

ATS/CIRA Colloquium

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**Chemical Heterogeneity in Wildfire Plumes:
Implications for Large-scale Air Quality Models and
Satellite Retrievals**

Wildfires affect weather and climate, with major impacts on air quality and human health. With the record high heat and extreme drought conditions in the western United States, the future outlook for wildfires is grim. Despite decades of research, wildfires are still challenging to represent in modern air quality forecast models. One fundamental reason is that the spatial resolution at which air quality models are operated (mostly a few to tens of km) is much coarser than the spatial extent of wildfires. As a result, several key processes in wildfires cannot be explicitly resolved, such as plume rise, chemical evolution and moisture processes in the early stage. Methods available to parameterize these processes remain highly uncertain and largely affect the modeled plume transport and the impacts on air quality downwind. In this presentation, I seek to address some of these questions faced by large scale air quality models. An idealized Large Eddy Simulation (LES) model, coupled with simple yet representative chemistry, is used to study the turbulence-chemistry interactions in fresh wildfire plumes. I will focus on the following aspects: (1) the chemical heterogeneity in fresh wildfire plumes; (2) the impacts of model resolution on chemical regime; (3) plume rise parameterization in large-scale models. I will then discuss the implications for future air quality forecast systems and satellite retrievals.

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