

Satellite Multi-Angle Observations of Wildfire Smoke Plumes During the CalFiDE Field Campaign: Aerosol Plume Heights, Particle Properties, and Aging TimescalesK.T. Junghenn Noyes^{1,2} and R.A. Kahn²

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Introduction

This supplement contains additional figures and key tables presenting the MISR and MODIS data for the 30 August Rum Creek and the 08 September 2022 overpasses of the NASA Earth Observing System's Terra satellite, coordinated with NOAA's CalFiDE campaign field operations. First, we present figures of the MISR Research Aerosol (RA) algorithm results constraining particle size. Next, we include tables of MODIS fire pixel data for each fire, followed by tables with statistical summaries of the major RA particle properties for each fire, and finally tables of the MISR-MINX output containing retrievals of plume heights and the associated wind vectors for each plume.

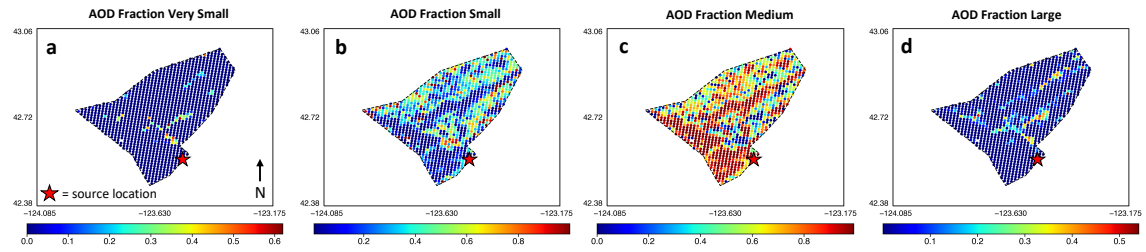


Figure S1. MISR Research Aerosol retrieval algorithm results for the North Plume of the Rum Creek Fire, 30 August 2022, ~18:54 UTC. (a) Fraction AOD₅₅₈ interpreted as very small

in particle size. (b) Fraction AOD₅₅₈ small. (c) Fraction AOD₅₅₈ medium. (d) Fraction AOD₅₅₈ large.

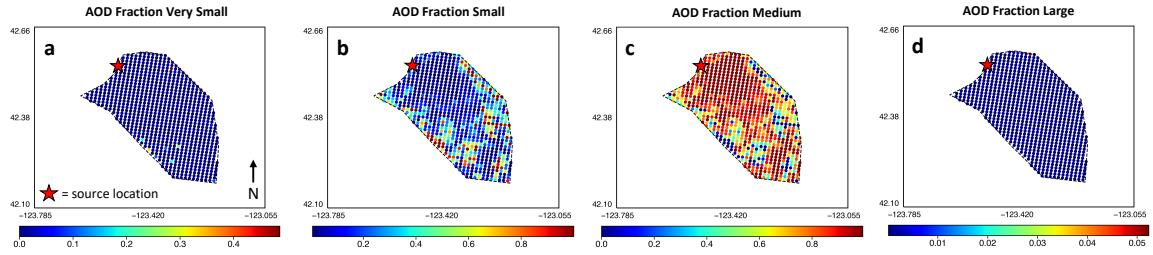


Figure S2. Same as Figure S1, but for the South Plume of the Rum Creek Fire on 30 August 2022.

