Nowcasting in IODC Region with NWCSAF-GEO

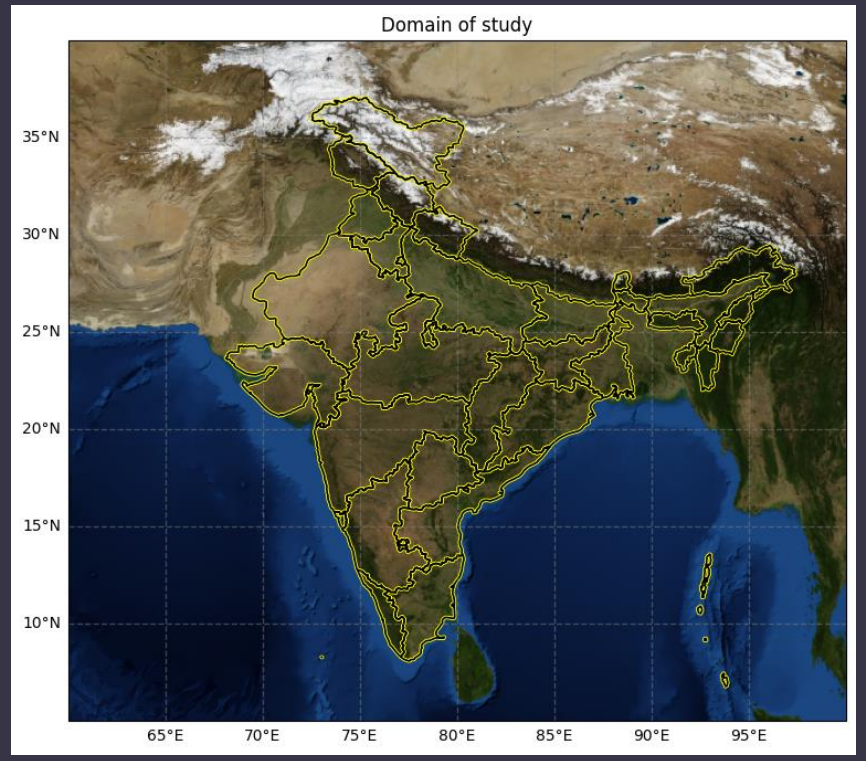
ABHISHEK CHHARI

SCIENTIST/ENGINEER-SE

SPACE APPLICATION CENTRE

INDIAN SPACE RESEARCH ORGANISATION

India: Meteorological & Climatological Aspects



Diverse Climate & Rainfall Patterns

India's rainfall is driven by the Southwest Monsoon (June–September), contributing >70% of annual precipitation.

Mawsynram, Meghalaya: World's highest annual rainfall (>10,000 mm) due to monsoonal & orographic effects.

Orographic rainfall influenced by Himalayas, Western Ghats, and Eastern Ghats, shaping regional weather patterns.

Convective Weather & Severe Storms

India, as a tropical country, experiences intense thunderstorms, lightning, and hailstorms, particularly in the pre-monsoon season (March–May).

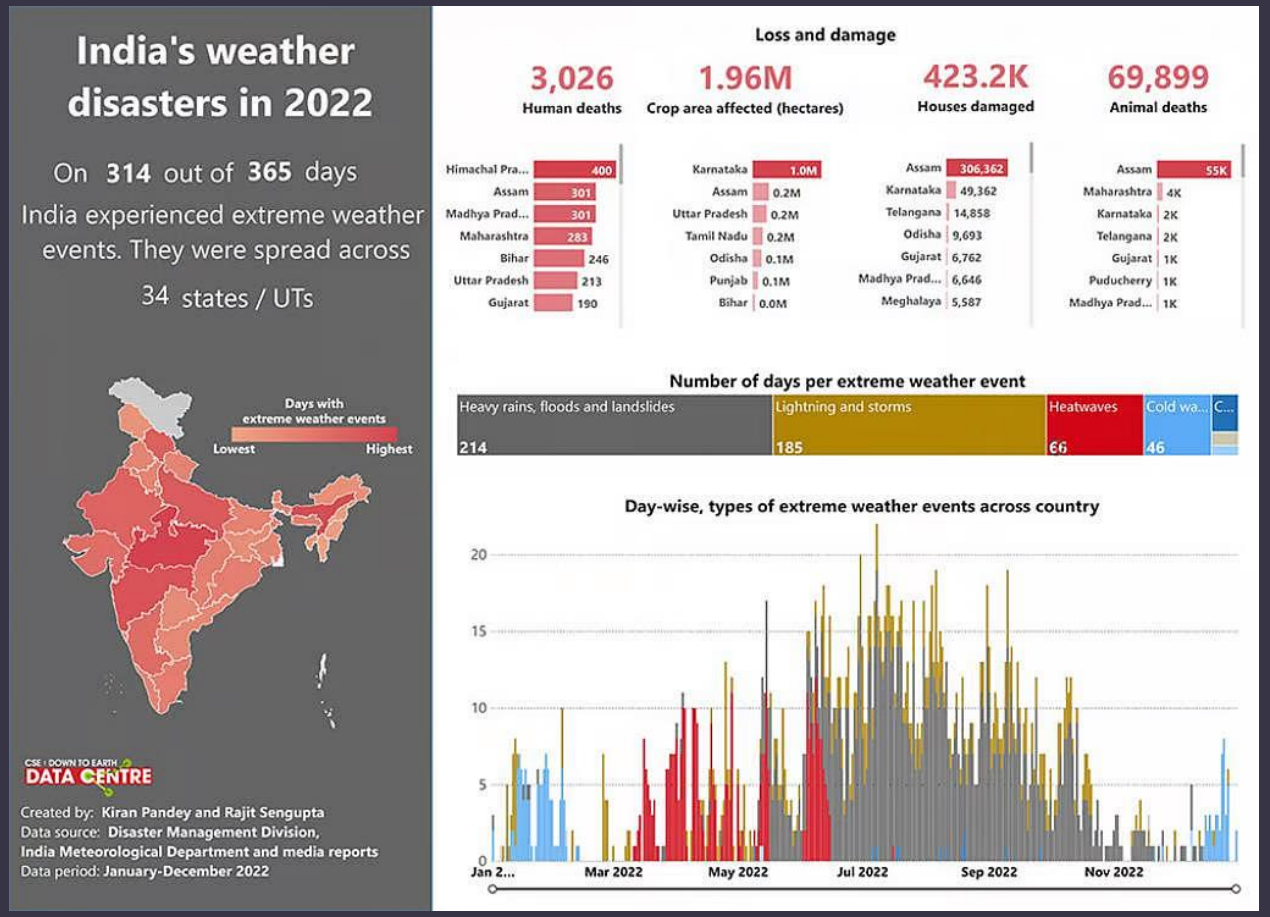
Frequent lightning and severe thunderstorms in Northeast India, Odisha, Jharkhand, and Gangetic plains, making real-time monitoring crucial.

Cyclonic Storms & Coastal Hazards

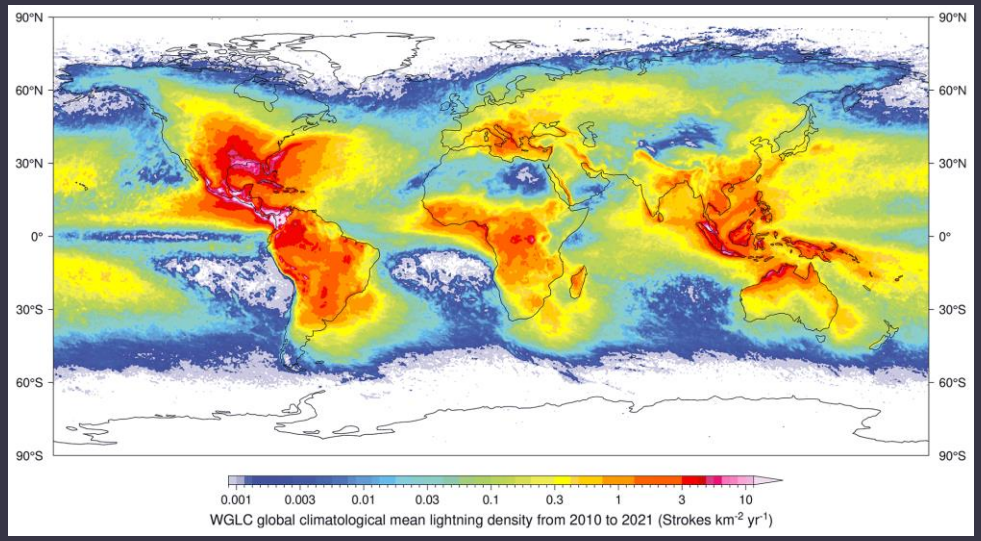
Cyclones originate in both Bay of Bengal (more intense & frequent) and Arabian Sea (increasing in recent years).

