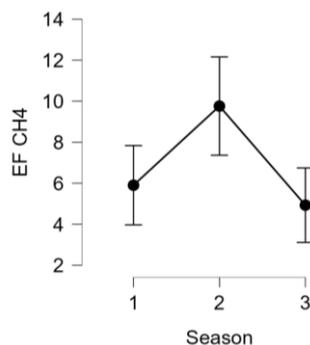


Supplementary 1. ANOVAs

Descriptives plots



ANOVA

One-way ANOVA for CH4
means by season, using n=86 (CO2 outlier removed).

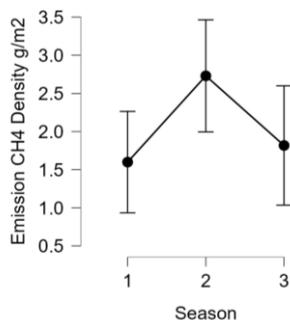
ANOVA - EF CH4

Cases	Sum of Squares	df	Mean Square	F	p	η^2	ω^2
Season	401.024	2	200.512	6.639	0.002	0.138	0.116
Residuals	2506.752	83	30.202				

Note. Type III Sum of Squares

Figure S1. ANOVA for Methane Emission Factor by Season.

Descriptives plots



ANOVA

One-way ANOVA for CH4
means by season, using n=86 (CO2 outlier removed).

ANOVA - Emission CH4 Density g/m2

Cases	Sum of Squares	df	Mean Square	F	p	η^2	ω^2
Season	20.621	2	10.310	2.686	0.074	0.061	0.038
Residuals	318.599	83	3.839				

Note. Type III Sum of Squares

Figure S2. ANOVA for Methane Emission Density by Season.

Supplementary 2. Pearson's Correlations

Tables S1–S16. Methane EF and ED Correlations for Key Variables by Fire Type and Season ($n = 86$).

Table S1. Methane EF Correlations for Key Variables for All Fires.

EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Variable		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.467***	—								
	p-value	< .001	—								
3. Log Byram Intensity	Pearson's r	-0.133	-0.226*	—							
	p-value	0.220	0.036	—							
4. 2.2- Grass %	Pearson's r	0.027	0.167	0.048	—						
	p-value	0.804	0.124	0.658	—						
5. True CC	Pearson's r	-0.126	-0.260*	0.606***	0.081	—					
	p-value	0.248	0.016	< .001	0.461	—					
6. Log Humidity	Pearson's r	0.242*	0.506***	-0.219*	-0.164	-0.044	—				
	p-value	0.025	< .001	0.042	0.132	0.690	—				
7. Eff_Visual (BE)	Pearson's r	3.218e-4	-0.280**	0.216*	-0.029	0.256*	-0.257*	—			
	p-value	0.998	0.009	0.046	0.790	0.017	0.017	—			
8. Log total moisture	Pearson's r	0.220*	0.235*	-0.415***	0.047	-0.383***	0.486***	-0.132	—		
	p-value	0.042	0.029	< .001	0.665	< .001	< .001	0.227	—		
9. Wind_speed (m/s)	Pearson's r	0.391***	0.202	-0.021	0.081	0.038	0.082	-0.059	0.161	—	
	p-value	< .001	0.096	0.864	0.509	0.756	0.504	0.629	0.188	—	
10. ambient_temp	Pearson's r	-0.244*	-0.219*	0.111	0.076	0.005	-0.505***	0.280**	-0.454***	-0.428***	—
	p-value	0.023	0.043	0.310	0.488	0.964	< .001	0.009	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Table S2. Methane EF Correlations for Key Variables for Head Fires.

