

Urban Flood Analysis with Underground Space

KEIICHI TODA¹, KAZUYA INOUE² and SHINJI AIHATA³

¹Disaster Prevention Research Institute, Kyoto University, Uji, Kyoto, Japan ²Disaster Prevention Research Institute, Kyoto University ³Graduate Student, Graduate School of Engineering, Kyoto University

First, the recent urban floods that occurred in large cities in Japan are reviewed and the characteristics of them are discussed. Next, a storage pond model is developed which can treat inundation of both ground and underground spaces in urban area. The continuity equation, momentum equation without advection, and drop formula are used in the model. The model is applied to Fukuoka City, Japan, with the underground space in JR Hakata station, and Fukuoka flood in 1999 is simulated. The computation results show a good agreement with the actual record. The model is also applied to Kyoto City, Japan. The results show that the large inundation into underground malls and subways may occur if the Kamo River overflows. A hydraulic model test is also executed by use of the undistorted hydraulic model with 1/30 scale of the underground mall in Kyoto in order to study the inundation water behavior. The underground space is found to be very dangerous in flooding by the difficulty of evacuation. Finally, suitable countermeasures against urban floods are discussed.

References

[1] K.TODA et al., Inundation Analysis of Complicated Underground Space, Journal of Hydroscience and Hydraulic Engineering, Vol.22, No.2, pp.47-58, 2004.