IMD-GEFS for Medium Range forecasting:-

The IMD-GEFS global ensemble model (21 members) is run with ~12 km horizontal resolution 2 times a day to generate 10 days forecast. At present, it is the highest resolution global ensemble model operationally run in the world.
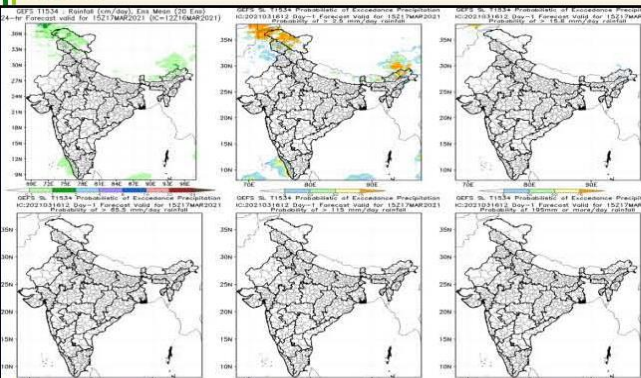
IMD-GEFS based Probabilistic Rainfall forecast

Multi Model ensemble for Extended Range forecasting:-

This suite of multi-model is based on CFSv2 and GFS system. It is run operationally for 32 days based on every Wednesday initial condition with 16 ensemble members to forecast for 4 weeks.

IMD-Extended Range Forecast of Rainfall for 4 weeks

Dynamical-Statistical modeling for Tropical Cyclone Forecasting:

The Cyclone Genesis Potential Parameter (GPP), Multi-Model Ensemble (MME) technique for cyclone track prediction and SCIP & decay models for tropical cyclone intensity forecast are run for to provide objective guidance for tropical cyclone forecasting.

GPP forecast and MME based cyclone track forecast

Aviation Sector   **Power Sector**

Agro-met Sector   **Severe Weather**

Numerical Weather Prediction Service Sectors

For further details contact:-

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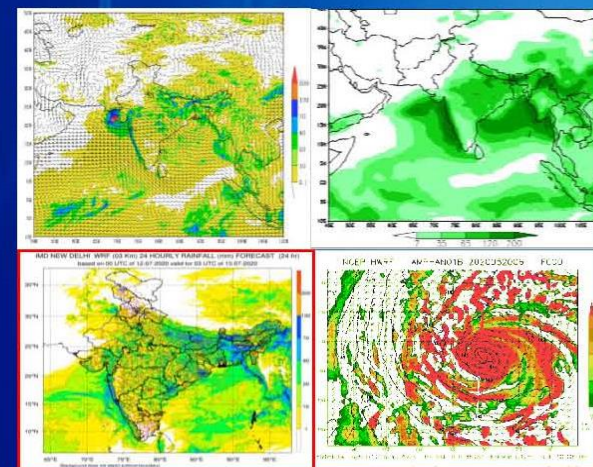WEBSITE: - HTTPS://NWP.IMD.GOV.IN

Numerical Weather Prediction
India Meteorological Department
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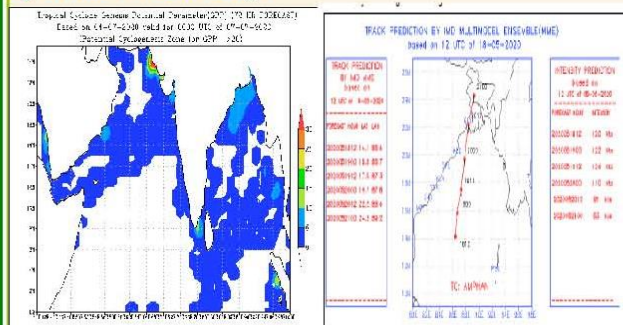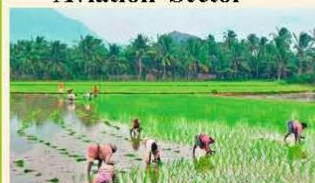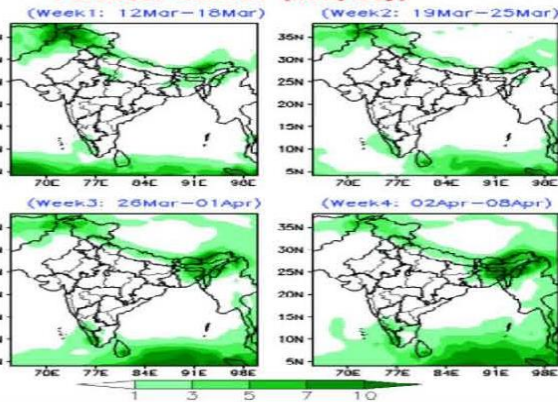## Government of India

