Three-dimensional analyses of initial stage of convective precipitation using two X-band polarimetric radars

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Convective precipitation rapidly develops and often brings about localized torrential rain which cause flooding and landslides. The polarimetric radar is one of the key instruments for precipitation study, since it provides kinematic properties of precipitation developments as well as information on microphysical process in the precipitation. The present study uses two X-band polarimetric radars to understand the initiation process of convective precipitation. However, the volumetric data of X-band radar currently available is 5 min interval data which is not enough for studying initial stage of developing convective cell. In this study, to investigate three dimensional structure of convective cell in early stage, we developed an algorithm based on the interpolation method in both space and time. The algorithm produces three dimensional high spatio-temporal resolution CAPPI data using two X-band polarimetric radars (3D CAPPI). The mosaic of two radars has an advantage to construct whole images of precipitation compared to single radar analysis. The algorithm is applied a localized convective precipitation observed in Kanto area of Japan on 19 July 2012. The 3D CAPPI gives us detailed structure of rapidly developing convective cell and provides quantitative information on echo top height, maximum reflectivity, and first observation time of each cell. Using mosaic 3D CAPPI information, the present study clearly shows the back-building process at the initial stage of convective precipitation. In initial stage, the three dimensional analyses of convective precipitation could be helpful to detect the first core of cell and develop a short-term forecasting model.

Acknowledgment
This work was supported by the Grant-in Aid for Scientific Research (B) 16H03145 of MEXT, Japan, the Korea Meteorological Industry Promotion Agency under Grant KMIPA 2015-1050, and the BK21 plus Project of the Graduate School of Earth Environmental Hazard System. The X-band polarimetric radar data was provide by the National Institute for Earth Science and Disaster Prevention, Japan and the Ministry of Land, Infrastructure, Transport and Tourism, Japan.

Keywords: localized convective precipitation, X-band polarimetric radar, high resolution, initial stage

