Geophysical Research Letters

Supporting Information for

High Temporal Resolution Satellite Observations of Fire Radiative Power Reveal Link Between Fire Behavior and Aerosol and Gas Emissions

Elizabeth B. Wiggins[1,2], Amber J. Soja[2,3], Emily Gargulinski[3], Hannah S. Halliday[4], R. Bradley Pierce[5], Christopher C. Schmidt[5], John B. Nowak[2], Joshua P. DiGangi[2], Glenn S. Diskin[2], Joseph M. Katich[6,8], Anne Perring[7], Joshua P. Schwarz[8], Bruce E. Anderson[2], Gao Chen[2], Ewan C. Crosbie[2,9], Carolyn Jordan[2,3], Claire E. Robinson[2,9], Kevin J. Sanchez[1,2],Taylor J. Shingler[2], Michael Shook[2], Kenneth L. Thornhill[2,9], Edward L. Winstead[2,9], Luke D. Ziemba[2], and Richard H. Moore[2]

[1]NASA Postdoctoral Program, Universities Space Research Association, Columbia, MD

[2]NASA Langley Research Center, Hampton, VA

[3]National Institute of Aerospace, Hampton, VA

[4]Environmental Protection Agency, Research Triangle, NC

[5]Space Science and Engineering Center, University of Wisconsin Madison, Madison, WI

[6]CIRES, UC Boulder, Boulder, CO

[7]Colgate University, Department of Chemistry, Hamilton, NY

[8]NOAA Chemical Sciences Laboratory, Boulder, CO

[9]Science Systems and Applications, Inc., Hampton, VA

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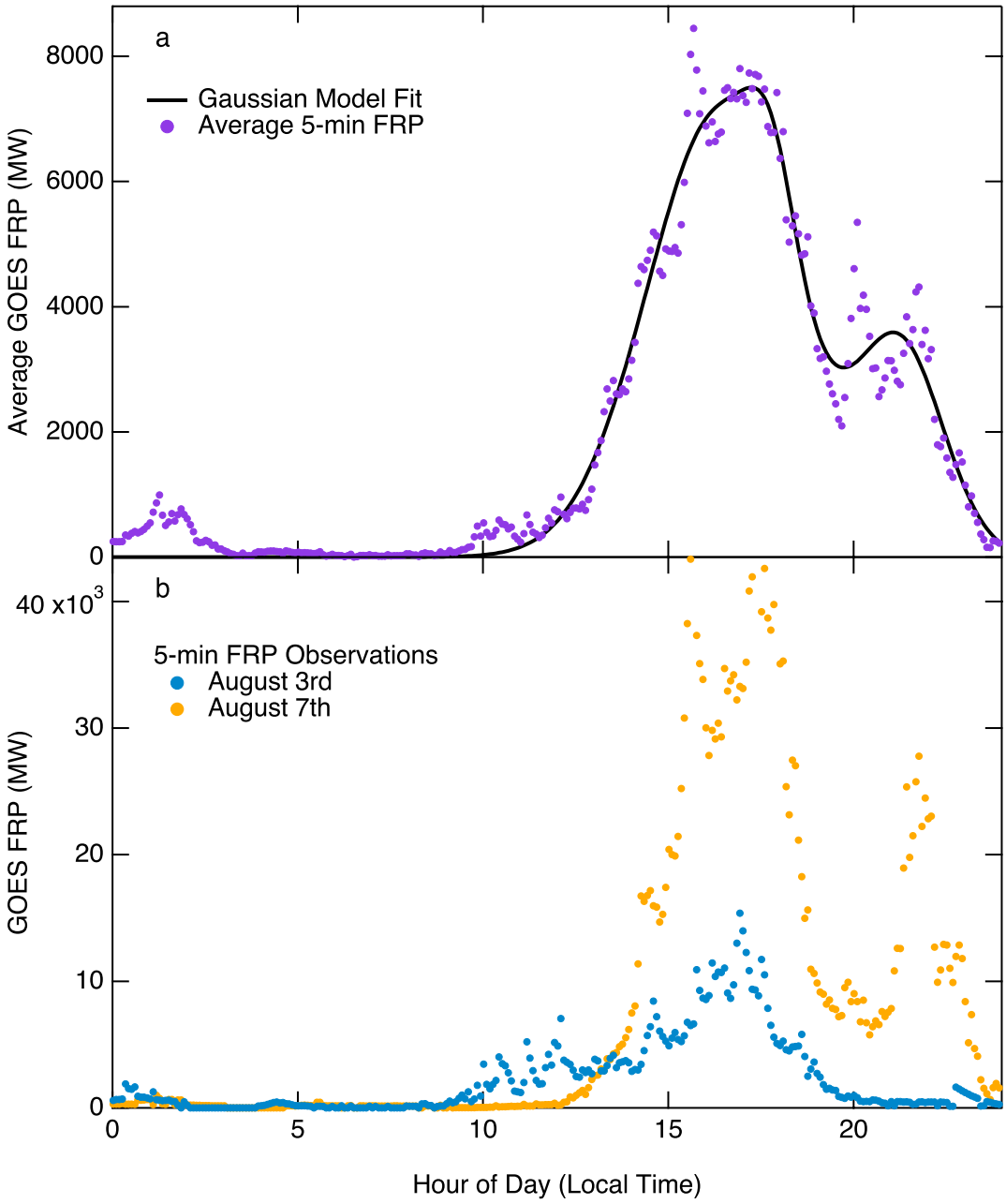