Head Fires EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Variable		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.467**	—								
	p-value	0.005	—								
3. Log Byram Intensity	Pearson's r	-0.109	-0.142	—							
	p-value	0.535	0.416	—							
4. 2.2- Grass %	Pearson's r	0.019	0.214	-0.028	—						
	p-value	0.913	0.218	0.874	—						
5. True CC	Pearson's r	-0.152	-0.179	0.461**	0.081	—					
	p-value	0.385	0.304	0.005	0.643	—					
6. Log Humidity	Pearson's r	0.218	0.434**	-0.194	-0.081	0.160	—				
	p-value	0.209	0.009	0.265	0.643	0.358	—				
7. Eff_Visual (BE)	Pearson's r	0.059	-0.300	0.026	-0.030	0.338*	-0.252	—			
	p-value	0.738	0.080	0.884	0.864	0.047	0.144	—			
8. Log total moisture	Pearson's r	0.154	0.070	-0.496**	0.120	-0.318	0.506**	-0.133	—		
	p-value	0.378	0.689	0.002	0.491	0.062	0.002	0.447	—		
9. Wind_speed (m/s)	Pearson's r	0.399*	0.364	-0.172	0.225	-0.156	0.042	0.007	0.361	—	
	p-value	0.032	0.052	0.371	0.240	0.420	0.827	0.970	0.054	—	
10. ambient_temp	Pearson's r	-0.425*	-0.247	0.044	0.138	0.114	-0.412*	0.260	-0.509**	-0.373*	—
	p-value	0.011	0.152	0.800	0.428	0.515	0.014	0.132	0.002	0.046	—

* p < .05, ** p < .01, *** p < .001

Table S3. Methane EF Correlations for Key Variables for Backfires. Backfires EFCH4 and Byram_act_dry; grass_biomass_%, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity.

Pearson's Correlations		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.470*** < .001	— —								
3. Log Byram Intensity	Pearson's r p-value	-0.162 0.257	-0.363** 0.009	— —							
4. 2.2- Grass %	Pearson's r p-value	0.035 0.808	0.125 0.384	0.049 0.733	— —						
5. True CC	Pearson's r p-value	-0.117 0.413	-0.304* 0.030	0.746*** < .001	0.084 0.557	— —					
6. Log Humidity	Pearson's r p-value	0.261 0.064	0.562*** < .001	-0.286* 0.042	-0.236 0.096	-0.152 0.287	— —				
7. Eff_Visual (BE)	Pearson's r p-value	-0.039 0.785	-0.276* 0.050	0.320* 0.022	-0.036 0.804	0.224 0.114	-0.264 0.061	— —			
8. Log total moisture	Pearson's r p-value	0.278* 0.048	0.355* 0.010	-0.501*** < .001	-0.027 0.852	-0.437** 0.001	0.469*** < .001	-0.141 0.324	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.381* 0.015	0.119 0.466	0.124 0.446	-0.006 0.972	0.133 0.412	0.120 0.462	-0.097 0.553	0.019 0.907	— —	
10. ambient_temp	Pearson's r p-value	-0.101 0.480	-0.202 0.154	0.152 0.285	0.020 0.889	-0.052 0.715	-0.587*** < .001	0.295* 0.036	-0.413** 0.003	-0.472** 0.002	— —

*p < .05, ** p < .01, *** p < .001

Table S4. Methane EF Correlations for Key Variables for Early Fires.

EDS EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Pearson's Correlations		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.439* 0.036	— —								
3. Log Byram Intensity	Pearson's r p-value	-0.002 0.993	-0.120 0.585	— —							
4. 2.2- Grass %	Pearson's r p-value	0.135 0.539	0.539** 0.008	-0.123 0.576	— —						
5. True CC	Pearson's r p-value	0.242 0.267	0.112 0.611	0.648*** < .001	0.249 0.251	— —					
6. Log Humidity	Pearson's r p-value	-0.094 0.669	-0.109 0.621	-0.104 0.638	-0.220 0.313	-0.181 0.408	— —				
7. Eff_Visual (BE)	Pearson's r p-value	-0.008 0.971	-0.266 0.221	0.208 0.340	-0.371 0.081	0.135 0.540	-0.229 0.294	— —			
8. Log total moisture	Pearson's r p-value	-0.253 0.244	-0.602** 0.002	-0.183 0.404	-0.311 0.149	-0.570** 0.005	0.377 0.077	0.202 0.355	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.271 0.212	0.268 0.216	0.204 0.351	-0.184 0.400	0.238 0.273	0.424* 0.044	-0.341 0.112	-0.177 0.420	— —	
10. ambient_temp	Pearson's r p-value	0.089 0.686	0.131 0.551	0.039 0.861	0.383 0.071	0.203 0.352	-0.879*** < .001	0.230 0.291	-0.312 0.147	-0.504* 0.014	— —

*p < .05, ** p < .01, *** p < .001

Table S5. Methane EF Correlations for Key Variables for Middle Fires.

