



AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



Satellite-Based Weather Analysis Using METEOSAT SERIES: Enhancing Forecasting and Tracking of Synoptic Weather Systems

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► Content

- MSG – MTG Transition
- Visualization on PUMA – (**P**reparation for **U**se of **M**eteosat for **A**frica)
- Case Study
- Conclusion and Future Outlook

▶ **MTG: Meteosat Third Generation**

- MTG succeeds the current MSG
- The MTG program is designed to provide high-precision meteorological observations to improve:
 - **Short-term weather forecasting (nowcasting)**
 - **Climate and atmospheric monitoring**
 - **Early detection of extreme weather events**
- Learn more: <https://www.eumetsat.int/meteosat-third-generation>

MTG: Meteosat Third Generation

- MTG consists of 3 spacecraft: 2 Imaging satellites (MTG-I) and 1 Sounding satellite (MTG-S).

- Key Capability:

1. Imaging (MTG-I) -

- Full Disc image service
- 16 Spectral Channels over Europe and Africa every 10 minutes
- Lightning Imager, the first imaging satellite, MTG-I1 now operational under the name Meteosat 12

2. Sounding (MTG-S) - Provides innovative data for Nowcasting/Short Range Forecasting of high-impact weather. (Not operational for Africa at the moment)



Difference between MSG (SEVIRI) & MTG (FCI)

Feature	MSG (SEVIRI)	MTG (FCI)
Total spectral channels	12 spectral channels.	16 spectral channels.
New visible (VIS) channels	Not equivalent to MTG's VIS 0.4, VIS 0.5, and VIS 0.9 channels.	Adds VIS 0.4 μm , VIS 0.5 μm , and VIS 0.9 μm for improved aerosol and atmospheric composition monitoring, as well as True Colour imagery.
New near-infrared (NIR) channels	Includes a NIR 1.6 μm channel.	Adds NIR 1.3 μm and NIR 2.2 μm , which improves the ability to distinguish cloud properties and surface features.
New infrared (IR) channels	Includes IR 3.9, 8.7, 9.7, 10.8, 12.0, and 13.4 μm channels.	Adds IR 12.3 μm for better monitoring of atmospheric composition, as well as the IR 10.5 μm channel with improved resolution.
Resolution	Visible channels at 1 km (High Resolution Visible) and 3 km (other channels).	Improves spatial resolution across the spectrum. Some channels now have spatial sampling distances (SSD) of 0.5 km or 1 km.
Scanning speed	Scans the full Earth disc every 15 minutes.	Scans the full Earth disc every 10 minutes, with the ability to scan Europe in 2.5 minutes.

NiMet's PUMA 2025 Transition

- **Legacy (PUMA 2015)** NiMet, like many African NMHSs, previously operated a PUMA 2015 station.
- **Key Limitations of PUMA 2015:**
 1. Relied on dedicated local receiving stations.
 2. Processed MSG data.
 3. Often required separate deployments for multiple locations
 4. The PUMA 2015 model will be decommissioned by the end of 2026, necessitating the upgrade to leverage MTG's advanced capabilities.
- **Transition consequence:** the PUMA 2015 workstation, operating with the **Synergie** software will not be able to process data from the MTG.



NiMet's PUMA 2025 Transition



ClimSA Initiative: Led by the **African Union Commission (AUC)** and funded by **E.U.**; aims to **strengthen African weather services** for predicting extreme events and providing **early warnings**.

Tecnavia developed PUMA 2025 which runs on **Skyceiver software**, an innovative workstation allowing all weather services of Africa to **visualize and represent** all data received via EUMETCast Africa.

PUMA 2025 allows forecasters to **display, visualize**, and **process** satellite data (especially the MTG data), NWP data, and observed data via web access.

Flashpoint Area

Data Quality & Speed

Operational Efficiency

Core Outcome

Detail/Advantage

Direct reception of **MTG data** with **higher resolution** and **increased frequency** (updates every 10 minutes).

New **Web-Based Portal** allows **all NiMet stations** to receive real-time data, significantly improving **data dissemination** and **saving costs**.

The combined technical upgrades lead to **more accurate and timely weather forecasts and critical early warnings**.

