RAINFALL-RUNOFF ANALYSIS IN URBANIZING AREAS

NAGASAKI UNIVERSITY,   STUDENT MEMBER,   HASAN M. TAHAT
NAGASAKI UNIVERSITY,   REGULAR MEMBER,   MASATO   NOGUCHI
NAGASAKI UNIVERSITY,   REGULAR MEMBER,   TAKEHIRO NAKAMURA

INTRODUCTION

The phenomenon of rainfall-runoff relationship per se is a complicated one. An exact estimation of runoff is not possible but near to the precise one may be possible . In this paper an attempt is made to estimate the runoff using up to date data that is remote sensing data through the modified kinematic wave model. other factors such as land use effect are included.

METHODOLOGY

The modified kinematic model is composed of two models namely the kinematic wave method to estimate the surface runoff, and the tank model to estimate the subsurface runoff, schematic diagram are shown in figure 1. From the continuity and the momentum equations the following equations are used in the model;

$$h = k \, q^p \tag{1}$$

$$\frac{\partial h}{\partial t} + \frac{\partial q}{\partial x} = r - i \tag{2}$$

$$i = c \, h \tag{3}$$

where, h is the water depth, q is the discharge,r is the rainfall, i is the infiltration intensity

For the the nearly precise estimation of runoff ,the input data of the model is the up to date data(remote sensing data) which is to be emphasized in this paper. The watershed was divided into subcatchment according to its tributary. the effect of land use is carefully considered using the remote sensing data and is classified into six categories using data processing (see table 1). The classification which is shown in table 1 includes each and every small portion of the watershed via the Cathode Ray Tube(C.R.T.). This small portion of of the watershed are denoted by a dot on the C.R.T which has a dimension of an area. The total number of dots for each category of the land use are also shown in table 1. The total number of dots for each land use are based on the summation of each sub catchment.

This method of computation is thought of for practicality since it includes the most important factors affecting the runoff mainly the land use changes in urban areas.

RESULTS AND DISCUSSION

The data and the application for the model are those for the Isahaya River Basin. figure 2. shows the hydrograph for the basin which is obtained by the kinematic wave model, using the above mentioned methodology. However this result have not yet been compared or analyzed with other results. Further results will be elaborated at a latter stage of the research, and during the conference.

REFERENCES
Iwasa,Y.,Noguchi, M.,and Nakamura,T.,1987.Simulation of urban storm drainage involving river and over land flows,proc.22nd IAHR Cong.
Bedient,P.B,Huber,W.C.,1988.Hydrology and Floodplain Analysis,Addison -Wesly Pub.co.

Table 1. Classification of the land use

FORESTRY	BARE-LAND	URBAN AREA	PADDY FIELD	FARMS	OPEN WATER SURFACE	TOTAL
4321 970	0.000	2788.530	1948.990	2459.020	75.000	11793.510

Note . Number of dots for each land use in the watershed
under study (Isahaya river basin)
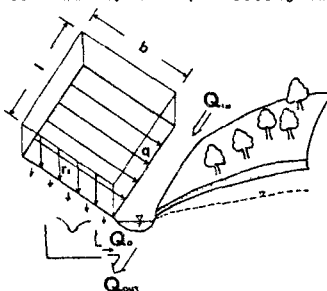Obtained by data processing through C.R.T

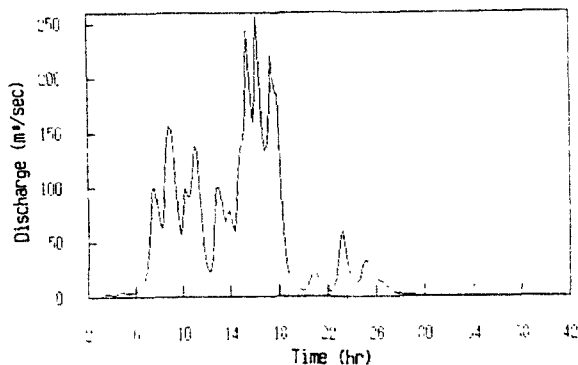FIGURE 1.SCHMATIC DIAGRAN OF THE KINEMATIC
KINEMATIC WAVE MODEL

FIGURE 2. HYDROGRAGH FOR THE UNDER STUDY
AREA (ISAHAYA RIVER BASIN)