Projected future changes in tropical cyclone genesis and its seed frequencies by using HighResMIP multi model ensemble simulation

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Projection of the frequency of tropical cyclone genesis due to global warming, even in signs of change, depends on the literatures. Here we systematically examine the projected changes in tropical cyclone using six global atmospheric models with middle and high horizontal resolutions participating in the sixth phase of Coupled Model Intercomparison Project / High Resolution Model Intercomparison Project (Haarsma et al., 2016). Simulated tropical cyclones were detected by an objective tracking algorithm, TempestExtremes (Ullrich and Zarzycki, 2017; Zarzycki and Ullrich, 2017). Here we simply regard a candidate of tropical cyclone in the algorithm as a tropical cyclone seed, which is a low-pressure system with a closed isobar. Changes in the frequency of tropical cyclone genesis could be broken down into the contributions from tropical cyclone seed, and survival rate, a rate of frequency of tropical cyclone genesis to that of tropical cyclone seed. The multi model ensemble mean indicates that the frequencies of the tropical cyclone genesis are significantly decreased during the period of 1950-2049, and it is attributable to the changes in the tropical cyclone seed. Analysis of individual model shows that, although most models project more or less decreasing trend of the frequencies of the tropical cyclone genesis and seed, the survival rate also contributes to the result in some models. This study suggests a usefulness of the decomposition into the frequency of the tropical cyclone seed and the survival rate to understand the cause of the uncertainty in the projected frequency of the tropical cyclone genesis.

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