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Impacts of organic nitrates on the NO_x budget: Insights from aircraft observations and chemical transport modeling

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Formation of organic alkyl nitrates ($RONO_2$) during oxidation of volatile organic compounds (VOC) significantly impacts the atmospheric distribution and lifetime of nitrogen oxide radicals (NO_x), key precursors for tropospheric ozone production. $RONO_2$ formed from biogenic VOC precursors tend to have short atmospheric lifetimes against deposition and aerosol uptake, and can therefore serve as an important sink for NO_x, particularly in regions where NO_x emissions are already low. Meanwhile, short-chain $RONO_2$ derived from anthropogenic VOCs (e.g., methane, ethane, and propane) have lifetimes of weeks to months and are therefore potentially important reservoir species that could serve to export NO_x from major source regions to the NO_x-limited remote troposphere. However, the chemistry, budgets, and NO_x impacts of both anthropogenic- and biogenic-derived $RONO_2$ remain uncertain. In this talk, I will describe implementation of a new $RONO_2$ chemical scheme in the GEOS-Chem global chemical transport model and its evaluation against a range of recent and historic aircraft campaigns across the world. I will use the new simulation combined with newly available measurements to identify the precursors responsible for observed $RONO_2$. Finally, I will use the model to quantify the impacts of $RONO_2$ formation (and resultant NO_x removal, export, and/or release) on the NO_x budget in diverse environments.

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Refreshments 3:15 p.m.
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