2.023 Biomass burning smoke predictions across scales: from regional forecasts using near-real-time emission constraints to city scale simulation and inversion of a fire plume.

Early Career Scientist

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Abstract:

Smoke from biomass burning is a global scale pollutant generating deep impacts to our society and planet. Thus, advancements in our ability to model and forecast this phenomena is crucial to further our understanding of the impacts. In this presentation we will show new developments and findings on multi-scale smoke simulations. First, we will present a novel system to operationally forecast smoke that includes near-real-time emission constraints based on aerosol optical depth (AOD) observations from ground-based and satellite data. We will show the performance of such system on the smoke forecasts from Central Africa, smoke transport over the Southeast Atlantic and smoke impact on the persistent stratocumulus deck in preparation for and during the NASA ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) field experiment. Second, we will present results of full-chemistry simulations at 2km resolution for a case study over Chile, where smoke from a wildfire heavily affected the air quality in the city of Santiago for about a week. The impacts from the fire were observed with multiple measurements, including an air quality network, ground-based Lidar, an AERONET site and 1km resolution satellite-based AOD retrievals (MAIAC algorithm), which can enable the evaluation of the model's ability to represent smoke loads and spatial (vertical and horizontal) distributions. We further apply a variational

inversion technique to better constrain the fire emissions with these observations, never done before at this scale. The results provide key information to understand the underlying biases and how to improve them. Finally, preliminary findings from the KORUS-AQ (Korea-US Air Quality study) field experiment with respect to fires from agricultural burning in China and wildfires in southern Siberia will be briefly presented.