

# PRESS RELEASE

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## INDIA METEOROLOGICAL DEPARTMENT

### Long Range Forecast Update for the 2009 Southwest Monsoon Rainfall

#### 1. Background

India Meteorological Department (IMD) issues operational long range forecasts for the southwest monsoon rainfall in two stages. First stage forecast is issued in April and the second stage forecast is issued in June. This year, the first stage forecast for the southwest monsoon rainfall over the country was issued on 17<sup>th</sup> April, 2009. IMD has now prepared the second stage forecasts.

#### 2. First Stage Forecast issued on 17<sup>th</sup> April, 2009

*“IMD’s long range forecast for the 2009 southwest monsoon season (June to September) is that the rainfall for the country as a whole is likely to be Near Normal. Quantitatively, monsoon season rainfall is likely to be 96% of the long period average with a model error of  $\pm 5\%$ . The Long period average rainfall over the country as a whole for the period 1941-1990 is 89 cm.”*

#### 3. Second Stage Forecasts

The following forecasts are being released now:

- a) Forecast update for the southwest monsoon season (June-September) rainfall over the country as a whole using a 6-parameter ensemble statistical model with a model error of  $\pm 4\%$ .
- b) Forecast for the monthly rainfall over the country as a whole for the months of July & August using separate principle component regression models with a model error of  $\pm 9\%$ .
- c) Forecasts for the southwest monsoon season (June-September) rainfall for the following four broad geographical regions of India using separate multiple linear regression models with a model error of  $\pm 8\%$ :

**Northwest India** – Jammu and Kashmir, Himachal Pradesh, Punjab, Rajasthan, Haryana, Chandigarh, Delhi, Uttaranchal and Uttar Pradesh.

**Northeast India** – Arunachal Pradesh, Meghalaya, Assam, Nagaland, Manipur, Mizoram, Tripura, Sikkim, West Bengal, Bihar and Jharkhand.

**Central India** – Gujarat State, Madhya Pradesh, Chattisgarh, Maharashtra, Goa and Orissa.

**South Peninsula** – Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Lakshadweep and Andaman and Nicobar Islands.

#### **4. 6-Parameter Ensemble Forecasting System**

The 6 predictors used in the ensemble forecasting for the update forecast for the southwest monsoon season (June-September) rainfall over the country as a whole are: North Atlantic Sea Surface Temperature (December + January), Equatorial SE Indian Ocean Sea Surface Temperature (February + March), East Asia Mean Sea Level Pressure (February + March), Central Pacific (Nino 3.4) Sea Surface Temperature Tendency (MAM-DJF), North Atlantic Mean Sea Level Pressure (May) and North Central Pacific Zonal Wind at 850hPa (May). The model error of the 6-parameter ensemble forecasting system is  $\pm 4\%$ .

#### **5. Experimental Forecasts**

IMD has also generated experimental forecast for the 2009 southwest monsoon rainfall based on the IMD's dynamical forecast system (Seasonal Forecast model of the Experimental Climate Prediction Centre (ECPC), USA). The forecast was generated using observed global sea surface temperature data of May.

In addition, IMD has taken into account the experimental forecasts prepared by the national institutes like Indian Institute of Tropical Meteorology (IITM), Pune, Indian Institute of Science (IISc), Bangalore, Space Applications Centre (SAC), Ahmedabad, National Aerospace Laboratories (NAL), Bangalore, Centre for Mathematical Modelling and Computer Simulation (CMMACS), Bangalore, National Centre for Medium Range Weather Forecasting (NCMRWF), Noida and *Centre for Development of Advanced Computing (C-DAC), Pune* and operational/experimental forecasts prepared by international institutes like World Meteorological Organization (WMO)'s Lead Centre for Long Range

Forecasting - Multi-Model Ensemble (LRFMME), the National Centers for Environmental Prediction (NCEP), USA, International Research Institute for Climate and Society (IRI), USA, Meteorological Office, UK, the European Center for Medium Range Weather Forecasts (ECMWF), UK, the Experimental Climate Prediction Center (ECPC), USA, and Asian-Pacific Economic Cooperation (APEC) Climate Centre, Korea.

*In general, the experimental forecasts based on both statistical and dynamical models suggest below normal to normal monsoon season rainfall over the country as a whole.*

## **6. Conditions over the equatorial Pacific and Indian Oceans**

The recent La Nina event that started in early December 2008 has ended. Since the middle of April, 2009, ENSO neutral conditions are prevailing with positive SST anomalies observed over the equatorial Pacific from the beginning of May. The latest observations and forecasts from both dynamical and statistical models suggest high probability (about 60%) for El Nino conditions to appear during the monsoon season. The probability for ENSO neutral conditions is about 40% and that for La Nina is negligible.

It is important to note that other factors such as the Indian Ocean Sea surface temperatures also influence the monsoon rainfall over India in addition to El Niño and La Niña events. Forecasts from few climate models suggest possibility of the development of a weak positive Indian Ocean Dipole event during the 2009 monsoon season, which may not have much impact on the Indian monsoon. However, IMD is carefully monitoring the possible evolution of El Nino conditions over Pacific and the Indian Ocean Dipole.

## **7. Summary of the Update Forecasts for 2009 Southwest Monsoon Rainfall**

### **i) South-West Monsoon Season Rainfall**

IMD's long range forecast update for the 2009 south-west monsoon season (June to September) is that the rainfall is likely to be below normal. Quantitatively, monsoon season rainfall for the country as a whole is likely to be 93% of the long period average with a model error of  $\pm 4\%$ . The Long period average rainfall over the country as a whole for the period 1941-1990 is 89 cm.

### **ii) Monthly (July & August) Rainfall**

Rainfall over the country as a whole in the month of July 2009 is likely to be 93% of its LPA and that in the month of August is likely to be 101% of LPA both with a model error of  $\pm 9\%$ .

### iii) **Rainfall over Broad Geographical Regions**

Over the four broad geographical regions of the country, rainfall for the 2009 South-West Monsoon Season is likely to be 81% of its LPA over North-West India, 92% of its LPA over North-East India, 99% of its LPA over Central India and 93% of its LPA over South Peninsula, all with a model error of  $\pm 8\%$ .

The long period average and coefficient of variation of rainfall based on the 1941-1990 data for all India and 4 broad geographical regions are given below along with the forecasts:

Area	Long period Average (mm)	Coefficient of variation (%)	Forecast (% of LPA)
All India (June to September)	890	10	93
All India (July)	293	13	93
All India (August)	262	14	101
NW India	612	19	81
Central India	994	14	99
NE India	1429	8	92
South Peninsula	725	15	93