भारत सरकार
GOVERNMENT OF INDIA

पृथ्वी प्रणाली विज्ञान संगठन
Earth System Science Organization (ESSO)

पृथ्वी विज्ञान मंत्रालय
Ministry of Earth Sciences

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

LONG RANGE FORECAST
FOR
2013 SOUTH-WEST MONSOON
SEASON (JUNE-SEPTEMBER) RAINFALL

1.   Background

ESSO-India Meteorological Department (IMD) issues various monthly and seasonal operational forecasts for rainfall during the south-west monsoon season. Operational models are critically reviewed regularly and further improved through in-house research activities. Operational forecasts for the southwest monsoon season (June – September) rainfall over the country as a whole are issued in two stages. The first long range forecast for the all India monsoon rainfall is issued in April and the forecast update is issued in June.

From 2007 onwards, ESSO-IMD has been using the following statistical models for preparing quantitative and probabilistic forecasts of the south-west monsoon season rainfall 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.

The first stage forecast for the 2013 South-west monsoon rainfall for the country as a whole is presented here.

2.   Operational Statistical Forecast System

In the ESSO-IMD's Ensemble Statistical Forecasting system for the April forecast, the following 5 predictors are used. The model forecast error of the April forecasting system is ±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

This year, Equatorial SE Indian Ocean SST (Feb + Mar) is favorable and the North Atlantic SST (Dec+Jan) & (Europe land surface air temperature (Jan) is unfavorable for good rainfall. However other two parameters (Warm water volume anomaly (Feb+Mar) and the East Asia Pressure (Feb+Mar)) are close to their normal values (neutral).

The 5-parameter ensemble statistical forecasting system was also used to prepare probability forecasts for five pre-defined rainfall categories. These are deficient (less than 90% of LPA), below normal (90-96% of LPA), normal (96-104% of LPA), above normal (104-110% of LPA) and excess (above 110% of LPA). The climatological probabilities for the above categories are 16%, 17%, 33%, 16% and 17% respectively.

For the 2013 southwest monsoon season, the predicted probabilities based on the 5-parameter ensemble forecasting system for these 5 categories are 10%, 27%, 46%, 14% and 3% respectively. Thus the all India monsoon season rainfall is most likely to be normal.

3.   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 forecast for the 2013 SW Monsoon season rainfall using the February initial conditions.

The experimental five category probability forecasts for the 2013 monsoon season rainfall over the country as a whole using the experimental dynamical prediction system are 19% (deficient), 10% (below normal), 33% (normal), 19% (above normal) and 19% (excess). The quantitative forecast indicates that the rainfall during the 2013 monsoon season (June to September) averaged over the country as a whole is likely to be 104% ±5% of long period model average (LPMA).

4.   Other Forecasts by national and international institutions

The ESSO-IMD has also taken into account the experimental forecasts prepared by the national institutes like Space Applications Centre, Ahmedabad, Indian Institute of Science, Bangalore, Centre for Mathematical Modeling and Computer Simulation, Bangalore, and Center for Development of Advanced Computing, Pune.

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 have also been consulted.

The experimental forecasts from various statistical and dynamical models indicate monsoon season rainfall over the country as a whole is most likely to be in the normal range.

5. Sea Surface Temperature Conditions in the equatorial Pacific & Indian Oceans

Borderline El Niño SST conditions were observed across the equatorial Pacific for a brief period between July and September 2012. Subsequently, ENSO neutral conditions returned during October 2012 and have continued through early part of April, 2013. The latest forecasts from a majority of the dynamical and statistical models favour (about 60% probability) ENSO neutral conditions to continue during the 2013 monsoon season. If ENSO neutral conditions prevail during the summer monsoon season, as most models indicate, there is little scope for typical ENSO impacts on the rainfall activity over the country.

It is important to note that in addition to the ENSO events, many other factors such as the Indian Ocean SSTs also influence the monsoon performance. Recent forecasts from some coupled models suggest possibility of the development of a weak negative Indian Ocean Dipole event during northern hemisphere (NH) summer and to have a maximum peak during NH autumn which may not have much impact on the Indian monsoon. As the extreme sea surface temperature conditions over Pacific and Indian Oceans particularly ENSO conditions over Pacific (El Nino or La Nina) are known to have strong influence on the Indian summer monsoon. IMD is carefully monitoring the sea surface conditions over Pacific and Indian oceans.

6.   Forecast for the 2013 South-west monsoon rainfall

ESSO-IMD's long range forecasts for the 2013 south-west monsoon season (June to September) are as follows:

(a) Southwest monsoon seasonal rainfall for the country as a whole is most likely to be Normal (96-104% of Long Period Average (LPA)) with the highest probability of 46%. The probability (27%) of seasonal rainfall to be below normal (90-96% of LPA) is also higher than its climatological value. However, the probability for the seasonal rainfall to be deficient (below 90% of LPA) or excess (above 110% of LPA) is relatively low (10% and 3% respectively).

(b) Quantitatively, the monsoon seasonal rainfall is likely to be 98% of the LPA with a model error of ± 5%.

The LPA of the season rainfall over the country as a whole for the period 1951-2000 is 89 cm.

ESSO-IMD will issue the update forecasts in June, 2013 as a part of the second stage forecast. Along with the update forecast, 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.

New Delhi
the 26nd April 2013   (L.S Rathore)
6th Vaisakha 1935 (SE)   Director General of Meteorology