

Urbanization and its impact on flood responses

Yangbo Chen

Sun Yat-sen University, Guangzhou, China, eescyb@mail.sysu.edu.cn

Urbanization is the world development trend for the past century, and the developing countries have been experiencing much rapider urbanization in the past decades. In the Pearl River Delta area of southern China, the rapidest urbanization in china has been observed for the past four decades, and dozens of highly urbanized watersheds have been appeared. Urbanization brings many benefits to human beings, but also causes negative impacts, such as increasing flood risk. Impact of urbanization on flood response has long been observed, but quantitatively studying this effect still faces great challenges. For example, deriving the urbanization pattern in the past, setting up an appropriate hydrological model representing the changed flood responses and determining accurate model parameters are very difficult in the urbanized or urbanizing watershed. In this study, a multiple classifier system (MCS) for estimating land use/cover(LUC) changes by utilizing satellite remote sensing images is proposed first, which combines advantages of different learning algorithms. With this algorithm, the LUC of the central area of Pearl River Delta area, including Guangzhou, Shenzhen and Dongguan from 1987 to 2015 at roughly every 3 years was estimated by using the Landsat satellite images, and the urbanization pattern is analyzed. Then, a physically based distributed hydrological model, the Liuxihe Model is developed for simulating the hydrological processes of the urbanized watershed. A model parameter optimization and updating strategy is proposed based on the remotely sensed LUC types, which optimizes model parameters with PSO algorithm and updates them based on the changed LUC types. Several watersheds in the highly urbanized area of the Pearl River Delta area were studied for this purpose. The LUC changes in these watersheds was first analyzed, and then the Liuxihe model was set up in these watersheds with parameters optimized and updated with the changed LUCs. Hydrological processes was simulated with the established model and parameters in different time periods, and the flood response changes was derived. The results show urbanization has big impact on the watershed flood responses, the peak flow increased a few times after urbanization which is much higher than previous studies in western countries.