



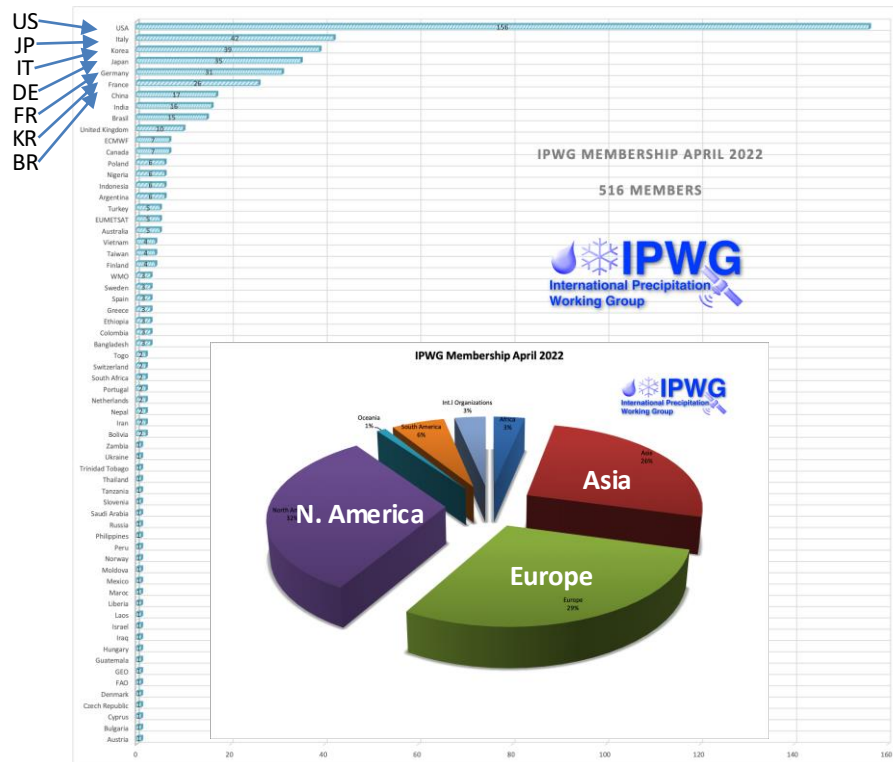
IPWG Initiatives and Goals

Presented At IPWG-12
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Christian Kummerow, Giulia Panegrossi and Sarah Ringerud - IPWG Co-Chairs

IPWG Membership

IPWG membership
exceeds 500 members



Paul Anthony Kucera
IPWG Co-chair 2010-2012

IPWG Working Groups

WG 1: Baseline Surface Precipitation Network

Goal: Produce a document that outlines the steps needed to produce a Quantitative Precipitation Estimation (QPE) product of uniform quality from radars/gauge networks for use in satellite data validation.

WG 2: Satellite Precipitation

Goal: Produce a document that outlines (a) User needs from global product producers (b) Needs from global product producers from research community.

WG 3: Machine Learning

Goal: Produce a standard training and independent test data set for individuals to test Machine Learning algorithm capabilities in a consistent fashion.

WG 4: CubeSat/SmallSat WG

Goal: Produce a document outlining relative capabilities of various channel combinations/spatial resolutions for helping constellation requirements.

IPWG: Emerging Topics and Trends

- Growing acceptance of global high resolution rainfall maps for applications
- Growing usage of AI/ML techniques in algorithms
- Growing availability use of Cube- and SmallSats
- Growing need for quality metrics

Emerging Topics in IPWG

Growing acceptance of global high resolution rainfall maps for applications

WG 2: Satellite Precipitation

Goal: Produce a document that outlines (a) User needs from global product producers (b) Needs from global product producers from research community.

In the future, should focus on real time, high resolution, easily available product with quality metrics. Should consider 0-6 hr forecast to be part of standard product.

WG 1: Baseline Surface Precipitation Network

Goal: Coordinate uniformly generated Quantitative Precipitation Estimation (QPE) products for use in satellite data validation that focuses on meteorological regimes instead of location.

Emerging Topics in IPWG

Growing usage of AI/ML techniques in algorithms

WG 3: Machine Learning

Goal: Produce a standard training and independent test data set for individuals to test Machine Learning algorithm capabilities in a consistent fashion. Test capabilities in regions w/o training data.

WG 1: Baseline Surface Precipitation Network

Goal: Provide Quantitative Precipitation Estimation (QPE) products for use in AI validation

Emerging Topics in IPWG

Growing availability use of Cube- and SmallSats

WG 4: CubeSat/SmallSat WG

Goal: Produce a document outlining relative capabilities of various channel combinations/spatial resolutions for helping constellation requirements.

IPWG is seeking support from the Agencies to build an OSE (observing system emulator) to determine the quality of potential constellations.

IPWG Focus Groups (FG)

FG 1: Orographic Precipitation

Longstanding issue, addressed in several algorithm products.

FG 2: Snowfall

Deficiencies in detecting and quantifying cold season precipitation.

