

Hybrid downscaling using high-resolution RCM information and rainfall-runoff-inundation model simulations

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The statistical downscaling is calculated with lighter computational costs for various patterns of climate states in future which are needed to estimate uncertainty of regional climate change. However, the estimation accuracy is low in areas of poor observations. On the other hand, dynamical downscaling with high-resolution regional climate model (RCM) use huge computational costs, whereas climatological features are well reproduced even in areas of poor observations. A statistical downscaling method as a hybrid-downscaling making use of the advantage of super high-resolution dynamical downscaling is proposed in previous JPGU annual meeting. In addition, the reproducibility of intense precipitation was improved by introducing a new precipitation correction method applying PDF for hourly precipitation. Downscaling results of climate change projections had been used for simulations of rainfall-runoff-inundation (RRI) model with the target area of Kinu and Kokai river basins, Kanto, Japan. The regional climate projection showed almost 6 % increase of precipitation in the river basins. In a simulation, the yearly maximum of daily precipitation was predicted to increase about 15 %, which is almost the same as the increase rate of yearly maximum of river discharge, 12 %. On the other hand, the increase rate of yearly maximum of peak water level was estimated to be only 1 %. In Japan, several high-risk water levels are configured at observation points. The frequencies of moderate high-risk water levels were projected to significantly increase. On the other hand, the changes in the frequencies of severe high-risk water levels were projected to be small. The small increase rate was due to structure of cross sections of the river and the dam control model. The inundation areas and depths were also calculated. The increase rate of the inundation area was estimated to be about 35 %. The risk of large inundation is regarded to increase in the future climate.

Keywords: Downscaling, Regional climate model, rainfall-runoff-inundation model