C06

The Impact of Climate Change on Water Resources in the Kiso River Basin Using 1km Resolution Data

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In Japan, the extreme events (e.g. 2018 western Japan heavy downpours) have been causing substantial economic loss and threatening lives. It is essential to predict and adapt to future changes of hydrological process and water resources under the impact of climate change. This impact is regional dependence because of the spatial variability of climate change [1]. In this study, the impact of climate change on water resources in the Kiso River basin, Japan were analyzed. The objective is to predict the future changes in streamflow, extremes and water resources. The findings will be used for climate countermeasures analysis to mitigate disaster risk.

The Kiso River basin, comprises three rivers, the Nagara River through Gifu and Mie Prefectures, the Ibi River through Gifu and Mie Prefectures, and the Kiso River through the prefectures of Nagano, Gifu, Aichi, and Mie. The total area is 9059 km^2. Four GCM outputs with low and high emissions scenarios (RCP2.6 and RCP8.5) were selected. They are GFDL-CM3, HadGEM2-ES, MIROC5 and MRI-CGCM3. The spatiotemporal resolution is 1km and daily. The changes from present (1981-2000) to near future (2031-2050) and future (2081-2100) were assessed. The observed data (1981-2000) used for bias correction is from AmeDAS. Linear scaling method was used to correct the bias in precipitation and temperature by matching the observed monthly mean values with the ones of corrected values.

The model used in this study is SiBUC-RRI-ROM, comprising five modules: land surface hydrology, irrigation, rice growth, reservoir operation, and streamflow [2, 3].

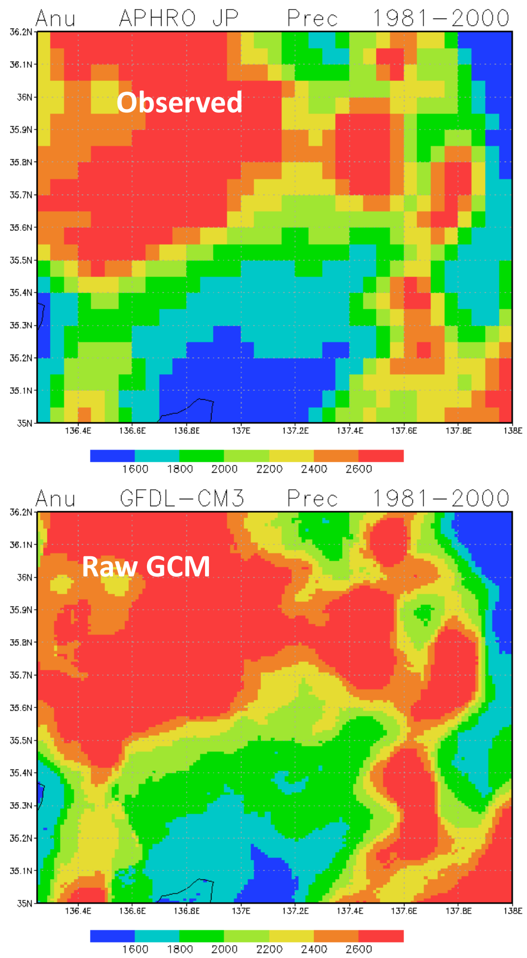
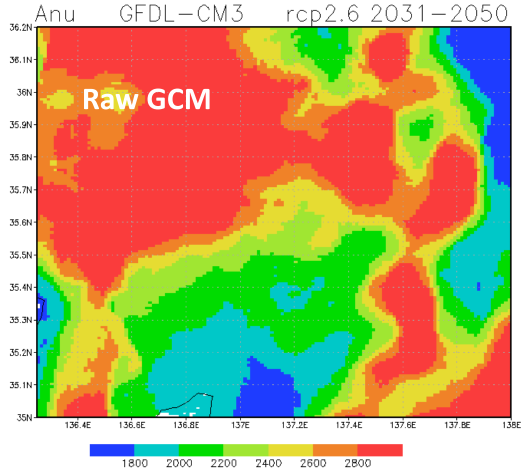


Figure 1 Comparison of observed and GCM annual mean precipitation from 1981 to 2000



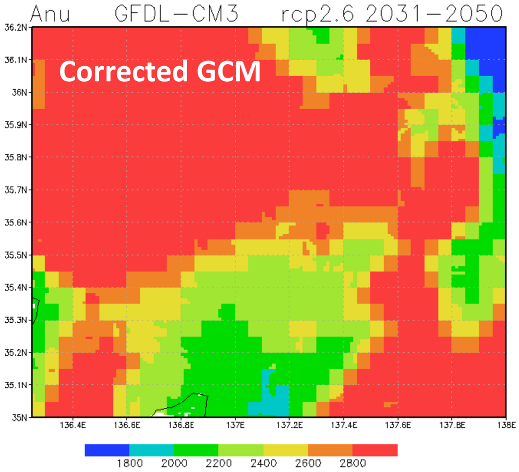


Figure 2 comparison of bias corrected and uncorrected GCM annual mean precipitation in near future

Taking GFDL-CM3 as an example, Figure.1 shows the observed and GCM present annual precipitation from 1981 to 2000. The corrected precipitation compared with uncorrected precipitation are shown in Figure 2. After bias corrected, the bias in GCM precipitation are effectively eliminated. Next step is to estimate the impact of climate change using bias corrected GCM output.

Acknowledge

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Reference

[1] Hu, M., Sayama, T., Duan, W., Takara, K., He, B., and Luo, P. Assessment of hydrological extremes in the Kamo River Basin, Japan. Hydrological Sciences Journal, 62(8), 1255-1265, 2017. doi: 10.1080/02626667.2017.1319063

[2] Tanaka K. Development of the New Land Surface Scheme SiBUC Commonly Applicable to Basin Water Management and Numerical Weather Prediction Model. Doctoral Dissertation, Graduate School of Engineering, Kyoto University, 2004.

[3] Sayama, T., Ozawa, G., Kawakami, T., Nabesaka, S., and Fukami, K. Rainfall–runoff–inundation analysis of the 2010 Pakistan flood in the Kabul River basin. Hydrological Sciences Journal, 57(2), 298-312, 2012.

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