Supplementary Table S1. Mantel Test Results for Fire Behavior (FRP and BRI) and Meteorological Factors for DBF.

Fire behavior Metric	Meteorological Factors	Mantel's r	*p*-value	Rank-based Mantel Statistic(r_d)	*p*-value for r_d(p_d)
FRP	TMP	0.0842	0.001	< 0.2	< 0.01
	DTR	0.0435	0.001	< 0.2	< 0.01
	CLD	-0.0277	0.989	< 0.2	> 0.05
	VAP	0.00186	0.407	< 0.2	> 0.05
	PDSI	0.174	0.001	< 0.2	< 0.01
	SSR	-0.00163	0.54	< 0.2	> 0.05
	RHair	0.0117	0.165	< 0.2	> 0.05
	WS	-0.027	0.998	< 0.2	> 0.05
BRI	TMP	0.0444	0.001	< 0.2	< 0.01
	DTR	0.00416	0.316	< 0.2	> 0.05
	CLD	0.00815	0.27	< 0.2	> 0.05
	VAP	0.00112	0.441	< 0.2	> 0.05
	PDSI	0.129	0.001	< 0.2	< 0.01
	SSR	-0.0398	0.99	< 0.2	> 0.05
	RHair	0.0179	0.092	< 0.2	> 0.05
	WS	-0.0294	0.99	< 0.2	> 0.05

Supplementary Table S2. Mantel Test Results for Fire Behavior (FRP and BRI) and Meteorological Factors for EBF.

Fire behavior Metric	Meteorological Factors	Mantel's r	*p*-value	Rank-based Mantel Statistic(r_d)	*p*-value for r_d(p_d)

FRP	TMP	0.0827	0.001	< 0.2	< 0.01
	DTR	-0.0342	0.99	< 0.2	> 0.05
	CLD	0.102	0.001	< 0.2	< 0.01
	VAP	0.102	0.001	< 0.2	< 0.01
	PDSI	0.0207	0.001	< 0.2	< 0.01
	SSR	-0.0234	0.99	< 0.2	> 0.05
	RHair	0.0662	0.001	< 0.2	< 0.01
	WS	0.0148	0.009	< 0.2	< 0.01
BRI	TMP	0.0947	0.001	< 0.2	< 0.01
	DTR	-0.0111	0.952	< 0.2	> 0.05
	CLD	0.182	0.001	< 0.2	< 0.01
	VAP	0.114	0.001	< 0.2	< 0.01
	PDSI	0.0559	0.001	< 0.2	< 0.01
	SSR	-0.00176	0.635	< 0.2	> 0.05
	RHair	0.176	0.001	< 0.2	< 0.01
	WS	0.0613	0.001	< 0.2	< 0.01

Supplementary Table S3. Mantel Test Results for Fire Behavior (FRP and BRI) and Meteorological Factors for MF.

Fire behavior Metric	Meteorological Factors	Mantel's r	p-value	Rank-based Mantel Statistic(r_d)	p-value for r_d(p_d)
FRP	TMP	0.0174	0.06	< 0.2	> 0.05
	DTR	-0.0604	0.99	< 0.2	> 0.05
	CLD	0.00328	0.342	< 0.2	> 0.05

	VAP	-0.0143	0.933	< 0.2	> 0.05
	PDSI	0.0376	0.003	< 0.2	< 0.01
	SSR	0.0456	0.001	< 0.2	< 0.01
	RHair	-0.00859	0.78	< 0.2	> 0.05
	WS	-0.0338	0.998	< 0.2	> 0.05
BRI	TMP	0.0152	0.137	< 0.2	> 0.05
	DTR	-0.0498	0.99	< 0.2	> 0.05
	CLD	-0.0116	0.836	< 0.2	> 0.05
	VAP	-0.0185	0.946	< 0.2	> 0.05
	PDSI	0.0222	0.069	< 0.2	> 0.05
	SSR	0.0354	0.01	< 0.2	< 0.01
	RHair	-0.0106	0.801	< 0.2	> 0.05
	WS	-0.0438	0.99	< 0.2	> 0.05

Supplementary Table S4. Mantel Test Results for Fire Behavior (FRP and BRI) and Meteorological Factors for IF.

Fire behavior Metric	Meteorological Factors	Mantel's r	*p*-value	Rank-based Mantel Statistic(r_d)	*p*-value for r_d(p_d)
FRP	TMP	0.214	0.001	0.2 - 0.4	< 0.01
	DTR	-0.0275	0.99	< 0.2	> 0.05
	CLD	-0.0327	0.99	< 0.2	> 0.05
	VAP	0.123	0.001	< 0.2	< 0.01
	PDSI	-0.0242	0.99	< 0.2	> 0.05
	SSR	0.215	0.001	0.2 - 0.4	< 0.01
	RHair	0.012	0.044	< 0.2	0.01 - 0.05

	WS	0.0503	0.001	< 0.2	< 0.01
BRI	TMP	0.0858	0.001	< 0.2	< 0.01
	DTR	0.0579	0.001	< 0.2	< 0.01
	CLD	0.241	0.001	0.2 - 0.4	< 0.01
	VAP	0.194	0.001	< 0.2	< 0.01
	PDSI	0.105	0.001	< 0.2	< 0.01
	SSR	0.0936	0.001	< 0.2	< 0.01
	RHair	0.235	0.001	0.2 - 0.4	< 0.01
	WS	0.0437	0.001	< 0.2	< 0.01

Meteorological Factors: TMP(annual temperature), DTR(annual diurnal temperature range) CLD(cloud cover), VAP(vapor pressure), PDSI(Palmer Drought Severity Index), SSR(surface solar radiation), RHair(relative humidity), WS(wind speed).

Fire Behavior: FRP(Fire Radiative Power), BRI(Brightness Temperature).

Mantel's r: Mantel correlation coefficient, indicating the strength and direction of the linear relationship between two distance matrices.

p-value: *p*-value associated with Mantel's r.

Rank-based Mantel Statistic(r_d): Rank-based Mantel Statistic,which is a measure of correlation between the ranks of elements in two distance matrices.

p-value for r_d(p_d): *p*-value associated with r_d.