

Tackling Extreme Precipitation Events Workshop -Indo-Pacific Region March 02, 2023

# Session 2: Application of Satellite Data for Extreme Precipitation Events

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# **Outline of the Presentation:**

- 1. DOST-PAGASA Mandate & Organizational Structure
- 2. Application of Satellite Data for Operational Forecasting
- 3. Case Studies / Research Projects / Technical Cooperation
- 4. Gaps and Potential Future Collaborations



REPUBLIC OF THE PHILIPPINES DEPARTMENT OF SCIENCE AND TECHNOLOGY Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) Science Garden Compound, Agham Road, Diliman, Quezon City, Philippines



#### **MANDATE:**

Provide adequate, up-to-date data and timely information on atmospheric, astronomical, and other weather-related phenomena using science to help the government and the people prepare for typhoons, floods, landslides, storm surges, extreme climatic events, and others for the protection of the people.

#### **MISSION:**

We deliver reliable weather-related information, products, and services to develop communities resilient to typhoons, floods, rain-induced landslides, storm surges, extreme climatic events, climate change, and astronomical hazards.

## PAGASA-DOST ORGANIZATIONAL STRUCTURE

#### OFFICE OF THE ADMINISTRATOR

03 Oct. 2009



## HYDRO-METEOROLOGY DIVISION (HMD) ORGANIZATIONAL STRUCTURE

OFFICE OF DIVISION CHIEF (OCD)

FLOOD FORECASTING & WARNING SECTION (FFWS)

0.09

HYDROMETEOROLOGICAL DATA APPLICATION SECTION (HMDAS) HYDROMETEOROLOGICAL TELEMETRY SECTION (HMTS)

2 p.m., 02 Oct 200

03 Oct. 2009

2 0.m., 07 Oct. 2009

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PAMPANGA RIVER FLOOD FORECASTING & WARNING CENTER (PRFFWC)

alah 3

AGNO RIVER FLOOD FORECASTING & WARNING CENTER (ARFFWC)

08 Oct. 2009

BICOL RIVER FLOOD FORECASTING & WARNING CENTER (BRFFWC) CAGAYAN RIVER FLOOD FORECASTING & WARNING CENTER (CRFFWC)

NOTE:— Technical and Administrative Supervisions under the HMD Technical Supervision under the HMD but the Administrative Supervision under the PRSD



## Flood Forecasting & Warning System

DATA ACQUISITION AND TRANSMISSION ANALYSIS FLOOD MODELS

DISSEMINATION (Fax, Internet, Media)



# 2. Application of Satellite Data/Imageries for Operational Flood Forecasting

 Use as a real-time rainfall monitoring tool and guide for issuing flood advisories, basin hydrological forecasts, ground-based radar observations, and Numerical Prediction Models (NWPs).





## Use of satellite-remote sensing data to estimate discharge over the mountainous region or ungauged /poorly gauged river basins



- Use as input to the Flash Flood Guidance System in real-time with gauge-adjusted data.



FLASH FLOOD GUIDANCE SYSTEM (FFGS) with GLOBAL COVERAGE



# 3. Case Studies & Research Projects / Technical Cooperation

## Applying Remote Sensing Technology in River Basin Management (JAXA/ADB Technical Assistance Project)



Disaster Management Support Systems Office, Japan Aerospace eXploration Agency (JAXA)

http://www.waterforum.jp/apwf/archive/documents/2013/1207/3-5.pdf

### Enhancing Typhoon Monitoring using Satellite Observations MECO-TECO Joint Research Project

### A. SATELLITE QUANTITATIVE PRECIPATION ESTIMATE (QPE)

Generated QPE products using a modified 2012 SCaMPR algorithm



Figure 1. Animated Satellite rainfall estimates in full disk.

**Figure 2.** Animated inset images show rainfall distribution during the TY SARIKA passage.

### Enhancing Typhoon Monitoring using Satellite Observations MECO-TECO Joint Research Project

#### **B. DATASETS**

Rainfall data were collected from PAGASA synoptic and satellite QPE for TY SARIKA case.



Date: 10/15/2016 01:00 UTC

Longitude()

Himawari Precipation Estimate (mm/hr)

**Figure 3.** Plotted location of PAGASA synoptic stations marked in red circle.

**Figure 4.** Animated output image of Satellite QPE during the TY SARIKA passage.

### Enhancing Typhoon Monitoring using Satellite Observations MECO-TECO Joint Research Project

#### C. RESULTS

(Statistical measures)

Score	<b>3HRLY</b>	6HRLY	24HR
BIAS	-1.33	-0.4	-1.83
Pearson's r	0.27	0.65	0.68
RMSE	11.37	14.97	34.96

Table 1.Summary of statisticalscores for 3 hourly, 6 hourly, anddaily rainfall between satellite andground data.





Figure 5. Corresponding scatter plots for 3-hourly, 6-hourly, and 24-hour rainfall to evaluate the relationship between satellite estimates and synoptic data.



A Case Study for the WCSSP-SEA Philippines Project (WCSSP-CASE-04)

#### A Case Report on the 07-08 December 2021 Eastern Visayas Heavy Rain Event

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Published: 29 December 2021. Correspondence to: R. P. Gile (rpgile@pagasa.dost.gov.ph)

- A continuing cold surge of the Northeast Monsoon during the first week of December 2021 generated a shear line over the Philippine Sea, triggering a heavy rain event over Eastern Visayas on 7-8 December along the tail-end of the shear line axis. Observed rainfall reached torrential levels exceeding 300 mm, while satellite estimates indicated offshore rains reaching 400-500 mm.
- Global and regional models were able to capture the overall synoptic presentation. However, regional
  models better handled the location of rainfall signal. Both models struggled in terms of intensity, with
  regional models performing worse. Issue identified with operationally using a regional model whose
  global model source of boundary condition is not operationally used.



Fig. 2. Gauge-adjusted satellite-derived estimates of total rainfall for 07, 08, and 07-08 December (left to right) from the Global Satellite Mapping of Precipitation (GSMaP).

# 4. Gaps and Potential Future Collaborations



Project proposal for future collaboration regarding the strategy and progressive cooperation relating to the following:

- Validation and data assimilation of satellite-derived rainfall products to improve the simulation of our existing Numerical Weather Predication (NWP-WRF).
- 2. Blind-area rainfall monitoring, development, and calibration of hydrological models for ungauged river basins.
- Assessment of satellite-based rainfall products for 18 Major River Basins in the Philippines.



Maraming Salamat po!

https://bagong.pagasa.dost.gov.ph



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