

Quantitative precipitation measurements from satellites: where now?

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The observation of precipitation by satellites has been possible indirectly through visible/infrared sensors since the early 1960's, more directly through passive microwave sensors since the mid-1970's, and directly through active microwave (radar) sensors from the end of the 1990's. During this time, and within each sensor group, sensors have evolved to improve their performance and enable better precipitation retrievals from their observations. The majority of these sensors have been designed to extract a range of geophysical parameters, with only two precipitation-specific missions to date, namely the Tropical Rainfall Measuring Mission (TRMM, 1997-2015) and the Global Precipitation Measurement (GPM) mission (l.2014). Over the last 5 years new technologies have allowed the development of smaller sensors, enabling the deployment of passive microwave sensors on cubesats (e.g. the Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats; TROPICS, 2021-2025) and smallsats (e.g. Arctic Weather Satellite Proto-Flight Model; AWS-PFM, l.2024). However, cubesats (for example), while cheaper per unit, have serious compromises that impact the accuracy of the direct retrieval of precipitation from their observations: in particular, to ensure a reasonable resolution for the size of antenna, they rely upon high frequencies that are less direct to the precipitation at (or near) the surface.

This presentation will address the critical issue for future precipitation observations and measurements from spaceborne sensors: how to improve global precipitation measurements. The ability (and capability) of different instruments to observe and retrieve precipitation will be examined together with their sampling characteristics. A number of scenarios will be presented to illustrate what future strategies should be adopted to provide optimum and threshold global precipitation retrievals for selected applications.