

## Effects of topographic characteristics on prediction in ungauged basin using distributed runoff model

Susumu Sakuma[1]; # Daichi Nakayama[1]; Hiroshi Matsuyama[1]

[1] Dept. Geography, Tokyo Metropolitan Univ.

The purpose of this study is to propose a method for estimating discharge in ungauged basin, using the basin classification based on the comparative hydrological approach and cell-based distributed runoff model. Shikoku island is selected as a case study area since it is composed of a relatively uniform geology. Firstly, a pair of basins whose topographic characteristics are similar is selected among 14 basins in the island with the use of Digital Elevation Model (DEM) alone. Secondly, distributed hydrological model is constructed and optimized in a basin of the pair, then, the evaluated parameters are applied to the other basin to estimate the discharge without any optimization in the other basin.

In Shikoku island, it was clarified that topographic characteristics of the basins could be explained by five factors. They were 'landform vertical interval', 'drainage network structure', 'landform flat level', 'development level of low-level path', and 'basin slenderness'. The most similar pair was the basin above Yuwatari discharge station in Ishite river and the basin above Tsunekanebashi discharge station in Doki river, therefore, the hydrological model was constructed and optimized to estimate the discharge at Tsunekanebashi. In the rainfall-runoff analysis above Tsunekanebashi, the Nash-Sutcliffe coefficient was 81.1% which was considered to be a good result. In contrast, the estimated discharge at Yuwatari was not so good because the Nash-Sutcliffe coefficient was -393.2%. However, the estimated discharge at Isonokawa in Nakasuji river whose topographic characteristics were similar to Tsunekanebashi next to Yuwatari, the Nash-Sutcliffe coefficient was 68.6%.

The estimated discharge at Yuwatari was not so good because the discharge was affected by the dam in the upper reach. On the other hand, the shape and phase of the estimated hydrograph at Yuwatari showed good correspondence with those of the observation. This is because 'drainage network structure' above Yuwatari is similar to that above Tsunekanebashi. The estimated discharges at both above Yuwatari and Isonokawa were larger than the corresponding observations. This is because the slope is gentler in these basins than in the basin above Tsunekanebashi, and thickness of the soil layer in the hydrological model, constructed and optimized in the basin above Tsunekanebashi, is not suitable which tends to overestimate the discharges at Yuwatari and Isonokawa.

In conclusion, the classification of the basins using topographic characteristics made clear that the phase of hydrograph was affected by 'drainage network structure' which was one of the horizontal topographic characteristics. Also, it was clarified that the peak discharge was influenced by 'landform vertical interval' which was one of the vertical topographic characteristics. It is confirmed that the hydrological model optimized in a basin is transferable to basins other than those whose topographic characteristics are most similar.