

Sensitivity of a GSLA Urban Canopy Model to Mesh Resolution

The increasing urbanization of the greater Salt Lake City area (GSLA) has contributed to the development of an urban canopy over the GSLA. This canopy refers to the effects of building profiles, varying land surface properties and anthropogenic heating on local meteorological conditions including temperature, humidity, and wind velocity. Urban Canopy Models (UCM) can be used to model these changes on a mesoscale without needing to develop models accounting for effects of individual buildings. UCM models can range in their complexity. Single-layer UCMs, which represent urban areas by including estimations of street canyons, roofs, and roads are commonly used due to their combination of simplicity and accuracy. Typically, meteorological models have computational grid resolutions of several kilometers. However, characteristics of urban areas can change drastically over relatively short distances. As a result, it is desirable to run simulations with urban resolutions of a few hundred meters. To avoid excess computation time, nesting is employed with grids of differing resolutions. Nesting is the practice of using increasingly refined computational grids over a geographic region. This study uses the Weather Research and Forecasting (WRF) model, which can be configured to include a single-layer UCM to model the GSLA and to predict local meteorological conditions. Simulations are run and compared that are identical except for the inclusion of a single-layer UCM to directly evaluate the inclusion of a UCM. This study also examines the effects of varying the nesting parameters on the predicted meteorological conditions with and without a UCM. Results of these simulations are compared to each other and to ground measurements from locations within the GSLA and atmospheric measurements taken at the Salt Lake City Airport.

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