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Potential increase of flood hazards in Korea due to global warming from a high-resolution regional climate simulation

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Because of the importance of the changes in the hydrologic cycle, accurate assessment of precipitation characteristics is essential to understand the impact of climate change due to global warming. This study investigates the changes in extreme precipitation with sub-daily and daily temporal scales. For a fine-scale climate change projection focusing on the Korean peninsula (20 km), we performed the dynamical downscaling of the global climate scenario covering the period 1971-2000 (130-year) simulated by the Max-Planck-Institute global climate model, ECHAM5, using the latest version of the International Centre for Theoretical Physics (ICTP) regional climate model, RegCM3. While annual mean precipitation exhibits a pronounced interannual and interdecadal variability, with the increasing or decreasing trend repeated during a certain period, extreme precipitation with sub-daily and daily temporal scales estimated from the generalized extreme value distribution shows consistently increasing pattern. The return period of extreme precipitation is significantly reduced despite the decreased annual mean precipitation at the end of 21st century. The decreased relatively weak precipitation is responsible for the decreased total precipitation, so that the decreased total precipitation does not necessarily mean less heavy precipitation. Climate change projection based on the ECHAM5-RegCM3 model chain clearly shows the effect of global warming in increasing the intensity and frequency of extreme precipitation, even without significantly increased total precipitation, which implies an increased risk for flood hazards.

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