LONG RANGE FORECAST UPDATE FOR 2014 SOUTHWEST MONSOON RAINFALL

1. Experimental Dynamical Forecast System

1.1. Monsoon Mission Experimental Coupled Dynamical Model Forecasting System

The Monsoon Mission was recently launched by the ESSO with an objective to improve the monsoon forecasts over the country in short range to long range time scales. The ESSO-Indian Institute of Tropical Meteorology (IITM), Pune is coordinating and working along with different climate research centers from India and abroad on the development of a coupled model for the forecasting Indian summer monsoon rainfall. For this purpose, the state-of-the-art coupled climate model, the Coupled Forecasting System (CFS) developed by the National Centers for Environmental Prediction (NCEP), USA has been implemented at the ESSO-IITM. The latest high resolution research version of the coupled model (CFS Version 2) has been used to generate the experimental update forecast for the 2014 SW Monsoon season rainfall using the April initial conditions. The model has moderate skill.

The experimental forecast based on the ESSO-IITM model suggest that the monsoon rainfall during the 2014 monsoon season (June to September) averaged over the country as a whole is likely to be 96% ± 5% of long period model average (LPMA). The experimental five category probability forecasts for the 2014 monsoon season rainfall over the country as a whole using the experimental dynamical prediction system are 29% (deficient), 13% (below normal), 35% (normal), 19% (above normal) and 4%(excess).

1.2. IMD Seasonal Forecast Model (SFM)

Since 2004, IMD has been generating experimental dynamical forecast for the southwest monsoon rainfall using the seasonal forecast model (SFM) of the Experimental Climate Prediction Center (ECPC), USA. The global sea surface temperature (SST) forecasts from NCEP coupled forecasting system (CFS) version 2 model was used as boundary forcing for the SFM model. The model showed moderate skill. For generating the forecasts, ten ensemble member forecasts were obtained using the initial conditions corresponding to 00Z b from 1st to 10th of May.

The experimental ensemble forecast based on IMD SFM indicates that the rainfall during the 2014 monsoon season (June to September) averaged over the country as a whole is likely to be 85% ± 4% of long period model average (LPMA).

2. Experimental Forecasts from National and International Institutions

The experimental forecasts prepared by various national institutes like the Space Applications Centre, Ahmedabad, Centre for Mathematical Modeling and Computer Simulation, Bangalore, Indian Institute of Technology, Bhubaneswar, Indian Institute of Science, Bangalore, Centre for Disaster Mitigation, Jain University, Bangalore, and Center for Development of Advanced Computing, Pune were available. Operational/experimental forecasts prepared by international institutes like the National Centers for Environmental Prediction, USA, International Research Institute for Climate and Society, USA, Meteorological Office, UK, Meteo France, the European Center for Medium Range Weather Forecasts, UK, Japan Meteorological Agency, Japan Agency for Marine-Earth Science and Technology, Asian-Pacific Economic Cooperation (APEC) Climate Centre, Korea and World Meteorological Organization's Lead Centre for Long Range Forecasting - Multi-Model Ensemble were also available.

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The forecasts from most of the national and international centers indicate that the 2014 monsoon season (June to September) averaged over the country as a whole is likely to be below normal rainfall.

3. Sea Surface Temperature (SST) Conditions in the Equatorial Pacific & Indian Oceans

The warming trend in the sea surface temperatures over the equatorial Pacific which started during later part of March continued during April through May has resulted the observed ENSO conditions to move from warm-neutral to be borderline of a weak El niño condition. The latest forecast from ESSO-IITM coupled dynamical model indicates continuation of the warming trend leading to a moderate El niño conditions during the southwest monsoon season with a probability of around 70%. On the other hand, the forecast suggest neutral IOD conditions over the tropical India Ocean during the monsoon season with uniformly warmer than normal sea surface temperatures throughout basin.

4. The second Stage Forecasts for 2014 Southwest Monsoon Rainfall

i) Season (June-September) Rainfall over the country as a whole

Quantitatively, the season rainfall for the country as a whole is likely to be 93% of the long period average (LPA) with a model error of ±4%. The LPA rainfall over the country as a whole for the period 1951-2000 is 89 cm. The 5 category probability forecasts for the Season (June to September) rainfall over the country as a whole is given below.

Category	**Rainfall Range(% of LPA)**	**Forecast Probability (%)**	**Climatological Probability (%)**
Deficient	< 90	**33**	16
Below Normal	90-96	**38**	17
Normal	96-104	**26**	33
Above Normal	104-110	**3**	16
Excess	> 110	**0**	17

ii) Season (June-September) Rainfall over Broad Geographical Regions

The season rainfall is likely to be 85% of LPA over North-West India, 94% of LPA over Central India, and 93% of LPA over South Peninsula, and 99% of LPA over North-East India all with a model error of ± 8 %. The 3 category probability forecasts for seasonal rainfall over the four broad geographical regions are given below. All the 3 rainfall categories have equal climatologically probabilities (33.33% each).

Rainfall category	**NW India**		**Central India**		**South Peninsula**		**Northeast India**	
	Range(% of LPA)	Forecast Probability (%)	Range (% of LPA)	Forecast Probability (%)	Range (% of LPA)	Forecast Probability (%)	Range (% of LPA)	Forecast Probability (%)
Below Normal	<92	**71**	<94	**51**	<93	**50**	<95	**33**
Normal	92-108	**26**	94-106	**34**	93-107	**35**	95-105	**37**
Above Normal	>108	**3**	>106	**15**	>107	**15**	>105	**30**

iii) Monthly (July & August) Rainfall over the country as a whole

The rainfall over the country as a whole is likely to be 93% of its LPA during July and 96% of LPA during August both with a model error of ± 9 %. The 3 category probability forecasts for the monthly rainfall over the country as a whole is given below. All the 3 rainfall categories have equal climatological probabilities (33.33% each).

Rainfall Category	**July**		**August**	
	Range (% of LPA)	Forecast Probability (%)	Range (% of LPA)	Forecast Probability (%)
Below Normal	<94	53	<94	43
Normal	94-106	35	94-106	35
Above Normal	>106	12	>106	22