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Simulating flood process of highly urbanized watershed with remote sensed land use/cover change

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In the highly urbanized watersheds, flood processes will be significantly affected by Changes in land use/cover (LUC) induced by urbanization, but simulating this changes has been a great challenges due to both the lack of time series LUC data and appropriate hydrological models. In this study, a multiple classifier system for LUC change estimation was proposed to improve the LUC classification capability, which uses support vector machines (SVM), C4.5 decision tree, and neural networks (ANN) as the training algorithms of the base classifiers, and the weighted vector combination techniques to combine the results from the base classifiers, and the Ada Boost method to boost the classification accuracy. A time series of LUC maps from Landsat imageries for Guangzhou City, a highly dynamic, large metropolitan area in southern China was obtained based on 11 Landsat imageries from 1987 to 2015 at an average 3 year interval were obtained by using the proposed algorithm. A fine resolution hydrological model is then proposed for simulating the flood processes of highly urbanized watersheds by relating the LUC with model parameters, so to reflect the impact of urbanization. The proposed model is a physically based, distributed watershed hydrologicial model, which divides the watershed into fine grid cells that is done by using DEM. In every grid cell, there is unique terrain properties, including elevation, soil type and land use/cover type, this makes the model could describe the inhomegeneousity of the terrain properties over the watershed. The model estimates the river network and its cross section size by using GIS techniques and satellite remote sensing imageries, so it could do distributed runoff routing. The model categorizes its model parameters into four types, including climate-based, topography-based, vegetation-based and soil-based parameters, every type of parameters are physically related to terrain property it belongs, so is related the parameters with the LUC changes. Shijing Creek, a highly urbanized watershed in Guangzhou city has been selected for a case study, and 11 LUCs from 1987 to 2015 at an average 3 year was exatracted from the dataset of Guangzhou City. Precipitation from three flood events was collected to simulate the flood processes, and the result show that both the flood peak flow and the runoff coefficient have increased tremendously, that was not reported yet in other watersheds in the world.