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INDIA METEOROLOGICAL DEPARTMENT

**Seasonal Outlook for Winter Temperatures and
Rainfall and Temperature Forecast for December 2022**

Highlights

- a) During the upcoming winter season (December 2022 to February 2023), below normal minimum temperatures are most likely over many parts of peninsular India and some parts of central India and isolated parts of northwest India. Normal to above normal minimum temperatures are most likely over many parts of northwest India and most parts northeast India.
- b) During the upcoming winter season (December 2022 to February 2023), Above normal maximum temperatures are likely over most parts of the northwest India, east & northeast India and many parts of Central India. Normal to below normal maximum temperatures are likely over most parts of the southern Peninsular India and some parts of central India.
- c) Monthly rainfall for December 2022 over the South Peninsular India consisting of five meteorological subdivisions (Tamil Nadu, Puducherry & Karaikkal, Coastal Andhra Pradesh & Yanam, Rayalaseema, Kerala & Mahe and South Interior Karnataka) is most likely to be normal (69-131% of Long Period Average (LPA)). Monthly rainfall over the country as a whole during December 2022 is most likely to be below normal (< 71 % of Long Period Average (LPA)). Below-normal rainfall is most likely over most parts of the country except some areas of south peninsular India and some pockets of extreme northwest India where normal to above normal rainfall is likely.
- d) During December 2022, monthly minimum temperatures are most likely to be below normal over most parts of peninsular India, many parts of Central India and some parts of northwest India. Normal to above normal minimum temperatures are most likely over most parts of northeast India and some parts of east and northwest India.
- e) Monthly maximum temperatures for December 2022 are likely to be above normal over most parts of east & northeast India and some parts of central and northwest India. Normal to below normal maximum temperatures are likely over many parts of the Peninsular India and some parts of northwest India.

Seasonal Outlook for the Temperatures during December 2022 to February 2023 and Rainfall Forecast for December 2022

1. Background

Since 2016, the India Meteorological Department (IMD), Ministry of Earth Sciences (MoES) has been issuing seasonal forecast outlooks for subdivision scale temperatures over the country for both hot and cold weather seasons. These predictions were based on the Monsoon Mission Coupled Forecasting System (MMCFs) Model developed under MoES's monsoon mission project. IMD has recently adopted a new strategy using Multi-Model Ensemble (MME) based forecasting system for issuing monthly and seasonal outlooks of rainfall and temperature over the country. The MME approach uses the coupled global climate models (CGCMs) from different global climate prediction and research centers including IMD/MoES MMCFs model. IMD has prepared a seasonal outlook for temperatures over the country for the upcoming winter season (December 2022 to February 2023) and rainfall and temperature forecasts for December 2022.

2 Seasonal Temperature Forecast for December 2022 to February 2023

Fig.1 and Fig.2 show forecasted probabilities of the minimum and maximum temperatures respectively for December 2022 to February 2023 (DJF) season. It indicates that during the upcoming winter season (December 2022 to February 2023), below normal minimum temperatures are most likely over many parts of peninsular India and some parts of central India and isolated parts of northwest India. Normal to above normal minimum temperatures are most likely over many parts of northwest India and most parts northeast India.

During the upcoming winter season (December 2022 to February 2023), Above normal maximum temperatures are likely over most parts of the northwest India, east & northeast India and many parts of Central India (Fig.2). Normal to below normal maximum temperatures are likely over most parts of the southern Peninsular India and some parts of central India.

3. Probabilistic Forecast for the Temperature during December 2022

Fig.3 and Fig.4 show forecasted probabilities of the minimum and maximum temperatures respectively for December 2022. The probability forecast for the minimum temperatures (Fig.3) indicates that during December 2022, monthly minimum temperatures are most likely to be below normal over most parts of peninsular India, many parts of Central India and some parts of northwest India. Normal to above normal minimum temperatures are most likely over most parts of northeast India and some parts of east and northwest India

The probability forecast for the maximum temperatures (Fig.4) during December 2022 indicates that above normal over most parts of east & northeast India, some parts of central and northwest India. Normal to below normal maximum

temperatures are likely over many parts of the Peninsular India and some parts of northwest India.

4. Probabilistic Forecast for the Rainfall during December 2022

Monthly rainfall for December 2022 over the South Peninsular India consisting of five meteorological subdivisions (Tamil Nadu, Puducherry & Karaikkal, Coastal Andhra Pradesh & Yanam, Rayalaseema, Kerala & Mahe and South Interior Karnataka) is most likely to be normal (69-131% of Long Period Average (LPA)). The LPA of rainfall over South Peninsular India during December based on data from 1971 to 2020 is about 43.0 mm. Monthly rainfall over the country as a whole during December 2022 is most likely to be below normal (< 71 % of Long Period Average (LPA)). The LPA of rainfall over the country as a whole during the month of December based on data from 1971 to 2020 is about 15.9 mm.

The probabilistic forecast for the spatial distribution of tercile rainfall categories (above normal, normal, and below normal) over the country for the month of December is shown in Fig.5. The forecast suggests that below-normal rainfall is most likely over most parts of the country except some areas of south peninsular India and some pockets of extreme northwest India where normal to above normal rainfall is likely. The dotted areas in the map climatologically receive very less rainfall during December and the white-shaded areas within the land areas represent climatological probabilities.

