Supplementary information: Global scale coupling of pyromes and fire regimes

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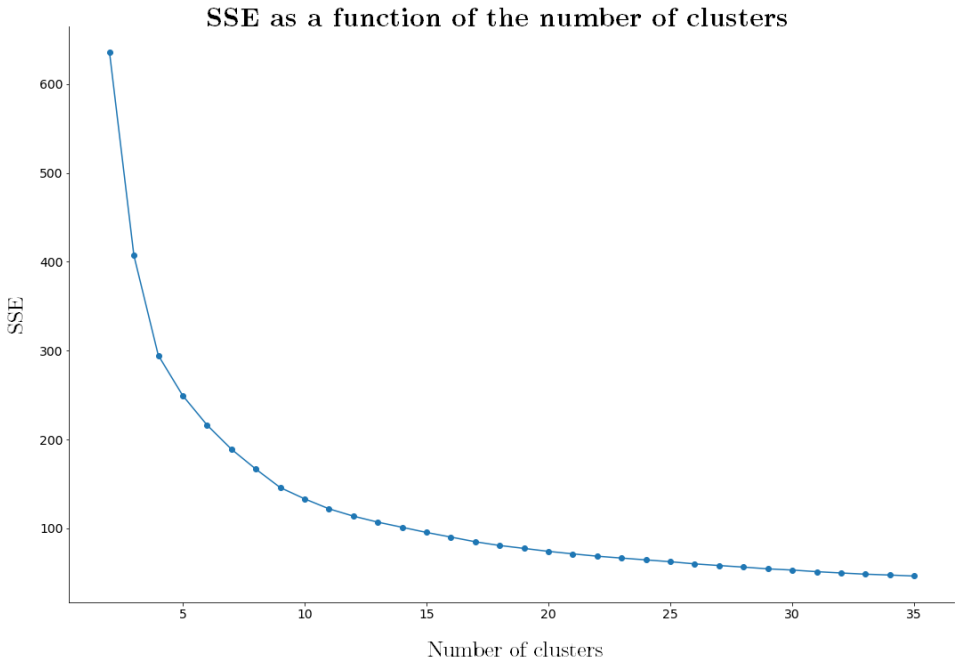
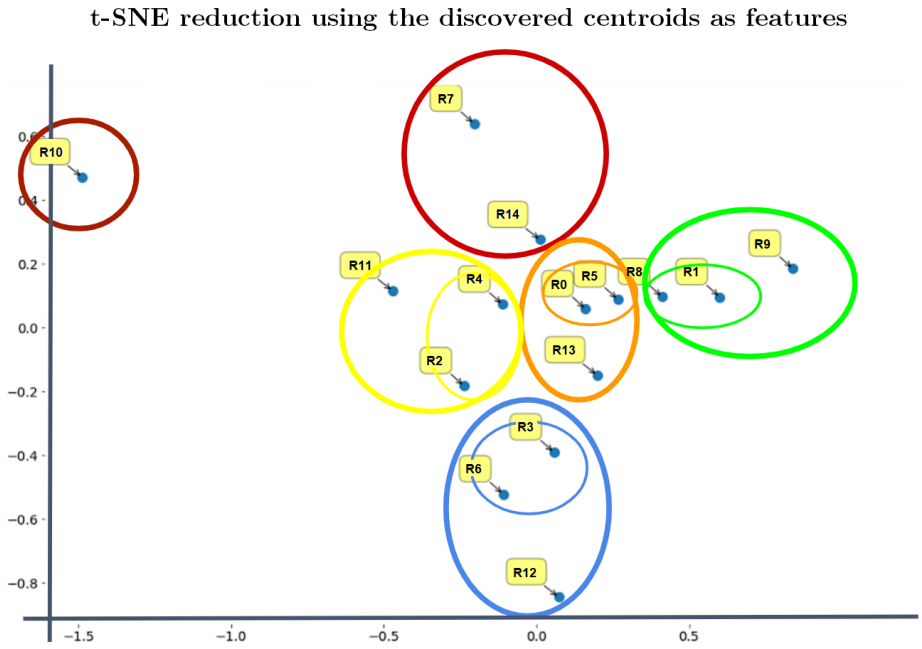
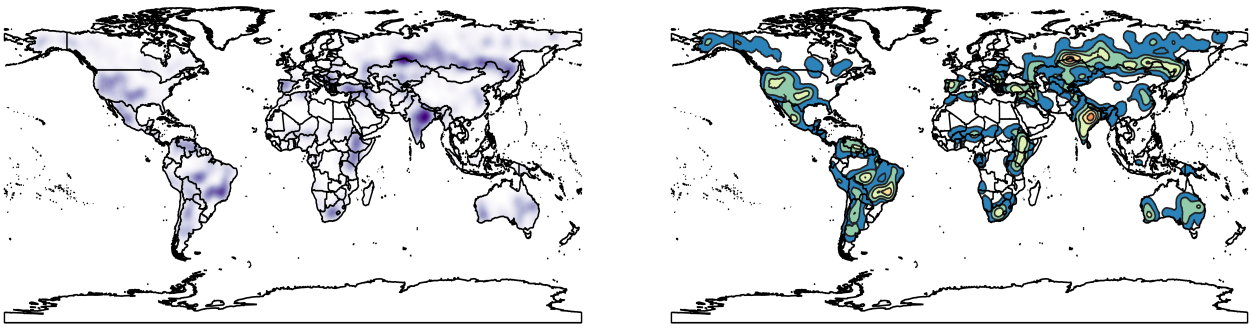
A1. Supplementary Methods



