

Report from the International Precipitation Working Group

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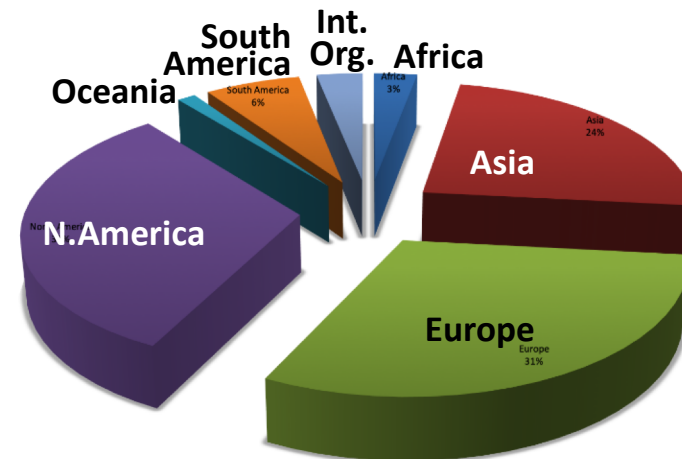
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What is IPWG?

- IPWG was established as a permanent Working Group of the Coordination Group for Meteorological Satellites (CGMS) in 2001.
- The IPWG is co-sponsored by CGMS and the World Meteorological Organization (WMO).
- Focused on operational and research satellite based quantitative precipitation measurement issues and challenges.
- Provides a forum for operational and research users of satellite precipitation measurements to exchange information.
- IPWG fosters:
 - Development of better measurements, and improvement of their utilization;
 - Improvement of scientific understanding;
 - Development of international partnerships.

IPWG Membership October 2018



IPWG Meetings

- Under the lead of the two Co-Chairs, the IPWG organizes Workshops, co-sponsored by CGMS and WMO, approximately every two years.
- The Workshops promote the exchange of scientific and operational information between the producers of precipitation measurements, the research community, and the user community.

IPWG-1: Madrid (2002)

IPWG-2: Monterey (2004)

IPWG-3: Melbourne (2006)

IPWG-4: Beijing (2008)

IPWG-5: Hamburg (2010)

IPWG-6: São José dos Campos (2012)

IPWG-7: Tsukuba (2014)

IPWG-8: Bologna (2016)

IPWG-9: Seoul (2018)

IPWG-10 : ~~Fort Collins~~ (2020) => Online sessions in 2020 and 2021; next meeting in 2022



IPWG activities

Several Online sessions have been organized around topics of interest in place of the in-person meeting:

➤ On the future of the Passive Microwave Constellation

- June 2020, **120** remote participants from **20** different countries
- Goals:
 - *To provide an update to the IPWG community on several space programs relevant for precipitation estimation (e.g. MWI/ICI, CIMR, TROPICS, AMSR-3)*
 - *To collect information on the future needs of the community for precipitation observations from space*

➤ Two subsequent activities:

- A paper accepted in BAMS : “The Global Satellite Precipitation Constellation: current status and future requirements” by Kidd et al. 2021 (DOI : 10.1175/BAMS-D-20-0299.1)
- A dedicated presentation during CGMS-49 on the future microwave constellation and precipitation monitoring

From CGMS Baseline document :

Microwave Sounder	LEO	Atmospheric temperature, humidity, and precipitation	3 sun-synchronous orbits, nominally early morning, mid-morning and afternoon
Microwave Imagers	LEO	Sea surface temperature, ocean surface winds, precipitable water, soil moisture, snow and ice properties, sea ice properties, precipitation, cloud liquid water	2 sun-synchronous orbits, nominally mid-morning and afternoon

Precipitation monitoring needs **well distributed and regular MW observations** along the day :

- ⇒ Continued coverage of 6am/6pm orbit is important to continue long-term record that began with DMSP-F08 in mid 1987
- ⇒ Coordination **between the baseline orbits for sounders and imagers** would be required to ensure **reduction/optimization of time gaps between observations** (e.g. imagers and sounders staggered)

