

Short-term flood prediction for Ciliwung river basin using C-band Doppler radar and distributed hydrological model

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In order to mitigate flood disasters occurring frequently in Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi) area, application of the weather radar technology to an early warning system against extreme weather is needed strongly and urgently. In this study, both observation and model calculation are done using a radar installed in Jabodetabek area.

First, rainfall data have been derived from observations with a C-band Doppler radar (CDR) during the intensive observational period of HARIMAU2010 (14 January to 15 February 2010). Analyzing these data, we have found two types of rainfall propagation patterns: zonal (from west to east) and meridional (from south to north, or from north to south). The latter is more important to cause floods over the major (Ciliwung) river basin in the Jabodetabek area, which is related with convective clouds migrating in the meridional direction with a diurnal cycle.

Next, the data for typical heavy rainfall cases were used to simulate runoff in the Ciliwung river basin by using a distributed hydrological model (the CDRMV3 model). From the radar rainfall data over the Ciliwung river basin, generated runoff has been calculated for each cell of the model. Discharge hydrograph obtained by this runoff simulation has been verified with the discharge observational data. Simulations for the cases of meridional propagation patterns with diurnal cycle provide large discharges as observed actually. Therefore, this approach could provide a useful system for short-term flood prediction in Jabodetabek area.

Keywords: Weather radar, Distributed hydrological model, Rainfall, Runoff, Flood prediction, Ciliwung river basin