Figure S1. Panel a shows a time series in local time of the average GOES FRP diurnal cycle for Williams Flats fire over the entire lifetime of the fire. Average 5-min FRP is shown as purple circles. The FRP reflects the sum of all detections within a 5-min interval. The bimodal Gaussian model fit to the lifetime average 5-min FRP is shown as a black line. Panel b shows 5-min FRP for all observations on August 3rd (blue) and August 7th (gold). The Gaussian model fit shown in panel a is used to inform the interpolation of the daily 5-min FRP shown in panel b.

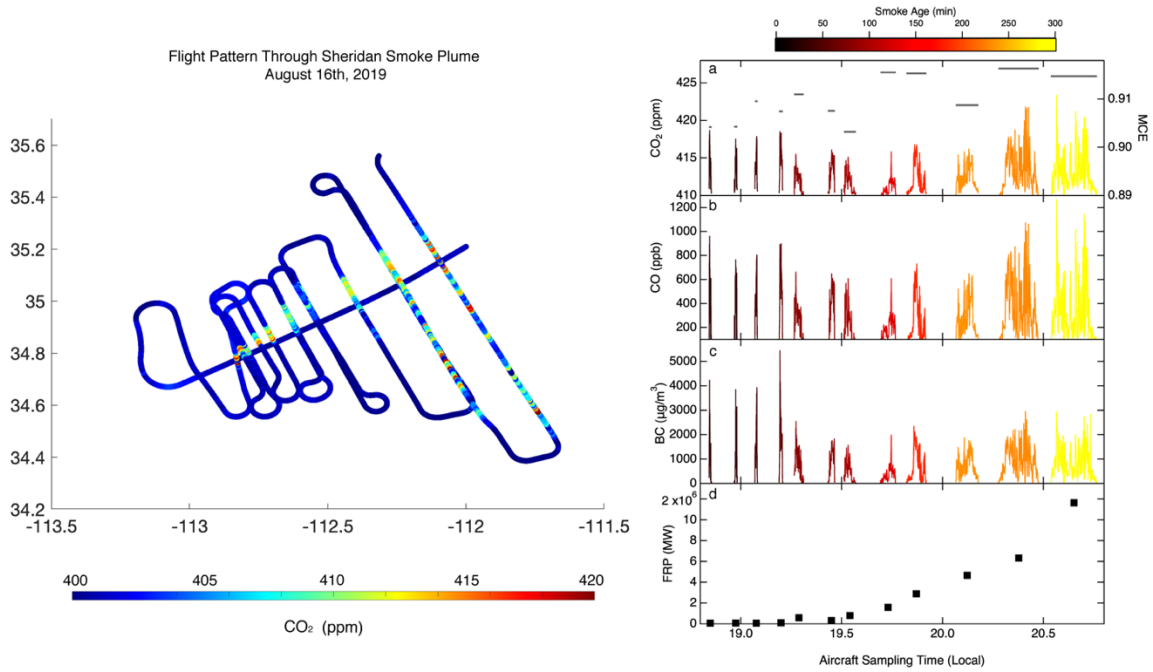

Figure S2. Left panel shows a map of the DC-8 flight track on August 16th, 2019 for the first set of orthogonal transects through the Sheridan smoke plume. Colors correspond to the CO_2 mixing ratios from DC-8 measurements. Example of positive rate of change in observations and corresponding FRP for Sheridan fire. Time series of CO_2, CO, and BC observations from the DC-8 (panels a-c) highlighted by average smoke age. Panel d shows the sum of GOES FRP integrated over the same time interval represented by the smoke plume transects and aligned in time with the observations.