60+ Glorious years of NWP @ IMD

Mandate of NWP Division

- To operationally run NWP models for different time scales (Nowcast to Extended range) on real time basis.
- Post processing & sector specific products generation for users (forecaster's) and their dissemination.
- To provide value added model guidance for weather forecasting activities.
- Research and development related to models and its post processing.
- To provide training to stake holders.

Brief History of NWP Division

1958:- Publication of first paper on NWP titled Numerical prediction of the movement of Bay depressions" by Dr. P. K. Das.

1969:- Initial NWP research group was setup.

1970s:- Development of Objective Analysis of meteorological observations; crucial component of NWP.

1980s:- Attempts to forecast movement of monsoon depressions and tropical cyclones.

1990s:- Operational implementation of Limited Area Analysis & Forecast Model (LAM) on cyber computing system and Quasi-Lagrangian Model (QLM) for cyclone track prediction on servers.

2000s:- Operational implementation of regional modeling system like WRF, ARPS.

2010:- IBM-P5 HPCS purchased and Global Model IMD-GFS (T-254) and Mesoscale model WRF operationally implemented.

2016:- Operational implementation of coupled modeling system (CFSv2) with 16 ensemble members for real time extended range forecasts (upto 4 weeks).

2018:- HWRF modeling system coupled with POM-TC ocean model operationally implemented for Tropical Cyclone Forecasting. Another Ocean Model HYCOM coupled with HWRF in 2019.

2018:- High resolution Global Ensemble Forecast System IMD-GEFS with 21 members ensemble is operationalized.

Present Status:-

- High resolution (12 km) global model and global ensemble forecasting system for short to medium range forecast of weather.
- Coupled model for generation of operational extended range forecast.
- High resolution cloud resolving mesoscale forecasting system for nowcast/very short range.
- Specific models for tropical cyclone like HWRF Ocean coupled model,
- Multi-model ensemble/dynamical statistical model for cyclone track/intensity prediction.
- WRF-Polar model for Antarctica & WRF-HYSPLIT for trajectory forecasting.
- Generation of NWP based products for various sectoral applications.

Operational Model Details:

