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Establishment of Intensity-Duration-Frequency curves for precipitation in the monsoon area of Vietnam

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1. Introduction

The rainfall Intensity-Duration-Frequency (IDF) relationship is one of the most commonly used tools in water resources engineering, either for planning, designing and operating of water resource projects, or for various engineering projects against floods. The establishment of such relationships was done as early as in 1932 (Bernard, 1932). Since then, many sets of relationships have been constructed for several parts of the globe. However, such map with rainfall intensity contours has not been constructed in many developing countries, including Vietnam. There is a high need for IDF curves in the monsoon region of Vietnam.

This research is to construct IDF curves for seven stations in the monsoon area of Vietnam and to propose generalization IDF formula using base rainfall depth, and base return period for Red River Delta (RRD) of Vietnam.

2. Methodology

In this study, 210 rainfall events at 7 stations have been statistically analyzed for the period 1956-1985 in RRD. The Pearson type III is commonly used in Vietnam for frequency analysis and it is utilized in this study. Least square method is applied to determine the parameter of four empirical IDF equations (table 1) are used to represent intensity-duration relationships.

Table 1 Empirical IDF equations.

Talbot	*Bernard*	*Kimijima*	*Sherman*
$i = \frac{a}{t+b}$	$i = \frac{a}{t^b}$	$i = \frac{a}{t^D + b}$	$i = \frac{a}{(t+b)^D}$

Where: i is rainfall intensity (mm/hour); t rainfall duration (minutes); a,b,c,D are parameters.

3. Result

The Kimijima equation is acceptable fitting to the IDF relationship in Vietnam. The contour map of parameters of Kimijima equation is constructed, which can be used for non-recording rain gauges. Further research on the regional IDF curves for non-recording rain gauges in RRD of Vietnam.

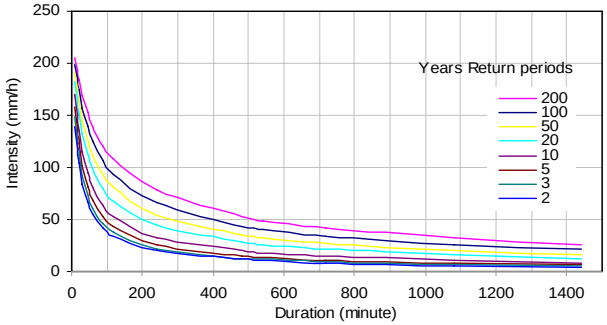

Fig. 1 Rainfall IDF curves for Hanoi station with Kimijima equation.

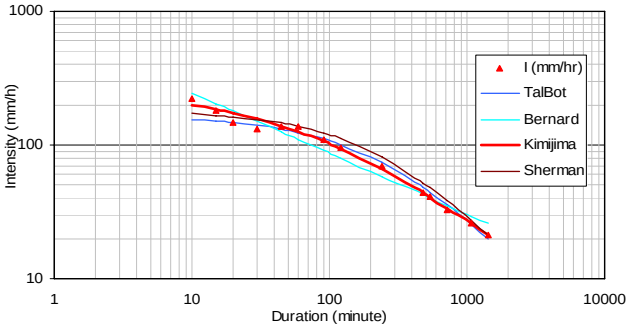

Fig. 2 Comparison IDF curves with fours equations at Hanoi station. (Return periods: 100 years)

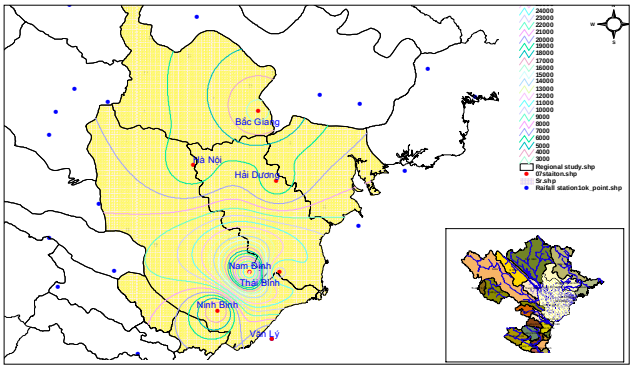

Fig. 3 Contour map of parameters of IDF equation.