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An application of super ensemble simulation with appropriate bias correction for river planning in Japan

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In this study, a methodology that uses super ensemble simulation with appropriate bias correction for river planning was proposed. The Database for Policy Decision-Making for Future Climate Change (d4PDF) is a super ensemble experiments that comprise over 1000-year output have been conducted. The d4PDF provides regional downscaling simulation that focuses around Japan. It is expected that the impact assessments of climate changes on various fields considering uncertainly are conducted.

The impact of climate change on floods is a serious issue. In Japan, all class A river has design rainfall for the river planning that is defined considering historical observations of precipitation that happens once in several hundred years, which the planning year is different depending on the situation of a river. The design rainfall provides the fundamental information for planning river management. The Ministry of Land, Infrastructure, Transportation and Tourism defines the value of the rainfall in the planning year in each class A river basin by considering the hydro-meteorological and social characteristics of each basin. As the design rainfall was defined in the mid-1900s for most of the rivers, the method to estimate precipitation in the planning year was conducted with limited observation data using extreme statistical value. The super ensemble simulation data is expected to contribute for the decision making with appropriate setting of design rainfall.

We proposed a method to correct the bias of super ensemble simulation and estimated the design rainfall in 47 river basins selected from class A river basins. The estimated design rainfall was compared between the one estimated with super ensemble simulation and the one estimated with conventional approach. The spread of results oriented from super ensemble simulation indicated that uncertainly of design rainfall estimated with conventional approach was so high that the consideration of uncertainty is necessary for river planning. The experiments indicated that the use of super ensemble simulation with appropriate bias correction could provide knowledge that aids us in understanding the hydrological extremes.