

論文 / 著書情報
Article / Book Information

Title	Inter-comparison of present and future urban climates of three cities considering multiple CMIP6 scenarios and urbanization
Authors	Xiao Jin, Alvin Christopher Galang Varquez, Ngoc Khanh Do, Ihara Tomohiko, Itsubo Norihiro, Manabu Kanda, Atsushi Inagaki
Citation	12th International Conference on Urban Climate
Pub. date	2025, 7
Creative Commons	See next page.

License



Creative Commons : **CC BY**



ICUC12-709

12th International Conference on Urban Climate
© Author(s) 2025. This work is distributed under
the Creative Commons Attribution 4.0 License.



Inter-comparison of present and future urban climates of three cities considering multiple CMIP6 scenarios and urbanization

Xiao Jin¹, Alvin C.G. Varquez², Ngoc Khanh Do³, Ihara Tomohiko⁴, Itsubo Norihiro⁵, Manabu kanda⁶, and Atsushi Inagaki⁷

¹Institute of Science Tokyo, Tokyo, Japan (jin.x.ac@m.titech.ac.jp)

²Institute of Science Tokyo, Tokyo, Japan (varquez.a.aa@m.titech.ac.jp)

³Shibaura Institute of Technology, Tokyo, Japan (hanhdn@shibaura-it.ac.jp)

⁴The University of Tokyo, Tokyo, Japan (ihara-t@k.u-tokyo.ac.jp)

⁵Waseda University, Tokyo, Japan (itsubo-n@waseda.jp)

⁶Institute of Science Tokyo, Tokyo, Japan (kanda.m.aa@m.titech.ac.jp)

⁷Institute of Science Tokyo, Tokyo, Japan (inagaki.a.ab@m.titech.ac.jp)

Rising climate risks in urban areas, driven by global warming and rapid urbanization, pose significant challenges to thermal comfort and urban sustainability. Global warming and urbanization effects on megacities remain uncertain. While considering urbanization in the form of spatial changes in urban parameters and anthropogenic heating (AH), this study models the present and future climate of Tokyo, Cairo, and Jakarta in 2050 under three CMIP6-based Shared Socioeconomic Pathways (SSP126, SSP245, and SSP370) at 1.5-km spatial resolution. To incorporate both global warming and detailed urban distributions, we used the pseudo-global warming (PGW) method and the WRF model 4.6, which explicitly considers the spatial distribution of urban parameters and AH in the single-layer urban canopy modeling framework. Extending our focus beyond temperature changes to thermal comfort, we further estimated the UTCI from the empirical UTCI-Fiala model. Results show global warming has a greater overall impact on air temperature and UTCI increases compared to future urbanization and AH change, with the effect intensifying from SSP126 to SSP245 to SSP370 and UTCI rising more sharply. However, urbanization and AH changes introduce significant spatial variability in temperature and UTCI changes within each city, with some locations having similar scale of increases as background climate. Global warming scenarios evidently influence the temperature increases from present to future across all cities, with monthly variations driven by seasonal differences. Additionally, the influence of urbanization on temperature and UTCI varies across seasons and cities. The mechanisms behind them are further examined by inspecting other modeled meteorological variables, such as climate-change influence on background winds and precipitation. From feature importance analysis, we find that while the overall urbanization effect on temperature and UTCI change remains consistent across scenarios, variations arise due to differing influences of urbanization on other factors, such as mean radiation temperature, wind speed, and relative humidity.