MDS EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Variable		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.692***	—								
	p-value	< .001	—								
3. Log Byram Intensity	Pearson's r	0.008	-0.154	—							
	p-value	0.966	0.409	—							
4. 2.2- Grass %	Pearson's r	-0.128	-0.110	0.018	—						
	p-value	0.493	0.555	0.922	—						
5. True CC	Pearson's r	-0.201	-0.290	0.677***	0.052	—					
	p-value	0.279	0.114	< .001	0.779	—					
6. Log Humidity	Pearson's r	0.398*	0.519**	-0.024	0.051	0.121	—				
	p-value	0.026	0.003	0.897	0.786	0.516	—				
7. Eff_Visual (BE)	Pearson's r	0.263	0.202	0.077	-0.130	0.246	0.117	—			
	p-value	0.153	0.276	0.680	0.485	0.182	0.531	—			
8. Log total moisture	Pearson's r	0.172	0.246	-0.430*	0.322	-0.280	0.432*	-0.057	—		
	p-value	0.354	0.183	0.016	0.078	0.127	0.015	0.761	—		
9. Wind_speed (m/s)	Pearson's r	0.289	0.010	-0.008	0.207	0.100	-0.008	0.207	0.002	—	
	p-value	0.115	0.956	0.968	0.265	0.591	0.964	0.264	0.991	—	
10. ambient_temp	Pearson's r	-0.229	-0.177	-0.161	-0.371*	-0.283	-0.595***	0.186	-0.199	-0.034	—
	p-value	0.215	0.339	0.386	0.040	0.123	< .001	0.316	0.282	0.856	—

* p < .05, ** p < .01, *** p < .001

Table S6. Methane EF Correlations for Key Variables for Late Fires.

LDS EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Variable		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.231	—								
	p-value	0.203	—								
3. Log Byram Intensity	Pearson's r	-0.190	0.044	—							
	p-value	0.299	0.810	—							
4. 2.2- Grass %	Pearson's r	0.081	0.644***	0.156	—						
	p-value	0.661	< .001	0.395	—						
5. True CC	Pearson's r	-0.202	-0.435*	0.144	-0.150	—					
	p-value	0.267	0.013	0.432	0.414	—					
6. Log Humidity	Pearson's r	-0.058	0.054	-0.193	-0.071	0.279	—				
	p-value	0.752	0.768	0.289	0.701	0.122	—				
7. Eff_Visual (BE)	Pearson's r	-0.549**	-0.078	0.114	-0.154	0.234	0.247	—			
	p-value	0.001	0.672	0.533	0.399	0.197	0.174	—			
8. Log total moisture	Pearson's r	-0.143	-0.191	-0.162	-0.344	0.325	0.759***	0.306	—		
	p-value	0.436	0.294	0.377	0.054	0.069	< .001	0.088	—		
9. Wind_speed (m/s)	Pearson's r	0.160	0.043	0.210	-0.159	-0.082	0.718**	-0.131	0.680**	—	
	p-value	0.568	0.879	0.454	0.570	0.771	0.003	0.642	0.005	—	
10. ambient_temp	Pearson's r	0.087	0.342	0.013	0.429*	-0.121	0.083	-0.139	-0.579***	-0.549*	—
	p-value	0.637	0.055	0.942	0.014	0.511	0.652	0.447	< .001	0.034	—

* p < .05, ** p < .01, *** p < .001

Table S7. Methane ED Correlations for Key Variables for All Fires.

All fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations

Variable		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.297**	—								
	p-value	0.005	—								
3. Log Byram Intensity	Pearson's r	0.134	-0.226*	—							
	p-value	0.219	0.036	—							
4. 2.2- Grass %	Pearson's r	0.097	0.167	0.048	—						
	p-value	0.374	0.124	0.658	—						
5. True CC	Pearson's r	0.109	-0.260*	0.606***	0.081	—					
	p-value	0.317	0.016	< .001	0.461	—					
6. Log Humidity	Pearson's r	0.024	0.506***	-0.219*	-0.164	-0.044	—				
	p-value	0.826	< .001	0.042	0.132	0.690	—				
7. Eff_Visual (BE)	Pearson's r	0.072	-0.280**	0.216*	-0.029	0.256*	-0.257*	—			
	p-value	0.511	0.009	0.046	0.790	0.017	0.017	—			
8. Log total moisture	Pearson's r	-0.026	0.235*	-0.415***	0.047	-0.383***	0.486***	-0.132	—		
	p-value	0.809	0.029	< .001	0.665	< .001	< .001	0.227	—		
9. Wind_speed (m/s)	Pearson's r	0.367**	0.202	-0.021	0.081	0.038	0.082	-0.059	0.161	—	
	p-value	0.002	0.096	0.864	0.509	0.756	0.504	0.629	0.188	—	
10. ambient_temp	Pearson's r	-0.135	-0.219*	0.111	0.076	0.005	-0.505***	0.280**	-0.454***	-0.428***	—
	p-value	0.217	0.043	0.310	0.488	0.964	< .001	0.009	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Table S8. Methane ED Correlations for Key Variables for Head Fires.

Headfire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations

Variable		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.371*	—								
	p-value	0.028	—								
3. Log Byram Intensity	Pearson's r	0.070	-0.142	—							
	p-value	0.691	0.416	—							
4. 2.2- Grass %	Pearson's r	0.048	0.214	-0.028	—						
	p-value	0.786	0.218	0.874	—						
5. True CC	Pearson's r	-0.152	-0.179	0.461**	0.081	—					
	p-value	0.384	0.304	0.005	0.643	—					
6. Log Humidity	Pearson's r	-0.061	0.434**	-0.194	-0.081	0.160	—				
	p-value	0.727	0.009	0.265	0.643	0.358	—				
7. Eff_Visual (BE)	Pearson's r	0.116	-0.300	0.026	-0.030	0.338*	-0.252	—			
	p-value	0.507	0.080	0.884	0.864	0.047	0.144	—			
8. Log total moisture	Pearson's r	-0.046	0.070	-0.496**	0.120	-0.318	0.506**	-0.133	—		
	p-value	0.793	0.689	0.002	0.491	0.062	0.002	0.447	—		
9. Wind_speed (m/s)	Pearson's r	0.372*	0.364	-0.172	0.225	-0.156	0.042	0.007	0.361	—	
	p-value	0.047	0.052	0.371	0.240	0.420	0.827	0.970	0.054	—	
10. ambient_temp	Pearson's r	-0.340*	-0.247	0.044	0.138	0.114	-0.412*	0.260	-0.509**	-0.373*	—
	p-value	0.046	0.152	0.800	0.428	0.515	0.014	0.132	0.002	0.046	—

* p < .05, ** p < .01, *** p < .001

Table S9. Methane ED Correlations for Key Variables for Backfires.

Backfire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Variable		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.267	—								
	p-value	0.058	—								
3. Log Byram Intensity	Pearson's r	0.250	-0.363**	—							
	p-value	0.076	0.009	—							
4. 2.2- Grass %	Pearson's r	0.145	0.125	0.049	—						
	p-value	0.311	0.384	0.733	—						
5. True CC	Pearson's r	0.223	-0.304*	0.746***	0.084	—					
	p-value	0.116	0.030	< .001	0.557	—					
6. Log Humidity	Pearson's r	0.087	0.562***	-0.286*	-0.236	-0.152	—				
	p-value	0.545	< .001	0.042	0.096	0.287	—				
7. Eff_Visual (BE)	Pearson's r	0.053	-0.276*	0.320*	-0.036	0.224	-0.264	—			
	p-value	0.709	0.050	0.022	0.804	0.114	0.061	—			
8. Log total moisture	Pearson's r	0.001	0.355*	-0.501***	-0.027	-0.437**	0.469***	-0.141	—		
	p-value	0.994	0.010	< .001	0.852	0.001	< .001	0.324	—		
9. Wind_speed (m/s)	Pearson's r	0.350*	0.119	0.124	-0.006	0.133	0.120	-0.097	0.019	—	
	p-value	0.027	0.466	0.446	0.972	0.412	0.462	0.553	0.907	—	
10. ambient_temp	Pearson's r	0.012	-0.202	0.152	0.020	-0.052	-0.587***	0.295*	-0.413**	-0.472**	—
	p-value	0.933	0.154	0.285	0.889	0.715	< .001	0.036	0.003	0.002	—

* p < .05, ** p < .01, *** p < .001

Table S10. Methane ED Correlations for Key Variables for Early Fires.

