Geophysical Research Abstracts
Vol. 17, EGU2015-8101-3, 2015
EGU General Assembly 2015

Projection of Heat Waves over China under Different Global Warming Targets

Xiaojun Guo, Yong Luo, Jianbin Huang, and Zongci Zhao
Center for Earth System Science, Tsinghua University, Beijing 100084, China (guoxj13@mails.tsinghua.edu.cn)

Global warming targets, which are determined in terms of global mean temperature increases relative to pre-industrial temperature levels, have been one of the heated issues recently. And the climate change (especially climate extremes) and its impacts under different targets have been paid extensive concerns. In this study, evaluation and projection of heat waves in China were carried out by five CMIP5 global climate models (GCMs) with a $0.5^\circ \times 0.5^\circ$ horizontal resolution which were derived from EU WATCH project. A new daily observed gridded dataset CN05.1 ($0.5^\circ \times 0.5^\circ$) was also used to evaluate the GCMs. And four indices (heat waves frequency, longest heat waves duration, heat waves days and high temperature days) were adopted to analyze the heat waves. Compared with the observations, the five GCMs and its Multi-Model Ensemble (MME) have a remarkable capacity of reproducing the spatial and temporal characteristic of heat waves. The time correlation coefficients between MME and the observation results can all reach 0.05 significant levels. Based on the projection data of five GCMs, both the median year of crossing 1.5°C, 2°C, 2.5°, 3°C, 3.5°C, 4°C, 4.5°C and 5°C global warming targets and the corresponding climate change over China were analyzed under RCP 4.5 and RCP 8.5 scenarios, respectively. The results show that when the global mean surface air temperature rise to different targets with respect to the pre-industrial times (1861-1880), the frequency and intensity of heat waves will increase dramatically. To take the high emission scenario RCP8.5 as an example, under the RCP8.5 scenario, the warming rate over China is stronger than that over the globe, the temperature rise(median year) over China projected by MME are 1.77°C(2025), 2.63°C(2039), 3.39°C(2050), 3.97°C(2060), 4.82°C(2070), 5.47°C(2079) and 6.2°C(2089) under 1.5°C, 2°C, 2.5°C, 3°C, 3.5°C, 4°C and 4.5°C global warming targets, respectively. With the increase of the global warming targets, the difference between global and China's temperature rise increases gradually. The linear trends of regional mean heat waves number, longest heat waves duration, heat waves days and high temperature days over China are 0.9 times/°C,3 days/°C,10 days/°C and 8.3 days/°C with the enhancement of global warming targets. It is noteworthy that the increase rates of heat waves indices are expected to increase initially , decrease sharply afterwards and slightly increase finally as the global mean temperature increases rise from 2°C to 5°C. Moreover, the areas with severe heat waves occurring display a vast expansion correspondingly. For example, the percentage of area with annual longest heat waves duration longer than 12 days will increase from 3.2% under a 2°C target to about 54.92% under a 5°C target. The percentage of area with annual heat waves days more than 40 days will increase from 0.09% under a 2°C target to about 49.89% under a 5°C target. Furthermore, the uncertainties in the projections of heat waves in China under different targets are analyzed. And the causes (global warming and the atmospheric circulation) of the heat waves are also explored.