



Status and Future plans of Severe Weather and Flash Flood Hazard Early Warning Mechanism

By

Dr.(Mrs) Manorama Mohanty and Dr. Jayanta Sarkar

India Meteorological Department, Ahmedabad

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

- India is one of the worst flood affected country and large scale damages occur due to flood .
- Every year, floods are responsible for more deaths nation wide than any other weather phenomenon. Forecasting flash floods is especially challenging because a forecaster must predict not only the occurrence of the event but also its magnitude i.e. the amount of precipitation and the time frame in which it occurs that can transform an ordinary rainfall event into a deadly one. The challenge is particularly great in regions with complex terrain and in which storms approach over water where there are sparse, intermittent surface-level observations.
- Owing to its geo-climatic, geological and physical features, Gujarat is vulnerable to all-major natural hazards (Drought, Flood, Cyclone, Earthquake, Tsunami etc.).



Flood

Flood

- **Snow-melt floods**
- **Flash floods / cloudburst floods**
- **Monsoon floods of Single & multiple events**
- **Cyclone floods**
- **Floods due to dam bursts / failure**



Early Warning System

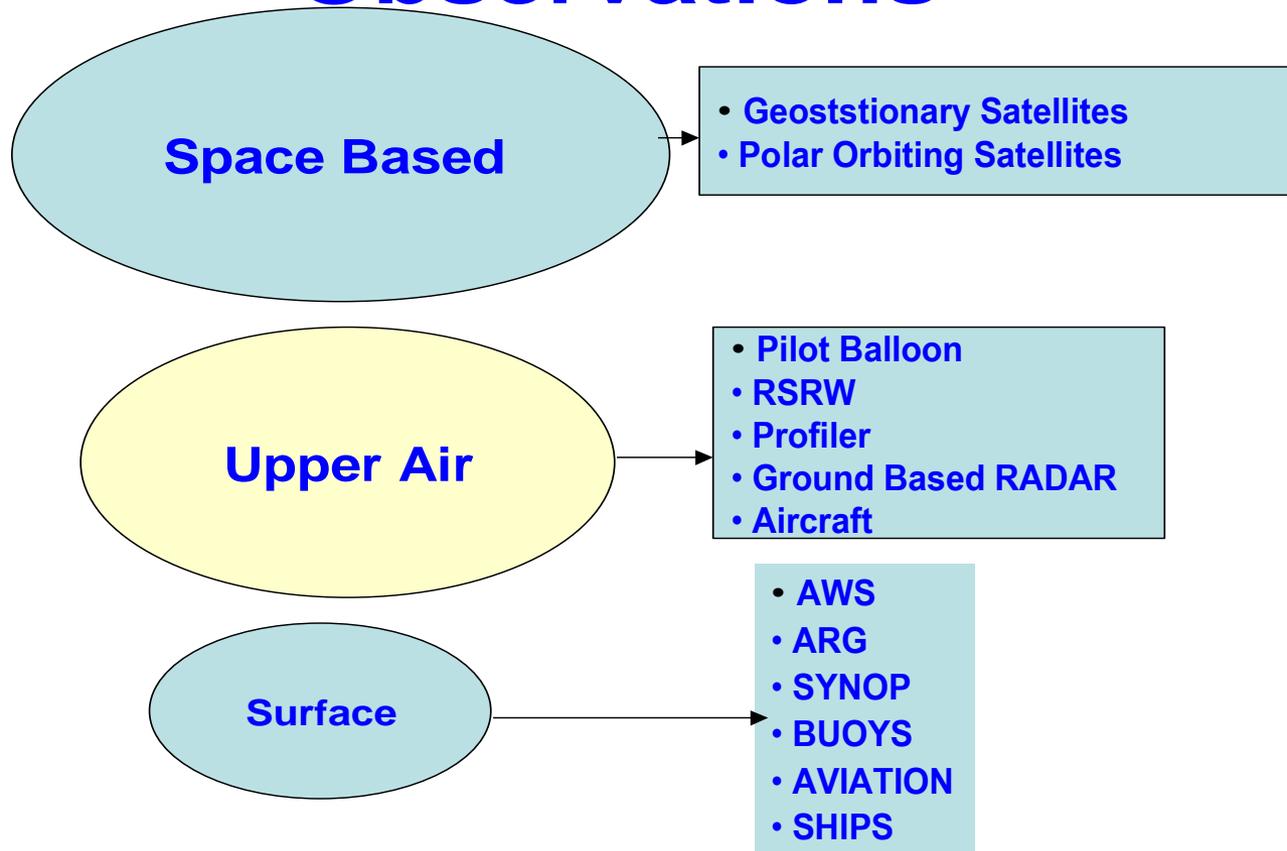
Flood Forecasting - Role of IMD

- **Observation and Collection of Meteorological Data.**
- **Transmission of data to forecasting centers.**
- **Analysis of data and formulation of forecast & issue of heavy rainfall warnings.**
- **Dissemination of forecasts/warnings to the state govt. official.**



Forecasting tools

Broad Classification of Observations



IMD Observing Systems



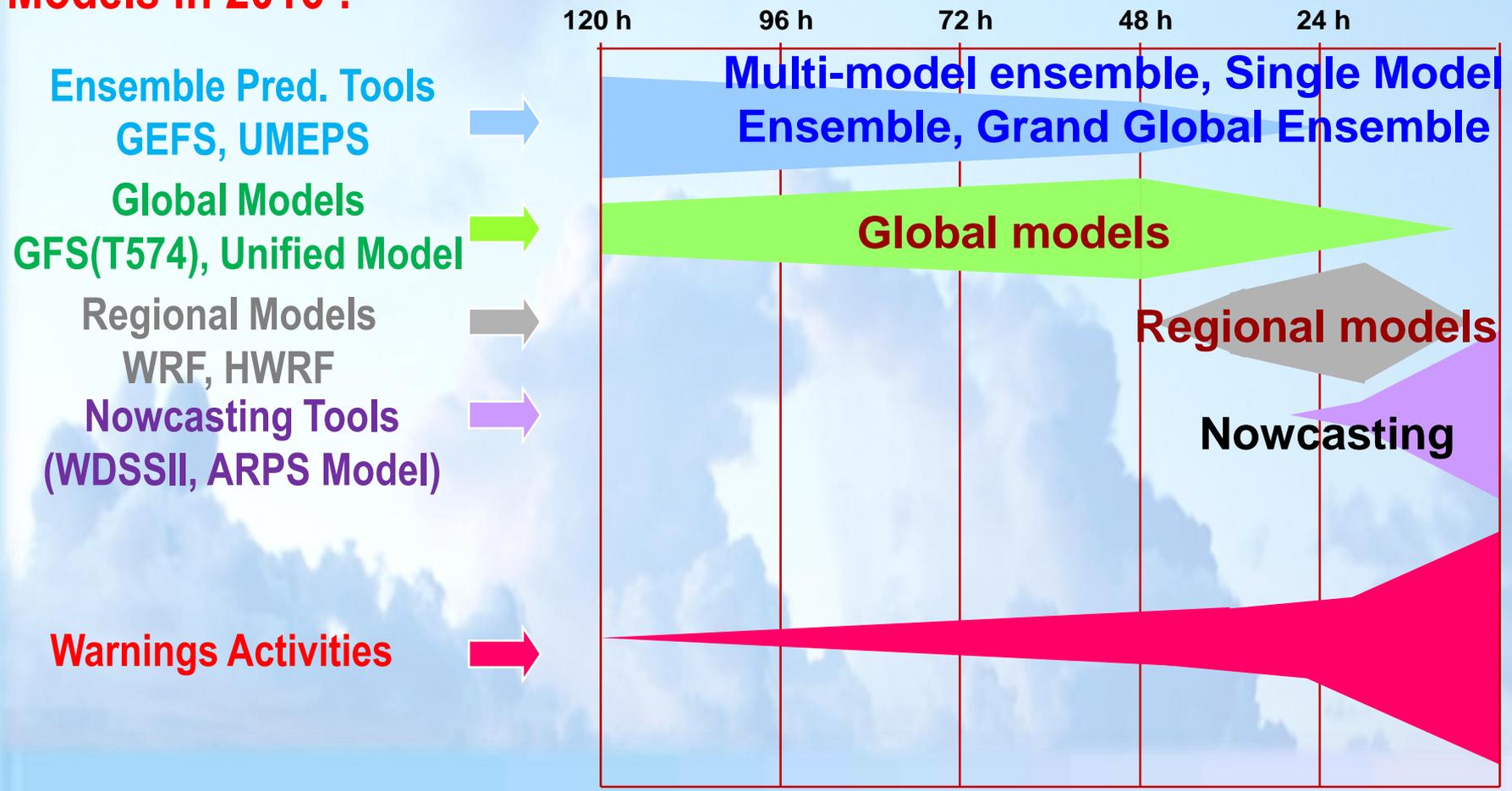
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Agromet= 264