EDS fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Variable		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r	—									
	p-value	—									
2. MCE	Pearson's r	0.158	—								
	p-value	0.470	—								
3. Log Byram Intensity	Pearson's r	0.168	-0.120	—							
	p-value	0.445	0.585	—							
4. 2.2- Grass %	Pearson's r	-0.039	0.539**	-0.123	—						
	p-value	0.861	0.008	0.576	—						
5. True CC	Pearson's r	0.394	0.112	0.648***	0.249	—					
	p-value	0.063	0.611	< .001	0.251	—					
6. Log Humidity	Pearson's r	-0.112	-0.109	-0.104	-0.220	-0.181	—				
	p-value	0.611	0.621	0.638	0.313	0.408	—				
7. Eff_Visual (BE)	Pearson's r	0.199	-0.266	0.208	-0.371	0.135	-0.229	—			
	p-value	0.363	0.221	0.340	0.081	0.540	0.294	—			
8. Log total moisture	Pearson's r	-0.265	-0.602**	-0.183	-0.311	-0.570**	0.377	0.202	—		
	p-value	0.221	0.002	0.404	0.149	0.005	0.077	0.355	—		
9. Wind_speed (m/s)	Pearson's r	0.198	0.268	0.204	-0.184	0.238	0.424*	-0.341	-0.177	—	
	p-value	0.365	0.216	0.351	0.400	0.273	0.044	0.112	0.420	—	
10. ambient_temp	Pearson's r	0.086	0.131	0.039	0.383	0.203	-0.879***	0.230	-0.312	-0.504*	—
	p-value	0.695	0.551	0.861	0.071	0.352	< .001	0.291	0.147	0.014	—

* p < .05, ** p < .01, *** p < .001

Table S11. Methane ED Correlations for Key Variables for Middle Fires.

MDS fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.368* 0.042	— —								
3. Log Byram Intensity	Pearson's r p-value	0.391* 0.030	-0.154 0.409	— —							
4. 2.2- Grass %	Pearson's r p-value	-0.080 0.670	-0.110 0.555	0.018 0.922	— —						
5. True CC	Pearson's r p-value	0.182 0.327	-0.290 0.114	0.677*** < .001	0.052 0.779	— —					
6. Log Humidity	Pearson's r p-value	0.068 0.716	0.519** 0.003	-0.024 0.897	0.051 0.786	0.121 0.516	— —				
7. Eff_Visual (BE)	Pearson's r p-value	0.227 0.219	0.202 0.276	0.077 0.680	-0.130 0.485	0.246 0.182	0.117 0.531	— —			
8. Log total moisture	Pearson's r p-value	-0.184 0.321	0.246 0.183	-0.430* 0.016	0.322 0.078	-0.280 0.127	0.432* 0.015	-0.057 0.761	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.360* 0.047	0.010 0.956	-0.008 0.968	0.207 0.265	0.100 0.591	-0.008 0.964	0.207 0.264	0.002 0.991	— —	
10. ambient_temp	Pearson's r p-value	-0.216 0.243	-0.177 0.339	-0.161 0.386	-0.371** 0.040	-0.283 0.123	-0.595*** < .001	0.186 0.316	-0.199 0.282	-0.034 0.856	— —

* p < .05, ** p < .01, *** p < .001

Table S12. Methane EF Correlations for Key Variables for Late Fires.

LDS fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.367* 0.039	— —								
3. Log Byram Intensity	Pearson's r p-value	-0.048 0.796	0.044 0.810	— —							
4. 2.2- Grass %	Pearson's r p-value	0.209 0.251	0.644*** < .001	0.156 0.395	— —						
5. True CC	Pearson's r p-value	-0.186 0.308	-0.435* 0.013	0.144 0.432	-0.150 0.414	— —					
6. Log Humidity	Pearson's r p-value	-0.035 0.851	0.054 0.768	-0.193 0.289	-0.071 0.701	0.279 0.122	— —				
7. Eff_Visual (BE)	Pearson's r p-value	-0.545** 0.001	-0.078 0.672	0.114 0.533	-0.154 0.399	0.234 0.197	0.247 0.174	— —			
8. Log total moisture	Pearson's r p-value	-0.116 0.528	-0.191 0.294	-0.162 0.377	-0.344 0.054	0.325 0.069	0.759*** < .001	0.306 0.088	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.215 0.442	0.043 0.879	0.210 0.454	-0.159 0.570	-0.082 0.771	0.718** 0.003	-0.131 0.642	0.680** 0.005	— —	
10. ambient_temp	Pearson's r p-value	0.090 0.622	0.342 0.055	0.013 0.942	0.429* 0.014	-0.121 0.511	0.083 0.652	-0.139 0.447	-0.579*** < .001	-0.549* 0.034	— —

