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Data processing of MLIT X-band MP radar

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Flood disasters caused by localized heavy rainfall frequently occurred in July and August 2008. National Research Institute for Earth Science and Disaster Prevention's (NIED's) results on monitoring of the heavy rainfall and severe wind by using X-band multi-parameter (MP) radar boosted Ministry of Land, Infrastructure, Transport and Tourism (MLIT) to start deploying the X-band MP radars in Japan. They deployed 11 radars in Tokyo, Nagoya, Kinki, Hokuriku areas in FY 2009, and are deploying 15 radars in other areas in FY 2010. NIED developed an operational data processing system, which estimates the rainfall intensity from the radar data, and which creates regional composite data every one minute, under a commission from National Institute for Land and Infrastructure Management (NILIM), MLIT.

The observed radar data are transferred to two data processing centers in Kanto and Kinki Regional Development Bureaus, MLIT, and the same processing is done for redundancy in these two centers. After a quality control of the received radar data is performed, K_{DP} is estimated by a differentiation of PHI_{DP} , which is filtered by two different FIR filter for removing the local phase shift by strong backscattering and smoothing. As radio wave attenuation by rainfall is not negligible in X-band, the attenuation is estimated from the K_{DP} to correct Z_H and Z_{DR} . The attenuation is also used for determining radio wave extinction areas, where the radar cannot detect the received power from the precipitation by the rainfall attenuation. Finally, the precipitation intensity is estimated with Z-R and K_{DP} -R relationships. The estimated rainfall data are immediately sent to compositing server. The data of radars that belong to the same area are composited into a quarter third mesh (with a resolution of about 250 m). For this compositing, the modified Cressman interpolation method, which also considers with a weight that becomes greater with the decrease of the height above the ground, is used. These procedures are performed with parallel computing to finish the calculations in several seconds.

The precipitation information calculated by this system is tentatively provided by MLIT since July 2010. The accurate information updated every minute is sure to contribute to the monitoring of extreme weather in urban areas.

Keywords: MP radar, X-band, MLIT