IMD-HRRR model for Nowcast Applications:-

The High Resolution Rapid Refresh Model is cloud resolving non-hydrostatic model which is run every hour at 2 km resolution giving forecast for next 12 hours using the observations available from Doppler Weather radars every 10-15 minutes.
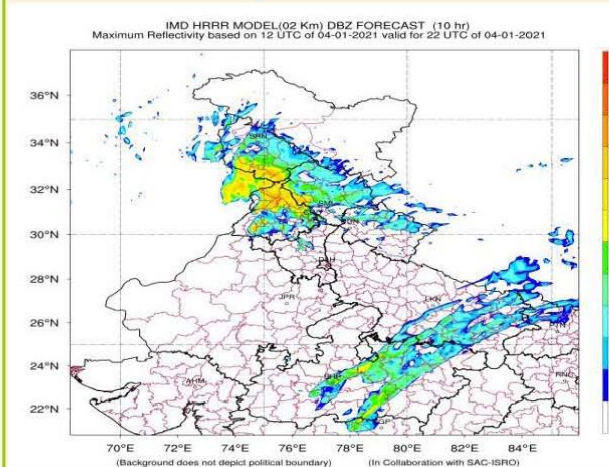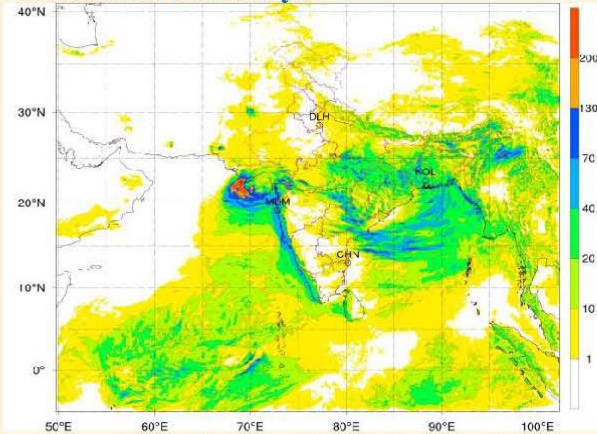

IMD-HRRR based Reflectivity forecast

### Regional Models for short range forecast:-
IMD-WRF model:-I

IMD-WRF is a cloud resolving Mesoscale model, run at 3 km resolution four times a day covering the entire Indian region. Forecast products are available for next 3 days.

IMD-WRF based Rainfall forecast

IMD-HWRF-HYCOM/POM coupled model:-I

IMD-HWRF ocean coupled model is triple nested (18x6x2km) and run 4 times a day during cyclones over NIO to give 5 day forecast products for tropical cyclone predictions. It is the only regional ocean coupled modeling system being run operationally in India for Tropical Cyclone forecasting.
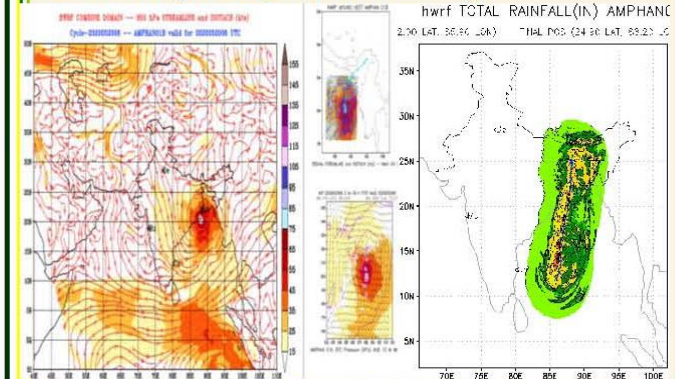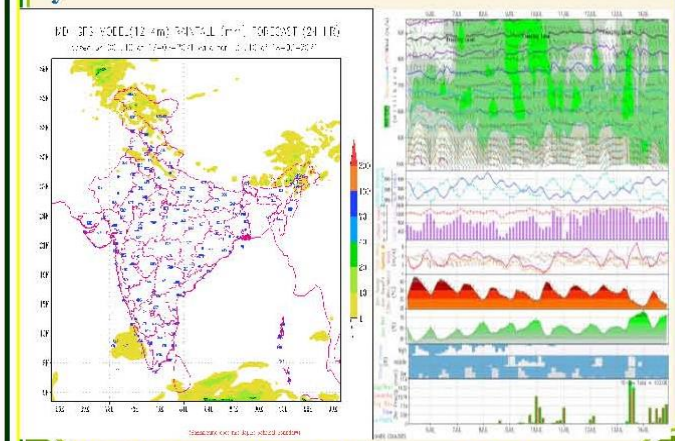

HWRF-HYCOM Coupled model forecast

Apart from above IMD also operationally runs the WRF polar model for Antarctica, Hysplit model for particle trajectories

IMD-GFS for Medium Range forecasting:-

The IMD-GFS global model is run with ~12 km horizontal resolution 4 times a day to generate 10 days forecast.

IMD-GFS based Rainfall forecast & Meteogram