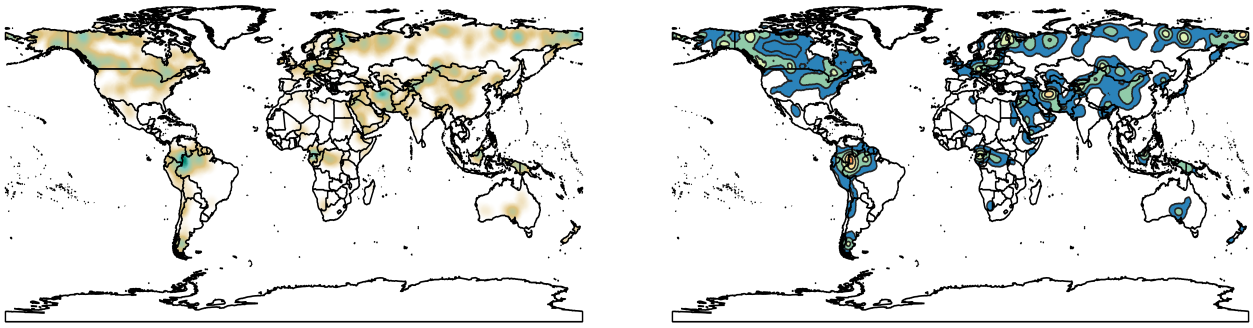
Supplementary Fig. 1. **Cluster convergence**. Sum of squared distances of samples with respect to the nearest cluster center as a function of the number of clusters k using the K-means algorithm on the data obtained after training our self organizing map. As expected, larger values of k lead to lower SSE values, converging towards 0. We found significant variations in the slope of the function in the [15,20] interval across all tested algorithms.



