EGU2020-5192
https://doi.org/10.5194/egusphere-egu2020-5192
EGU General Assembly 2020

Hotspots of Extreme Heat under Global Warming

Laura Suarez-Gutierrez, Wolfgang A. Müller, Chao Li, and Jochem Marotzke
Max Planck Institute für Meteorologie, The Ocean in the Earth System, Hamburg, Germany (laura.suarez@mpimet.mpg.de)

We evaluate how hotspots of different types of the most extreme summer heat change under global warming increase of up to 4°C, to determine the level of global warming that allows us to avert the risk of these hotspots considering the irreducible range of possibilities defined by well-sampled internal variability. We use large samples of low-probability extremes simulated by the 100-member Max Planck Institute Grand Ensemble (MPI-GE) for five metrics of extreme heat: maximum reachable temperatures, return periods of extreme temperatures, maximum temperature variability, sustained tropical nights, and wet bulb temperatures. At 2°C of warming, MPI-GE projects maximum summer temperatures below 50°C over most of the world. Beyond 2°C, this threshold is overshot in all continents, with projected temperatures above 60°C in hotspots such as the Arabic Peninsula. Extreme 1-in-100-years pre-industrial temperatures occur every 10-25 years already at 1.5°C of warming. At 4°C, these 1-in-100-years extremes are projected to occur every one to two years over most of the world. The range of maximum temperature variability increases by 10-50% at 2°C of warming, and by 50-100% at 4°C. Beyond 2°C, heat stress is aggravated substantially over non-adapted areas by sustained tropical night and hot and humid conditions that occur rarely in a pre-industrial climate. At 4°C of warming, tropical night hotspots spread polewards globally, and prevail for at least 95% of the summer months; whilst extreme monthly mean wet bulb temperatures beyond 26°C spread over large tropical as well as mid-latitude regions.