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Urbanizing GFDL's global climate model

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The ongoing urbanization over the world has drawn great attention from scientists, engineers, urban planners and the public at large. Yet, how urban areas modify regional and global climate and how urban areas respond to climate change on decadal time scale (potentially in a different way than surrounding rural areas) remain critical area of research. To answer such questions, a high-resolution global climate model with simple but realistic urban representation is strongly needed. In this study, efforts toward urbanizing the Geophysical Fluid Dynamics Laboratory (GFDL) land model LM3 are described.

First, previous lessons learned from analysis with a new urban canopy model in the Weather Research and Forecasting (WRF) framework for urban heat island studies are discussed. The in-canyon vegetation representation is shown to be extremely critical for modulating the urban heat island effect. Second, challenges associated with resolving sub-grid urban features and processes in a global climate model are highlighted. Simulations with the climate model, including the sub-grid urban parameterization, are compared to those with the WRF model, which resolve urban features explicitly at 1km.