

Influence of topography on annual maximum heavy rainfalls over upper catchments in Hokkaido

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Heavy rain was caused by Typhoon 7th, 11th, 9th, and 10th which attacked and approached Hokkaido, northern island in Japan, during two weeks in August 2016. Tokachi river basin located in the east of Hidaka Mountains and is one of the areas where floods occurred due to embankment failure caused by heavy rain due to Typhoon 10th. A record-breaking rainfall in excess of 500 mm, which is equivalent to half of annual precipitation, occurred in the high elevation areas of mountains. Nguyen-Le and Yamada (2017) shows the heavy rainfall due to Typhoon 10th was intensified by the topography of Hidaka Mountains. The topographical heavy rain may cause huge damage, but it is said that it has regionality because it is heavy rain which is caused by the topography which is invariant condition. It is possible to extract areas susceptible to topographical heavy rainfall and lead to the improvement of flood control plans etc. tailored to the area.

We investigated annual maximum rainfall events in each year, using radar AMeDAS analysis rainfall (2006~2016) over Tokachi river basin. In order to classify topographic heavy rainfall that is not clearly defined as other heavy rainfall, we use the Froude Number (Fr) defined by Hughes et al. (2009). It is said that, as the value of Fr is larger, it is more likely that topographic heavy rainfall occurs.

As a result of setting the threshold value of Fr and classifying heavy rain according to whether it is above or below the threshold, in cases where Fr is above the threshold, rainfall is concentrated in the area of high elevation. It became clear that the relationship between the rainfall intensity and the elevation appears strongly. In addition, it was found that the threshold value of Fr in Tokachi river basin, which is the analysis target, is 1 as appropriate.