AGU PUBLICATIONS

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Supporting Information for

Agricultural Fires in the Southeastern US during SEAC[4]RS: Emissions of Trace Gases and Particles and Evolution of Ozone, Reactive Nitrogen, and Organic Aerosol

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Introduction

The supporting information contains five figures including: (S1) NASA DC-8 camera frames showing two agricultural fires; (S2) time series of species in fire plumes measured by two types of transects; (S3) the evolution of ΔBC/ΔCO in 6 aged fire plumes; (S4) Simulated CO evolution along cross section; (S5) closure analysis of b_{ap} at 365 nm for agricultural fire plumes; (S6) the evolution of ΔOA/ΔCO in 7 aged fire plumes; and (S7) additional sensitivity test results of ΔPAN/ΔCO vs. smoke age.

Figure S1. NASA DC-8 camera frames of two agricultural fires sampled: (a) Fire 1 at 18:57:18 UTC on 6 September 2013, taken by front camera and (b) Fire 3 at 23:38:51 UTC on 9 September 2013, taken by nadir camera.

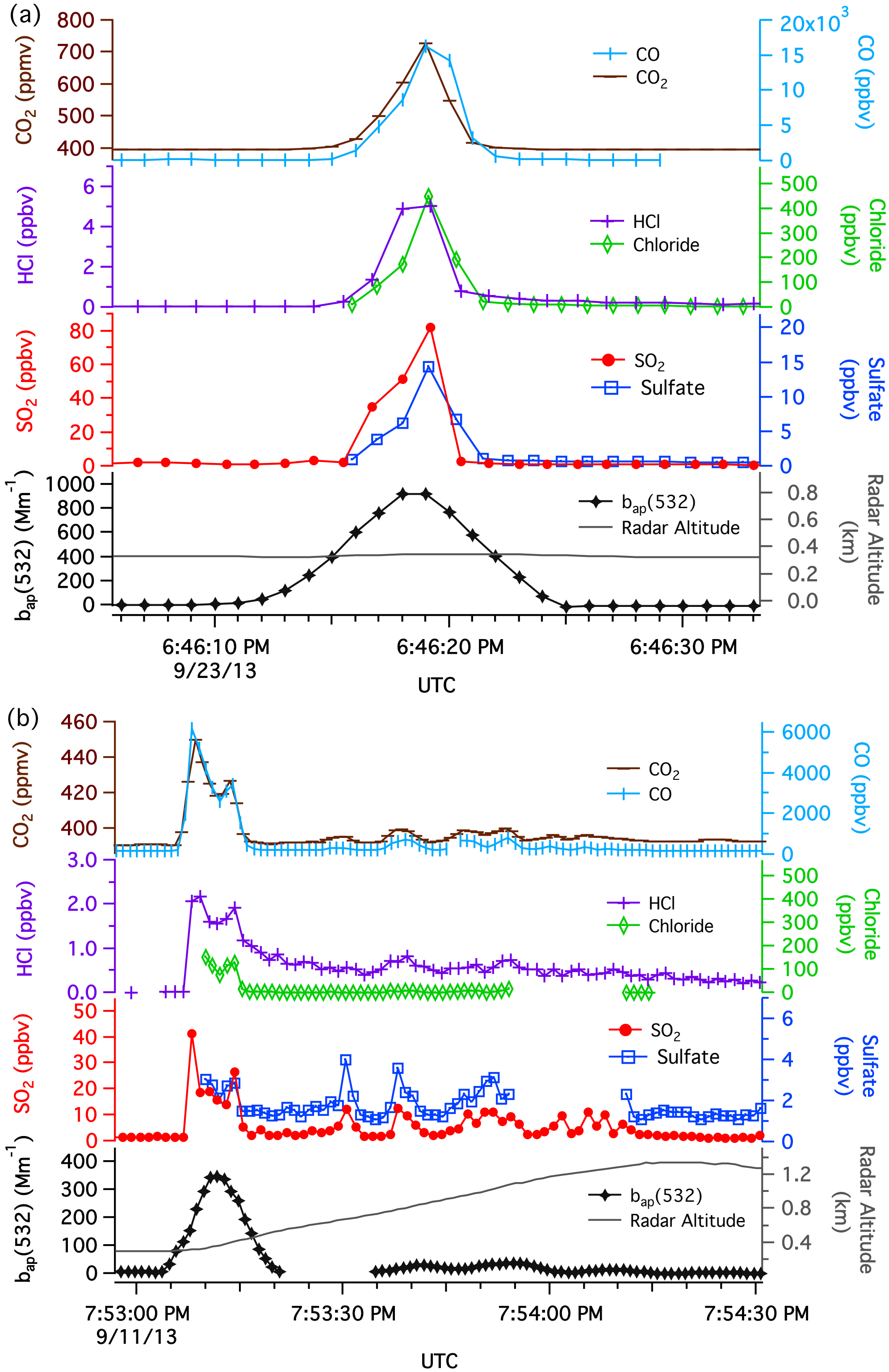

Figure S2. Time series of CO, CO_2, HCl, chloride, SO_2, sulfate, particle light absorption coefficient at 532 nm, and radar altitude for two typical transects: (a) cross-plume transect of Fire 12 on 23 September 2013 and (b) source to downwind transect of Fire 4 on 11 September 2013.