5. SST conditions in the Pacific and the Indian Oceans

Currently, the Sea Surface Temperatures (SSTs) and the atmospheric conditions over the equatorial Pacific Ocean indicate La Niña conditions. The latest forecasts from MMCFS and other global models suggest that La Niña conditions are likely to continue during the upcoming winter 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, neutral Indian Ocean Dipole (IOD) conditions are prevailing over the Indian Ocean and the latest MMCFS forecast indicates that the neutral IOD conditions are likely to continue during the forecast period.

6. 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 short to medium range forecast issued daily by IMD.

Minimum Temperature Outlook for December 2022 to February 2023

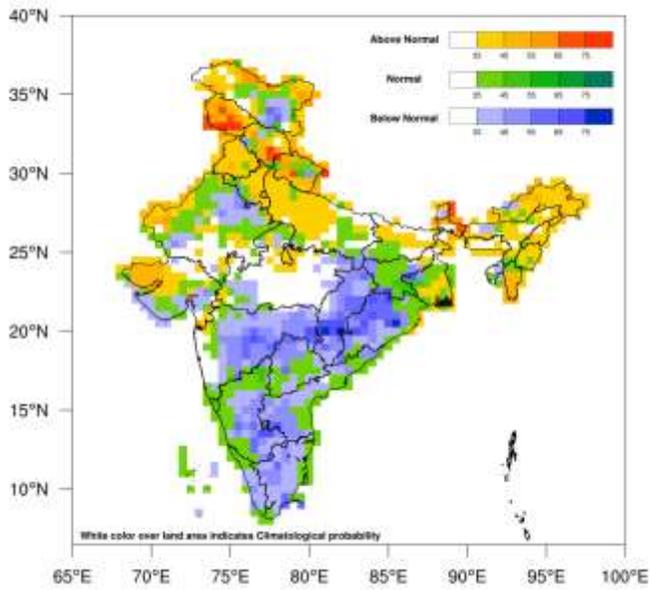


Fig1. Probability forecast of Minimum Temperature for December 2022 to February 2023

Maximum Temperature Outlook for December 2022 to February 2023

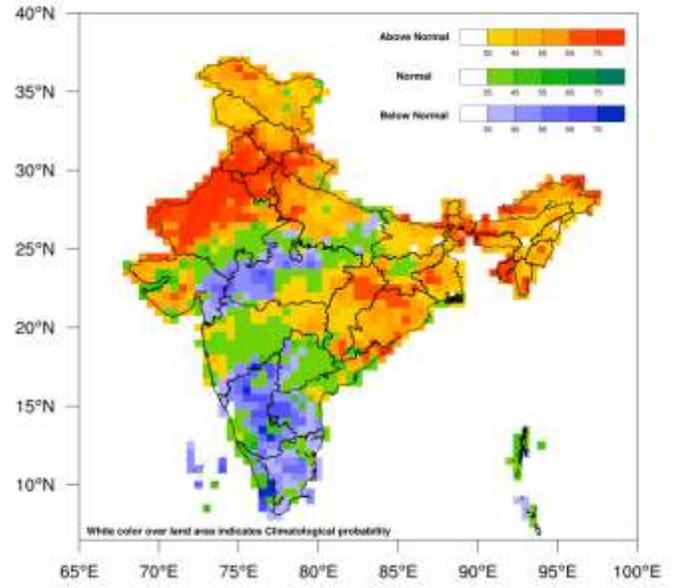


Fig2. Probability forecast of Maximum Temperature for December 2022 to February 2023

