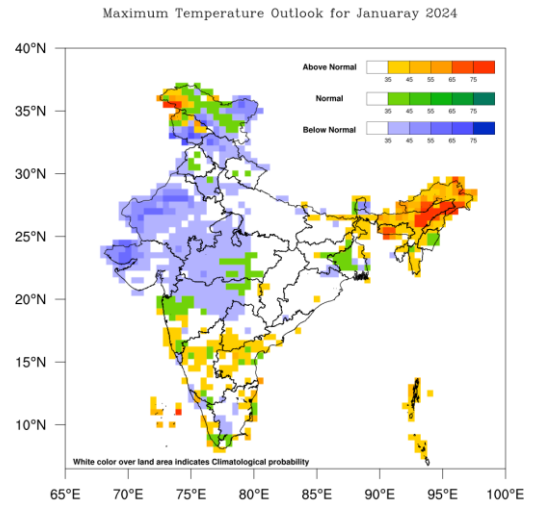


Fig.4. Probability forecast of Maximum Temperature for January 2024.

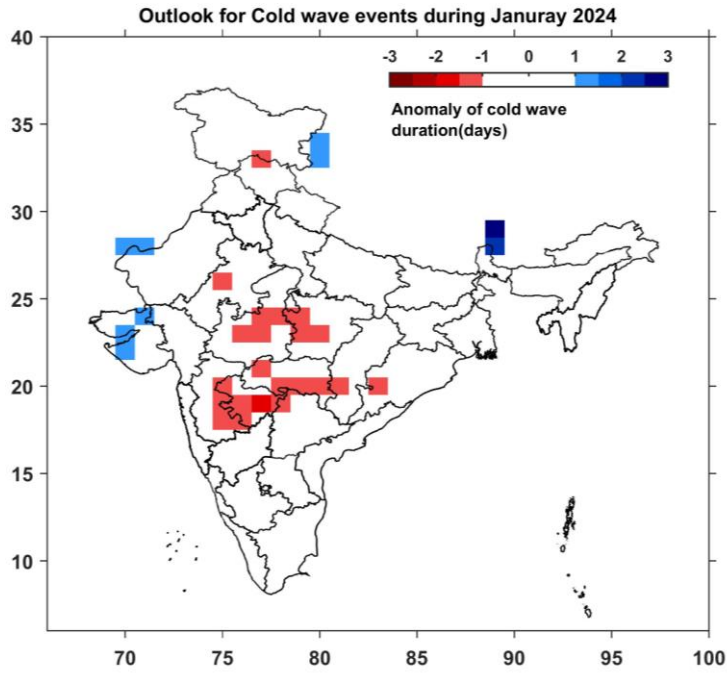


Fig 5. Anomaly of Cold Wave Duration (in days) for the month of January 2024