The Power of RGB Products for Synoptic Analysis



- Visualizing Synoptic Systems: The Role of RGBs
- Core Channels-
 - IR (Cloud top temperatures),
 - VIS (Daytime cloud/fog),
 - WV (Atmospheric moisture/systems).
- RGB Products-
 - Air Mass RGB,
 - Rapid Developing Thunderstorm RGB,
 - Dust RGB, Cloud Phase RGB, etc.

Focus: Cloud Phase RGB- Better distinction between ice (Blue/Purple) and water (Yellow/Pink) clouds.

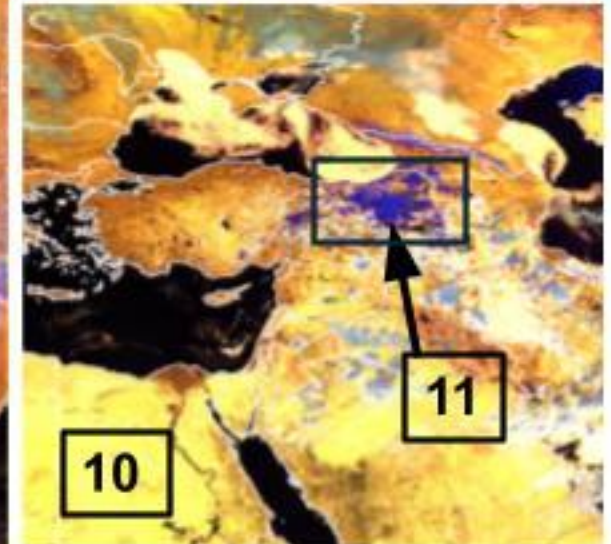
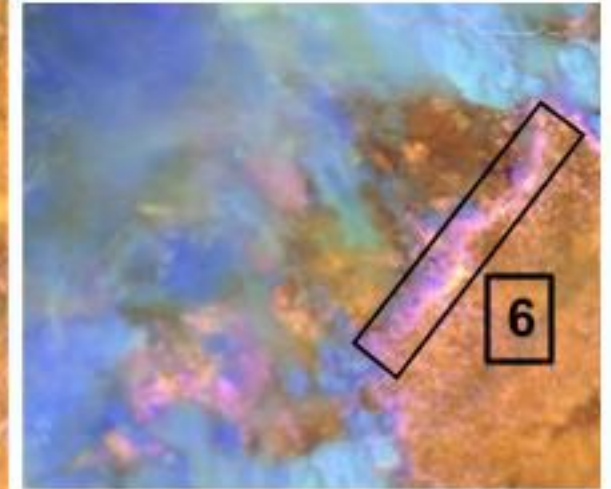
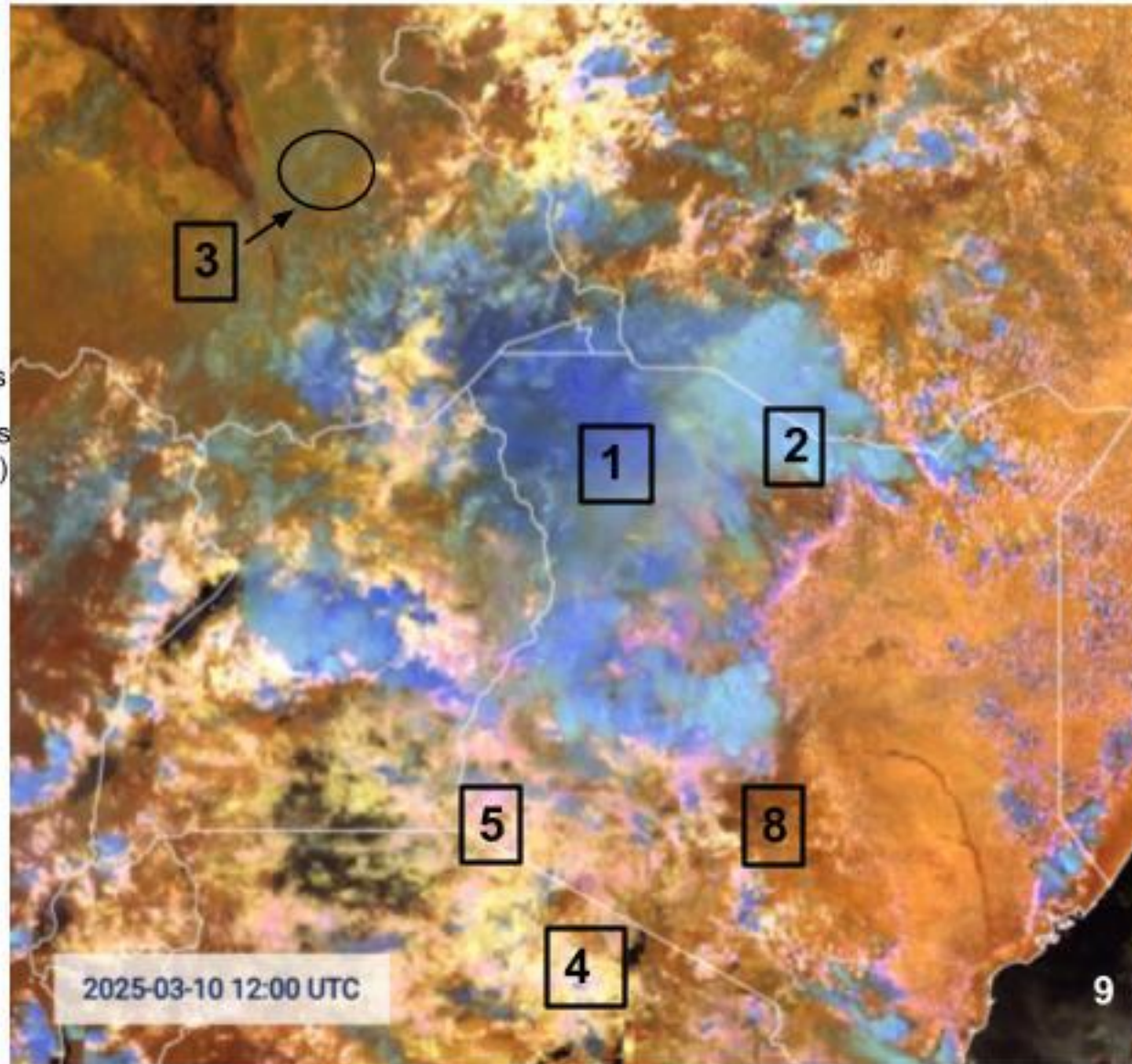
MTG NEW RGBs... In detail

