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Regional Flood Frequency Analysis for Ungauged Watersheds According to RCP Scenarios

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Various climate change scenarios expect the rainfall in South Korea to increase by 3-10% in the future. The increase in precipitation is directly related to the stability of existing and newly installed hydro-structures. It is necessary to estimate the appropriate design flood for the future life time of hydro-structure. In this study, we developed a regional frequency analysis for ungauged watershed to investigate the flood risk according to RCP scenarios. To develop a regional frequency analysis, we selected 12 mid-sized watersheds in South Korea. Using the observed streamflow and rainfall data, we estimated design floods using flood-frequency analysis (FFA) and design rainfall-runoff analysis (DRRA). After investigating the differences between design floods from the FFA and DRRA, we developed a regional flood frequency analysis for ungauged watersheds through adjusting the flood quantiles by the DRRA using natural flow data as an index flood. The regional flood frequency analysis was applied to estimate future design floods using synthesized natural flows according to RCP scenarios for 113 mid-sized watersheds in South Korea. The estimated future flood risks based on the design floods were 0.193 and 0.068 according to the RCP 8.5 and RCP 4.5, respectively. Since the flood risk was identified to increase in the future comparing with the present, comprehensive flood mitigation measures are needed to cope with extreme floods in the future.

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