

Six responses with answers to the science questions

In your opinion, what are the main challenges to be addressed in snowfall retrieval from space?

- Andy Hemsfield: Knowledge of the particle size distributions, masses, and radar backscatter cross-sections
- Ryan Gonzalez: mountain snowfall, accurate reference snowfall datasets, linking our snowfall products with snow water equivalent
- YOO-JEONG NOH: Detection and more accurate quantitative estimation over land
- Lisa Milani: for passive microwave retrievals: land surface characterization, supercooled liquid water detection (and TB adjustment)
- Ali Behrangi: one of the main issues is the lack of reliable data sets for training and evaluation , the other one lack of enough sensitivity of the space sensors to capture the signals, ...
- Veljko Petkovic: Accuracy of snowfall (rate/accumulation) products, both the reference and satellite.

What are the potentials brought by new satellite missions, e.g. EarthCare, AWS, EPS-SG etc.?

- AH: Potential to map out snowfall rates globally
- RG: Validation and comparison including imagery besides retrieval products
- YN: Regular communication opportunities between developers and forecasters/non-science decision making teams
- LM: availability of higher frequency channels on radiometers for better characterization of ice phase particles, doppler velocity for better phase characterization
- AB: they have more sensitivity to snowfall than the other sensors.
- VP: EarthCare: Validation of snowfall products and [over time] providing a database for training snowfall-relevant algorithms.

What are your thoughts on the direction that future snowfall remote sensing science should take?

- AH: Better direct in-situ measurements with collocated multi-wavelength radar data
- RG: interdisciplinary science with snow hydrologists
- LM: in passive microwave adapt to higher frequencies, consider uncertainties
- AB: to start finding additional training/evaluation data sets.

What actionable advancements (satellites, sensors, algorithms etc.) need to be made to improve the usefulness of satellite snowfall products?

- AH: Algorithms to retrieve microphysical properties from radar
- AB: more W band radar obs. with swath, improving in situ obs of snow
- VP: Provide (an estimate of) uncertainty of the satellite product.

What are some effective approaches to engage users and promote the applications of satellite snowfall (and precipitation in general) products?

- AH: I'd say funding.

- LM: provide the users with a clear target and corresponding uncertainties. they cannot expect to use a W band radar to measure heavy rain for example.

Please suggest additional discussion topics for the Snowfall FG breakout session.

- AH: Global distributions of particle size distributions and associated snowfall rates
- RH: MRMS Z-S advancements? MRMS dual pol snow products?