IPWG activities

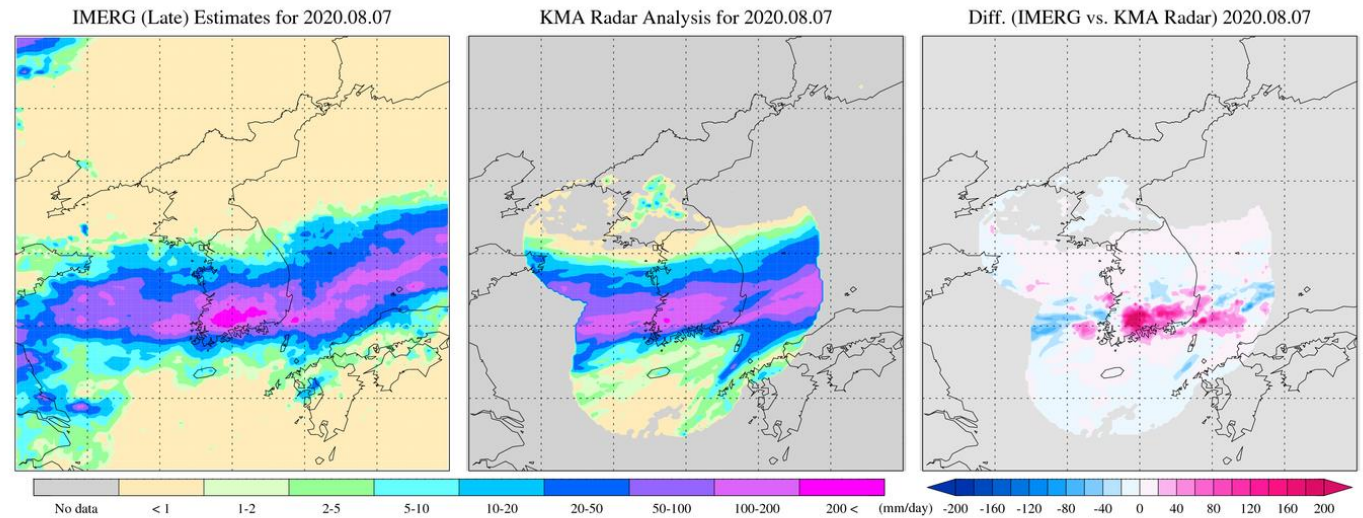
Several Online sessions have been organized around topics of interest in place of the in-person meeting:

➤ On Validation activities

- November 2020, **87** remote participants from **28** different countries
- Goals:
 - *To provide an update to the IPWG community on ongoing satellite precipitation validation efforts;*
 - *To collect information on the future needs of the community for validating precipitation observations from space.*

➤ *Presentation of the new Validation site over South Korea :*

New validation site in addition to the existing ones



Courtesy of Jun Park

IPWG activities

Two documents have been elaborated :

➤ The Joint IPWG/GEWEX Precipitation Assessment

- Led by Rémy Roca (Chair of GEWEX/GDAP and former IPWG Co-chair) and Ziad Haddad (former IPWG Co-chair)
- Publication stage at the WCRP/GEWEX international project office

➤ A review of the different operational applications of precipitation radars within the International Precipitation Working Group (IPWG) community:

- Coordinated by the IPWG Co-Chairs; 20 contributors
- Submitted to CGMS WGII - endorsement by CGMS Plenary ongoing

Highlight on 3 applications, at different stages of maturity, which all need a continuity of these data in the future:

- ⇒ Use of precipitation radars as **calibrator for precipitation retrievals** from the constellation of PMW instruments
- ⇒ Use of precipitation radars in **NWP (model validation and data assimilation)**
- ⇒ Use of precipitation radars as **calibrator for ground radar networks**

A recommendation section for future instruments

A review of the different operational applications of spaceborne precipitation radars within the International Precipitation Working Group (IPWG) community

