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Modeling Urban Climate in East China with CLM5 coupling Local Climate Zone Schemes

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The urban expansion-induced heat can exacerbate heat stress for urban dwellers, especially during heat waves. The urban parameterization within the Community Land Model version 5 (CLM5) was modified incorporating the local climate zones (LCZs) framework, named CLM5-LCZs, to simulate the urban climate of cities in eastern China. The results exhibited that daytime and nighttime canopy urban heat island intensity (CUHII) were highest in the Compact Low Rise (LCZ3) and the Compact High Rise (LCZ1) areas respectively, while surface urban heat island intensity (SUHII) peaked in the Large Low Rise (LCZ8) and the Compact High Rise (LCZ1) areas during daytime and nighttime respectively. Urban dwellers were easier exposed to serious heat environment in LCZ3 and LCZ1 areas over the north subtropical climate zone. Contrasts of CUHII and SUHII among different urban classes could exceed 1.7 °C and 5.4°C. The intra-urban heterogeneity may alter the dominant factors controlling SUHII, which were also modulated by local climate and HW intensity. Unlike other controlling factors, the impact of local climate on the contribution from the urban-rural contrast of convection efficiency was larger than urban features. Overall, CLM5-LCZs displayed potential of implementing detailed simulations for inter- and intra-city UHIs at a larger scale, and enhancing the capabilities in modelling urban climate and exploring the causes and controls of UHIs.