* p < .05, ** p < .01, *** p < .001

Supplementary 3. Methane and Carbon Monoxide EF Correlations

Table S13. Methane and Carbon Monoxide EF correlation with Ambient Weather Conditions for all fires.

Pearson's Correlations		EF CH4	EF CO	Wind_speed (m/s)	ambient_temp	Log Humidity
1. EF CH4	Pearson's r p-value	— —				
2. EF CO	Pearson's r p-value	-0.525*** < .001	— —			
3. Wind_speed (m/s)	Pearson's r p-value	0.391*** < .001	-0.205 0.091	— —		
4. ambient_temp	Pearson's r p-value	-0.244* 0.023	0.197 0.068	-0.428*** < .001	— —	
5. Log Humidity	Pearson's r p-value	0.242* 0.025	-0.489*** < .001	0.082 0.504	-0.505*** < .001	— —

* p < .05, ** p < .01, *** p < .001

Supplementary 4. Methane EF and ED Correlations for Local and Random Fires

Tables S1–S16. Methane EF and ED Correlations for Key Variables by Local and Random Fire

Table S14. Methane EF Correlations for Key Variables for Local Fires.

Local EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Pearson's Correlations		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.655* 0.021	— —								
3. Log Byram Intensity	Pearson's r p-value	0.534 0.073	0.214 0.504	— —							
4. 2.2- Grass %	Pearson's r p-value	-0.396 0.202	-0.098 0.762	-0.486 0.109	— —						
5. True CC	Pearson's r p-value	-0.055 0.865	-0.325 0.302	0.379 0.224	-0.029 0.929	— —					
6. Log Humidity	Pearson's r p-value	0.105 0.745	0.300 0.343	-0.042 0.896	0.004 0.989	0.528 0.078	— —				
7. Eff_Visual (BE)	Pearson's r p-value	0.319 0.313	0.108 0.739	-0.022 0.946	-0.101 0.755	0.199 0.534	0.081 0.802	— —			
8. Log total moisture	Pearson's r p-value	-0.462 0.131	-0.159 0.621	-0.450 0.142	0.401 0.196	0.080 0.805	0.330 0.294	0.004 0.991	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.229 0.475	-0.201 0.532	0.153 0.635	-0.146 0.651	0.129 0.690	-0.154 0.633	0.226 0.480	-0.490 0.105	— —	
10. ambient_temp	Pearson's r p-value	-0.281 0.377	-0.466 0.127	-0.117 0.717	0.082 0.800	-0.462 0.130	-0.775** 0.003	-0.063 0.846	0.105 0.744	-0.006 0.986	— —

* p < .05, ** p < .01, *** p < .001

Table S15. Methane EF Correlations for Key Variables for Random Fires.

Random EF CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as EF CH4. No transformed variables.

Pearson's Correlations		EF CH4	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. EF CH4	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.736*** < .001	— —								
3. Log Byram Intensity	Pearson's r p-value	-0.205 0.399	-0.365 0.124	— —							
4. 2.2- Grass %	Pearson's r p-value	0.018 0.940	-0.124 0.612	0.222 0.362	— —						
5. True CC	Pearson's r p-value	-0.261 0.281	-0.325 0.175	0.738*** < .001	0.038 0.878	— —					
6. Log Humidity	Pearson's r p-value	0.709*** < .001	0.835*** < .001	-0.017 0.946	-0.111 0.652	-0.044 0.859	— —				
7. Eff_Visual (BE)	Pearson's r p-value	0.224 0.357	0.294 0.222	0.127 0.603	-0.107 0.663	0.301 0.210	0.203 0.404	— —			
8. Log total moisture	Pearson's r p-value	0.564* 0.012	0.601** 0.006	-0.453 0.052	0.137 0.575	-0.432 0.064	0.475* 0.040	-0.064 0.796	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.357 0.133	0.243 0.317	-0.084 0.733	0.283 0.241	0.079 0.747	0.017 0.944	0.252 0.299	0.215 0.377	— —	
10. ambient_temp	Pearson's r p-value	-0.242 0.319	-0.007 0.977	-0.214 0.379	-0.384 0.105	-0.250 0.301	-0.407 0.084	0.334 0.163	-0.200 0.411	0.194 0.426	— —

* p < .05, ** p < .01, *** p < .001

Table S16. Methane ED Correlations for Key Variables for Local Fires.