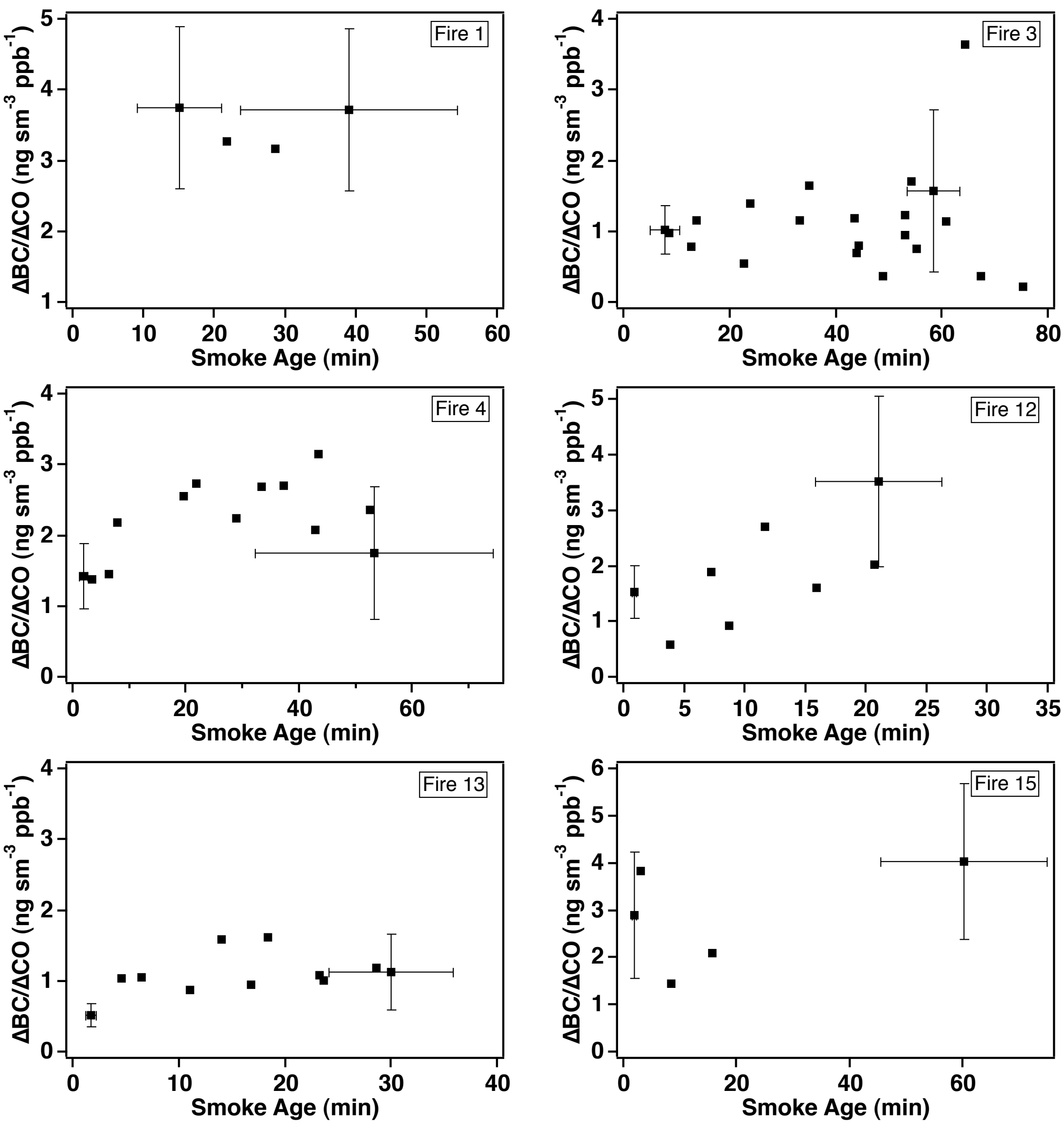

Figure S3. Changes of ΔBC/ΔCO in 6 aged plumes (not available for Fire 14). Vertical error bars are a result of measurement uncertainties. Only error bars of one fresh and one aged measurement are shown as examples for each fire. Horizontal error bars represent the 1σ uncertainty in the estimated age based on the variability of wind direction and wind speed.

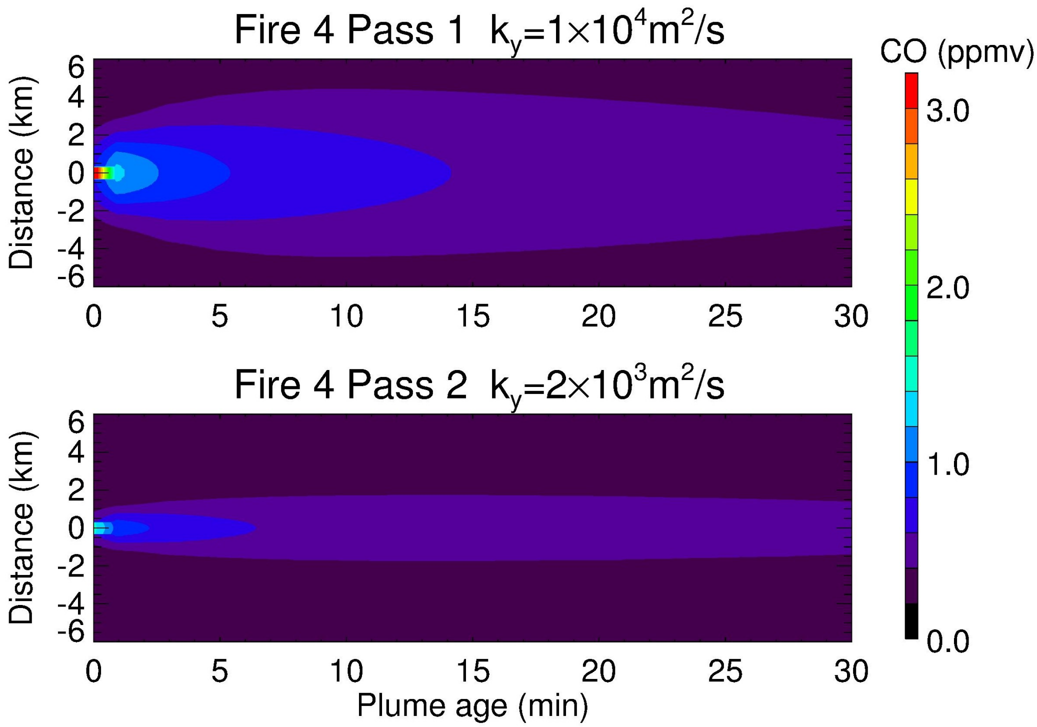

Figure S4. Evolution of simulated CO mixing ratio along the cross section of the two plumes from Fire 4.