Numerical Weather Prediction (NWP) Modeling : backbone for Forecasting and Warning Services

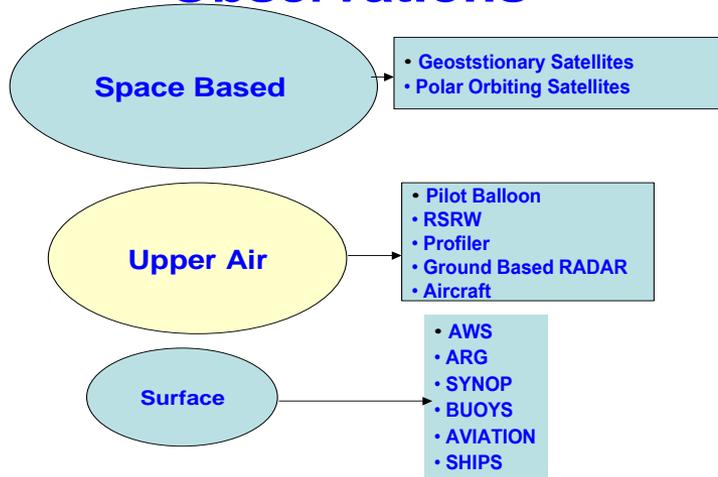
Models in 2006 : Deterministic Limited Area Model, GFS T80 Model

Models in 2016 :



Monitoring and Forecast Process

Broad Classification of Observations



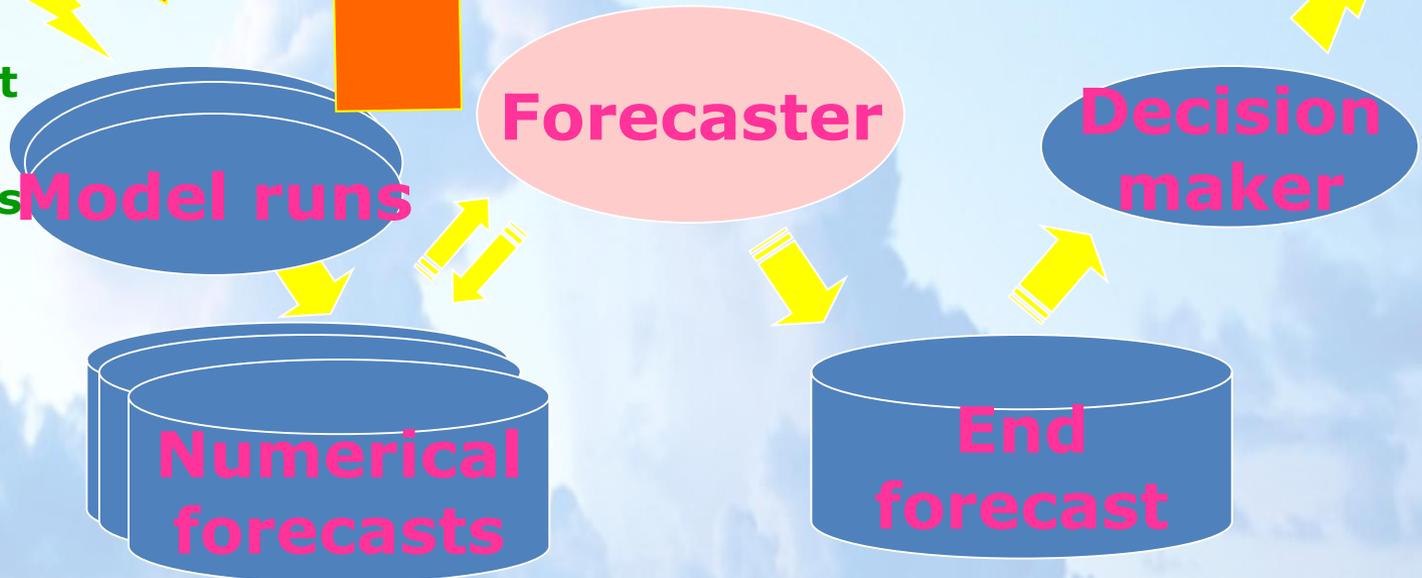
Initial conditions (Observation)

