Table S1. Details of relevant field campaigns of aging biomass burning measurements. (Citations are provided in the main supporting information document.)

Campaign[a]; Citation(s)[b]	Fire size(s); Fire type(s)	Age(s) of measurement; Measurement location	Atmospheric conditions	Background aerosol concentration	Net OA; Net extinction; Net CCN[c]
ARCTAS A, B, C; Cubison et al. (2011), Hecobian et al., (2011)	Not in text; North American wildfires	Up to ~24 hours (Hecobian), up to ~5 hours (Cubison); Aircraft	Not in text	Not in text	Some plumes showed OA loss (Hecobian), many showed no significant change (Hecobian, Cubison); Not included in analysis; Not included in analysis
BBOP; Collier et al. (2016), Zhou et al. (2017)	Not in text; Western U.S. wildfires	8-11 hours (Zhou), 6-45 hours (Collier); Aircraft	Not in text	Not in text	No significant net OA change (both studies); Not included in analysis; Not included in analysis
BORTAS; Jolleys et al. (2015), Sakamoto et al. (2015)	Not in text; North American boreal forest fires	1-5 days (Jolleys), 1-2 days (Sakamoto); Aircraft	Not in text	Not in text	Net OA loss (Jolleys), no significant change (Sakamoto); Not included in analysis; Not included in analysis
DODO and DABEX; Capes 2008	A large number of fires "tens of meters in diameter"; West African agricultural burns	Up to 48 hours; Aircraft	Not in text	Not in text	No significant net OA change; Not included in analysis; Not included in analysis[d]
MILAGRO; Yokelson et al. (2009)	Each fire assumed to be 1 km^2; Yucatan peninsula agricultural burns and forest fires (17 fires)	Up to 1.5 hours; Aircraft	Average wind of 2.6 m s^{-1}, in-plume [OH] > 10^7 molec cm^{-3}	Not in text	Increase in $PM_{2.5}$, attributed to SOA production; Increase in SSA[e]; Not included in analysisd
SAFARI 2000; Abel et al. (2003),	10 km^2; Controlled burn	Not specified (Abel), 1-3 days	"Sunny"[f], in-plume	Not in text	Net OA increase (Formenti), net OA loss (Hobbs);

Formenti et al. (2003), Hobbs et al. (2003)	in South Africa (grassland)	(Formenti), up to ~40 minutes (Hobbs); Aircraft	[OH] ~1.7×10^{7} molec cm^{-3} (Hobbs)		Increase in SSA (Abel)
SAMBBA; Brito et al. (2014)	Not in text; Fires within the southwestern Brazilian Amazon rainforest	Not specified; Ground level	Transition between dry to wet season	Not in text	No significant change in OA; Not included in analysis; Not included in analysis
SCREAM; May et al. (2015)	0.3 km^2 and 1.47 km^2[g]; Prescribed agricultural fires in South Carolina (U.S.)	~2 hours (1.47 km^2 fire), ~5 hours (0.3 km^2 fire); Aircraft	Not in text	Not in text	No significant change in OA for 1.47 km^2 fire (~2 hours old), net OA loss for 0.3 km^2 fire (~5 hours old); Not included in analysis; Not included in analysis
SEAC4RS; Forrister et al. (2015), Liu et al. (2016)	Not in text (Forrister), 0.16 km^2-1.27 km^2 (Liu); 2 "large" U.S. wildfires (Forrister), 7 U.S. agricultural fires (Liu)[h]	Up to 3 hours (Forrister), up to 1.2 hours (Liu); Aircraft	Not in text	Not in text	Decrease during first 2 hours and then no net OA change (Forrister), possible net increase in OA for 4 fires and no significant net change for 4 fires (Liu); Not included in analysis Not included in analysis
Interstudy comparison between ACTIVE, DABEX, ITOP, and MILAGRO; Jolleys et al. (2012)	Not in text; northern Australia (ACTIVE), western Africa wildfires (DABEX), boreal forest fires around the Azores (ITOP), Altzomoni (MILAGRO)	Up to days (all campaigns); Aircraft (ACTIVE, DABEX, ITOP), ground level (MILAGRO)	Not in text	Not in text	Small net OA loss; Not included in analysis; Not included in analysis
Akagi et al. (2012)	0.81 km^2; prescribed chaparral burn in	2.4-4.5 hours; Aircraft	Winds between 0.5-2.2 m s^{-1},	Not in text	Net loss of OA (evaporation dominant in first 2 hours, SOA formation observed

	California (U.S.)		"sunny", 292-297 K, in-plume [OH] ~5.27×10^{6} molec cm^{-3}		after that); Increase in scattering efficiency[i]; Not included in analysis
Eagan et al. (1974)	0.04 km^{2},[j]; 2 forest fires in Olympic Peninsula (U.S.)	Not given; Aircraft	Not in text	Not in text	Not included in analysis; Not included in analysis; Increase in CCN up to 40 km downwind[k]
Nance et al. (1993)	>~40 km^{2}; Alaskan wildfire A121 (U.S.)	2 "aged" measurements 15 and 20 km downwind; Aircraft	Not in text	36 µg m^{-3}	No significant change in $PM_{3.5}$; Not included in analysis; Not included in analysis
Radke et al. (1995)	390 km^{2} total[l]; Oregon forest fire (U.S.)	Up to 50 hrs; Aircraft	"Low" wind speeds	Not in text	Gain in observed volume concentrations of nucleation, accumulation, and coarse modes in first 10 hours and loss after that; Increase in the optical scattering coefficient in first 10 hours and loss after that; Not included in analysis
Reid et al. (1998)	Not in text; Brazilian agricultural burns	Variable ages, usually ~2-4 days; Aircraft	"Sunny", wind speeds generally < 5 m s^{-1}	Not given in text but entire measurement region described as "hazy"	Particle mass concentrations increased, with 50-75% of this mass increase estimated to be from organics; Increase in mass-scattering efficiency and SSA but decreases in mass absorption efficiency[m]; Not included in analysis
Vakkari et al. (2014; 2018)	Not in text; 60 burns in South Africa (30% savannas, 30% grasslands, 40% mixed cropland, savanna, and	Average age of 2.4 hours (2014); 3-5 hours (2018)	Not in text	Not in text	Net increase in OA (2014 and 2018); Increase in extinction and SSA (2014); 2/3[rds] of plumes showed increases in CCN, 1/3rd of plumes showed no

	grassland) (2014); 5 years of data on savannas, grasslands, and croplands (2018)				significant change in CCN (2014)

[a]When applicable
[b]Many of these campaigns have further publications associated with them; we only cite the papers that directly contributed information to this table.
[c]We report net OA, net extinction, and net CCN values that have been normalized to an inert tracer (e.g. CO) to account for plume dilution, unless otherwise noted
[d]Total number concentration observed to decrease with age
[e]Single scatter albedo
[f]Terms in quotations indicate the term used in the specific paper (in lieu of a quantitative measurement)
[g]Fire size data from Akagi et al. (2013)
[h]Liu et al. (2105) examined 15 total fires but only 7 aged fires
[i]Although net OA was observed to decrease, net $PM_{2.5}$ was observed to increase
[j]Two fires were examined but only one fire's size was given
[k]The CCN measurements were not corrected for dilution
[l]"Hundreds" of smaller fires were observed within the 390 km^2 fire boundaries
[m]Decreases in mass absorption efficiency with age can indicate a decreasing fraction of black carbon in the aerosol (e.g. Reid et al., 2005)