Geophysical Research Abstracts
Vol. 21, EGU2019-12552, 2019
EGU General Assembly 2019

Projections of global urban warming under climate change

Lei Zhao

Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, United States (leizhao@illinois.edu)

Many serious climate threats are compounded in built areas by the unique urban microclimates. Because the majority of the world's population is projected to live in cities, there is a pressing need to understand how urban microclimates will change with climate change. It is recognized that the ensemble approach of multi-model projections is, by far, the best method to project future climates. However, multi-model projections of future urban microclimates are absent because most of the state-of-the-art Earth system models (ESMs) do not have urban representation. The NCAR's Community Earth System Model (CESM) is the only exception that has a sufficiently physics-based urban land parameterization in CMIP5 ESMs and that has been widely validated against ground and remote sensing observations. Here, we develop a novel method that combines process-based simulations and reduced-order modeling to provide multi-model projections of global urban microclimates under climate change. We utilize simulations from CESM to build a reduced-order emulator, which can be applied to other ESMs in CMIP5 to generate urban-specific projections under RCP scenarios. K-fold cross validation and inter-realization validation demonstrate the credibility and the robustness of the emulator. Results illustrate how the current ESMs project future urban microclimates under climate change.