Action

Runs of different Models,

Consecutive runs from the same model,

Ensemble runs ("choosing the best member")



Weather Monitoring and Forecast Process



Flood producing Systems

- i) **Low Pressure Systems**
- ii) **Troughs, CyCirs**



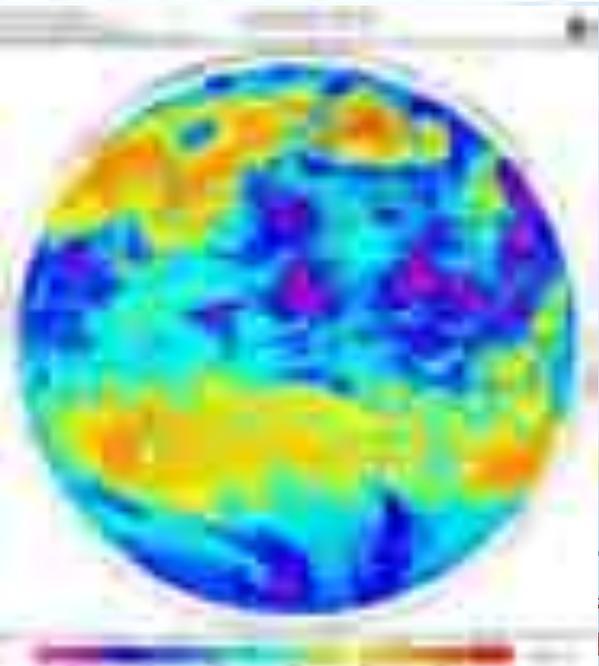
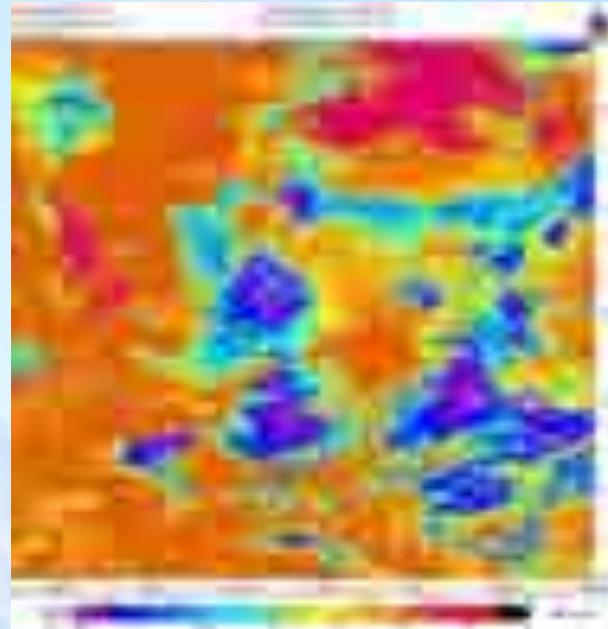
✓ Movement of
Monsoon Trough to
Foothills of Hamalaya



