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統計的ダウンスケーリングによる四国域の将来降水予測
Assessment of future precipitation change in Shikoku region using statistical downscaling

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The objective of this study was to downscale large-scale atmospheric variables from GCM outputs to produce climate variables at a regional- and local-scale using statistical downscaling methods and investigate the impact of future climate change scenarios on hydrological and agriculture. Statistical downscaling methods were evaluated to simulate local-scale mean and extreme precipitation indices such as number of days greater than 10 mm/day (R10), maximum total precipitation accumulated over 5-days (R5d), max dry-spell length (MaDSL) and max wet-spell length (MaWSL) in the Shikoku region of Japan. We obtained the following conclusions.

1. The performance of downscaling methods is compared for both the calibration period (1961-1990) and the validation period (1991-2000). The overall R2 and SE of each month during the calibration period have clear seasonal variation, and that the simulation results were better in the winter than in the summer. In modeling the monthly precipitation, the annual mean R2 values are over 0.20. The overall trend was revealed successfully and SDSM was adaptable in Shikoku region. In validation periods, the simulation results by NCEP, HadCM3 are largely underestimated MDP in autumn, and almost overestimate it in winter. However, it demonstrates that the validate model reproduces the monthly and annual MDP values well.

2. For tadotsu, matsuyama, shimizu, murotomisaki, tsurugisan and tokushima, the representation less than 10 mm/day in the distribution will increase, and for rainfall maxima are also more decreased in the future. In contrast, the distribution at takamatsu, uwajima, sukumo and kochi shows the opposite trend. The summer and annual MDP in future compared to present precipitation would be consistently negative across models for stations of northern Shikoku, but were positively for kochi and sukumo. In addition, for most locations, absolute annual change MDP values in precipitation across HadCM3 were larger than that of CGCM3.

3. The future change of annual R10 would increase in southern and western part of Shikoku and decrease in northern Shikoku. The future change of annual R5d would decrease under H3A2 and H3B2 in north-eastern Shikoku. MaDSL would increase in the northern Shikoku and MaWSL would decrease in north-eastern Shikoku. It found that the future change of extreme precipitation indices provide a potential to cause an increase in the drought events across the north-eastern Shikoku, especially A2 and A1B scenario. On the other hand, it is suggested that future precipitation indices change is increasing the risk of flood in kochi. The regional difference of extreme precipitation indices cannot be markedly seen in the B2 scenario compared to the other scenarios. These results would provide important scientific base and practical information for agricultural, hydrological field and water resources management in this region.

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