Go to <https://eumetrain.org/quick-guides>

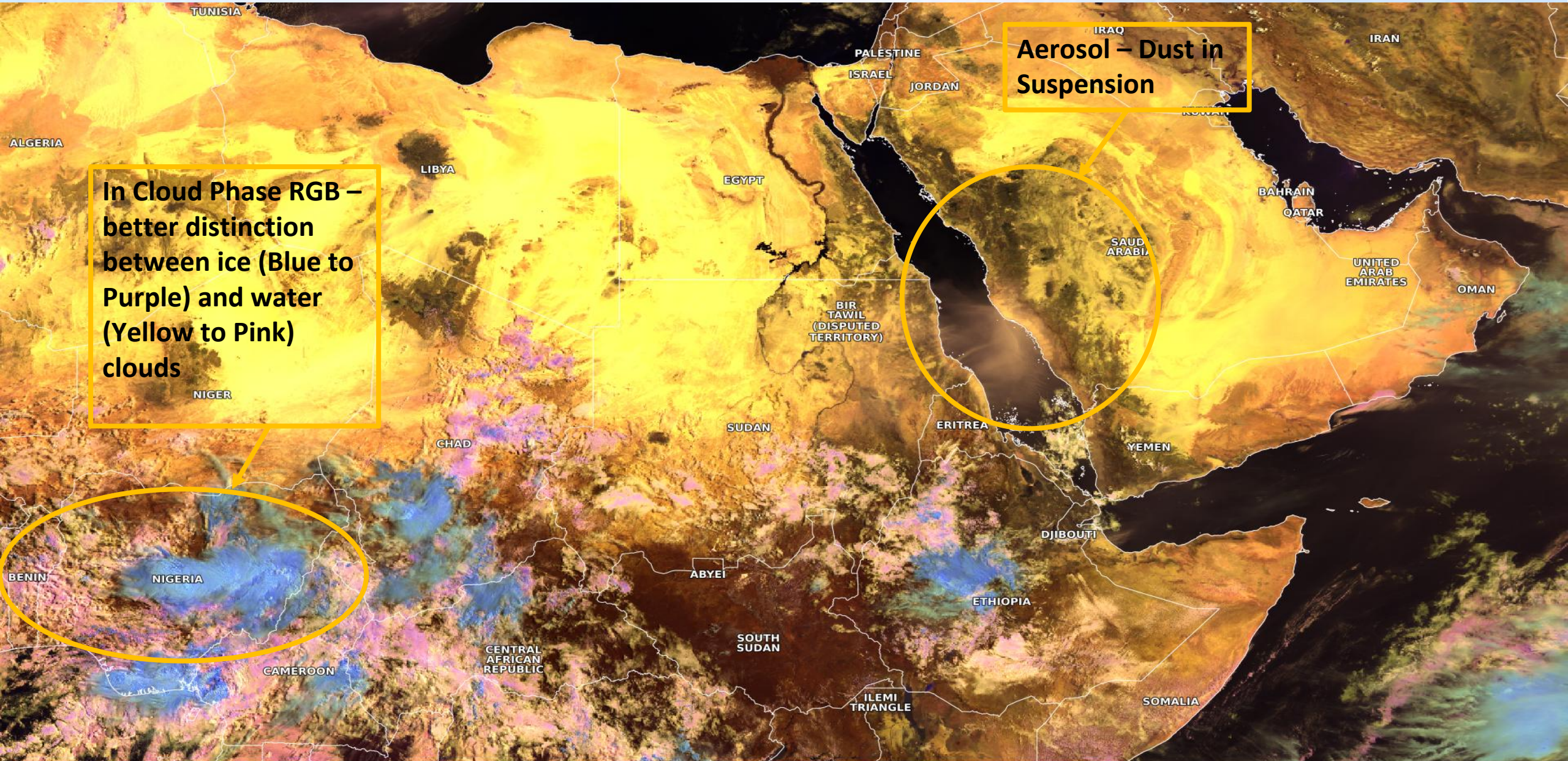
Cloud Phase RGB

Colour Interpretation

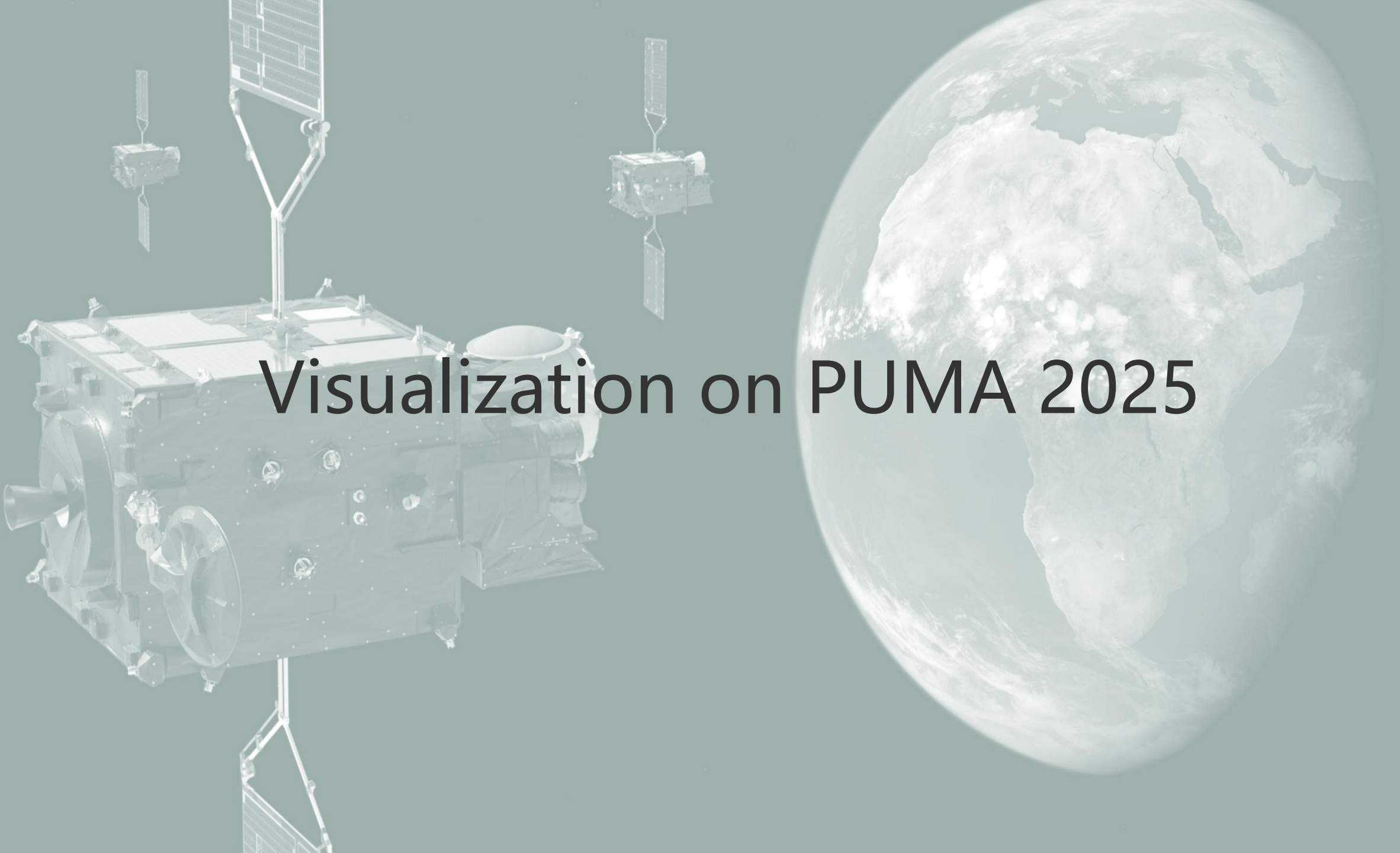
- 1** Thick ice clouds, large particles
- 2** Thick ice clouds, small particles
- 3** Thin ice clouds
- 4** Thick water clouds, small droplets
- 5** Thick water clouds, larger droplets
(The larger droplets are dark pink)
- 6** Thick water clouds, extremely large droplets (or thick mixed phase clouds)
- 7** Thin water clouds over sea
- 8** Vegetated land (snow free)
- 9** Sea (ice free)
- 10** Desert
