

# INDIA METEOROLOGICAL DEPARTMENT

## Long Range Forecast For 2009 South-west Monsoon Season Rainfall

### 1. Background

India Meteorological Department (IMD) follows a two-stage forecast strategy for long range forecasting of the south-west monsoon rainfall over the country as a whole. The first long range forecast for the south-west monsoon season (June-September) rainfall is issued in April and the forecast update is issued in June.

During the last two years (2007 & 2008), IMD has been using the following statistical models for forecasting the south-west monsoon rainfall (June – September) for the country as a whole:

- a) A 5- parameter statistical ensemble forecasting system requiring data up to March, for the first forecast in April.
- b) A 6- parameter statistical ensemble forecasting system requiring data up to May for the forecast update in June. Three of these 6-parameters are same as that used for April forecast.

The operational forecast issued by IMD for the 2008 seasonal rainfall over the country as a whole was accurate as the first and second stage forecasts were 99% and 100% of Long Period Average (LPA) respectively and the actual rainfall was 98% of LPA.

For preparing the first stage forecast for the 2009 South-west monsoon rainfall for the country as a whole presented here, the same 5-parameter statistical ensemble forecasting system as that used for 2008 has been used.

### 2. Operational Statistical Forecast System

In the IMD's Ensemble Statistical Forecasting system for April forecast, the following 5 predictors are used. The model error of the April forecasting systems is  $\pm 5\%$ .

S.No	Predictor	Period
1	North Atlantic Sea Surface Temperature	December + January
2	Equatorial South Indian Ocean Sea Surface Temperature	February + March
3	East Asia Mean Sea Level Pressure	February + March
4	NW Europe Land Surface Air Temperature	January
5	Equatorial Pacific Warm Water Volume	February + March

### **3. Experimental Forecasts**

As a part of ongoing efforts to improve the long range forecast capabilities, experimental forecast for the 2009 south-west monsoon rainfall based on IMD's dynamical forecast system was also generated. For this purpose, observed sea surface temperature data of March have been used.

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

### **4. La Nina Conditions over the equatorial Pacific**

Following the 2007/08 La Niña event, near neutral ENSO conditions had prevailed in the tropical Pacific from early June to November 2008. However, La Nina conditions returned in early December 2008. From early March, 2009 the SSTs over central and eastern Pacific have weakened and as on now, weak La Nina conditions are prevailing. The latest forecasts from both dynamical and statistical models indicate equal probabilities for weak La Nina and ENSO neutral conditions till May 2009. For the subsequent monsoon season (June to September), majority of the models predict ENSO neutral conditions. It may be mentioned that as the lead time of the forecast increases there is considerable spread and uncertainty in the ENSO forecasts.

### **5. Forecast for the 2009 South-west monsoon rainfall**

**IMD's long range forecast for the 2009 south-west 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.**

IMD will update the above forecast in June 2009 as a part of the second stage forecasts. Separate forecasts for the monthly (July and August) rainfall over the country as a whole and seasonal (June-September) rainfall over the four geographical regions of India will also be issued.

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