May 4, 2021

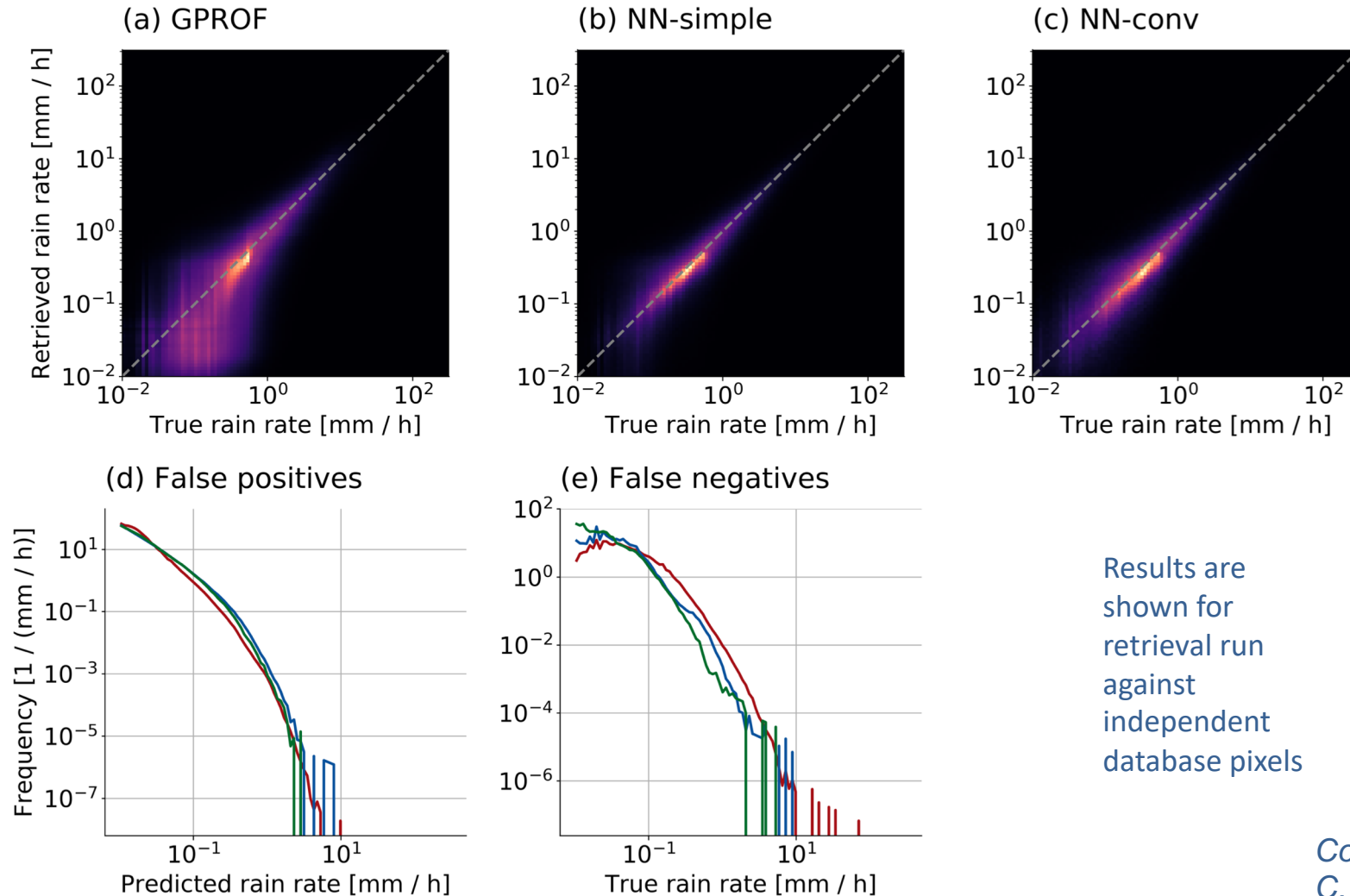
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Philippe Chambon⁷ and Viviana Maggioni¹⁷

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Science Highlight: GPROF implementation using Neural Networks and Convolutional Neural Networks