- 11** Snow on ground or sea ice



MTG CLOUD PHASE RGB



Visualization on PUMA 2025

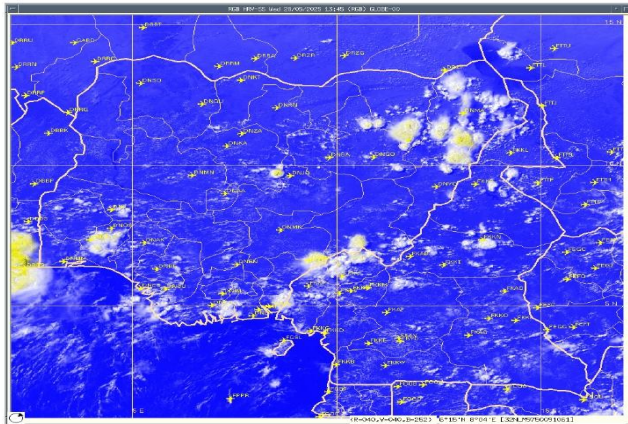




CASE STUDY- Weather Alert Issued that resulted in Flash-Flooding incidence in Mokwa Community, Niger State, Nigeria on Thursday, 29-05-2025.

NiMet
NIGERIAN METEOROLOGICAL AGENCY
Central Forecast Office (CFO)
WEATHER ALERT ISSUED ON 28.05.2025 AND
VALID 15:25 28.05.2025 TO 21:00 28.05.2025

SYNOPSIS: Thunderstorms are currently observed over Yobe, Borno, Adamawa, Taraba, Bauchi, Plateau, Kaduna, Benue, Oyo and Cross River states.



