2.080 Estimating Biomass Burning Smoke Plume Injection Height using CALIOP, MODIS, and the NASA Langley Trajectory Model.

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Abstract:

Biomass burning has the potential to alter numerous land and atmospheric processes, which has strong implications for air quality and feedbacks to the climate system. If plume injection height is incorrect, transport models of those emissions will likewise be incorrect, adversely affecting our ability to analyze and predict climate feedbacks (i.e. black carbon snow/ice, patterns of precipitation, cloud-radiation relationships) and provide timely public health warnings (air quality forecast).

Historically, plume height was based on the pioneering work of G.A. Briggs [1969; 1971] and verified with limited field campaigns. However, presently, there are two instruments that are capable of determining plume injection height, Cloud-Aerosol LIdar with Orthogonal Polarization (CALIOP) and Multi-angle Imaging SpectroRadiometer (MISR).

In this presentation, we will demonstrate a novel method that has been developed to estimate biomass burning plume injection height using CALIOP aerosol data, Moderate Resolution Imaging Spectroradiometer (MODIS) Thermal Anomaly data, and the NASA Langley Trajectory Model (LaTM). CALIOP aerosol data are used to initialize aerosol-filled air parcels in the LaTM, which is then run backwards until there is a coincidence between MODIS fire detections and smoke parcels. Specific examples will include smoke transport from North America to the Greenland Ice Sheet and the Tripod fire (July-August 2006), one of the largest fires in the lower 48 in recent U.S. history.

Together, CALIOP and MISR can produce the statistical knowledge necessary to improve our understanding of the dynamics of fire plume injection height, thus improving our ability to forecast poor air quality and to accurately define smoke feedbacks with the climate system.