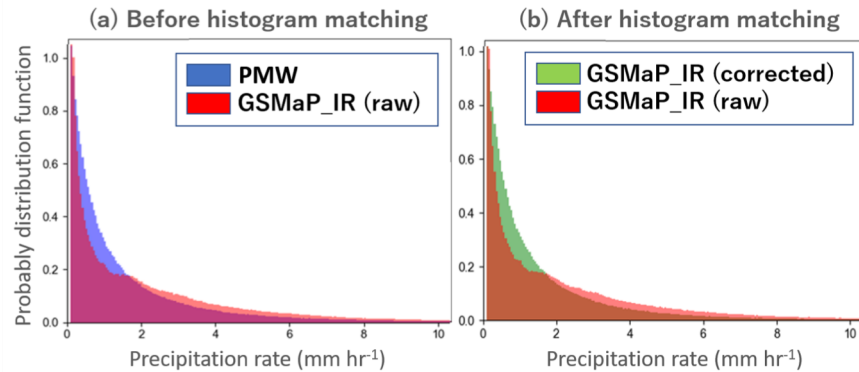


Results are shown for retrieval run against independent database pixels

Courtesy of
C. Kummerow, S. Pfreundschuh, P. Eriksson,
P. Brown, V. Petkovic

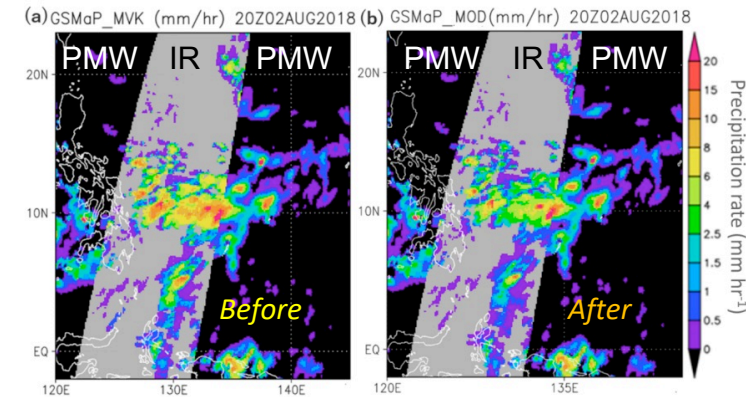
Science Highlight: GSMaP

GPM-GSMaP V05 (algorithm version 8) released in 2021 will include algorithm evolutions such as a **histogram matching method by Hirose et al. (2021)** in the PMW-IR Combined algorithm.



Hirose et al. 2021: Histogram Matching to Improve Homogeneity in Satellite Merged Precipitation Products, submitted to *IEEE GRSL*.

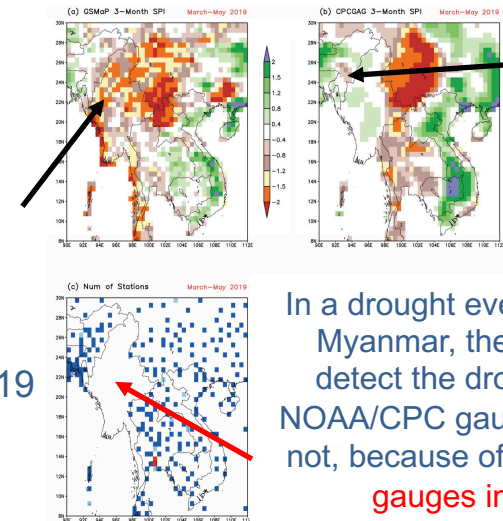
Mitigations of spatial gaps between PMW and IR retrievals



Tashima et al. (2020) demonstrates the value of space-based rainfall estimates for **drought detection and monitoring**, especially for regions where rain gauge observations are limited or unavailable, like Myanmar.

