India Meteorological Department's Operational Extended Range Forecast (IMD-ERF) System

Background

Of late, there have been some efforts by various research groups to predict the monsoon and topical weather on extended range time scale. The extended range forecasting (forecasts between 7 and 30 days) fills the gap between medium-range weather forecasting and seasonal forecasting. It is often considered a difficult time range for weather forecasting, since the time scale is sufficiently long so that much of the memory of the atmospheric initial conditions is lost, and it is probably too short so that the variability of the ocean is not large enough, which makes it difficult to beat persistence. Since the Madden Julian Oscillation (MJO) is the most important mode of tropical intra-seasonal variability with potentially important influences on the monsoon activity in the Asian regions, the capability of statistical or numerical models in capturing MJO signal is very crucial in capturing the active/break cycle of monsoon.

Current Extended Range Forecast System of IMD

Recently, with the efforts from the Ministry of Earth Sciences (MoES), operational implementation of coupled model with a suite of models from CFSv2 coupled model has been implemented in IMD during July 2016. This dynamical prediction system developed at IITM has been transferred to IMD and the same has been implemented by IMD for generating operational Extended Range Forecast products to different users. This suite of models at different resolutions with atmospheric and oceanic Initial conditions obtained from NCMRWF and INCOIS assimilation system respectively are (i) CFSv2 at T382 ($\approx$ 38 km) (ii) CFSv2 at T126 ($\approx$ 100 km) (iii) GFSbc (bias corrected SST from CFSv2) at T382 and (iv) GFSbc at T126. The operational suite is ported in ADITYA HPCS at IITM Pune for day-to-day operational run. The Multi-model ensemble (MME) out of the above 4 suite of models are run operationally for 32 days based on every Wednesday initial condition with 4 ensemble members (one control and 3 perturbed) each for CFSv2T382, CFSv2T126, GFSbcT382 and GFSbcT126. The same suites of model are also run on hindcast mode for 13 years (2003-2015). The average ensemble forecast anomaly of all the 4 set of model runs of 4 members each is calculated by subtracting corresponding 13-years model hindcast climatology. For the preparation of mean and anomaly forecast on every Thursday, which is valid for 4 weeks for days 3-9 (week1; Friday to Thursday), days 10-16 (week2; Friday to Thursday), days 17-23 (week3; Friday to Thursday) and days 24-30 (week4; Friday to Thursday). **(It is shown in a figure in next page)**

IMD's Operational Extended Range Forecast (ERF) System

**Atmospheric ICs
NCMRWF**

Current week **Forecast** run for 32 days
based on Wednesday day ICs

*Total 16 ensemble members
(1 control + 3 perturbed) each
CFSv2_T126 (4 mem)
CFSv2_T382 (4 mem)
GFSv2bc_T126 (4 mem)
GFSv2bc_T382 (4 mem)
(Based on Wednesday ICs)*

Ocean ICs - INCOIS

**Atmospheric ICs
NCMRWF**

13 years **Hindcast** run for 32 days
(2003 to 2015) based on same date ICs
*Total 16 ensemble members
(1 control + 3 perturbed) each
CFSv2_T126 (4 mem)
CFSv2_T382 (4 mem)
GFSv2bc_T126 (4 mem)
GFSv2bc_T382 (4 mem)
(Based on Corresponding Date ICs)*

Ocean ICs - INCOIS

**Bias Corrected
Forecasts for 4 weeks**

(Wind, Rainfall, Tmax and Tmin)
**and its anomaly
Friday to Thursday**

**Week 1 : (Days 03-09)
Week 2 : (Days 10-16)
Week 3 : (Days 17-23)
Week 4 : (Days 24-30)**