Cause storm surges, heavy rainfall, and coastal flooding (e.g., Cyclones Amphan, Fani).

Extreme Weather Events India



Source: downtoearth.in/natural disasters



Kaplan, J.O and Lau et al., 2022

Nowcasting and Very Short Range Forecasting Satellite Application Facility for Geostationary Satellites (NWCSAF-GEO)

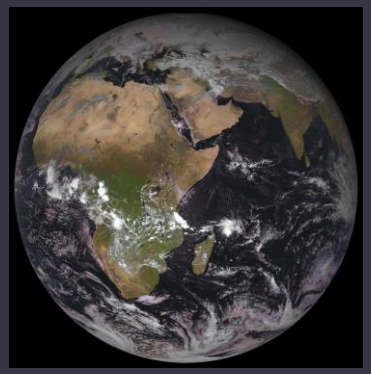
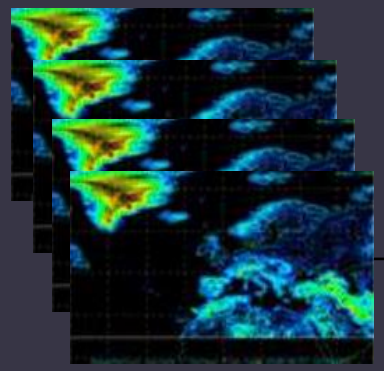
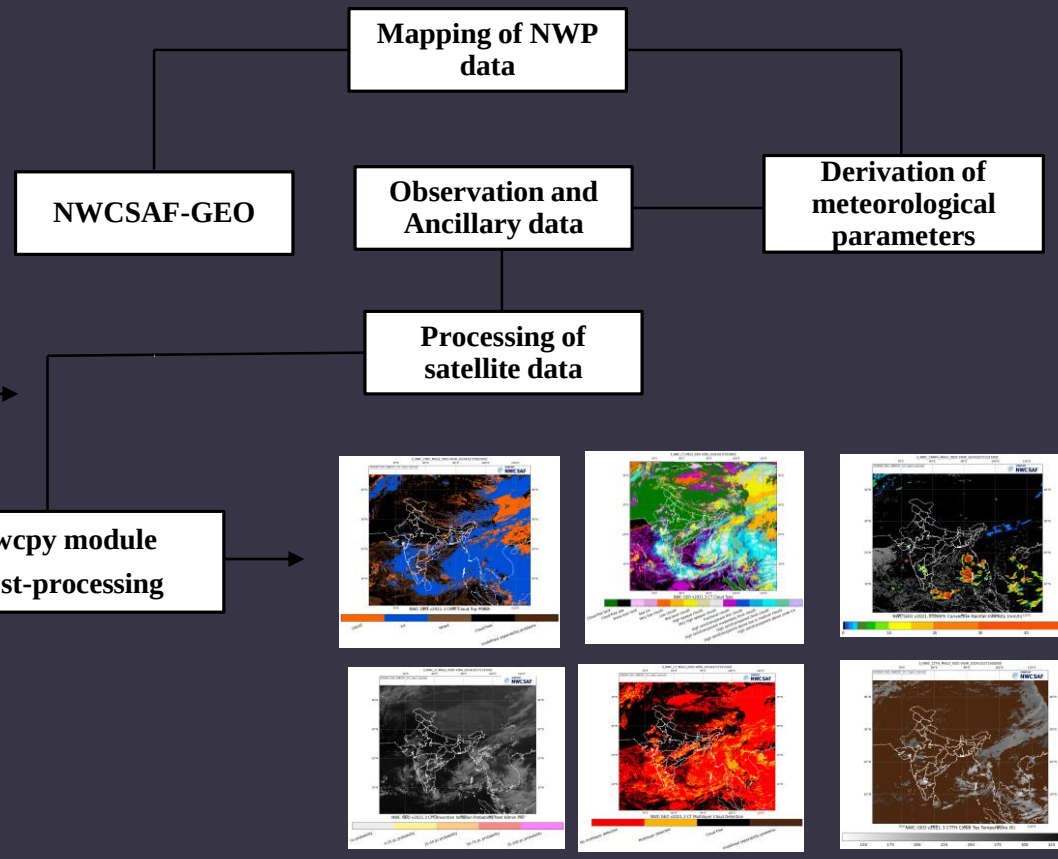
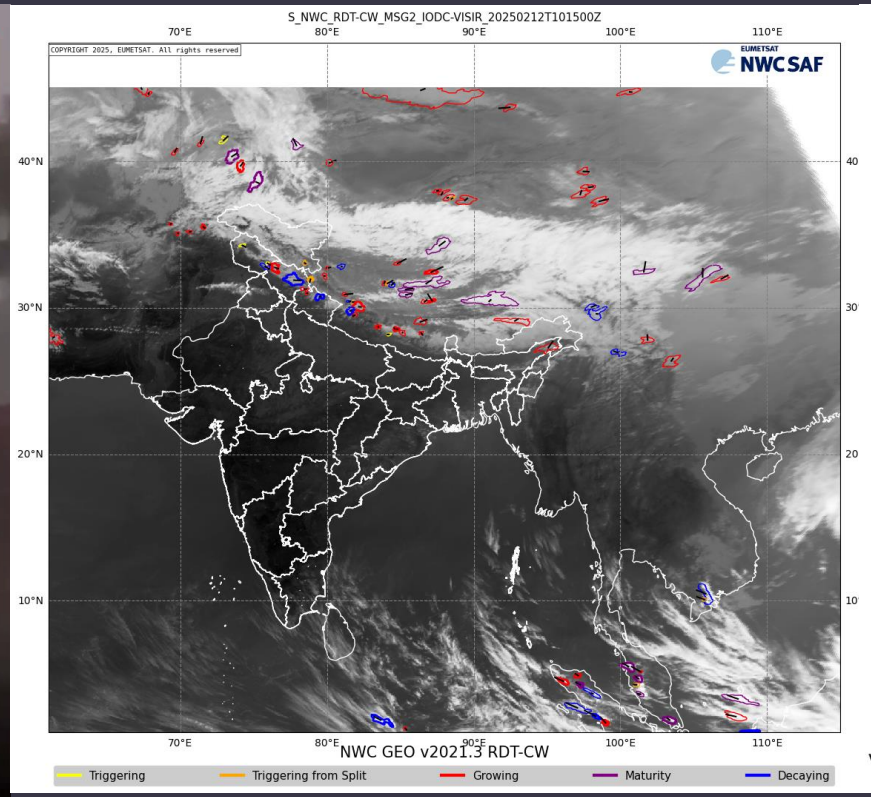


