Geophysical Research Abstracts
Vol. 20, EGU2018-739, 2018
EGU General Assembly 2018

Observed urban-rural differences in relationships between convective rainfall extremes and temperature in tropical Southeast Asia

Yafei Li (1,2), Stephen Blenkinsop (1), and Hayley Fowler (1)

(1) School of Engineering, Newcastle University, Newcastle upon Tyne, United Kingdom (y.li138@newcastle.ac.uk), (2) State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, Beijing, China (yafei.li@mail.bnu.edu.cn)

Intense convective rainfall can have significant impacts on society. Observations and model simulations in many places have confirmed an increase in the intensity of convective rainfall extremes with temperature at a rate of ∼7% per K, which is in agreement with the Clausius-Clapeyron (CC) scaling relation. However, a super-CC scaling or even a negative scaling is often observed under different conditions in terms of temperature range or moisture availability. Due to the urban heat island effect, urban areas may be significantly warmer than their surrounding rural areas. The extra heat provided from urban areas may lead to a greater upward motion which results in more convective rainfall and enhanced urban-rural moisture transitions. Thus, we hypothesize that convective rainfall extremes may increase with warming at different rates due to the urban heat island effect between urban and rural areas and that this can be reflected by the degree of consistency between CC scaling and the observed precipitation–temperature scaling relations. A newly compiled observed sub-daily precipitation dataset is used in this study to examine the scaling relationships of major urban areas and their surrounding rural areas in tropical Southeast Asia where most precipitation appears to be convective. To take the directly measured atmospheric humidity into consideration, we use dew point temperature instead of mean daily temperature. The observed scaling relationships between convective rainfall extremes and dew point temperatures are presented at both daily and hourly timescales, and can be used to assess the performance of convection-permitting models in simulating convective extremes and the associated urban-rural transitions.