<https://doi.org/10.1109/JSTARS.2020.3014881>

3-mon Standardized Precipitation Index (SPI) by GSMaP in March-May 2019

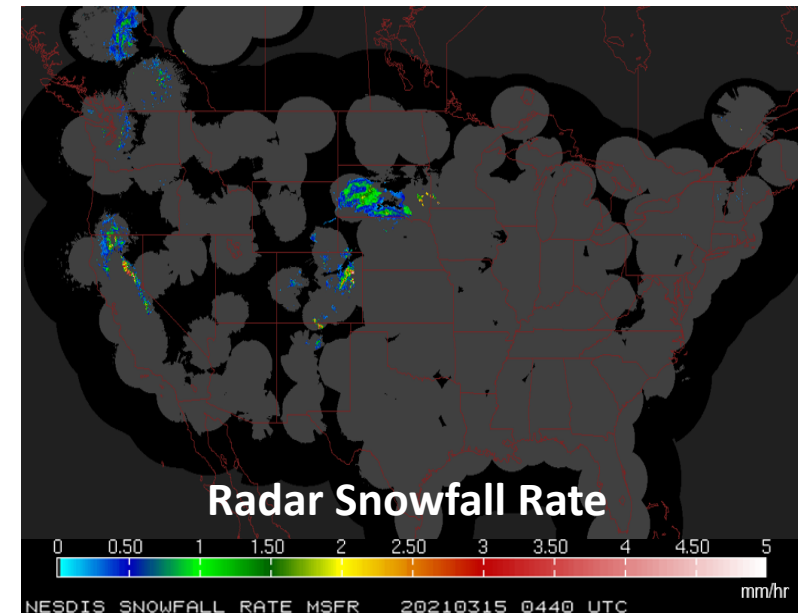
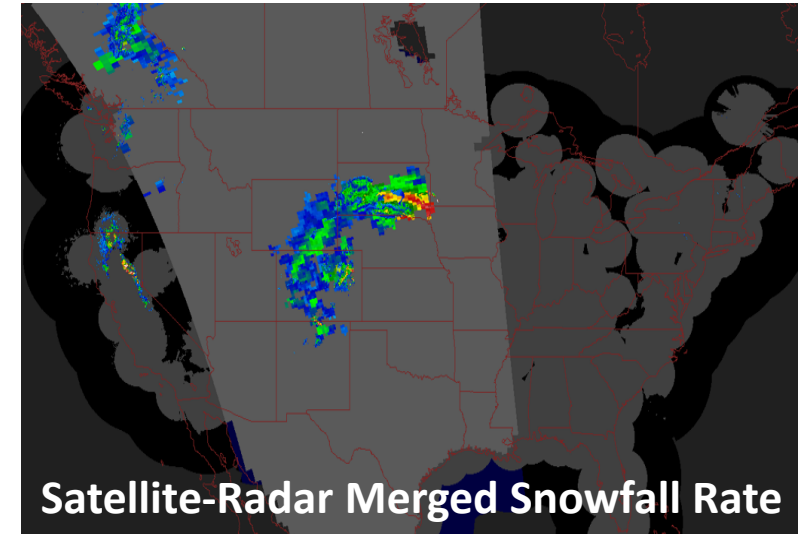


3-mon SPI by NOAA/CPC Gauges in March-May 2019

In a drought event over the 2019 Myanmar, the GSMaP could detect the drought, while the NOAA/CPC gauge analysis could not, because of **no available rain gauges in Myanmar**.

Science Highlight: NOAA Operational Snowfall Rate Product

- Liquid equivalent snowfall rate estimates
 - Retrieved from measurements by passive microwave sounders and imagers
 - Radiometers onboard ten polar orbiting satellites: JPSS, Metop, POES, GPM, DMSP
 - Twenty overpasses per day on average in mid-latitudes and more in high-latitudes
 - Over global land (ocean algorithms under development)
- Near real-time production
 - Up to 3-hour latency over global land
 - Less than 20-minute latency over the contiguous United States and Alaska using direct broadcast data
- Satellite-radar merged snowfall rate product
 - Satellite fills in radar gaps; improved spatiotemporal resolution
 - Looping capability with 10-minute refresh rate
- Applications
 - Weather forecasting: providing situational awareness
 - Hydrology: Input for blended global precipitation products for hydrological applications



Courtesy of Huan Meng, Yongzhen Fan, Jun Dong, Cezar Kongoli, Yalei You, Ralph Ferraro

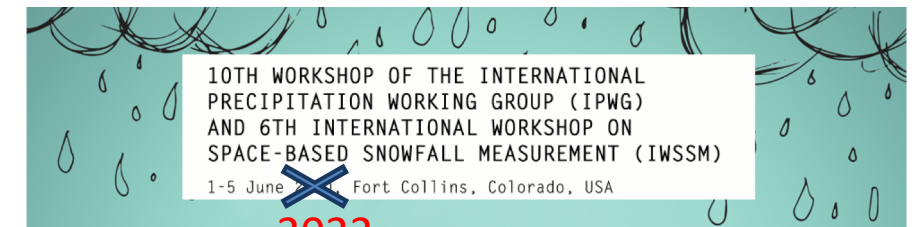
IPWG future online sessions :

Two more online sessions will be planned for 2021 following a similar format around the topics of :

- On All-Sky data assimilation
 - Date: October 19th (TBC)
 - Session Chairs: Ben Johnson, Alan Geer, Ian Adams
- On Scattering (co-organized with IWSSM)
 - Date: Nov 15 – 17 (TBD)
 - Session Chairs: Stefan Kneifel, Ralf Bennartz

IPWG10 meeting

- Joint meeting with the Scattering community IWSSM
 - June 2022
 - Host: Cooperative Institute for Research in the Atmosphere,
Colorado State University, Fort Collins, CO
- The abstract submission will open in December 2021
- Sessions dedicated to training, organized together with the Virtual Laboratory (plenary session, working group + dedicated interactive session of training)



2022