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

By

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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

- 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

- **Space Based**
  - Geostationary Satellites
  - Polar Orbiting Satellites

- **Upper Air**
  - Pilot Balloon
  - RSRW
  - Profiler
  - Ground Based RADAR
  - Aircraft

- **Surface**
  - AWS
  - ARG
  - SYNOP
  - BUOYS
  - AVIATION
  - SHIPS
IMD Observing Systems

Surface=559
AWS=675
ARG=1250
DRMS=3000
UA=43+69
RADAR=23
RADIATION=44
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:

- Ensemble Pred. Tools: GEFS, UMEPS
- Global Models: GFS(T574), Unified Model
- Regional Models: WRF, HWRF
- Nowcasting Tools: WDSSII, ARPS Model

Warnings Activities

- 120 h
- 96 h
- 72 h
- 48 h
- 24 h

Multi-model ensemble, Single Model Ensemble, Grand Global Ensemble

Global models

Regional models

Nowcasting
Monitoring and Forecast Process

Initial conditions (Observations)

Runs of different Models,
Consecutive runs from the same model,
Ensemble runs ("choosing the best member")

Model runs

Numerical forecasts

Forecast

Decision maker

End forecast

Weather Monitoring and Forecast Process

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Action
Flood producing Systems

i) Low Pressure Systems

ii) **Troughs**, CyCirs
Flood producing Systems
Movement of Monsoon Trough to Foothills of Hamalaya
Analysis for 9th August 2019
Satellite Imagery and Products
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

- Nowcast:
  - 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
जनित्व दृष्टि से भी दिखाई पड़ता है कि इस प्रकार का रिपोर्ट लिखने का प्रयास किया जा रहा है। इसमें नहीं मिली जानकारी की सीमा।

उपरोक्त विषयों के अनुसार इस प्रकार का रिपोर्ट लिखने का प्रयास किया जा रहा है।
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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](http://www.imd.gov.in) and [https://mausam.imd.gov.in/](https://mausam.imd.gov.in/)
- IMD Ahmedabad: [http://www.imd.gov.in](http://www.imd.gov.in)
- Coastal Weather Bulletin, Port Warning and Fisherman warning: [http://www.rsmcnewdelhi.imd.gov.in](http://www.rsmcnewdelhi.imd.gov.in)
Thanks