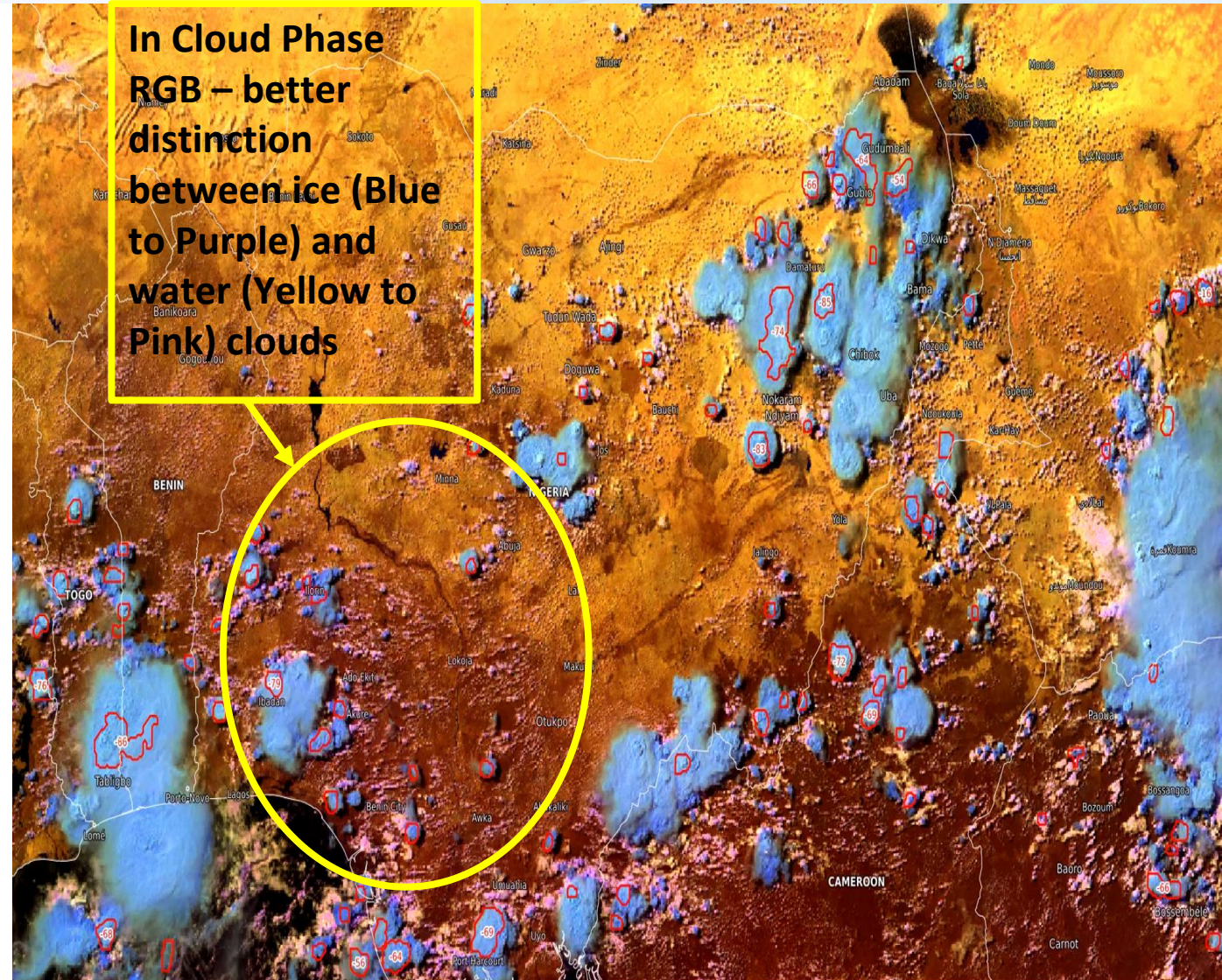
FORECAST OUTLOOK:

The storms are expected to propagate to affect parts of Jigawa, Kano, Katsina, Gombe, Bauchi, **Niger**, Kwara, Kogi, Kaduna, Benue, FCT, Ogun, Oyo, Enugu and Ebonyi states in the next 1-6 hours.