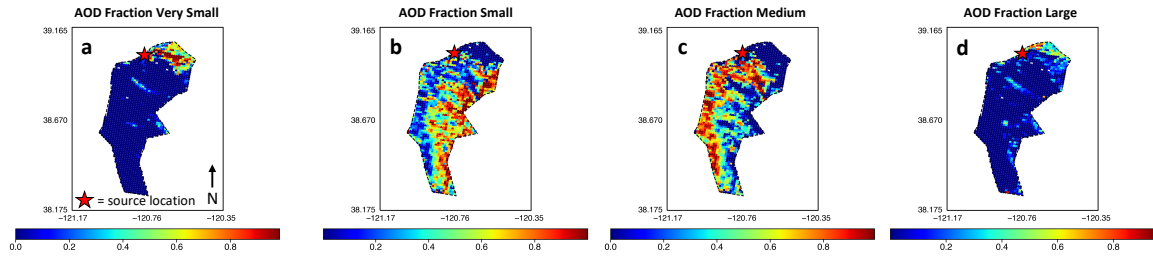


Figure S3. Same as Figure S1, but for the Mosquito Fire on 08 September 2022, ~18:49 UTC.

Table S1. MODIS Terra Fire Radiative Power for the Rum Creek fire (North and South Plumes), 30 August 2022. Fire pixels are retrieved at 1-km horizontal resolution and 5-minute temporal resolution.

Latitude (° N)	Longitude (° W)	FRP (W/m²)
42.60	-123.62	13.29
42.60	-123.62	26.11
42.62	-123.56	13.15
42.62	-123.54	25.43
42.61	-123.55	14.56
42.57	-123.54	8.95
42.56	-123.55	8.90

Table S2. MODIS Terra Fire Radiative Power for the Mosquito fire, 08 September 2022. Fire pixels are retrieved at 1-km horizontal resolution and 5-minute temporal resolution.

Latitude (° N)	Longitude (° W)	FRP (W/m²)
39.059	-120.723	149.79
39.061	-120.735	34.72
39.057	-120.711	23.22
39.052	-120.737	30.88
39.042	-120.728	102.98
39.04	-120.716	133.95
39.031	-120.718	31.36
39.029	-120.707	56.77
39.027	-120.695	59.62
39.020	-120.709	36.68
39.018	-120.697	54.16
39.010	-120.705	44.87
39.009	-120.694	534.5
39.007	-120.683	131.55
39.001	-120.708	12.41
39.000	-120.696	192.58
38.999	-120.685	96.80

38.994	-120.721	14.06
38.992	-120.71	57.15
38.991	-120.698	46.86
39.031	-120.778	229.86
39.029	-120.767	113.97
39.023	-120.786	32.31
39.021	-120.775	82.90
39.013	-120.788	16.42
39.012	-120.776	18.48
39.005	-120.79	47.12
39.003	-120.779	57.75
39.001	-120.767	26.31

Table S3. MISR Research Algorithm (RA) retrieved particle microphysical properties for the Rum Creek fire North Plume.

AOD₅₅₈	mean	1.70	ANG	mean	1.42
	$\pm \sigma$	1.59		$\pm \sigma$	0.281
	Q1	0.735		Q1	1.200
	median	1.12		median	1.37
	Q3	2.00		Q3	1.56
SSA₅₅₈	mean	0.970	Very Small Particle Fraction	mean	0.0131
	$\pm \sigma$	0.0237		$\pm \sigma$	0.0654
	Q1	0.952		Q1	0.0
	median	0.973		median	0.0
	Q3	0.993		Q3	0.0
Non-spherical Fraction	mean	0.0264	Small Particle Fraction	mean	0.301
	$\pm \sigma$	0.0752		$\pm \sigma$	0.265
	Q1	9.90E-05		Q1	0.0560
	median	9.90E-05		median	0.263
	Q3	9.90E-05		Q3	0.455
Non-absorbing Fraction	mean	0.692	Medium Particle Fraction	mean	0.653
	$\pm \sigma$	0.244		$\pm \sigma$	0.313
	Q1	0.505		Q1	0.474

	median	0.719		median	0.719
	Q3	0.917		Q3	0.938
Black Smoke Fraction	mean	0.250	Large Particle Fraction	mean	0.0320
	$\pm \sigma$	0.212		$\pm \sigma$	0.0815
	Q1	0.00989		Q1	0.000100
	median	0.232		median	0.000100
	Q3	0.410		Q3	0.000100
Brown Smoke Fraction	mean	0.0298			
	$\pm \sigma$	0.0786			
	Q1	0.000537			
	median	0.00304			
	Q3	0.00604			

Table S4. MISR Research Algorithm (RA) retrieved particle microphysical properties for the Rum Creek fire South Plume.