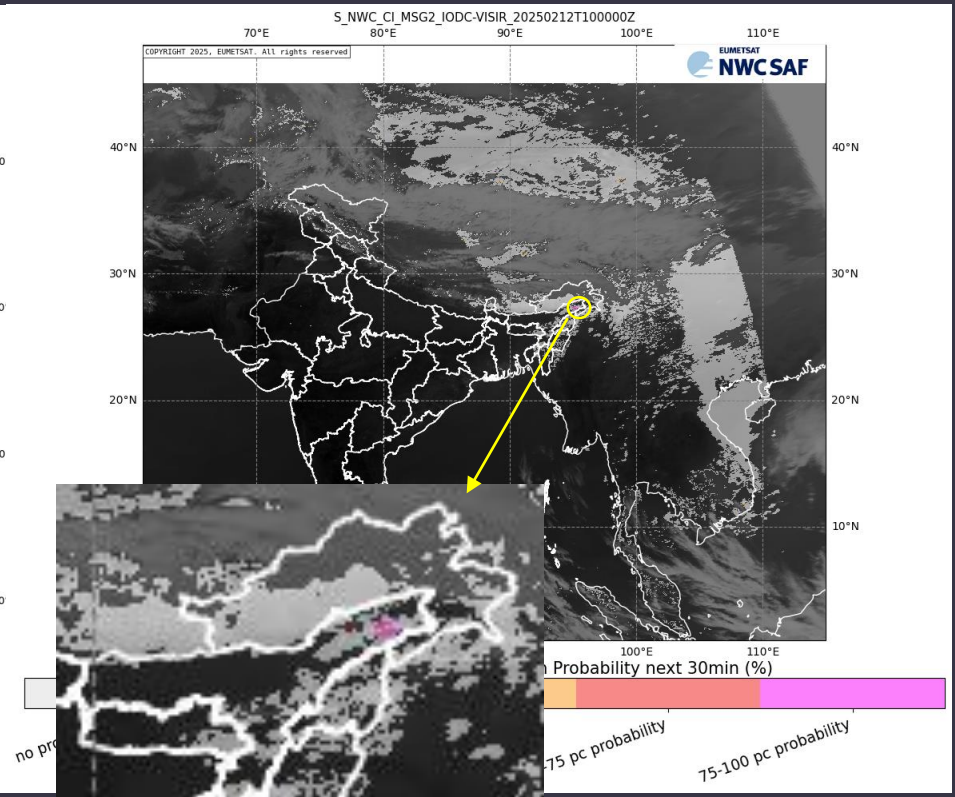
Image source http://www.eumetsat.int



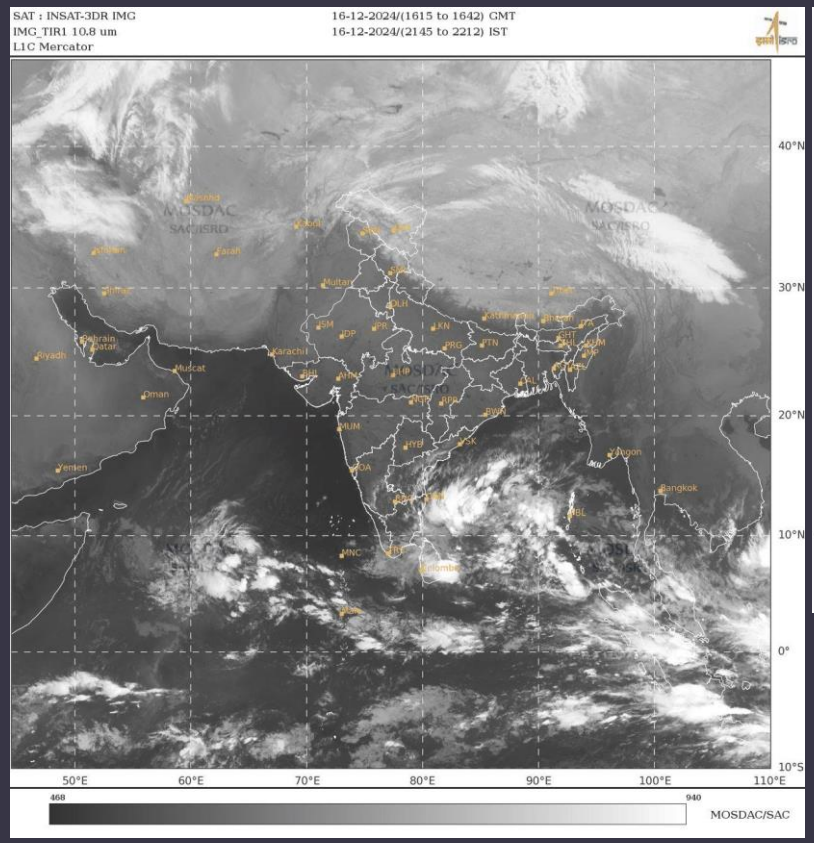


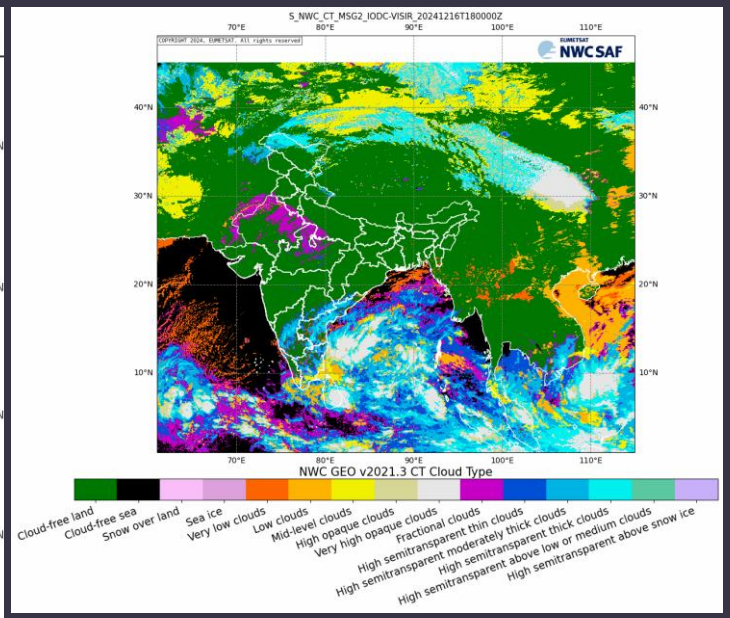
Severe Thunderstorm Activity

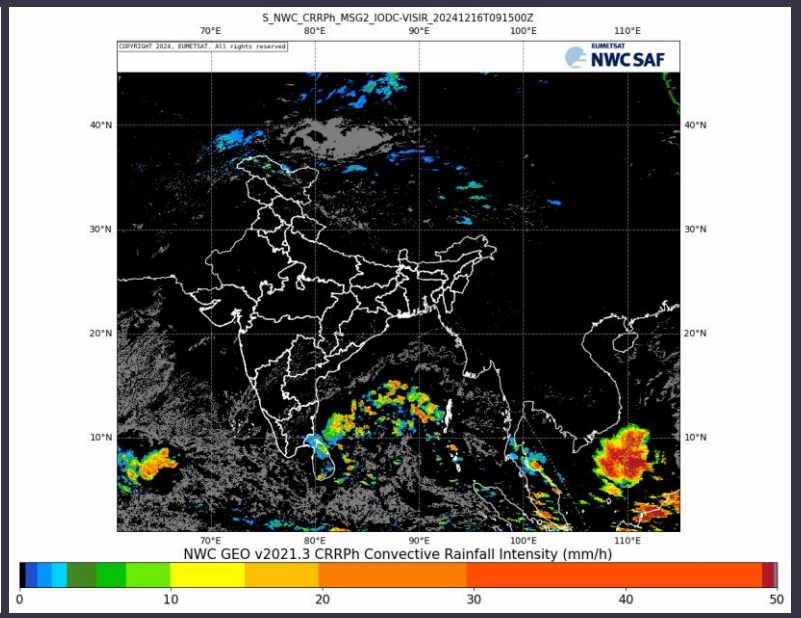




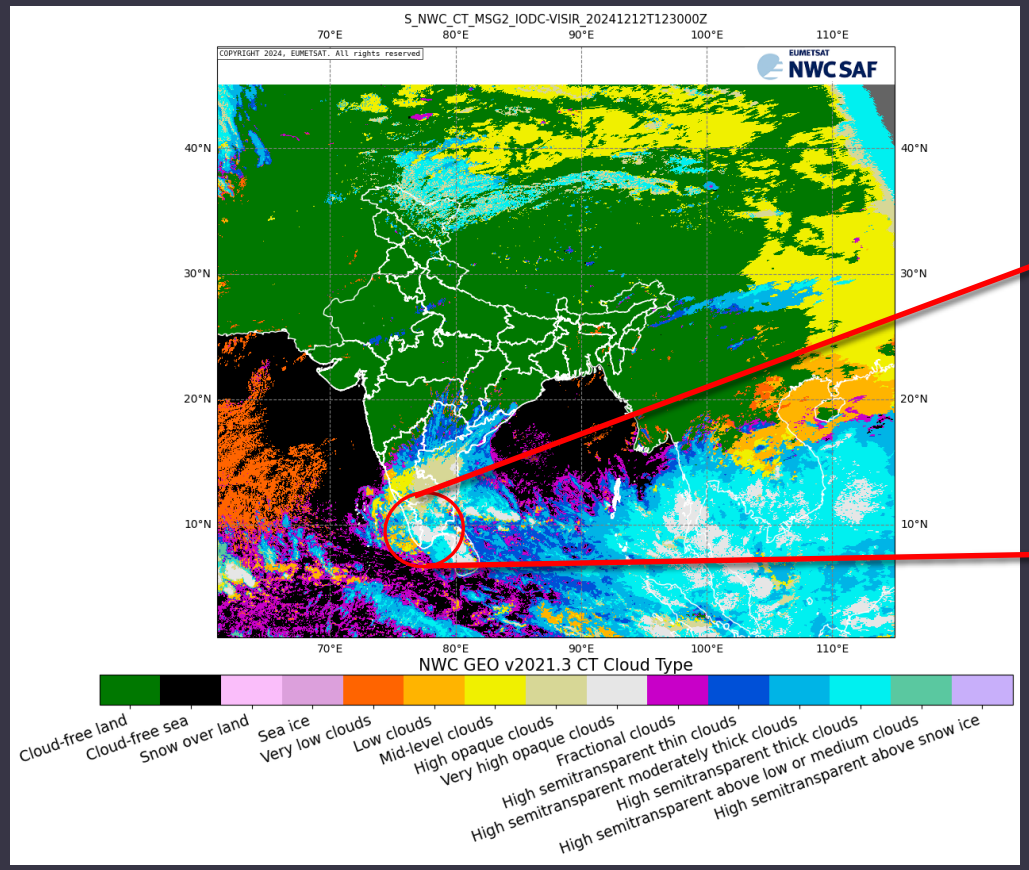
Cyclonic Circulation in Bay of Bengal