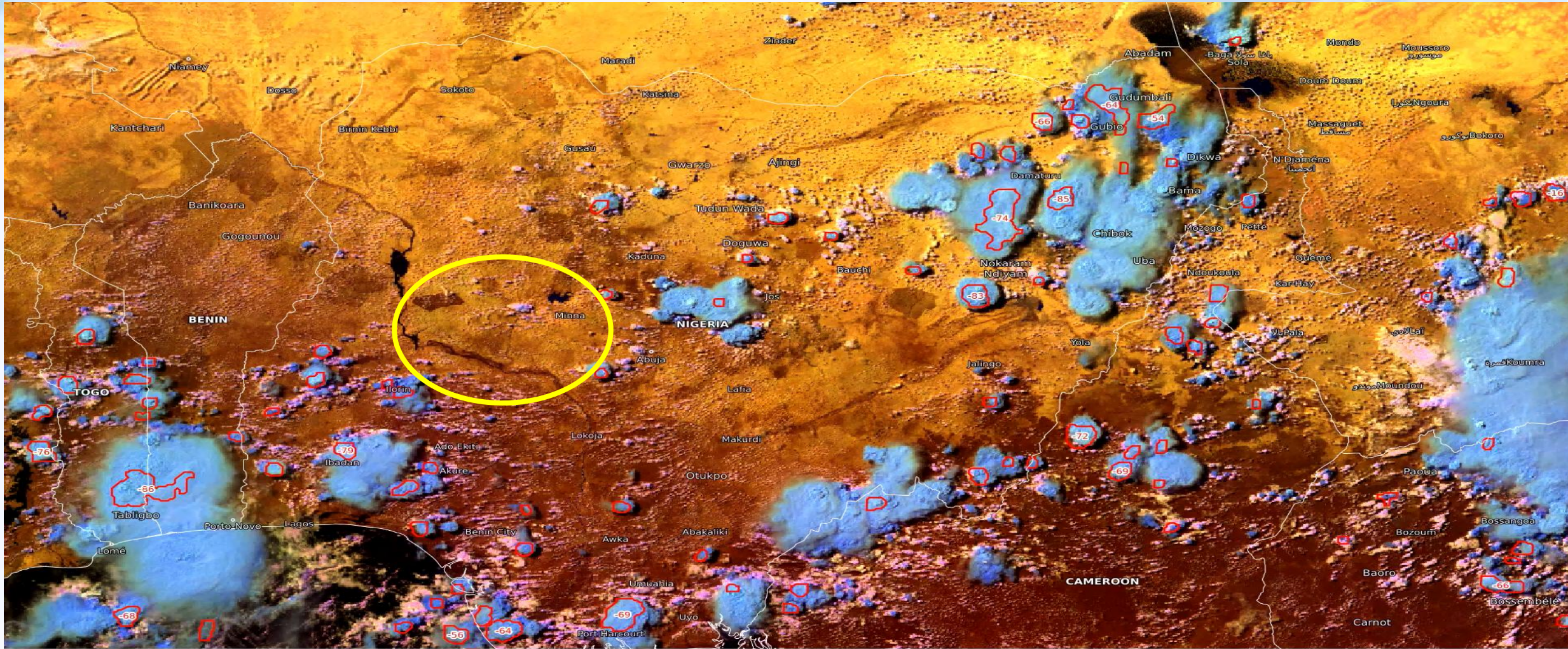
Advisory:

- Strong winds may precede the rains in areas where thunderstorms are likely to occur, public should take adequate precaution.
- Ensure that loose objects are fastened to avoid collision
- Driving under heavy rain should be avoided.
- Disconnect electrical appliances from electrical sockets.
- Stay away from tall trees to avoid impact from falling branches and broken trees.
- Airline operators are advised to get airport-specific weather reports (flight documentation from NiMet for effective planning in their operations.
- Residents are advised to stay informed through weather updates from NiMet. Visit our website

