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Comprehensive isoprene and terpene chemistry is necessary for accurately simulating surface ozone in the Southeastern United States in CAM-Chem

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Ozone is a greenhouse gas and air pollutant that is harmful to human health and plants. During the summer in the Southeastern U.S., many models are biased high for surface ozone compared to observations. Past studies have suggested different solutions including the need for updates to model representation of clouds, chemistry, ozone deposition, and emissions of nitrogen oxides (NOx) or biogenic hydrocarbons. There are particularly large emissions of biogenic hydrocarbons like isoprene and terpenes in the Southeastern U.S., so more comprehensive and updated isoprene and terpene chemistry was added into CESM/CAM-Chem (Community Earth System Model/Community Atmosphere Model with chemistry) to evaluate the impact of improved chemistry on simulated ozone. The model results were compared with data collected during the Studies of Emissions Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys (SEAC4RS) field campaign and US EPA CASTNET monitoring stations. The chemistry updates reduced the surface ozone model bias in the daily maximum 8-hr average (MD8A) by up to 7 ppb. In the past, terpene oxidation in particular has been ignored or heavily reduced in chemical schemes used in many regional and global models, and this study demonstrates comprehensive isoprene and terpene chemistry is needed to reduce surface ozone model biases. Sensitivity tests were performed in order to evaluate the impact of lingering uncertainties in isoprene and terpene oxidation on ozone. Results suggest that even though isoprene emissions are higher than terpene emissions in the Southeastern U.S., because isoprene oxidation is better understood, remaining uncertainties in isoprene and terpene oxidation have similar impacts on ozone. Additionally, this project identifies the need for further constraint on aerosol uptake of isoprene and terpene derived organic nitrates in order to reduce uncertainty in simulated ozone. A more explicit treatment of secondary organic aerosol formation in models used to understand air quality may be necessary for accurately simulating both aerosols and ozone.

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Refreshments 3:15 p.m
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