Minimum Temperature Outlook for December 2022

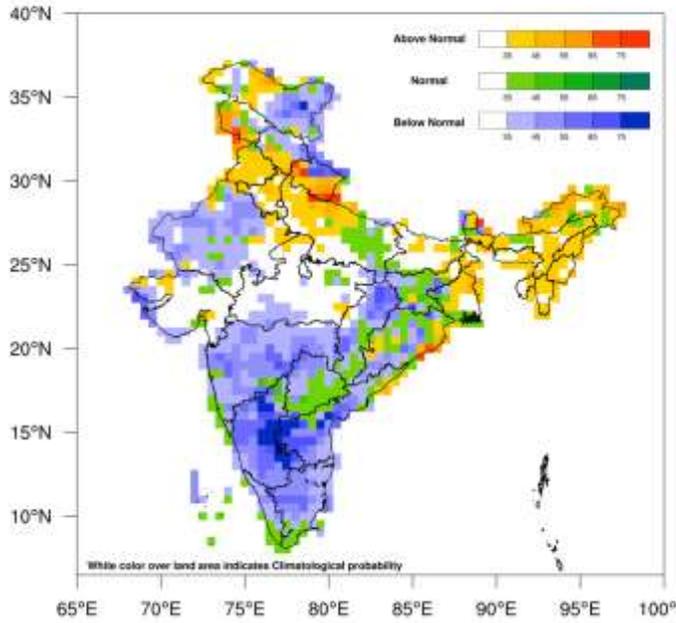


Fig3. Probability forecast of Minimum Temperature for December 2022

Maximum Temperature Outlook for December 2022

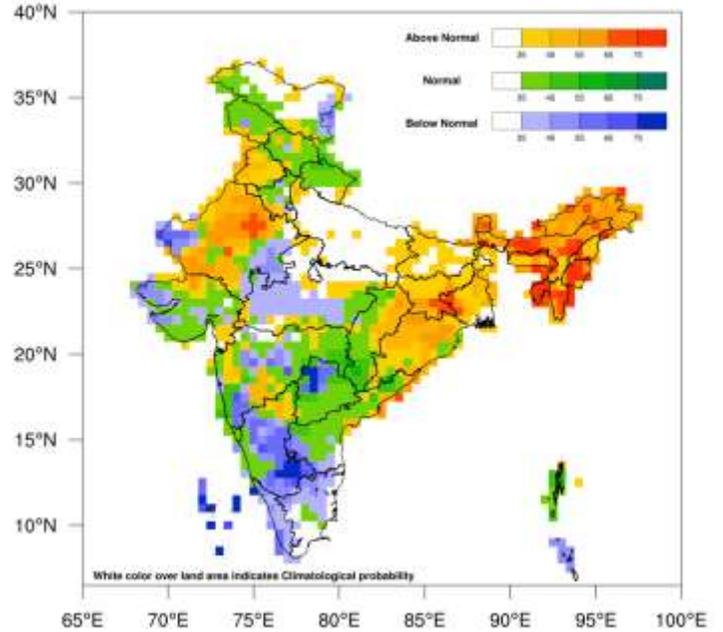


Fig4. Probability forecast of Maximum Temperature for December 2022

probability rainfall forecast for 2022 December

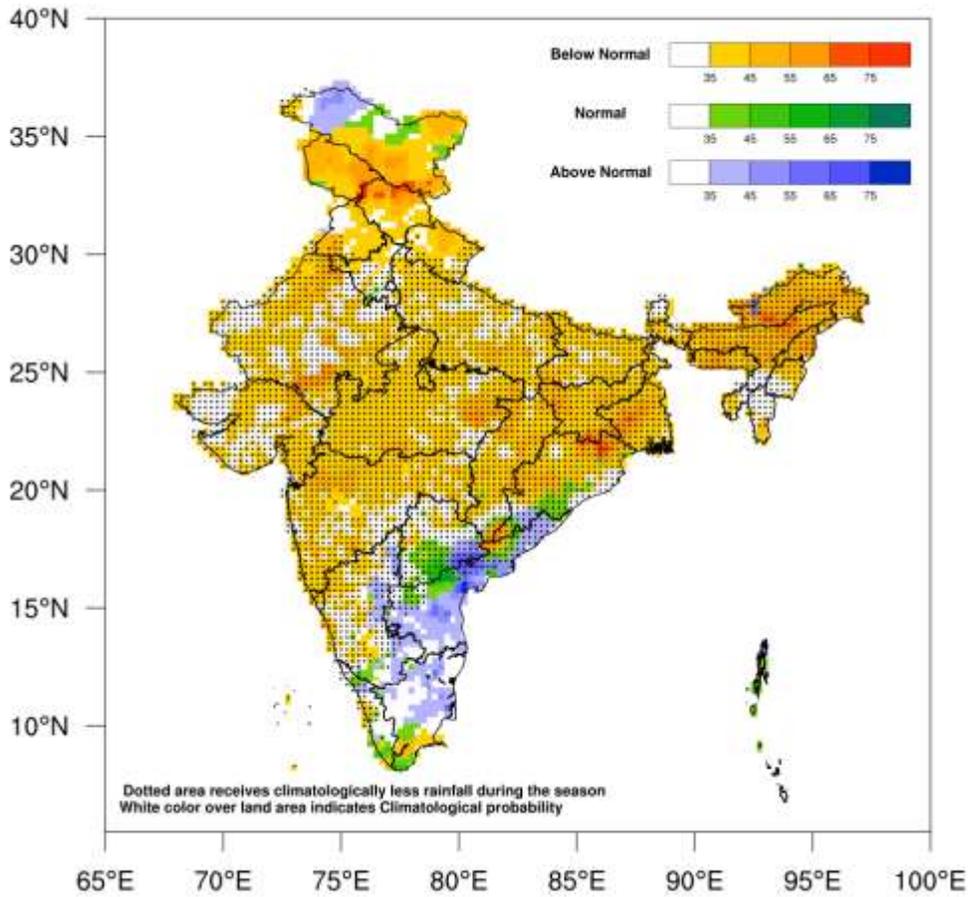


Fig.5. Probability forecast of tercile categories* (below normal, normal and above normal) for the rainfall over India during December 2022. The figure illustrates the most likely categories as well as their probabilities. The dotted area showed in the map climatologically receives very less rainfall during December month and the white shaded areas within the land areas represent climatological probabilities. The probabilities were derived using the MME forecast prepared from a group of coupled climate models. (*Tercile categories have equal climatological probabilities, of 33.33% each).