Analysis for 9th August 2019



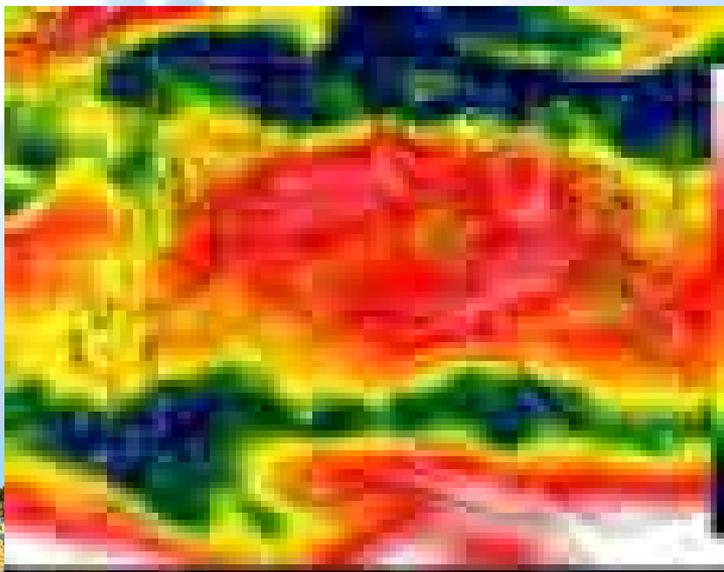
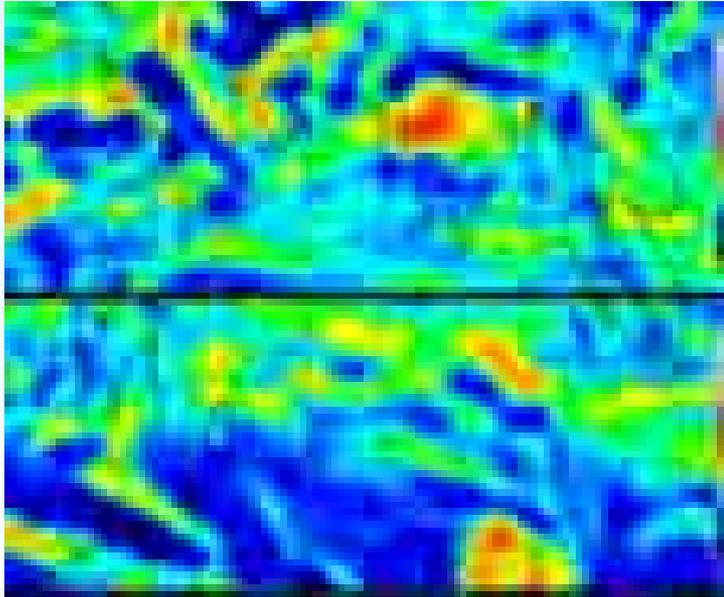
Satellite Imagery and Products



