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Prospective of future spaceborne precipitation radar mission

Nobuhiro Takahashi (1) and Kinji Furukawa (2)

(1) Nagoya University, Institute for Space-Earth Environmental Research, Japan (ntaka@nagoya-u.jp), (2) Japan Aerospace Exploration Agency

The climate change became a big social issue in recent years. It is very important to understand the influences of climate change (global warming) on precipitation, because precipitation is directly related to our lives. Therefore, it is necessary to understand the precipitation system on a global scale, especially, comprehensive understanding of the linkage from aerosol and cloud to precipitation. For the studies on the climate change, accurate monitoring of precipitation over the earth is very important. For these purposes, observations from space is very effective, especially, precipitation radar observation gives very accurate precipitation distribution and also the three-dimensional structure of precipitation.
The Tropical Rainfall Measuring Mission (TRMM) satellite and the core satellite of Global Precipitation Measurement (GPM) equip precipitation radar (the precipitation radar: PR and the dual frequency precipitation radar: DPR) and these two satellite observations accumulate more than 20 years of reliable precipitation record. Studies using precipitation radar data from TRMM and GPM brought about great progress for understanding the global precipitation systems, especially for tropics.
For the further understandings of the climate change in terms of the linkage from aerosol and cloud to precipitation, comprehensive observation using not only precipitation radar but also the cloud observation is needed. Dynamic processes of cloud evolution are also important. For these purposes, we have been studying the future precipitation radar missions from space. Requirements to the radar system are broken down to the sensitivity, the spatial resolution, the swath width and the Doppler velocity measurement. First three items can be greatly improved from DPR by using the current state-of-art technology. The Doppler velocity measurement by the spaceborne precipitation radar is very difficult in principle. We are proposing possible missions that can realize these requirements (except for the Doppler measurement) and started to study key technologies and build international cooperation. In this presentation, we will introduce the outline of three types of future missions under consideration: 1) upgraded DPR that improves more 10 dB sensitivity, twice wider swath and twice finer spatial resolution, 2) radar constellation satellites that consists of four downsized single frequency precipitation radar with tree times wider swath than PR and DPR, and 3) precipitation radar from geostationary orbit that has Doppler measurement capability but poor spatial resolution.