Improving wide area disaster damage monitoring/predicting technologies

ITO Hiroyuki, Head
IINO Mitsunori, Senior Researcher
HIRATSUKA Mariko, Researcher

Research Center for Disaster Risk Management, Flood Disaster Prevention Division

(Key words) Monitoring/prediction system, ad hoc water level gauge, distributed flood prediction model

1. Introduction

In recent years concentrated torrential rainfall with hourly rainfall over 100mm has occurred frequently in Japan, causing disastrous floods and loss of human life. This means that it is now necessary improve the precision of flood discharge prediction methods, and to develop and build information transmission methods to support appropriate flood fighting and evacuation activities, and take other measures to further improve technologies for the wide area monitoring and prediction of flood damage.

This research was a study of real time observations by ad hoc water level gauges and of a distributed flood discharge prediction model in order to build flood disaster monitoring and prediction systems for entire river basins including medium and small rivers.

2. Real time observations by ad hoc water level gauges

Ad hoc water level gauges permit low cost simultaneous water level observations of multiple locations, because the water level gauges themselves are wireless communication units comprising part of data communication use networks. To verify their applicability to real time observation of river water level, proving tests were carried out on the Onda River, which is a tributary of the Tsurumi River. Figure 1 shows the network which was built. The results of the proving testing, which took 4 months to perform, confirmed that they are all fully applicable to observations during flood discharge and for long term observations.

3. Building and verifying the precision of the distributed flood discharge prediction model

In order to improve flood discharge predictions in medium and small rivers, which are characterized by the abrupt rise of the water level and short flood discharge arrival times, a distributed flood discharge prediction model capable of directly reflecting the spatial distribution of rainfall in the middle and upstream reaches of the Tsurumi River was built, and the precision of the object model was verified by 7 flood discharges which occurred in recent years. Figure 2 shows the results of verification of a flood discharge on September 21, 2011 at the Ochiai Bridge at the furthest downstream point of the object river basin. The wave forms at the start and near the peak of a flood discharge can be generally reproduced, but in order to further improve precision and reliability, we are studying a method of improving the applicability of a model to the characteristics of the flood discharge of an entire river basin by setting new water level observation points on a river system and reflecting the observation results in the model.

4. Conclusion

This research has confirmed the applicability and usefulness of ad hoc water level gauges and the distributed flood discharge prediction model, which contribute to wide area monitoring and prediction of flood damage. In the future, we will continue to boost precision and improve the system to advance flood disaster monitoring and prediction systems.

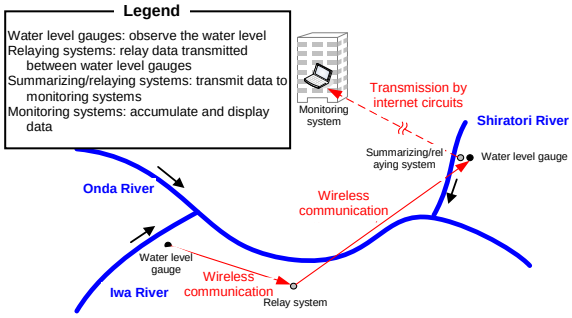

Figure 1. Ad Hoc Network

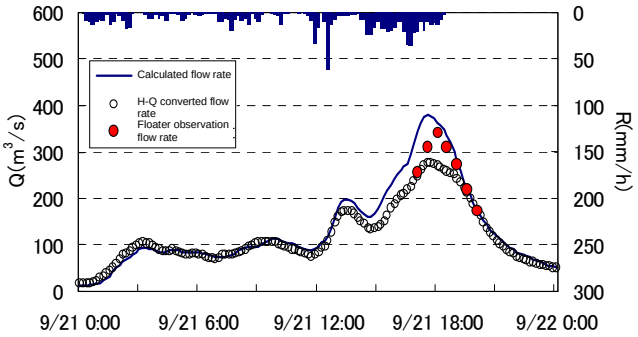

Figure 2. Results of Verification at the Ochiai Bridge (Flood of Sept. 21, 2011)