NCAR | RESEARCH APPLICATIONS LABORATORY

RAL SEMINAR SERIES

Building resolving capabilities in urban microscale simulations

A perspective on geometry modeling approaches and their impact on atmospheric street-scale predictions

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Tuesday, December 5, 2023
1:00 PM - 2:00 PM (MT)
HYBRID MEETING FL2-1001 | https://operations.ucar.edu/live-ral

Microscale simulations with resolved buildings provide insights into the effects of building geometries on urban flow prediction, a key component in addressing contemporary urban challenges such as pedestrian wind comfort, urban heat island effects, dispersion modeling, and urban air mobility. In these simulations, building geometries, generated from geospatial data, involve critical modeling decisions. Building models can range from simple blocks to detailed representations of reality, thanks to recent advancements in 3D city modeling. However, reconstructing these detailed models is more labor and computationally intensive, and it requires high-quality input data. This raises some questions: While we expect more detailed building models to yield better results, is the difference substantial enough to justify the additional effort? How does grid resolution relate to these modeling approaches? How do these varying building modeling approaches impact different the resulting atmospheric quantities of relevance to urban applications? This seminar provides an update on the ongoing cooperative work between the 3D Geoinformation Group at Delft University of Technology and the Research Applications Laboratory (RAL) at NCAR. This collaboration is tackling the challenges in state-of-the-art microscale simulations with respect to 3D city modeling. The seminar focuses on the current investigation and quantification of the effect of different building modeling approaches and resolutions on local wind speed and turbulence within the urban environment using RAL's GPU-accelerated FastEddy® LES model coupled to WRF. To conduct this investigation, we use the case study of a passing cold front in Dallas downtown.