Local fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.472 0.121	— —								
3. Log Byram Intensity	Pearson's r p-value	0.576 0.050	0.214 0.504	— —							
4. 2.2- Grass %	Pearson's r p-value	-0.512 0.089	-0.098 0.762	-0.486 0.109	— —						
5. True CC	Pearson's r p-value	-0.248 0.436	-0.325 0.302	0.379 0.224	-0.029 0.929	— —					
6. Log Humidity	Pearson's r p-value	-0.246 0.441	0.300 0.343	-0.042 0.896	0.004 0.989	0.528 0.078	— —				
7. Eff_Visual (BE)	Pearson's r p-value	0.250 0.434	0.108 0.739	-0.022 0.946	-0.101 0.755	0.199 0.534	0.081 0.802	— —			
8. Log total moisture	Pearson's r p-value	-0.689* 0.013	-0.159 0.621	-0.450 0.142	0.401 0.196	0.080 0.805	0.330 0.294	0.004 0.991	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.345 0.271	-0.201 0.532	0.153 0.635	-0.146 0.651	0.129 0.690	-0.154 0.633	0.226 0.480	-0.490 0.105	— —	
10. ambient_temp	Pearson's r p-value	0.086 0.791	-0.466 0.127	-0.117 0.717	0.082 0.800	-0.462 0.130	-0.775** 0.003	-0.063 0.846	0.105 0.744	-0.006 0.986	— —

* p < .05, ** p < .01, *** p < .001

Table S17. Methane ED Correlations for Key Variables for Random Fires.

Random fire Transformed: ED CH4 and Byram_act_dry; grass_biomass_%, m/s, Total Moisture, Wind_Speed (m/s), ambient_temp, humidity, everything that went into the regression with Y as ED CH4. No transformed variables.

Pearson's Correlations		Emission CH4 Density g/m2	MCE	Log Byram Intensity	2.2- Grass %	True CC	Log Humidity	Eff_Visual (BE)	Log total moisture	Wind_speed (m/s)	ambient_temp
1. Emission CH4 Density g/m2	Pearson's r p-value	— —									
2. MCE	Pearson's r p-value	0.258 0.287	— —								
3. Log Byram Intensity	Pearson's r p-value	0.339 0.156	-0.365 0.124	— —							
4. 2.2- Grass %	Pearson's r p-value	0.168 0.492	-0.124 0.612	0.222 0.362	— —						
5. True CC	Pearson's r p-value	0.371 0.118	-0.325 0.175	0.738*** < .001	0.038 0.878	— —					
6. Log Humidity	Pearson's r p-value	0.414 0.078	0.835*** < .001	-0.017 0.946	-0.111 0.652	-0.044 0.859	— —				
7. Eff_Visual (BE)	Pearson's r p-value	0.228 0.348	0.294 0.222	0.127 0.603	-0.107 0.663	0.301 0.210	0.203 0.404	— —			
8. Log total moisture	Pearson's r p-value	0.142 0.563	0.601** 0.006	-0.453 0.052	0.137 0.575	-0.432 0.064	0.475* 0.040	-0.064 0.796	— —		
9. Wind_speed (m/s)	Pearson's r p-value	0.346 0.147	0.243 0.317	-0.084 0.733	0.283 0.241	0.079 0.747	0.017 0.944	0.252 0.299	0.215 0.377	— —	
10. ambient_temp	Pearson's r p-value	-0.424 0.070	-0.007 0.977	-0.214 0.379	-0.384 0.105	-0.250 0.301	-0.407 0.084	0.334 0.163	-0.200 0.411	0.194 0.426	— —

* p < .05, ** p < .01, *** p < .001