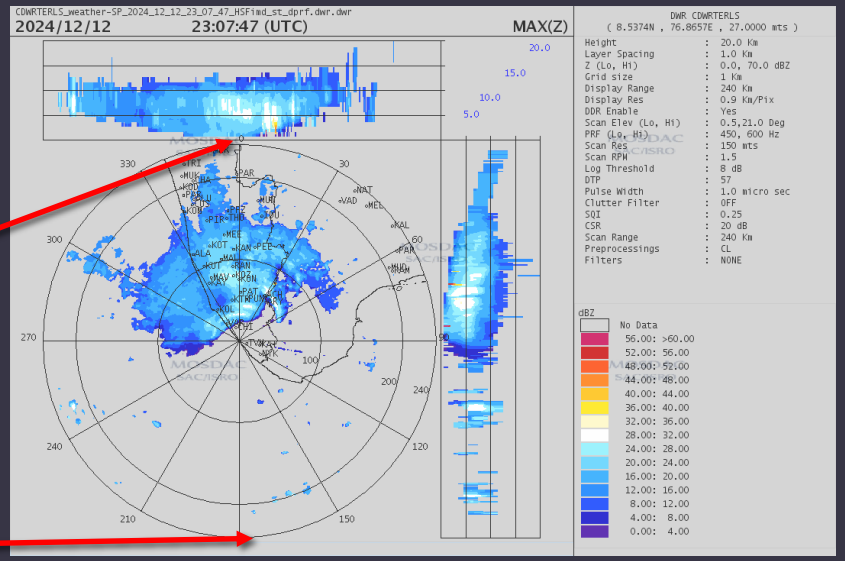




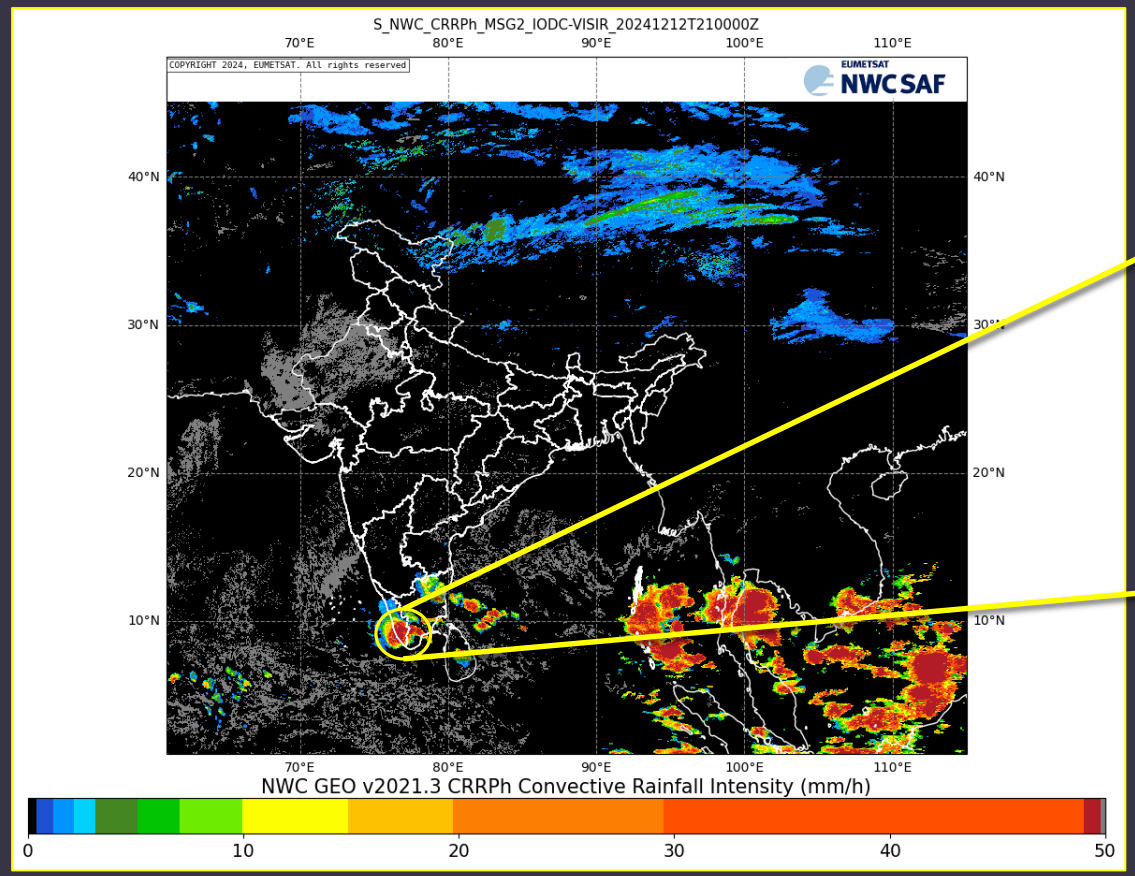


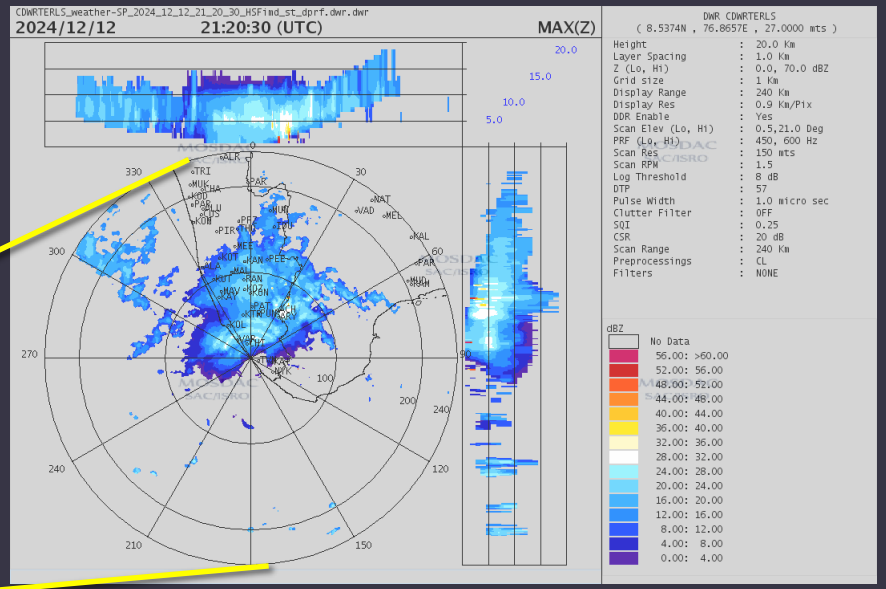
Heavy Rainfall Event



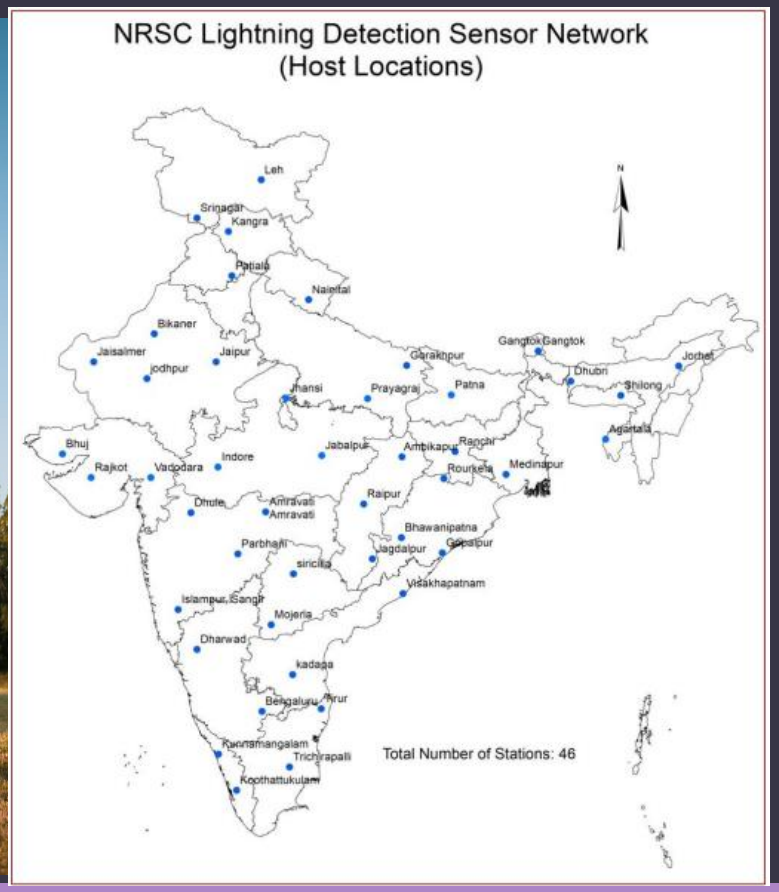


Heavy Rainfall Event



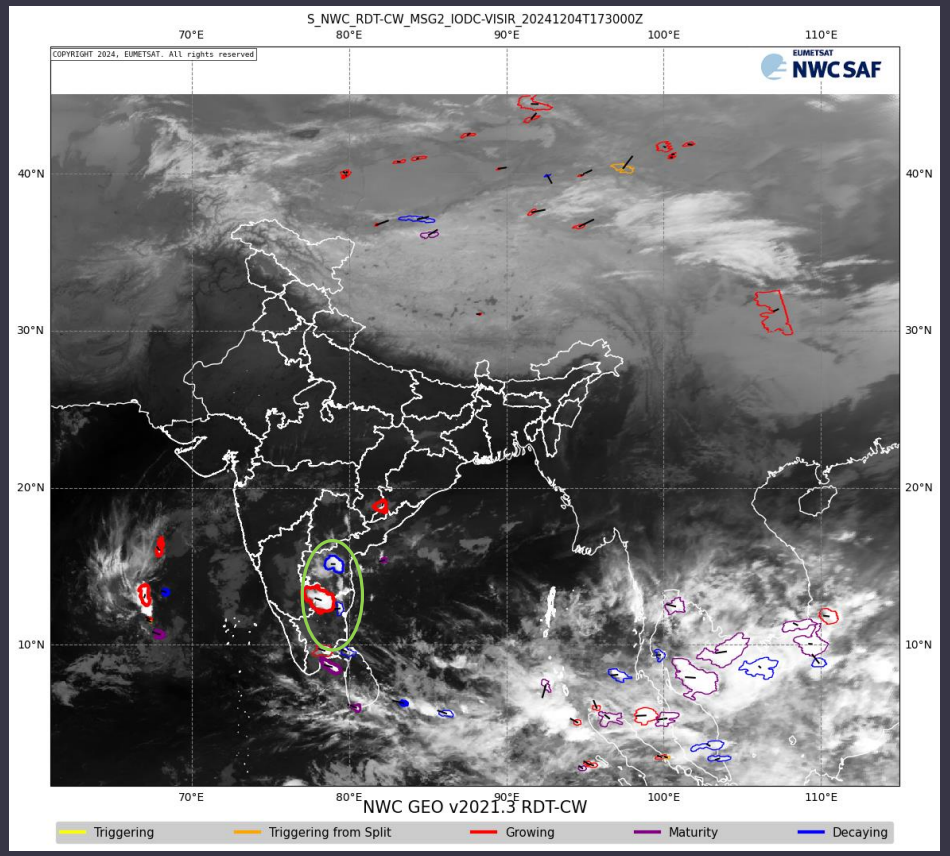


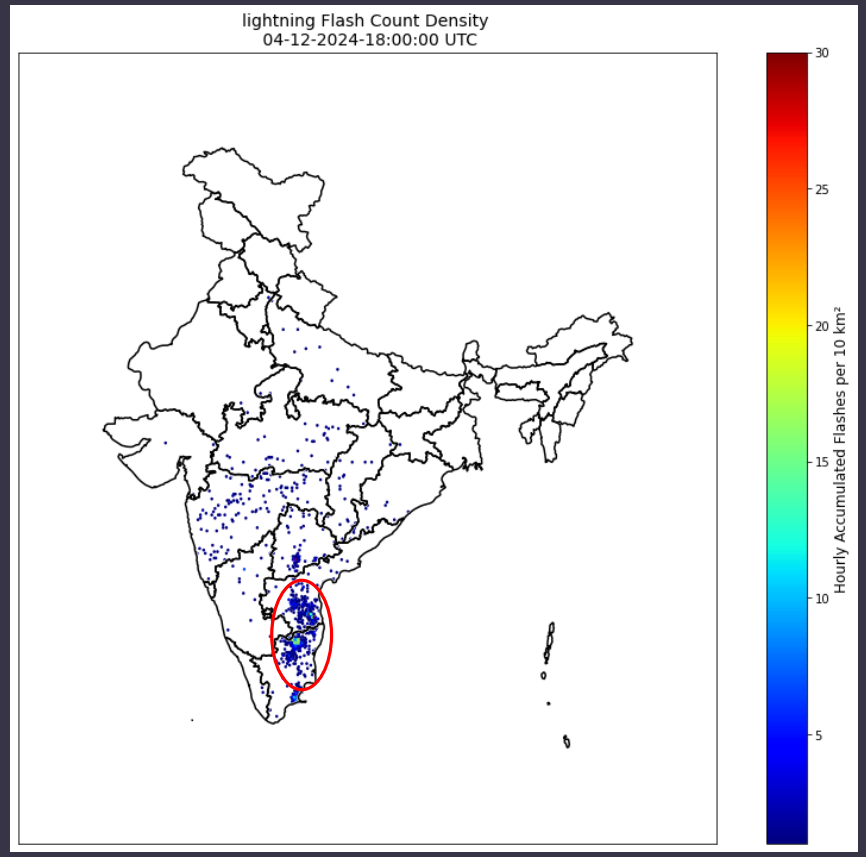
Lightning Detection Sensor Network



