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NESL's Atmospheric Chemistry Division Seminar

Rethinking organic aerosol formation and removal in chemistry-climate models

Alma Hodzic
NCAR - ACD

Abstract

Organic aerosols are observed worldwide to be the dominant constituents of submicron aerosols, and yet our understanding of their atmospheric lifecycle is still in its infancy. As a result, current models fail to describe the observed amounts and properties of chemically formed secondary organic aerosols (SOA), leaving large uncertainties on the effects of SOA on climate, visibility, and human health. I use the state-of-the-science mechanistic model GECKO-A (Generator of Explicit Chemistry and Kinetics of Organics in the Atmosphere) to simulate SOA gas-phase chemistry in various environments (e.g. urban, forest, idealized), developing new process-level insights into SOA formation, growth and removal that are then introduced as new constraints into chemistry-climate models. The results show that GECKO-A predicts significant SOA mass growth in both urban and forest plumes, and formation of less volatile and more soluble organic products, compared to parameterizations currently used in 3D models. Atmospheric ageing of gas-phase oxidation intermediates, which are poorly represented in 3D models, is shown to control SOA formation and lifetime. The effects of dry deposition and organic photo-fragmentation reactions on condensable organic vapors and SOA during atmospheric ageing are being explored. The findings from the mechanistic model lead to a conceptual revision of SOA lifecycles by suggesting a more dynamic formation as well as faster removal. These new insights are applied at regional and global scales to re-evaluate SOA concentrations, burden and lifetimes.

Wednesday, March 18th

10:15 a.m. - Refreshments

10:30 a.m. – Seminar

FL2-1022, Large Auditorium

(Please note day)