www.nimet.gov.ng



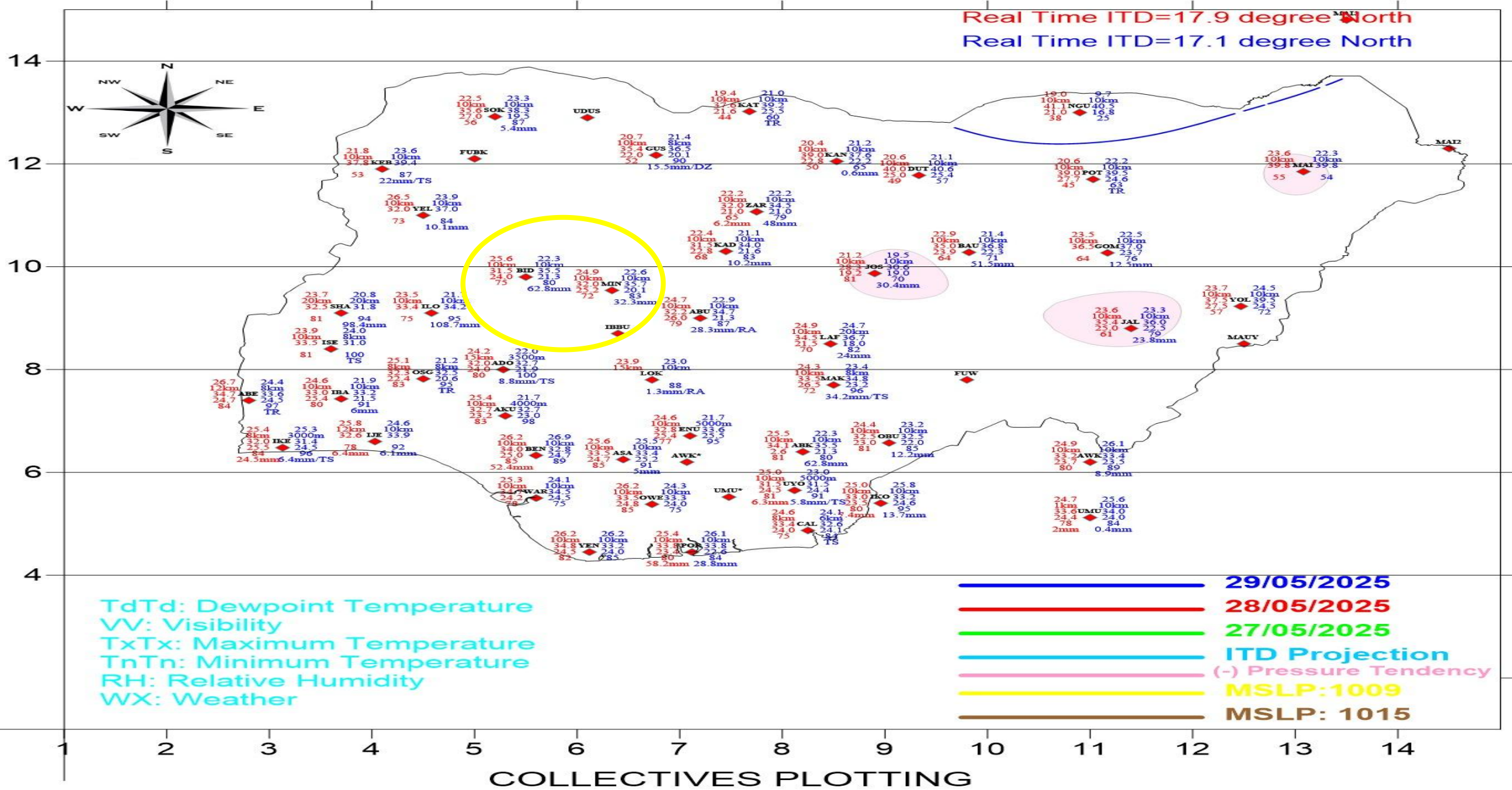
CASE STUDY: Animation showing Severe Thunderstorm over Bida & Minna , Niger State, Nigeria



Forecast Validation with the Synoptic Observation Charts

Synoptic Observations Chart

29/05/2025 ~ 0900Z Nigerian Meteorological Agency [NiMet]



Conclusion and Future Outlook

- **Enhanced Observational Resilience:** Integrating diverse satellite data, including Fengyun alongside Meteosat, will significantly strengthen Nigeria's weather and climate monitoring for improved warnings and preparedness.
- **Driving National Development:** Advanced satellite capabilities will directly support better forecasts, climate monitoring, and agricultural applications, crucial for Nigeria's socio-economic growth and disaster resilience.
- **Vital International Collaboration:** Continued global partnership is key to optimizing satellite data use, sharing best practices, and building collective climate resilience for all nations.