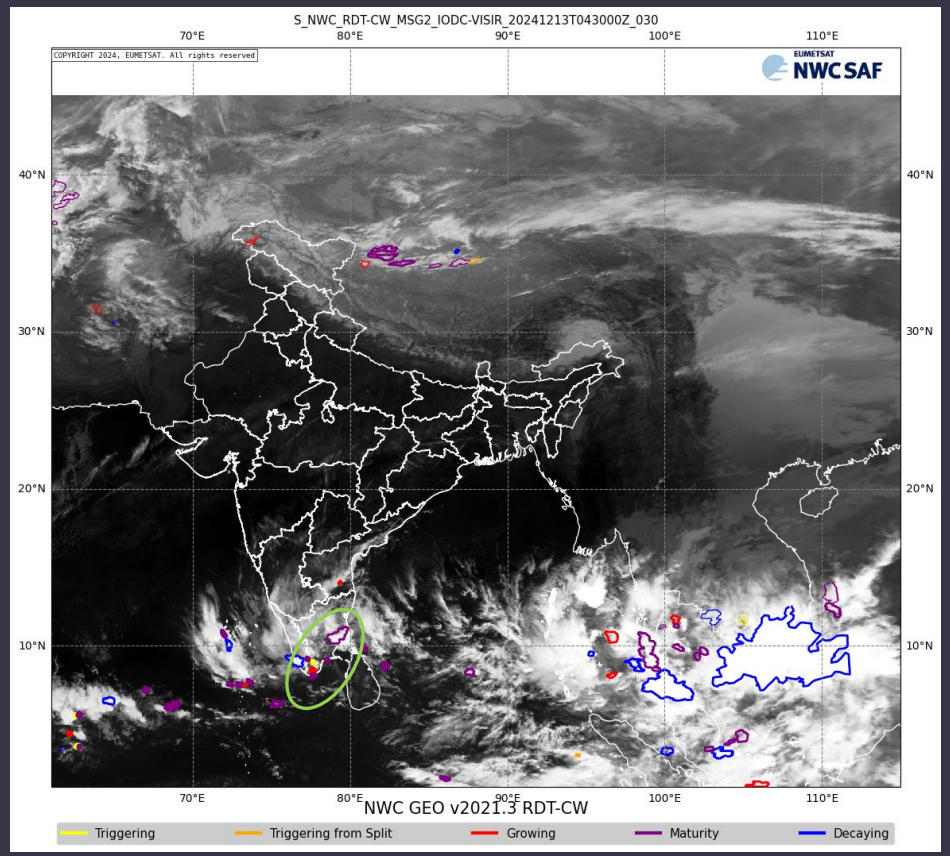
- Ground-based Lightning Detection Sensor Network
- 46 Sensors, installed at different part of India
- Detects very high frequency signal produced by lightning.
- has large frequency range of 5KHz – 50 MHz
- Use triangulation method to detect position of lightning

