

RADAR RAINFALL MEASUREMENTS FOR FLOW SIMULATION

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Floods are natural events with severe impact on many aspects of water use. Better management of water resources can be achieved if quantitative data on the temporal and spatial distribution of precipitation are made available while the event takes place. Weather radars show good promise for the development of effective methods for quantitative precipitation estimation. The improved precipitation estimation in time and space allows for better input data to operational hydrological models.

This paper is part of a flood management system study, which uses contemporary techniques to improve flood flow forecasting and simulation as well as reservoir operation scheduling. Specifically, the proposed methodology considers the measurement of rainfall by a system consisting of weather radar and raingages. During the preprocessing stage corrective techniques and adjustments are devised to account for meteorological and topographical sources of error of radar such as the rainfall attenuation, the ground clutter and the wind effect and subsequently the bivariate statistical rainfall analysis is applied to the adjusted radar data for the estimation of hourly surface rainfall. The calculated rainfall provided the input to the SIMPLE watershed model, which is a conceptual deterministic distributed parameter hydrologic model (Kouwen, 1973), for the simulation of runoff. This model accounts for interception, infiltration and depression storage losses and the runoff simulation is performed with the linear reservoir method (technique). Application of the proposed methodology in the Grand River watershed of North Ontario, Canada showed good results with the measured discharge data especially in the determination of the time of occurrence of the peak discharge. As a result the proposed methodology (bivariate statistical method) showed better rainfall hyetograph estimation than the method that uses only interpolation techniques of raingage data in space. Improving the rainfall hyetograph the computed hydrograph is improved which makes the use of weather radar data applicable for hydrological forecasting in real time conditions especially in the prediction of time of occurrence of peak discharge.