



Spatial variations and implication of stormwater runoff pollution from rapidly urbanizing Shiyan reservoir catchment in China

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Shiyan Reservoir catchment is located in the rapidly urbanizing coastal region of Southeast China. The catchment is a mixture of agricultural/industrial/residential land use. It has six sub-catchments named WJZ, SKL, BKW, SYH, MBS and YNK with impervious cover percentage varied from 85% to 6%. The considerable spatial variations of land use patterns and urbanization levels are deemed to have great effect on storm runoff pollution management in the catchment.

Since there is no gauge for continuous hydrological monitoring in each sub-catchment, in this study, temporary monitoring sites were set at the downstream section of each sub-catchment in Feb-May 2007 to measure stream flow and associated water quality, e.g. COD, NH₃-N, TP, SS, TN, BOD₅. In order to make up for data insufficiency due to relatively low frequency monitoring, IHACRES and exponential wash-off model were applied to fit the monitoring stream flow and water quality time series data. Three indicators, event pollutant loads per unit area (EPL), event mean concentration (EMC) and pollutant loads transported by the first 50% of runoff volume (FF₅₀), were used to describe the runoff pollution characteristics for each pollutant in each of six sub-catchments. The values of these three indicators were calculated in terms of fitted time series data using two very different rainfall events, a light rain and a heavy rain event. Furthermore, the spearman's rank correlation coefficients were used to discover the strength of links between runoff pollution spatial variations and land use patterns or urbanized levels.

The results indicated that: 1) in light rainfall event similar spatial variation trend were found for the EPL (or EMC) indicators of all the pollutants considered in this study. However, in heavy rainfall event, different spatial variations were found for the EPL (or EMC) indicators of different pollutants. The characteristics imply that during light rain, all pollutants' loads are mainly washed off from impervious land covers; however, in heavy rainfall event, some pollutants' (e.g. TP, SS) loads also come from pervious land covers. 2) EPL indicators of COD and NH₃-N have strong positive-correlation with percentage of residential land use in sub-catchment. It implies that residential land use pattern is the main source of COD/NH₃-N loads. 3) The intensity of first flush (FF₅₀) increase generally with increase of residential land use percentage. However, FF₅₀ is also affected by the shape of the residential land use and its topological relation with river.

Keywords: spatial variation; runoff pollution; urbanization; land use; rainfall intensity