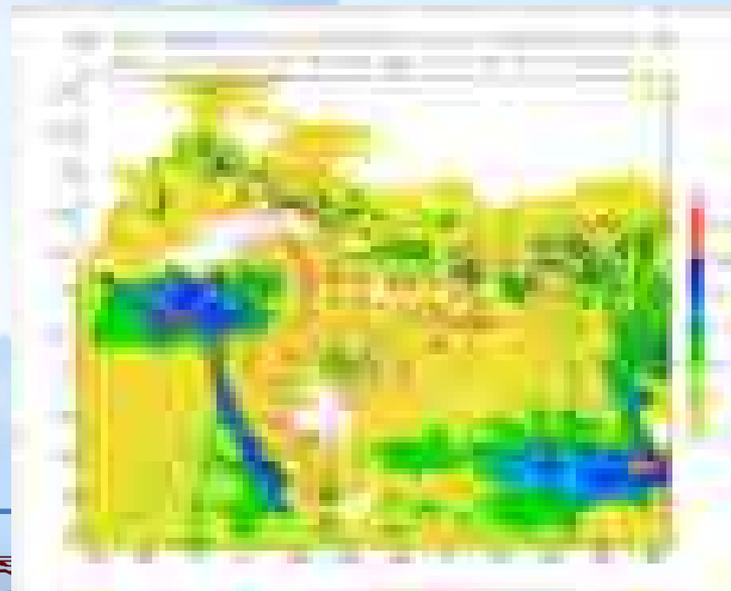
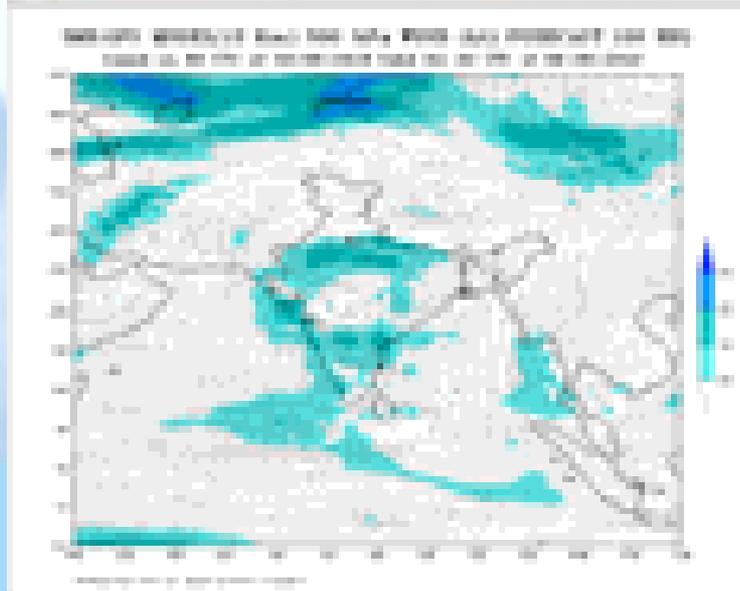
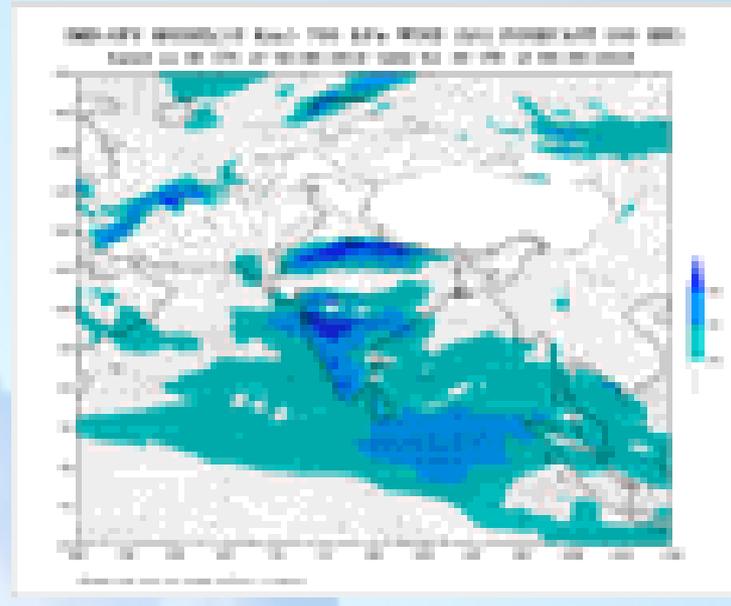
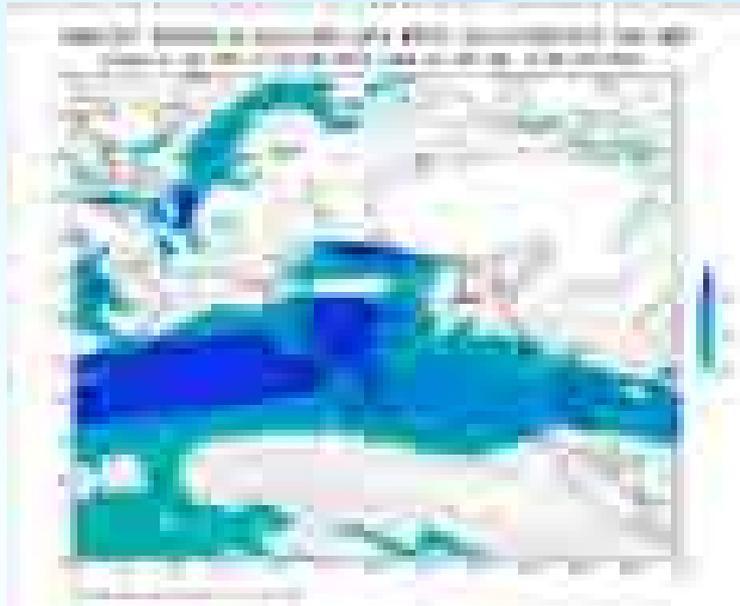
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Meteosat and radar Products



