

Surface Tension and Concentration Time on the Ground

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In recent years catastrophic rainfalls are frequently met all over the world due to glass room effect and impermeable coverings over large areas make the flood problem more severe. Peak floods are enhanced by reduced time of concentration which is caused by impermeable coverings. In order to reduce the flood damage precise prediction of flood is most important, and it may be possibly made by the use of proper model of flood forecasting. The flood forecasting model normally consists of effective flood prediction, catchment area runoff computation and river flow calculation, and to improve the estimation of impermeable covering effects the model of catchment area runoff should be revised by considering the surface runoff more carefully. Proper flood forecasting in metropolitan area is based on a precise estimation of concentration time. Most models assume that the surface runoff flow is gravity flow. But the laboratory results of Woo and Brater(1961) show that the friction factor of surface runoff flow is a function of bottom slope, which indicates the sheet flow might be strongly influenced by surface tension and hence bottom slope. New non-dimensional physical numbers are introduced by adopting bottom slope and roughness height, and new empirical equations of concentration time are developed respectively for both conditions of gravity flow and surface tension flow. Existing laboratory data are employed for this purpose, and new laboratory experiments have been conducted for the verification of new empirical equations. The new empirical equations of concentration time may contribute the basic improvement of catchment area runoff model.