ONLINE ISSN : 1882-4897
PRINT ISSN : 0021-5104

Japanese Journal of Limnology (Rikusuigaku Zasshi)
Vol. 67 (2006) , No. 3 pp.267-280

[PDF (2312K)] [References]

Quantitative approach and problems of river hydrological simulation models

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(Received June 5, 2005)
(Accepted April 3, 2006)

Abstract

A distributed hydrological model instead of a lumped model has been proposed as the most important tool in enabling the sharing of water information. In essence, a distributed model consists of sub-basins of tributaries and a main river channel. As for the latter, commercial models are available based on advanced mathematical techniques for hydraulic calculations. However, the methodologies for the description of rainfall-runoff phenomena from subbasins have not been fully discussed. Especially for forested areas two key topics need to be addressed. The first is how to continuously describe runoff phenomena over several rainfall events and dry periods for further improving water quality simulation. The second is the serviceability of a model for the identification of its parameters via the measurable soil conditions of a sub-basin. To address these issues, the authors propose a new rainfall runoff model, the Yamashita Model, based on the assumption that the retention capacities of the soil have a significant effect on runoff phenomena. This model consists of a two-step retention and three-step runoff mechanism. This model is basic parameters includ the retention capacities of soil pores, which were identified by the measured volumes of the soil pores based on the classification by Takeshita, which distinguishes the retention capacities of a soil by its suction force. They examined this model using the actual rainfall-runoff data of two small catchments in the Uryu Experimental Forest of Hokkaido University, Japan. The simulation results generally agreed with the observed data. To improve rainfall runoff models, future long-term observations of rainfall and runoff should be conducted at various

types and sizes of watersheds.

Key Words: distributed model, pseudo-physical model, infiltration, retention, soil pores

To cite this article:

Mitsuo YAMASHITA, Arata ICHIKAWA, Fuyuki SATOH and Hideaki SHIBATA (2006): Quantitative approach and problems of river hydrological simulation models . Japanese Journal of Limnology (Rikusuigaku Zasshi), 67: 267-280 .

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doi:10.3739/rikusui.67.267

JOI JST.JSTAGE/rikusui/67.267