NWP Products



Weather forecasts and Services

- ❖ District level forecast
- ❖ City Forecast
- ❖ Nowcast
- ❖ QPF Forecast
- ❖ Agromet Forecast
- ❖ Cyclone Forecast
- ❖ Port Warning
- ❖ Fishermen Warning

☐ Warnings:

- Subdivision Wise
- District wise

☐ Now cast:

- District wise
- Station wise

✓ Impact Based Forecast

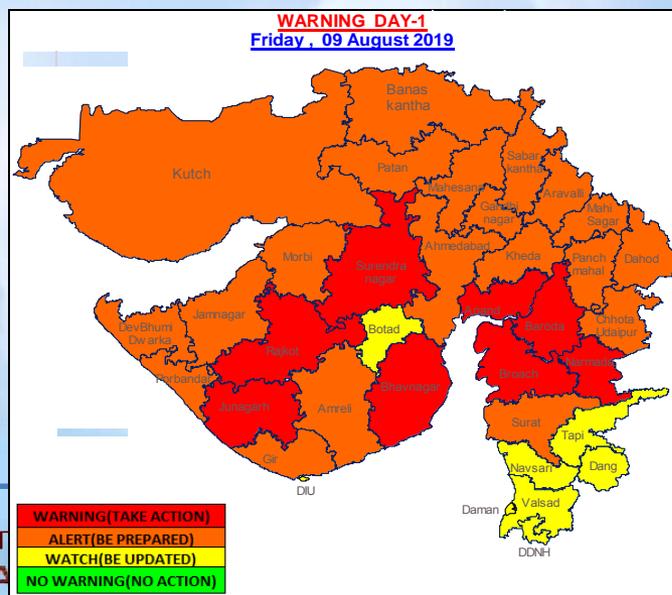
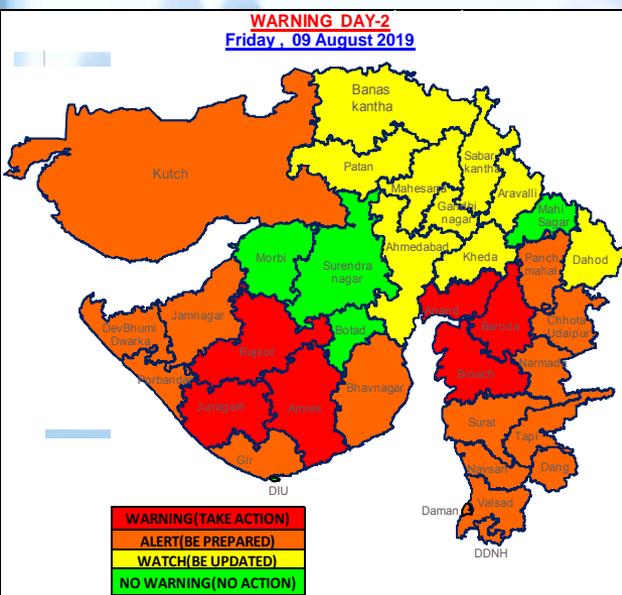
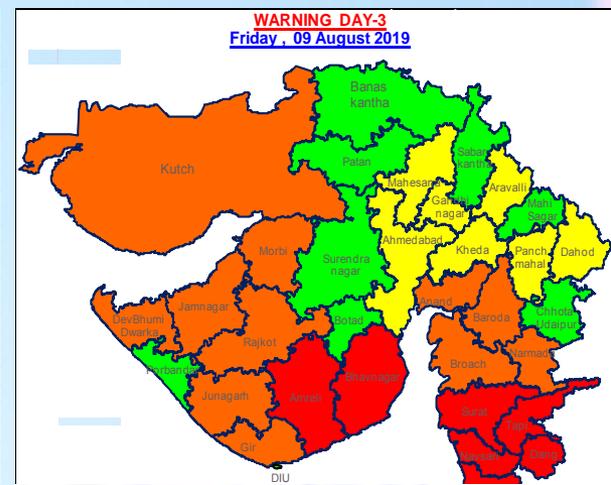
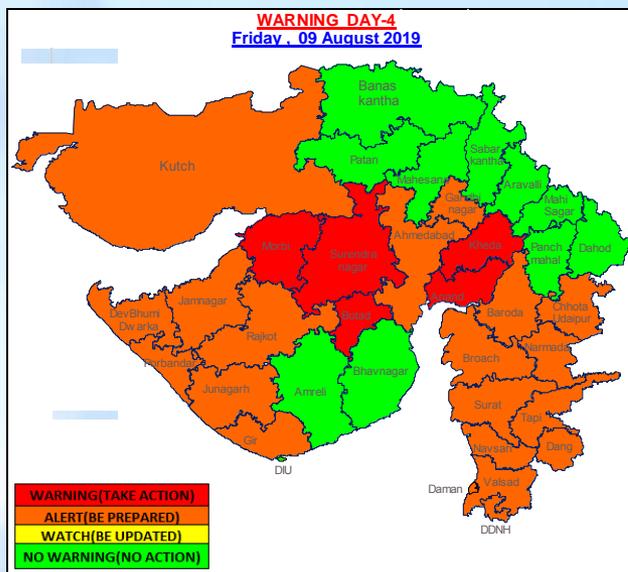
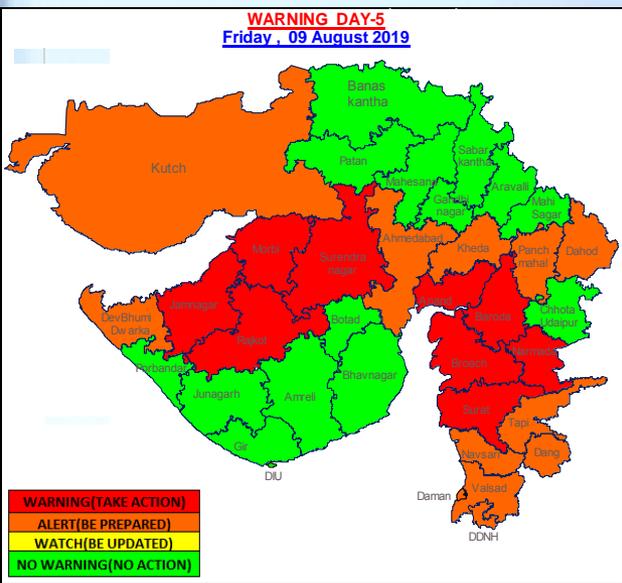


