
# IPWG Key Recommendations to Plenary

**Presented to CGMS-53 Plenary**
**Évian-les-Baines, France, 3-5 June 2025**

**Christian Kummerow (CSU, Colorado, US), Giulia Panegrossi (ISAC-CNR, Italy), IPWG Co-Chairs**
***F. Joseph Turk (JPL/Caltech), IPWG rapporteur to CGMS**

***presenter**

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## IPWG Leadership and Workshops

- IPWG-11 Workshop: 15-18 July 2024, Tokyo Institute of Technology, Tokyo, Japan

- Over 130 people from 16 countries, 3 continents and over 70 different affiliations, discussed current and future status of satellite-based global precipitation estimation

- "*Advancing Global Precipitation Data Products: Recommendations from the International Precipitation Working Group*", AMS Bulletin. https://doi.org/10.1175/BAMS-D-25-0011.1

- The IPWG leadership was moved to "staggered" co-chairs. Chris Kummerow will stay on as one chairperson, and Giulia Panegrossi will replace Takuji Kubota as the other chairperson. We acknowledge Dr. Kubota's efforts and JAXA contributions to the IPWG during his tenure.

- IPWG-12 is tentatively scheduled for summer 2026, hosted by the Institute of Meteorology and Water Management, in Krakow, Poland.

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## Achievements/Recommendations: Current and Future Satellite Missions and Products

- The GPM orbit boost (407 to 442-km in November 2023) should extend the GPM lifetime into the early 2030s. The next JAXA-built precipitation radar, the Ku-band Precipitation Measurement Mission (PMM), will bring Doppler capability owing to its two-antenna system.

- Since April 2023, the FY-3G Precipitation Measurement Radar (PMR) joins DPR space-based dual-frequency precipitation radar capabilities. Comparison between PMR and ground-based weather radars in China shows a high level of consistency.

- In 2025, the first of the European Polar System Second Generation (EPS-SG) spacecraft is expected. JAXA's Advanced Microwave Scanning Radiometer 3 (AMSR3) passive MW radiometer for GOSAT-GW follows on to the AMSR2 with additional high-frequency (HF) channels.

- COWVR+TEMPEST (smallsat) operations onboard the ISS are extended through late 2025.

- **Key Recommendations: Sustain core reference measurement with coordinated precipitation radar + radiometer sensing capabilities, including the constant incidence low frequency MW channels, to intercalibrate and reference the constellation of passive MW radiometers.**

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## Achievements/Recommendations: Surface Precipitation Observations

- For validation of global products, a longstanding problem is that the validation results have always depended on the selection of the ground reference (and its spatial/temporal resolution) and the domain of comparison (e.g., location, season).

- Several presentations focused on methods to combine radar and rain gauge datasets, to improve the spatiotemporal sampling otherwise missed by one or the other source.

- This will ensure that high-quality precipitation products from ground-based networks (radar and gauge) are processed as homogeneously as possible.

- **The key recommendation of WG1 is to establish and maintain a Baseline Surface Precipitation Network (BSPN), to collect radar/raingauge data processed to similar standards from as many different climatological regimes as possible.**

- Since IPWG-11, Japan, Korea and US have all provided some data processes in consistent ways to this BSPN effort.

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## Achievements/Recommendations: Merged Satellite Precipitation Products

- International programs such as Geo-Ring and ISSCP-NG (*Heidinger*, 2022) will produce combined measurements from all geostationary satellite imagers, and these products will greatly benefit the processing of science quality global merged precipitation products. .

- Geo-Ring data are not currently envisioned to be made available in near-real time, which limits their utility for production of operational, low latency (30 mins or less) global merged precipitation products.

- **Recommendation: CGMS should consider allowing real-time GeoRing processing for internal member use in precipitation products.**

- **A sustained benchmarking activity is encouraged, to properly assess the impact of the mixture of sensors (more sounders than imagers) that contribute to the passive MW satellite constellation. A key recommendation of WG2 is to ensure continuity of global precipitation data production, in the event of a catastrophic failure of the GPM core spacecraft, which currently serves as the core reference satellite**.

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## Achievements/Recommendations: Machine Learning Activities

- Studies that involved the use of machine learning techniques were prominently represented at the workshop, and are the main focus of WG3. Because of the current growth of ML approaches, WG3 is focused on making a general dataset, consisting of surface radar/raingauge plus all available satellite data available to algorithm developers for one year to serve as training and validation data.

- This dataset is constructed over the Continental US and consists of Multi-Radar/Multi-Sensor System (MRMS) radar data, all passive MW instantaneous overpasses, as well as visible and IR data every 15 minutes, for algorithms that exploit the high temporal sampling of the geostationary sensors. In addition, the team is distributing a one-year period of ground-based radar/raingauge data, processes similar to MRMS, but from Japan and S. Korea.

- **These datasets are made available to allow algorithm developers to assess how their algorithm performs in regions that are not represented in the training dataset and may have fundamentally different properties than the training data, yet this is critical if satellite algorithms are to be applied where no training data exists.**

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS

## Expected Increase in CubeSat/SmallSat

- While future passive MW sensors such as AMSR3 and MWI provide the preferred conically scanning, constant incidence angle observations, many of the near and future observations are expected to originate from coarser resolution, high frequency (above ~ 90 GHz) MW sounders. The focus of WG4 is to investigate how this more disparate MW satellite constellation will impact global precipitation data products.

- The number of cubesat and smallsat-sized passive MW radiometers continues to expand, with HF-based satellites planned by commercial sources (*e.g., tomorrow.io*), short lifetime science investigations (*e.g., TROPICS*) and operational agencies (*e.g., EPS Sterna*).

- **With expected increase in cubesats, a key recommendation of IPWG WG4 is to ensure that conically-scanning passive MW sensor capabilities (e.g., AMSR-3) are sustained. The expanding sensor diversity further emphasizes the need for the sustained MW sensor benchmarking mentioned earlier.**

## Conclusions:

- Growing usage of AI/ML techniques in algorithms and growth of unverified global products of questionable provenance
- Cubesat/Smallsat often lack QC/Intercalibration efforts needed for consistent precipitation applications. Ensure that cubesats are complemented by preferred conically-scanning passive MW imagers.
- Precipitation products have limited ability to predict uncertainties in regions w/o validation data. The Baseline Surface Precipitation Network effort collects radar/raingauge data and processes to similar standards from as many different climatological regimes.
- The IPWG benchmarking activity is the IPWG's equivalent of a weather OSSE, to assess the overall quality of the precipitation product generated from a suite of imagers, sounders and precipitation radar.
- Consistent long-term leadership will be needed to ensure that precipitation products retain the quality, accessibility, and documentation that are needed by the user community.

Coordination Group for Meteorological Satellites

IPWG International Precipitation Working Group

CGMS