

# **Earth System Science Organization Ministry of Earth Sciences**

## **PRESS RELEASE**

**Dated 26 December 2013**

### **Progress in Weather and Climate Prediction**

The Earth System Science Organization (ESSO), Ministry of Earth Sciences is responsible to provide the nation with best possible services in forecasting the monsoons and other weather/climate parameters and ocean state through well integrated programmes. At the ESSO/MoES, weather and climate prediction activities are managed by different ESSO institutions like India Meteorological Department (IMD), National Centre for Medium Range Weather Forecasting (NCMRWF), Indian Institute of Tropical Meteorology (IITM), Indian National Centre for Ocean Information System (INCOIS) and the National Centre for Ocean Technology (NIOT).

In general, during the last five years, the skill of weather and climate forecasts in India has improved. The improvement is noted especially in general public weather forecasts, monsoon forecasts, heavy rainfall warnings and tropical cyclone warnings and alerts. The recent success in predicting the Tropical Cyclone Phailin is the best example for the improvement in prediction capability during the recent years. In the context of successful prediction of the Tropical Cyclone Phailin, the following facts may be noted:

1. The prediction made by the ESSO-IMD regarding intensity of the cyclone Phailin was proved more accurate than those by the foreign agencies and the latter revised the intensity estimates to the same level as predicted by the ESSO-IMD on the morning of 12 October 2013.
2. Most of the observational capabilities for prediction of cyclone and intensity thereof were established as part of the modernization programme during the last 5 years. The Phase II of the modernization is currently in progress for further enhancing the observation capability.
3. Currently, ESSO-MoES has developed a capability of multi-tiered prediction strategy broadly under three levels. The first is probabilistic advisories on global ensemble prediction system (5-7 days in advance). The second tier relates to Weather Research and Forecast (WRF) Model used for daily real time prediction of all India weather at 9 km resolution. The third tier is a

special model for cyclone forecasting, namely the Hurricane Weather Research and Forecast (HWRF) which is an atmosphere-ocean coupled model adopted from USA for cyclone prediction over the north Indian Ocean.

4. Government has approved an augmented computational throughput capability from the present computational capability of 1.2 petaflops- that could enable improvement of the resolution of 12 km or less, which is better from the resolution of 25 km at present.
5. There has been steady improvement in our prediction for cyclone track forecast error, intensity as well as error for margin in landfall during 2008-2012. For instance, up to 72 hour forecast was introduced in 2009 and up to 120 hours from 2013, whereas prior to 2009, forecast was limited to 24 hours. Similarly, the skill improvement for 72, 48 and 24 hours for track prediction is 50%, 40% and 35% respectively in the last 5 years.

In particular, the achievements made during the last five years in terms of improvement of skill in weather and climate forecasts are attributed to the following reasons:

- a. **Improving observational systems of both atmosphere and oceans.** The atmospheric observational systems had been improved by the modernization programme, Phase-1 implemented by the ESSO-IMD. Under this programme, the state-of-the-art observing systems (Automatic Weather Stations, Automatic raingauges, GPS radiosonde stations, Doppler radar, Pilot Balloon stations) were installed and commissioned throughout the country with their networking and integration. Simultaneously, ocean observations over the north Indian Ocean also has improved. The ESSO-INCOIS and ESSO-NIOT had installed many ocean buoys and ARGO floats for better ocean observations. Satellite observations are very useful especially over data sparse regions like oceans and mountains. ESSO-NCMRWF and ESSO-IMD have been using satellite data from many satellites including Indian satellites for data assimilation in weather prediction models. These new observations were useful for better initializing the numerical weather prediction models and thus improving the skill of weather forecasts.
- b. **Research on Modelling:** Focused research activities were carried out at the ESSO-NCMRWF on weather prediction model development and data assimilation methods. With this effort, the ESSO institutions are capable of making use of the state-of-the-art weather prediction models with improved data assimilation

methods. Model developmental and data assimilation activities were carried out also at the ESSO-IMD.

- c. **Satellite Data Assimilation:** Data from the Indian satellites, Kalpana, INSAT-3D, Oceansat and Megha-Tropiques were used for data assimilation in weather prediction models. In addition, data from US and Europe satellites were used for data assimilation. Both satellite radiance and satellite derived products were assimilated into the models. The satellite data thus assimilated into the models amounted about 20 GB. The satellite data includes radiance, surface meteorological parameters and vertical profiles of temperature, humidity, and winds.
- d. **High Performance Computing (HPC) system:** The availability of HPC facilitated the ESSO institutions using high resolution weather and climate models on operational basis as well as to do research and developmental work. At present, the capability of computing resources at ESSO institutions has improved to 1.2 peta flops, which is the best in the country.
- e. **Capacity Building:** Training of operational and research personnel of the ESSO institutions on various modelling and data assimilation skills has really helped to improve the capability of weather and climate predictions in the country. Some of the staff was trained abroad in countries like USA, UK and Australia under the bilateral programmes.
- f. **Effective communication of forecasts**

The communication of forecasts to the stake holders on time and in proper language is very important in the effective use of weather and climate forecasts and minimising the loss and damages due to severe weather. ESSO-IMD has established an effective mechanism for dissemination of weather and climate forecasts to different stake holders using different communication channels like internet (web sites and e mails), news papers and Television, radio, mobiles and hot line telephone connections with the relevant control rooms and the concerned government officials.

Therefore, the improvement of prediction skill over the years is due to integrated activities related to observations, process studies, modelling, capacity building and forecasting.

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