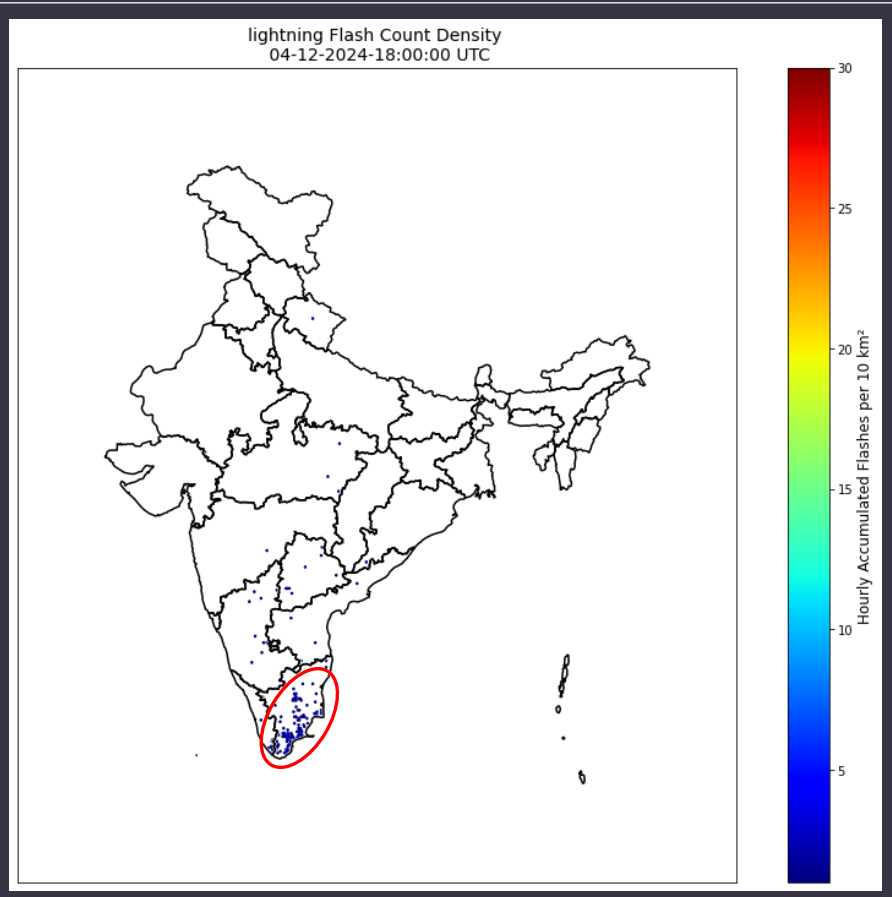
Lightning Event captured by RDT-CW



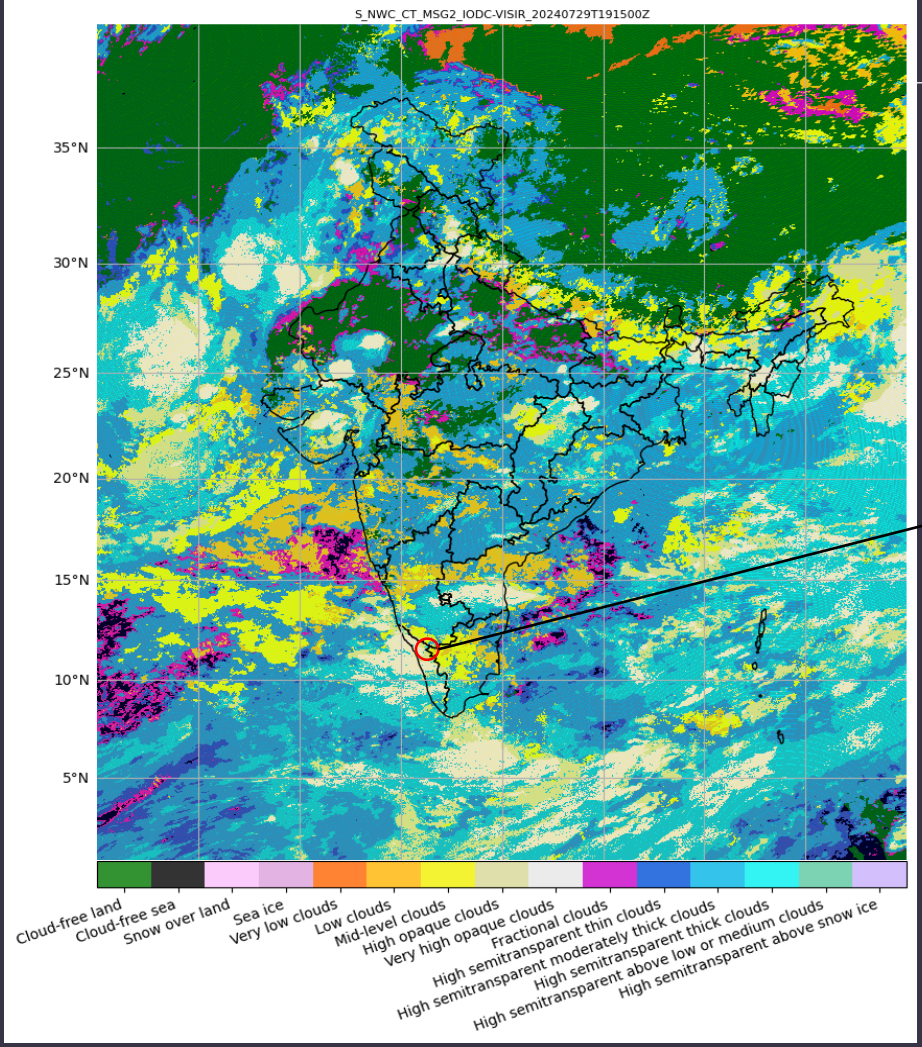


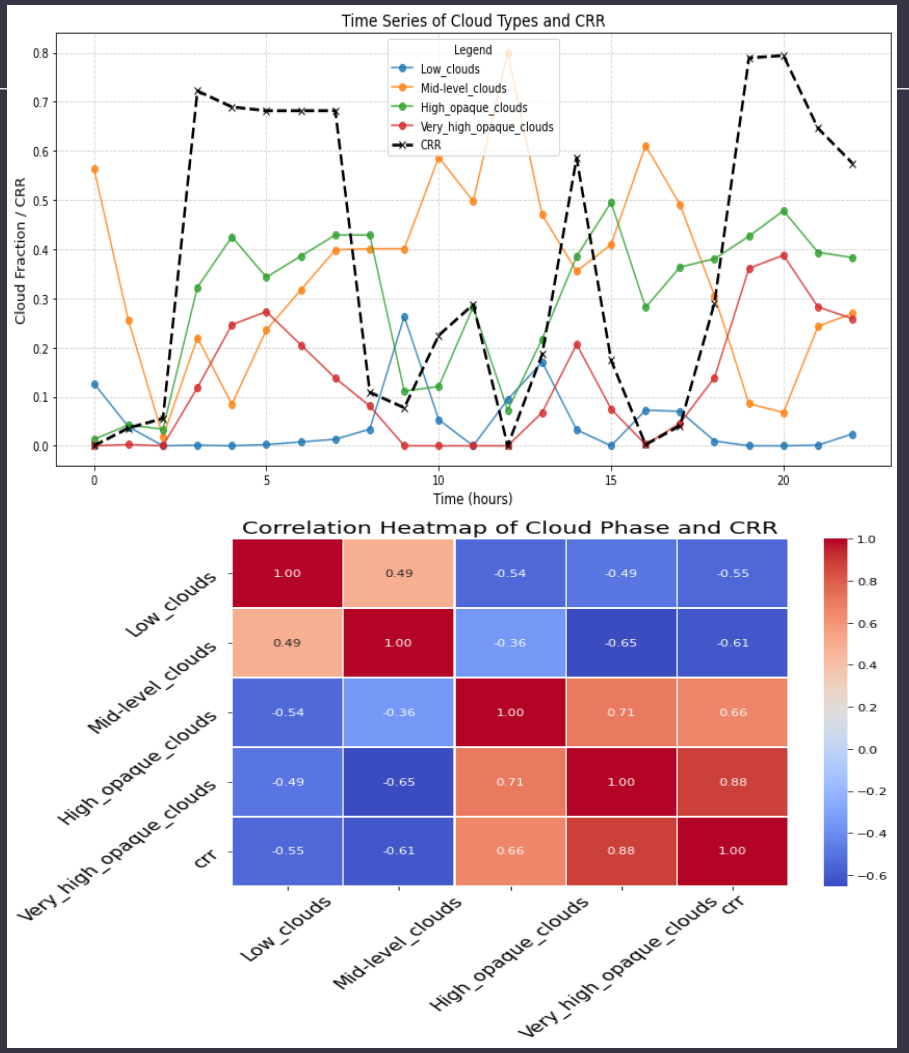
