Punpim Puttaraksa Mapiam 2009: Applications of Rain Gauge and Radar Rainfall to A Hydrologic Model for Flood Estimation. Doctor of Engineering (Water Resources Engineering), Major Field: Water Resources Engineering, Department of Water Resources Engineering. Thesis Advisor: Associate Professor Nutchanart Sriwongsitanon, Ph.D. 173 pages.

Radar rainfall was proved in this study to be an effective input data for improving the accuracy of flood estimates compared to the gage rainfall in the upper Ping river basin. The URBS (rainfall-runoff model) was first chosen for flood estimation at the stations P.20, P.4A, P.28, P.21, and P.71 using daily gauge rainfall (DGR) as the input data. The NAM model – one of the most reliable commercial models – was also applied at these 5 stations. Results of flood hydrograph obtained from these models are very close. However, the URBS model requires only 4 parameters whereas the NAM requires 6 in the calibration, the URBS model was therefore chosen for further analysis. The URBS model was then applied at other 6 stations in the study basin. The ungauged relationships between the URBS model parameters and catchment characteristics were also formulated to be used for the ungauged catchments in the study area. Thereafter, the radar reflectivity data (Z), obtained from the Omkoi radar, and the corresponding rainfall data (R) were used to formulate the most suitable relationship; $Z=74R^{1.6}$, which can be used to estimate daily radar rainfall (DRR) and hourly radar rainfall (HRR) in the upper Ping river basin. To be able to possibly improve the accuracy in runoff estimate, the scaling transformation equation was generated (using reflectivity and corresponding continuous rain gauge data from Bangkok, and Sydney and Brisbane, Australia) to be used as the logic to prepare the hourly radar rainfall (HRRS). Four types of rainfall data (DGR, DRR, HRR, and HRRS) were finally used as the input data for the URBS model to estimate the flood hydrographs at the stations P.21, P.71, P.77, P.24A, P.73, and P.14. The accuracy of overall hydrograph and peak flow estimated using all radar rainfall data are generally higher than that of estimated using the DGR, respectively. The use of HRR however cannot produce better results of runoff hydrograph than the use of DRR. On the other hand, the HRRS has shown its ability to improve the accuracy of runoff estimates, especially the overall hydrographs. The scaling logic is therefore necessary to be applied to prepare the HRRS for the situation like in the upper Ping river basin, where daily Z-R relationship is only available.

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