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Future Changes in Heat Stress over East Asia Resulting from Different Target Temperature Increases

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In assessing the impact of global warming, it is very important to understand the change in comprehensive heat stress as a function of several variables, rather than only temperature. Furthermore, in order to assess and implement the target temperature goals of the 2015 Paris Agreement, it is essential to have effective and scientifically valid information to predict and measure regional impact. In this study, the future changes in summer heat stress over East Asia were examined based on the Wet-Bulb Globe Temperature (WBGT) using CMIP5 multimodel simulations (historical and RCP scenario simulations), and differences in heat stress changes were assessed between 1.5-degree and 2-degree warmer worlds. Future boreal summer heat stress of land regions over East Asia, in excess of the 50-year return value, shows a rapid and nonlinear increase from the 2000s, and it is expected that severe heat stress will occur in the overall East Asia region by the 2040s. In particular, extreme heat stress events were found to occur much more frequently than summer mean intensity of heat stress. Comparisons of the increase in heat stress between 1.5-degree and 2-degree warmer worlds indicated a 20% decrease in the area experiencing severe heat stress over East Asia, and relatively large benefits (i.e. less frequent and less severe heat stress) were found in the southeastern China, the Korean Peninsula and Japan compared to other regions. Further, the equilibrium scenarios showed a larger increase in heat stress over East Asia than the transient scenarios, particularly in case of the 1.5-degree warmer world, which was found due to warmer water in the northwestern North Pacific in the equilibrium scenarios.