AOD₅₅₈	mean	1.10	ANG	mean	1.38
	$\pm \sigma$	0.372		$\pm \sigma$	0.291
	Q1	0.805		Q1	1.174
	median	1.06		median	1.27
	Q3	1.34		Q3	1.47
SSA₅₅₈	mean	0.970	Very Small Particle Fraction	mean	0.00242
	$\pm \sigma$	0.0219		$\pm \sigma$	0.0252
	Q1	0.960		Q1	0.0
	median	0.973		median	0.0
	Q3	0.985		Q3	0.0
Non- spherical Fraction	mean	0.000168	Small Particle Fraction	mean	0.236
	$\pm \sigma$	0.00182		$\pm \sigma$	0.285
	Q1	9.90E-05		Q1	0.00714
	median	9.90E-05		median	0.126
	Q3	9.90E-05		Q3	0.334
	mean	0.705		mean	0.760
	$\pm \sigma$	0.214		$\pm \sigma$	0.291

Non-absorbing Fraction	Q1	0.607	Medium Particle Fraction	Q1	0.664
	median	0.734		median	0.873
	Q3	0.851		Q3	0.992
Black Smoke Fraction	mean	0.288	Large Particle Fraction	mean	0.000170
	$\pm \sigma$	0.213		$\pm \sigma$	0.00184
	Q1	0.141		Q1	0.000100
	median	0.260		median	0.000100
	Q3	0.388		Q3	0.000100
Brown Smoke Fraction	mean	0.00602			
	$\pm \sigma$	0.0207			
	Q1	0.00151			
	median	0.00274			
	Q3	0.00424			

Table S5. MISR Research Algorithm (RA) retrieved particle microphysical properties for the Mosquito fire.

AOD₅₅₈	mean	1.41	ANG	mean	1.63
	$\pm \sigma$	1.28		$\pm \sigma$	0.428
	Q1	0.789		Q1	1.33
	median	1.09		median	1.60
	Q3	1.64		Q3	1.90
SSA₅₅₈	mean	0.946	Very Small Particle Fraction	mean	0.0831
	$\pm \sigma$	0.0361		$\pm \sigma$	0.220
	Q1	0.933		Q1	0.0
	median	0.949		median	0.0
	Q3	0.968		Q3	0.0
Non-spherical Fraction	mean	0.0336	Small Particle Fraction	mean	0.454
	$\pm \sigma$	0.0927		$\pm \sigma$	0.314
	Q1	9.90E-05		Q1	0.164
	median	9.90E-05		median	0.445
	Q3	0.0004		Q3	0.704
	mean	0.485		mean	0.407

Non-absorbing Fraction	$\pm \sigma$	0.261	Medium Particle Fraction	$\pm \sigma$	0.341
	Q1	0.322		Q1	0.000185
	median	0.476		median	0.400
	Q3	0.647		Q3	0.706
Black Smoke Fraction	mean	0.318	Large Particle Fraction	mean	0.0554
	$\pm \sigma$	0.262		$\pm \sigma$	0.132
	Q1	0.0472		Q1	1.00E-04
	median	0.300		median	1.00E-04
	Q3	0.501		Q3	0.00785
Brown Smoke Fraction	mean	0.162			
	$\pm \sigma$	0.216			
	Q1	0.00516			
	median	0.0530			
	Q3	0.276			

Table S6. MISR-MINX blue-band plume height data for the Rum Creek fire North Plume.

Table S7. MISR-MINX blue-band plume height data for the Rum Creek fire South Plume.

Table S8. MISR-MINX blue-band plume height data for the Mosquito fire.