Lightning Event captured by RDT-CW



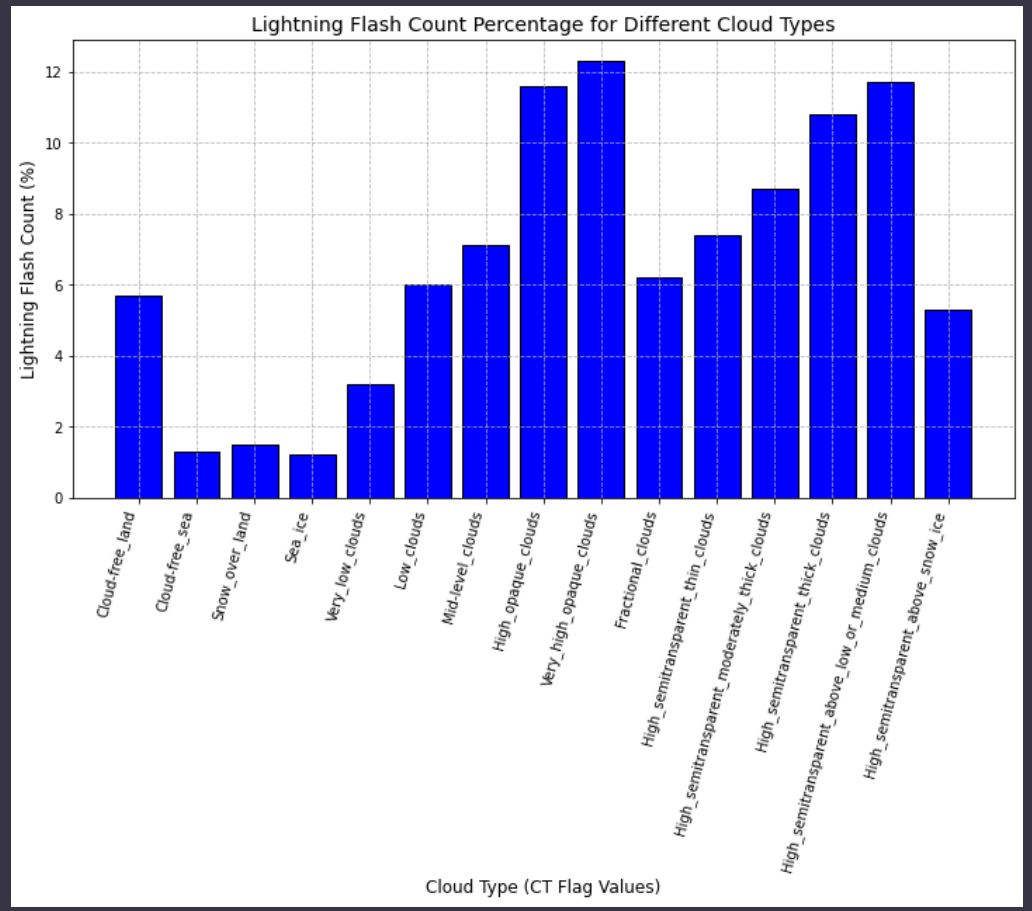


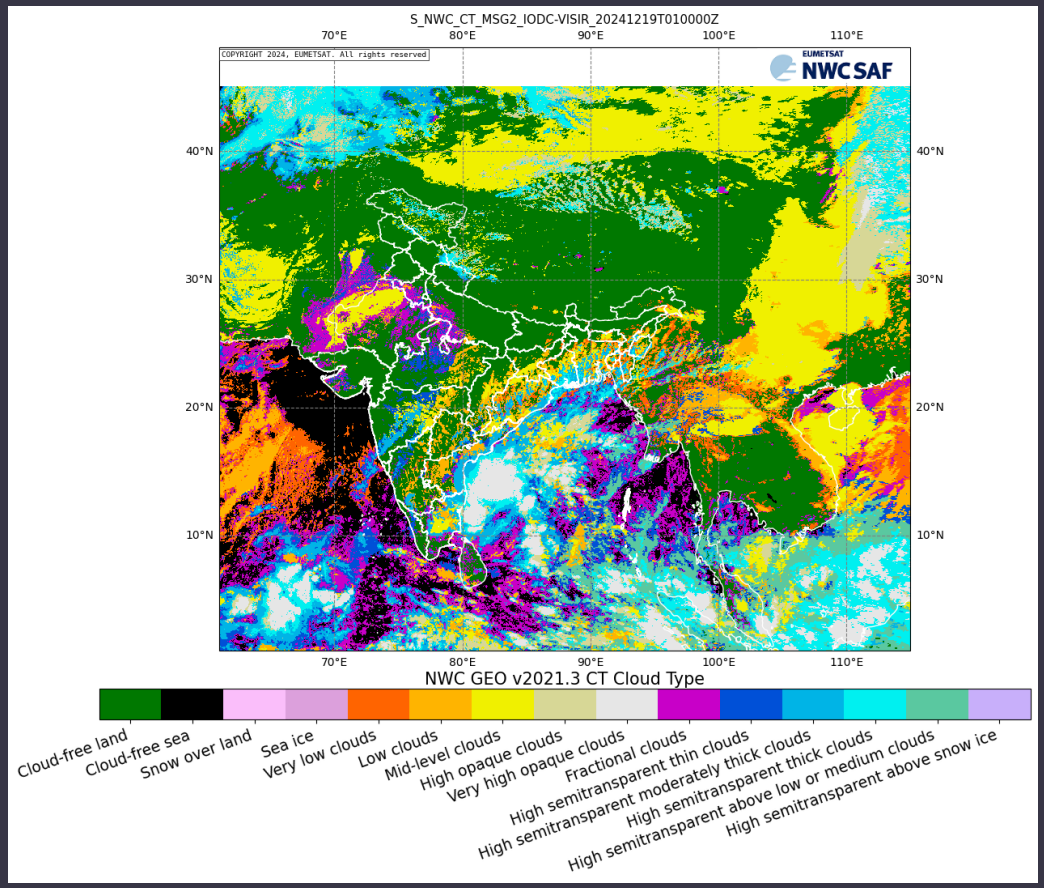
Case Study: Heavy Rain over Wayanad, 29-07-2024





