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Nonstationary Intensity-Duration-Frequency Curves for Drainge Infrastructure Coping with Climate Change

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Abstract

As the abnormal rainfall condition has been more and more frequently happen and serious by climate change and variabilities, the question whether the design of drainage system could be prepared with abnormal rainfall condition or not has been on the rise. Usually, the drainage system has been designed by rainfall I-D-F (Intensity-Duration-Frequency) curve with assumption that I-D-F curve is stationary. The design approach of the drainage system has limitation not to consider the extreme rainfall condition of which I-D-F curve is non-stationary by climate change and variabilities. Therefore, the assumption that the I-D-F curve is stationary to design drainage system maybe not available in the climate change period, because climate change has changed the characteristics of extremes rainfall event to be non-stationary.
In this paper, design rainfall by rainfall duration and non-stationary I-D-F curve are derived by the conditional GEV distribution considering non-stationary of rainfall characteristics. Furthermore, the effect of designed peak flow with increase of rainfall intensity was analyzed by distributed rainfall-runoff model, S-RAT(Spatial Runoff Assessment Tool). Although there are some difference by rainfall duration, the traditional I-D-F curves underestimates the extreme rainfall events for high-frequency rainfall condition. As a result, this paper suggest that traditional I-D-F curves could not be suitable for the design of drainage system under climate change condition.

Keywords : Drainage system, Climate Change, non-stationary, I-D-F curves

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