Utilization of Real-time Data Observed by Phased Array Weather Radar

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The Phased Array Weather Radar (PAWR), which was developed for early detection and prediction of torrential rain and tornados and gusts. has 100 m resolution (60 km radius, 15 km altitude), 300 azimuth (360 ˚), 100 elevation (0- 90 deg) in 30 seconds, and generate observation data at 100 times the data rate of conventional parabolic antenna type weather radar. Utilizing this observation big data in real time is very important for reducing the damage of sudden weather disasters. Real-time observation data of three PAWRs installed in Suita, Kobe, and Okinawa are converted into a quick look (QL) image showing the reflectivity at 2 km altitude within one minute of the end of observation (https://pawr.nict.go.jp/). The real-time 3-dimensional observation data every 30 seconds is used by the smartphone app "3D Rain Watch" and "RIKEN 3D Nowcast". To use these real-time observations, data quality control (QC) flags calculated within 10 seconds are periodically created. In this study, in addition to the network configuration of this data utilization system, the current situation and issues concerning real-time data distribution and processing are described. Also, the observation data of the multi-parameter phased array weather radar (MP-PAWR) installed at Saitama University, which started observation in July 2018, to this data system will be introduced. In MP-PAWR, the number of observation parameters by dual polarization observation increased, but the data rate was almost the same as that of PAWR due to format change and data compression.

On the other hand, it is important not only to use weather observation data in real-time, but also to understand phenomena and investigate mechanisms using past data. It is desirable that the observation data be archived in an easy-to-use form for use in deep learning, which is rapidly developing in recent years. All QL images since the start of the observation (Suita PAWR in 2012, Kobe / Okinawa PAWR in 2014) have been published on the above web page as "Past data", and observation data exceeding 3PB has been also stored in online storage. The observation data is compressed for one hour for each of the 13 types of observation parameters and stored in NICT Koganei or Keihanna storage. NICT hopes that all observation data will be used as open data in principle. However, archiving observational data larger than a few petabytes is costly, and publishing all data to the Web is impractical. Currently, the requested data is published on authenticated pages and downloaded by users, but assurance of continuous access is a future issue.

Keywords: Phased Array Weather Radar, Observation Big Data, Real-time Data Processing, Data Utilization