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Time Distribution of Design Rainfall Considering Area in Urban Watersheds

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It is very important how the time distribution of the design rainfall is determined because changes in the time distribution may vary runoff characteristics in peak flow and largely altered shape of a hydrograph calculated. This study revises the methodology of Huff (1967), which is widely used in engineering practice, for small urban watersheds. Modifying the Huff method to develop the Huff's dimensionless cumulative curve, we come up with a new definition of the ITED reflecting the characteristics of small urban watersheds. Then an Area-IETD relation curve is developed from applying the new IETD definition to a real urban watershed, the Joong-Rang watershed in Seoul, Korea. This Area-IETD relation curve can be used to determine a proper IETD for an urban watershed in accordance with area, especially, an ungaged watershed. In addition, since a small urban watershed has short rainfall-to-runoff time, minutely rainfall data are used. By these modifications, we can develop the Huff's dimensionless cumulative curves which are different to ones by the current Huff method. To demonstrate the difference in the runoff characteristics of a small urban watershed resulted from two of the Huff's dimensionless cumulative curves, that is, one is developed by the current Huff method and the other is developed by the modified Huff's method, four subbasins in the Joong-Rang watershed are selected. For each subbasin, two of the Huff's dimensionless cumulative curves are developed and based on them two hypothetical rainfall events (hyetographs) with 2 hour duration and 10 year return period are obtained. It is observed that the hypothetical rainfall events by the modified Huff's dimensionless curves are more evenly distributed than by the ones of the current Huff method. Finally, two runoff hydrographs from those hypothetical rainfall events are simulated by SWMM for each subbasin. Comparing them, we observe that peak flows of the hydrographs by the modified Huff's method are 5% to 12% lower than those by the current Huff method. This study was supported by the 2003 Core Construction Technology Development Project(03-SANHAKYOUN-C01-01) through the Urban Flood Disaster Management Research Center in KICTTEP of MOCT KOREA.