ANALYSIS OF RIVER TEMPERATURE BASED ON A HYDROLOGICAL MODEL

J.SHIRAIWA [1], S.KAZAMA [2], and M.SAWAMOTO [3]

[1] Graduate Student, Department of Civil Engineering, Tohoku University,
6-6-06 Aza Aoba Aramaki, Sendai, Miyagi, 980-8579, Japan
(Tel/Fax: +81-22-217-7458, e-mail: shiraiwa@kaigan.civil.tohoku.ac.jp)
[2] Associate professor, Department of Environmental Studies, Tohoku University, Japan
(Tel/Fax: +81-22-217-7458, e-mail: kazama@kaigan.civil.tohoku.ac.jp)
[3] Professor, Department of Civil Engineering, Tohoku University, Japan
(Tel/Fax: +81-22-217-7458, e-mail: sawamoto@mail.trans.tohoku.ac.jp)

It has a close connection to the territory and the native habitat of the living things. We have been interested in the change of river ecosystem by the global warming: especially, the change of water temperature, one of the important indexes related to the river ecosystem. It is necessary to estimate previously information of water depth and the flowmass in the river for the analysis of the water temperature. In order to simulate the water temperature in rivers located in a basin, we firstly estimated flow parameters (water depth, flow velocity) from continuous rainfall-runoff simulation with a hydrological model and analyzed heat budget with the flow parameters.

The object area is Natori river basin located at the center of Miyagi Prefecture in Japan. The basin has the Natori River and the Hirose River as mainstream and two large-scale dams called the Kamafusa dam and the Okura dam located in the middle part. As data required for simulation of the rainfall-runoff and the heat budget, we employed geographic data, satellite data and meteorological data prepared by Japanese government.

We referred to the study of Tsuchida *et al.* (2004) for flow parameters. They simulated the continuous hydrological response to precipitation from 1999 to 2000 of Natori basin using a distributed model and calibrated the model with discharge data observed at the outlet, Yokata. The discharge after calibration is well fitted with the observed data. The water flow within a basin is composed of surface flow, base flow and river flow calculated by the kinematic wave method, the accumulation function method and the dynamic wave model, respectively.

The heat budget model simulates the temperature change in the moving water mass with net radiation, sensible heat, and latent heat. The sensible heat and the latent heat are calculated by the bulk method. The source water of river has the same temperature of ground water because the source water was treated as gushing out from ground water.

We analyzed water temperature for 3 days of August in 1999. The dates of simulation, August 6, 18, 23, were selected considering precipitation and meteorological condition. The highest water temperature at the downstream point of the Hirose river was turn out to be about 29℃ at the 6^{th} with average flowmass of $11m^3/s$, 22℃ at the 18^{th} with average flowmass of $23m^3/s$ and 24℃ at the 23^{rd} with average flowmass of $15m^3/s$. The degree of the temperature rise in the Hirose River in simulation on 6^{th} is larger than those on other two dates. This is because there was the relatively little flowmass by few river joins in the whole basin and the water depth in river was underestimated during the drought by the assumption of constant width of river. Though, the relative evaluation of the valley scale

could be done. Unfortunately, because the water temperature was not measured in 1999 when the hydrological model was simulated, we could only simulate the heat budget model without calibration of the model. The heat budget model, therefore, should be applied for other dates with observed data.

We analyzed the water temperature, one of the habitat indicators of the aquatics. We would like to evaluate the habitat of the aquatic life with water temperature, water depth, flowmass, slope inclination, and land use as indicators.

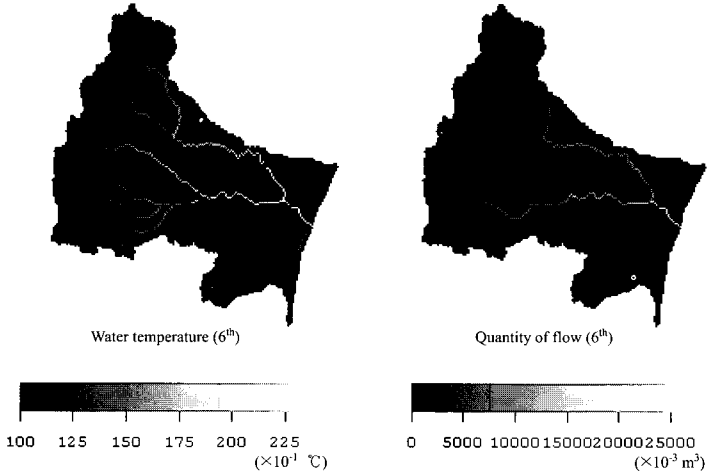

Fig. 1 Comparison between water temperature and flowmass

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