

Asian Small Precipitation Radar Constellation (ASPRC)

*Kinji Furukawa¹, Toshiaki Ogawa², Riko Oki¹, Takuji Kubota¹, Moeka Yamaji¹

1. Japan Aerospace Exploration Agency, 2. NEC Corporation

The Japan Aerospace Exploration Agency (JAXA) and NEC Corporation (NEC) have developed a Dual-frequency Precipitation Radar (DPR) equipped with a main satellite for the Global Precipitation Measurement (GPM) core observatory. GPM/DPR was launched in 2014, and its observation data is utilized in various ways such as being incorporated into the Global Satellite Mapping of Precipitation (GSMaP) provided by JAXA. GPM/DPR is superior to precipitation observation by microwave radiometer in that it can observe highly accurately without distinguishing between ocean and land, and it is possible to acquire vertical profile of rainfall etc. Meanwhile, GPM/DPR has a relatively narrow observation width and only one observatory is operated, so the problem is that the observation frequency at the same spot is small. In order to solve this problem, we propose Small Precipitation Radar Constellation based on the Ku band precipitation radar (KuPR) which constitutes GPM/DPR. It will decrease observation interval of the same spot about 6 hours. Note that this precipitation radar is supposed to be mounted on the small satellite bus NEXTAR-300L developed by NEC.

With the proposed Small Precipitation Radar Constellation, it is possible to greatly improve the observation frequency of the same spot with respect to GPM/DPR. Although the number of satellites will increase, both the precipitation radar and the satellite bus will utilize already developed products and it will be mounted on relatively inexpensive small satellite to reduce the cost of the overall system. Assuming that both the precipitation radar and the satellite bus utilize already developed products, we aim to target the development cost of the first observatory to 10 billion yen or less (excluding ground equipment, launch, operation cost).

As the application of the small precipitation radar constellation, it is assumed that utilization in disaster prevention such as improving the accuracy of weather forecast, predicting the occurrence of flood caused by typhoon and severe rainfall. Scientifically, it is useful for the study of the diurnal change of precipitation by high frequency observation in tropical zone. Observation data of this precipitation radar can also be used in Southeast Asian countries (Indonesia, the Philippines, Vietnam, etc.), and it is assumed that a satellite constellation will be constructed by countries which are interested in development and launch (Realized by ODA). As a technical development, we aim increase the number of constellation satellite for further high frequent precipitation obseravtion through further size down and cost reduction.

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