Forecast and Warning Dissemination

- ❖ Telephone
- ❖ Tele-fax
- ❖ IVRS
- ❖ WhatsApp
- ❖ Police Wireless
- ❖ AFTN (Aviation)
- ❖ Internet (e-mail)
- ❖ Websites
- ❖ Radio/TV network
- ❖ Mobile Phones
- ❖ SMS
- ❖ Media



District wise heavy rainfall warning issued for Gujarat state for 9th August 2019



❖ Future Plan:

- ❖ More focus on Impact based Forecast.
- ❖ High resolution forecast(Block level)
- ❖ Expansion of observational network
- ❖ Implementation of CAP

Common Alerting Protocol (CAP)

The CAP is a digital format for exchanging emergency alerts that allows a consistent alert message to be disseminated simultaneously over many different communications systems.

- ❖ **Since IMD is a alerting authority our responsibility will be to create message in a CAP format .**
- ❖ **Explore the dissemination mechanism to reach maximum number of users.**



Websites

- ❖ IMD New Delhi: <http://www.imd.gov.in> and <https://mausam.imd.gov.in/>
- ❖ IMD Ahmedabad: <http://www.imd.gov.in>
- ❖ Coastal Weather Bulletin, Port Warning and Fisherman warning: <http://www.rsmcnewdelhi.imd.gov.in>



