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### Introduction

In this study, sensitivity experiments are conducted to estimate the first-order effects of urban land use and anthropogenic gas/aerosol emissions on regional meteorological phenomena, particularly precipitation and lightning, using the NASA Unified Weather Research and Forecasting (NU-WRF) model as a fully coupled regional chemical transport model (WRF-Chem). The hindcast and sensitivity simulations focus on the Houston metropolitan area in the second half of August 2022, during the Intensive Operational Period (IOP) of the Tracking Aerosol Convection interactions ExpeRiment (TRACER) field campaign. The simulated cloud condensation nuclei (CCN) concentrations are compared to observations at the TRACER main site in Houston, and the simulated accumulated precipitation amounts are compared to the Quantitative Precipitation Multi-Sensor (MRMS) Multi-Radar Estimation (QPE) product.

# **Experiment Design**

	Aerosols	Land Surface Pr
Present	All	All
<b>Pre-Industrial</b>	No Anthropogenic	No Urba
Aerosol-only	All	No Urba
Urban-only	No Anthropogenic	All

## Software Development

NASA Unified WRF model customized for the urban-effect study



# Modeling Study of the Effects of Urbanization on Deep Convection, Precipitation, and Lightning around the Houston Metropolitan Area

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