

Development of flood routing models for Wang River basin

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Abstrak

Nowadays, severe flooding frequently occurs in various parts of Thailand resulted from changes in climatic condition and land use patterns. The flooding has caused great damages to properties and lives and affects country economy. Experience from the most severe flooding in the northern and central regions of Thailand in the year 2011 reveals that reliable flood warning system is still lagging. For flood warning purpose, it is necessary to have an accurate flood routing system. This study is aimed at developing mathematical models for flood routing so as to provide data for flood warning. Two different models are developed, i.e., kinematic overland flow model and kinematic stream flow model. The finite element method with Galerkin's weighted residual technique is used in model development. The second order Runge-Kutta method is applied to solve the set of differential equations obtained from finite element formulation. The developed models are applied to simulate flows in the Wang river basin in the northern region of Thailand during July 1 - October 31, 2011 when severe flooding occurred in this region. Model calibration is made by adjusting some parameters in the models and comparing the obtained results with measured data recorded by RID at 5 stream flow gauge stations along the Wang river. For correlation analysis, three statistical indices are determined, these include coefficient of determination, R², Nash-Sutcliffe model efficiency coefficient, NSE, and coefficient of variation of the root mean square error, CV(RMSE). It is found that the model results at the upstream portion of the river satisfactorily agree with the observed data, with the values of R² greater than 0.55 and CV(RMSE) less than 0.57. For the downstream portion of the river, there are remarkable differences between the model results and the observed data. The values of R² are less than 0.35, CV(RMSE) greater than 0.76, and the NSE values are less than 0.16. This might be due to some errors in the input data, including rainfall pattern, topography, land use, river cross-sectional area, and water seepage along the river. More detailed field investigation and model calibration are still needed.