Geophysical Research Abstracts
Vol. 20, EGU2018-6849, 2018
EGU General Assembly 2018

Internal variability in European summer temperatures at 1.5ºC and 2ºC of global warming

Laura Suarez-Gutierrez (1,2), Chao Li (2), Wolfgang A. Müller (2), and Jochem Marotzke (2)

(1) International Max Planck Research School on Earth System Modelling (IMPRS), Hamburg, Germany (laura.suarez@mpimet.mpg.de), (2) Max Planck Institute für Meteorologie, Hamburg, Germany

We use the 100-member Grand Ensemble with the climate model MPI-ESM to evaluate the controllability of mean and extreme European summer temperatures with the global mean temperature targets in the Paris Agreement. On average, we find that European summer temperatures at 2ºC of global warming are around 1ºC higher than at 1.5ºC of global warming with respect to pre-industrial levels. In a 2ºC warmer world, one out of every two European summers would be warmer than ever observed in our current climate. We also calculate the return levels of daily maximum temperature anomalies for extreme events with return periods of up to 500 years, which reach values of almost 5.5ºC at 2ºC of global warming and around 4ºC at 1.5ºC of global warming. The largest differences in return levels for shorter return periods of 20 years are over southern Europe, where we find the highest mean temperature increase. For events with return periods of over 100 years, these differences are in contrast largest over central Europe, where we find the largest changes in temperature variability. However, we also find that, due to the large effect of internal variability, only four out of every ten summers in a 2ºC warmer world could be distinguishable from those in a 1.5ºC world. Furthermore, only 5% of the most extreme summer maximum temperatures in a 2ºC world could be avoided by limiting global warming to 1.5ºC.