FG 3: Particle Scattering

Needed for simulating passive/active MW sensors and use in DA forward operators

FG 4: Data Assimilation

Assimilation of rain-affected radiances, use of products for model validation.
Latent Heating is being used in high resolution models

FG 5: Land Surface

Initially useful to properly simulate active/passive radiances but has clear feedback to cloud properties.

IPWG Needs

Coordinated sampling of Geo-IR sensors – GEO_RING (ideally used by operational agencies as well as research community)

Easily accessible, low latency data from partner Passive Microwave radiometers that form part of the sensor constellation (i.e. < 3 hrs). CubeSat WG will deal with QC needs for precipitation from low-cost sensors (GSICS).

Help with Baseline Surface Precipitation Networks – convincing member states to provide one or two years of gridded radar QPE adhering to BSPN guidelines.

Longer term roadmap for high resolution precipitation products to inform the agencies

Long term strategy for replacing GPM as the inclined radar/radiometer core for calibration/intercalibration for the global high resolution precipitation products. JAXA has plans for a wide swath Ku radar in the 2028 timeframe but no coincident high capability radiometer to serve as a transfer standard for new sensors.

IPWG Strenghts

Scientific excellence

Open collaboration

International community

Validation

Training & capacity building

Strong partnerships with CEOS, WMO and space agencies

IPWG is the international scientific forum that advances satellite precipitation science by connecting observations, retrievals, validation, AI, uncertainty, **applications and users**

IPWG aims at maximising the value of satellite precipitation missions

IPWG complements the work of CGMS and CEOS Precipitation Virtual constellation by focusing on science, validation and the effective exploitation of observations

Emerging Challenges

Transition beyond GPM

Loss of reference system (~2030)
JAXA radar follow-on likely but no radar/radiometer mission
→ **Risk:** reduced consistency across products

Fragmentation of observing systems

Growth of Small/CubeSats and commercial constellations
Heterogenous sensors and standards
→ **Risk:** inconsistent/non-comparable precipitation datasets

Calibration and intercalibration gaps

New sensors, short-lived missions
Limited resources for systematic intercalibration
Lack of common end-to-end protocols
→ **Risk:** reduced traceability and data quality

IPWG response

- **WG2:** *maintain* product requirements to ensure long-term consistency
- Promote multi-sensor continuity MW + GEO (GeoRing)
- Continue interactions with CEOS PVC and CGMS on post-GPM strategy and needs
- **Discussion:** Should IPWG establish a *Future Precipitation Missions* Focus Group?

- **WG4:** assessment of constellation capabilities
- Develop best practices for exploiting heterogeneous observations
- Foster research on multi-sensor synergies
- **Discussion:** Expand WG4 from *CubeSat* to *Future Observing Systems*? or New FG **Constellation and Synergies** ?

- Strengthen collaboration with GSICS
- Support calibration best practices (**White paper**)
- Promote reference datasets (vicarious calibration) and intercomparison
- **Discussion:** More explicit coordination on calibration guidelines?

Emerging Challenges

IPWG response

Rising dependence on AI/ML

Dependence on training data quality and representativeness

Error Propagation

Explainability

→ **Risk:** Uncertainty in retrieval performance

Insufficient global validation datasets

Limited availability of consistent, high-quality ground-based networks

Poor coverage across meteorological regimes

→ **Risk:** weak uncertainty quantification
limited AI/ML generalization

Research-to-operations/users gap

Advanced methods not operationally harmonized

Lack of common standards across agencies

Requirements depend on application

→ **Risk:** slow transition from innovation to operation

- **WG3** benchmark datasets
- AI-based retrieval error evaluation framework (presented at CGMS WGII)
- **Discussion:** Error propagation studies?
Expand toward **Trustworthy AI**

- **WG1 BSPN**
- Expand validation across regimes
- Promote uncertainty characterization **Discussion:** Validation → Validation & Uncertainty: consistent uncertainty characterization to ensure robustness and comparability of next-generation retrievals

- **WG2** define user needs and promote operational relevance
- **FG4 (DA):** support operational uptake in NWP
- Training / User workshops to bridge the gap
- Promote GEO-RING (also NRT), best practices and common standards
- **Discussion:** Strengthen interaction with users to understand limitations / requirements - *New WG Applications?*

Key questions for IPWG-12

Should IPWG evolve by adapting its existing Working Groups and Focus Groups, or are new cross-cutting activities needed to address the next generation of scientific challenges?

Can we identify emerging science topics/challenges to be addressed in the existing or new FG ? (e.g., extreme precipitation, aerosol-cloud-precipitation)

Should we have new dedicated WG/FG to account for emerging challenges/needs?

How to reinforce the transition Research -> Operations and engage users ?

Strengthen connection with CGMS and CEOS

as Takuji Kubota has been nominated IPWG Rapporteur for CGMS also serves co-lead of CEOS PV Constellation

Input from CGMS: Strengthen partnership between IPWG and GCOS/GPEX

Looking Ahead

Focus on IPWG needs and long-term strategy already stated

*Need both continuity and advances

Clear recommendations that reflect this

Dynamic constellation, new retrieval techniques and technology = dynamic IPWG

Periodic re-visit of WG and FG topics

More frequent check-ins

Assess inclusion – does everyone who should have a seat at the table
have one?

Encourage active participation!