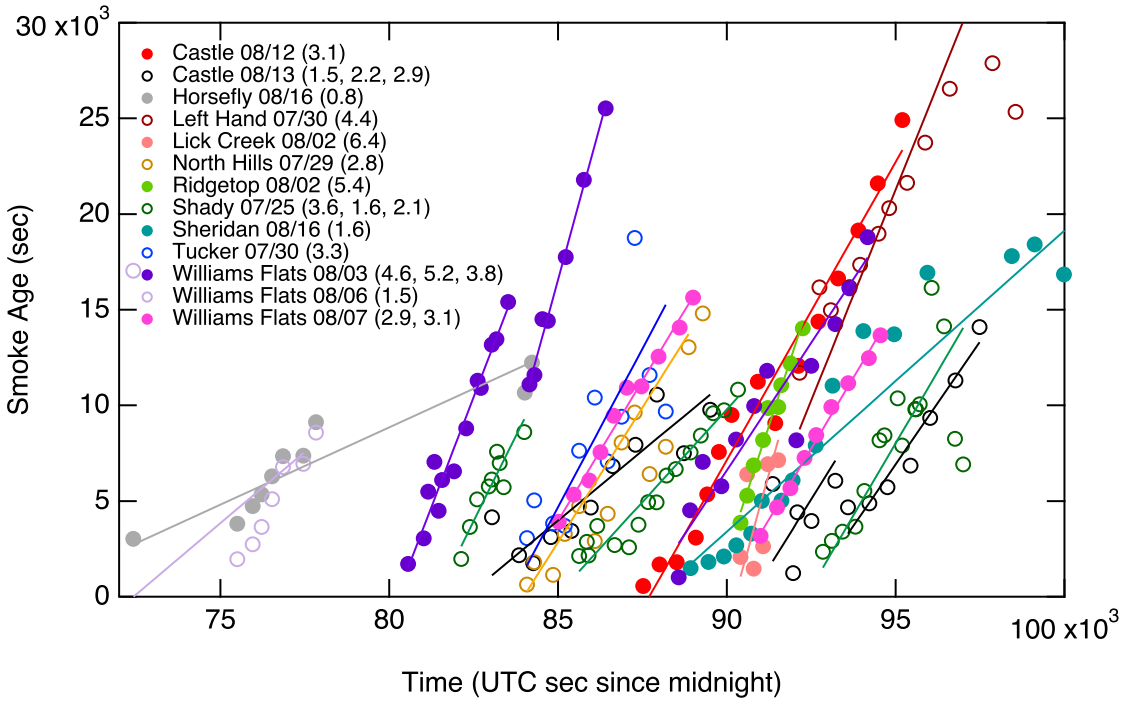

Figure S3. Relationship between time of sampling and smoke age. The linear fit is shown as solid lines and individual transects are shown as dots. Colors represent fires sampled on a given day. The slope of the linear fit for each fire is given in the legend following the fire name and sampling data in parenthesis. For days when the fire was sampled with more than one set of orthogonal transects going down the plume, the slope is given for all sets of transects sequentially.

	Grass / Shrublands			Forests / Woodlands				Mixed		
	Tucker	Castle	Sheridan	Shady	Left Hand	Lick Creek	Horsefly	North Hills	Ridgetop	Williams Flats
r (1)	0.91	0.97	0.95	0.89	0.91	0.86	0.76	0.76	0.84	0.95
r (2)	0.95	0.99	0.96	0.93	0.94	0.89	0.88	0.88	0.93	0.98
a_1 (MW)	1623	117	917	372	158.5	242	256	617	947	3560
t_1 (hr)	15.41	14.85	16.27	16.71	15.53	14.30	14.29	14.97	17.59	16.87
σ_1 (hr)	0.60	0.66	0.51	1.83	2.35	0.62	1.08	0.93	4.39	2.85
a_2 (MW)	1074	60	1320	242	108	114	300	637	391	1611
t_2 (hr)	17.98	16.54	17.07	19.87	18.75	15.66	17.04	20.05	18.45	21.896
σ_2 (hr)	1.68	2.041	2.34	1.01	5.39	0.54	0.94	2.57	0.60	1.692

Table S1: Fires classified into categories based on dominant landcover type of burned area. Pearson's correlation coefficient between the model fit and observation driven diurnal FRP cycle for single mode Gaussian distribution (r(1)) and bimodal Gaussian distribution (r(2)). Gaussian model fit parameters for the first mode (a_1), time of the first mode (t_1), and standard deviation of first mode (σ_1) are shown in the upper portion of the table. The bottom portion shows the Gaussian model fit parameters for the second mode, time, and standard deviation (a_2, t_2, σ_2).