Lightning flash and Cloud Types

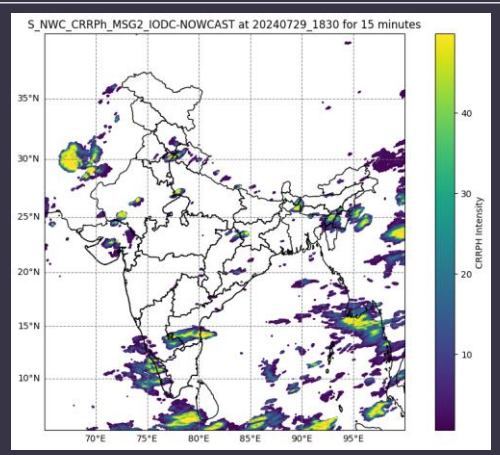


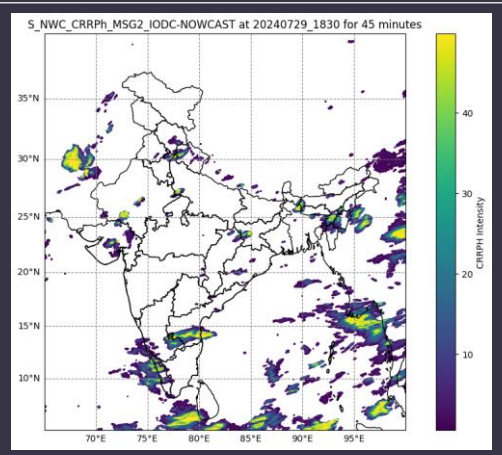


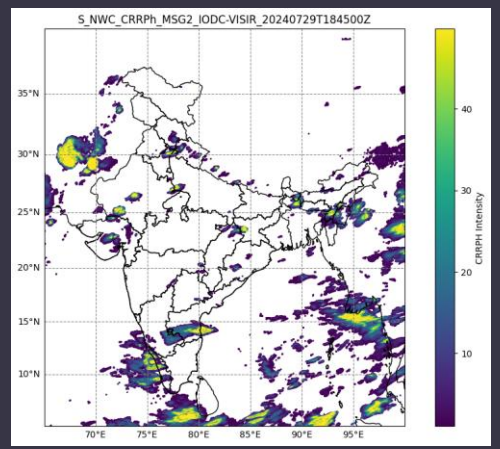
Integration with nowcasting model

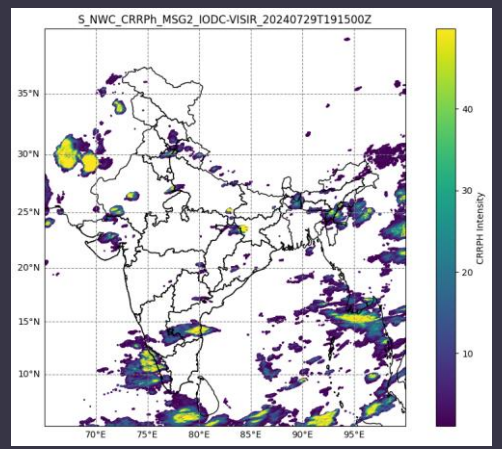
NOWCAST

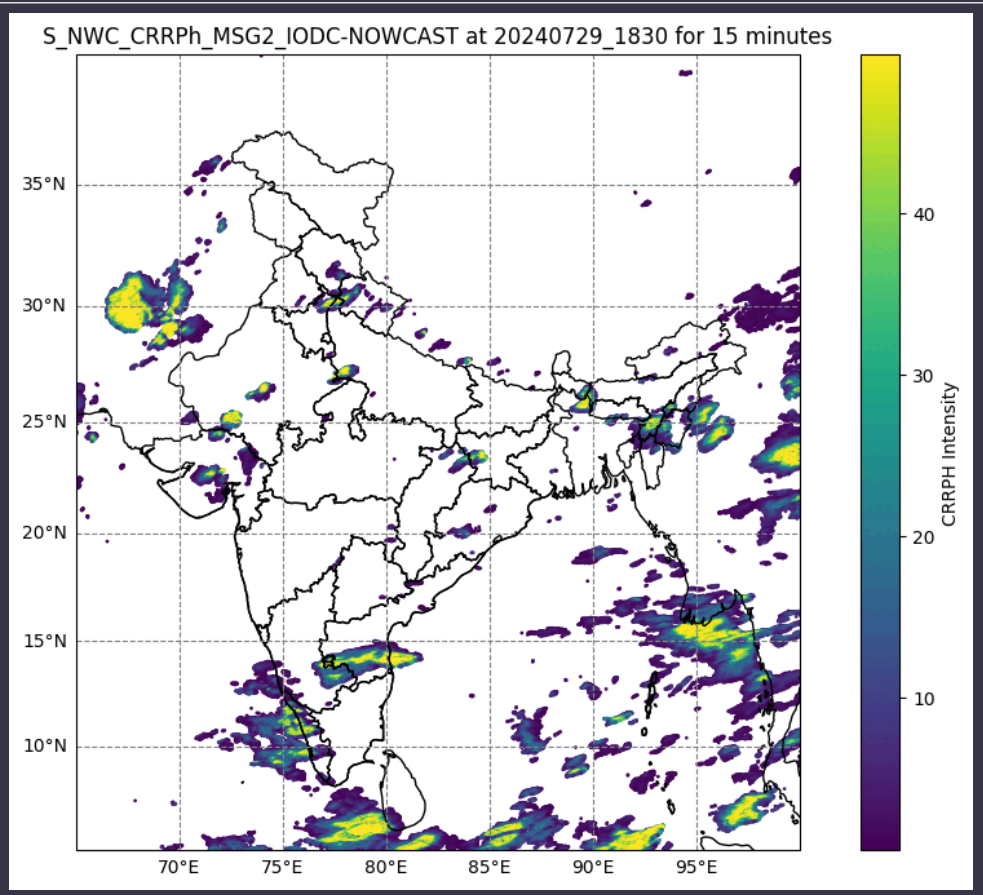
OBSERVATION



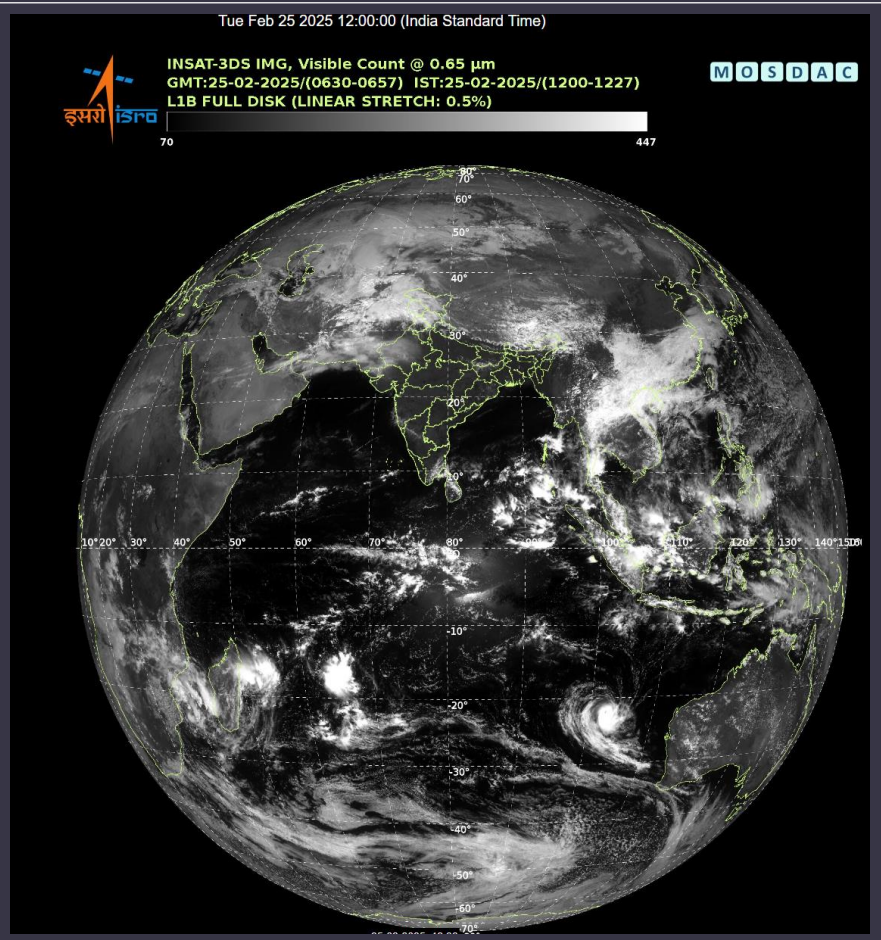








INSAT 3DR/3DS



- Temporal Frequency of 15min with combination of INSAT3S and INSAT3D (each with 30 min temporal frequency)
- 6 Imager Channels and 16 Sounders
- Satellite position: Geostationary at 74 E longitude

Future Plane of Fourth Generation of INSAT satellites

- 10 min temporal resolution
- Lightning Mapper
- More number of Imager channels

Thank You…