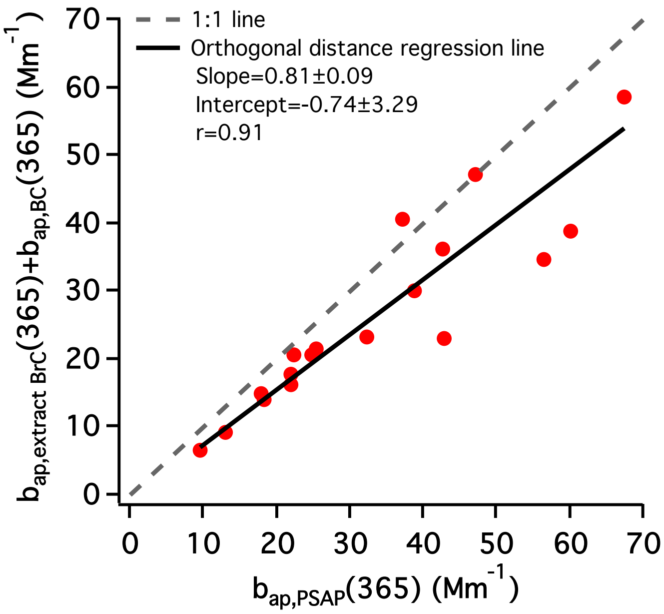

Figure S5. Closure analysis of b_{ap} at 365 nm for agricultural fire plumes via scatter plot of the sum of BrC absorption determined from liquid extracts plus estimated BC absorption based on PSAP measurements and an AAE_{BC} of 1 versus total aerosol absorption based on PSAP data. Orthogonal distance regression fit result and the 1:1 line are shown. Measurement uncertainties of the various absorption coefficients are estimated to be ~19%-45%.

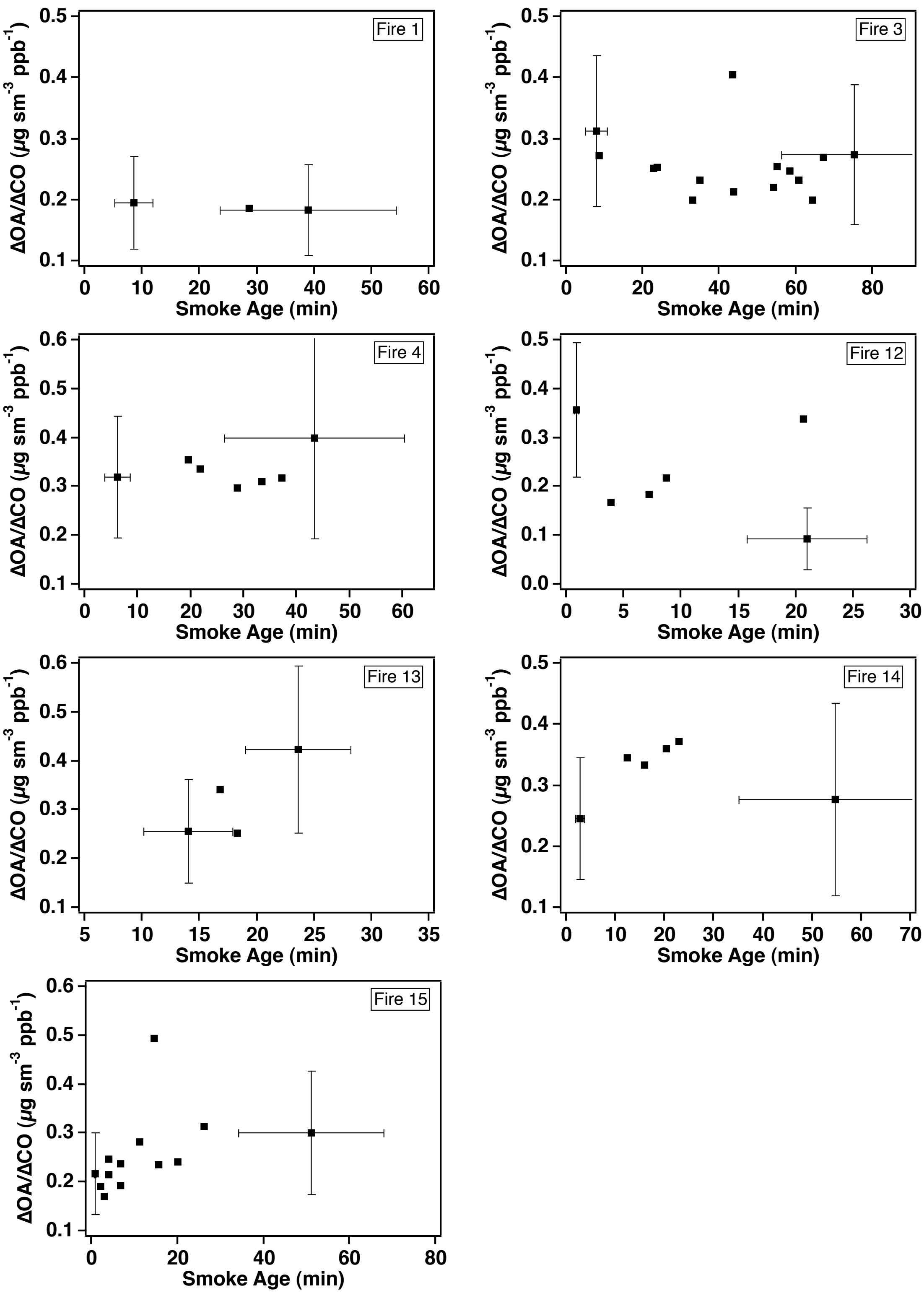

Figure S6. Changes of ΔOA/ΔCO in the 7 aged plumes. Vertical error bars are a result of measurement uncertainties. Only error bars of one fresh and one aged measurement are shown as examples for each fire. Horizontal error bars represent the 1σ uncertainty in the estimated age based on the variability of wind direction and wind speed.

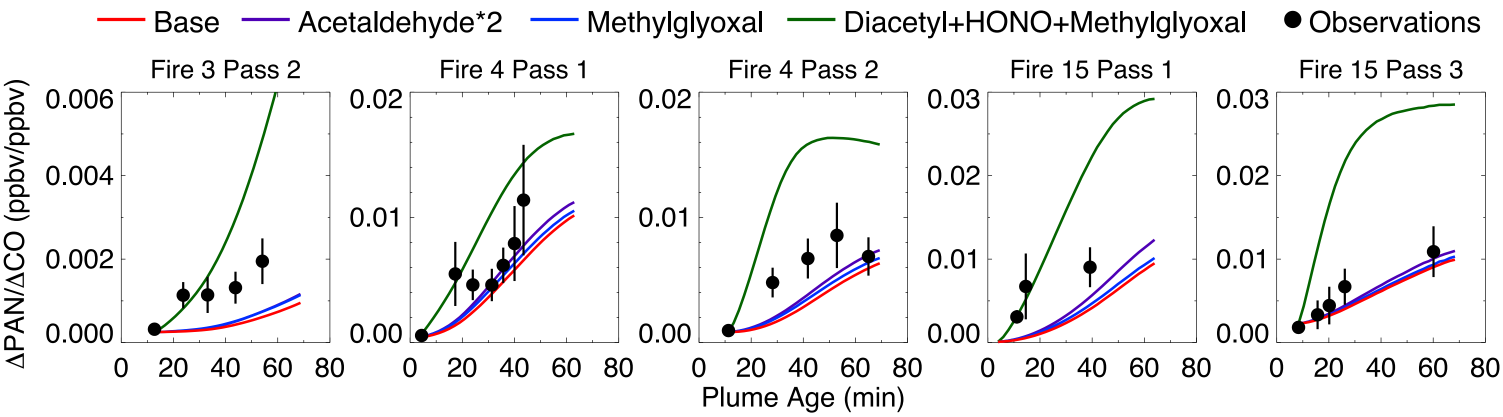

Figure S7. Additional sensitivity test results of ΔPAN/ΔCO vs. smoke age for the 5 selected cases. Circles are the measured enhancement ratios, with the vertical error bars showing the uncertainty in the measurement. The uncertainty in the estimated age is not shown but is same as in Figure 9. The red, purple, blue, and green lines are the results of the base model, the base model with doubled acetaldehyde input, the base model with estimated methylglyoxal using EF(methylglyoxal) by [*Stockwell et al.*, 2015], and the base model with estimated diacetyl, HONO, and methylglyoxal using EFs by [*Stockwell et al.*, 2015],

Reference

Stockwell, C. E., P. R. Veres, J. Williams, and R. J. Yokelson (2015), Characterization of biomass burning emissions from cooking fires, peat, crop residue, and other fuels with high-resolution proton-transfer-reaction time-of-flight mass spectrometry, *Atmos. Chem. Phys.*, *15*(2), 845-865, doi: 10.5194/acp-15-845-2015.