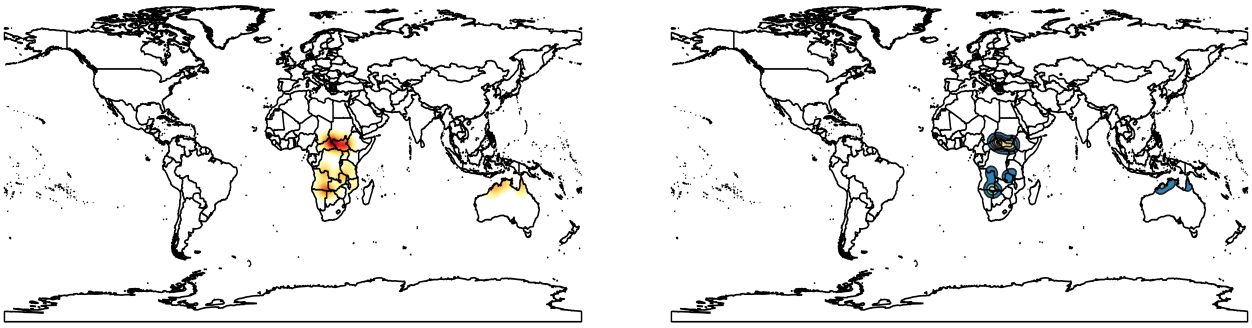
Supplementary Fig. 2. **Dimensionality reduction**. Two-dimensional reduction using the t-SNE algorithm with the centroids of the 15 pyromes discovered. From the plot, it is possible to observe the clear six macro-groups (highlighted with ovals of multiple colors) and the differences between the pyromes.



Supplementary Fig. 3. $\mathbf{Pyrome\ 0}$. R0 spatial distribution (left) and hot spots (right) representing local regimes.

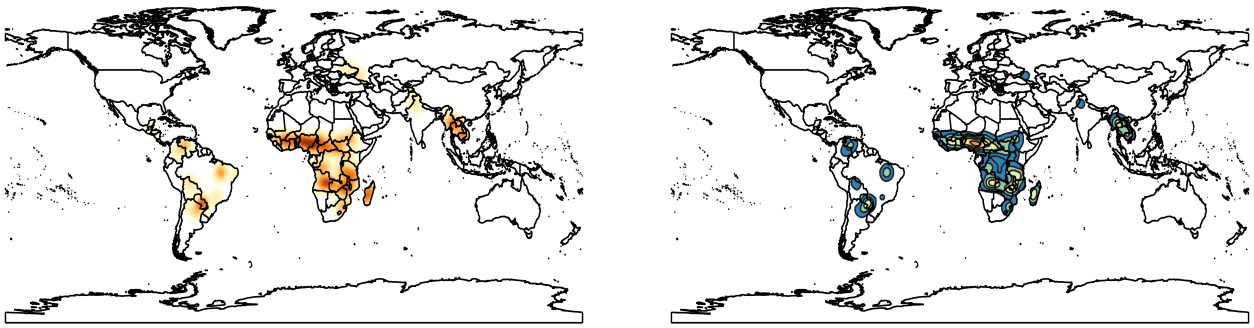


Supplementary Fig. 4. $\mathbf{Pyrome\ 1}$. R1 spatial distribution (left) and hot spots (right) representing local regimes.

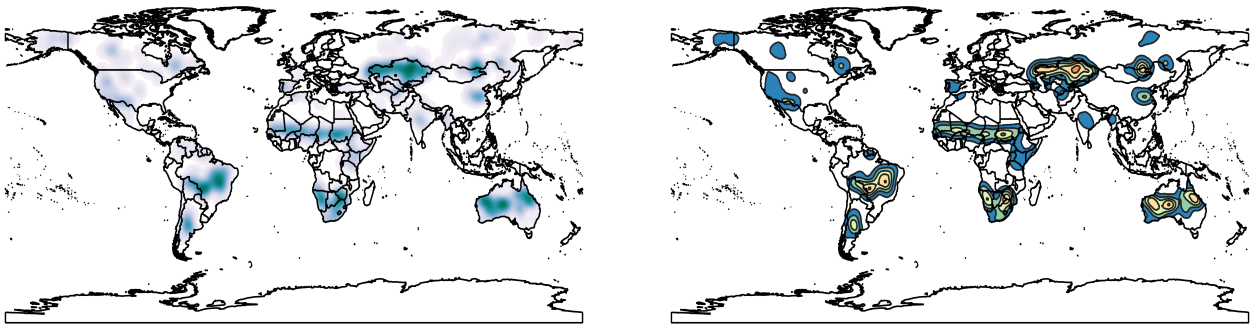


Supplementary Fig. 5. $\mathbf{Pyrome\ 2}$. R2 spatial distribution (left) and hot spots (right) representing local regimes.

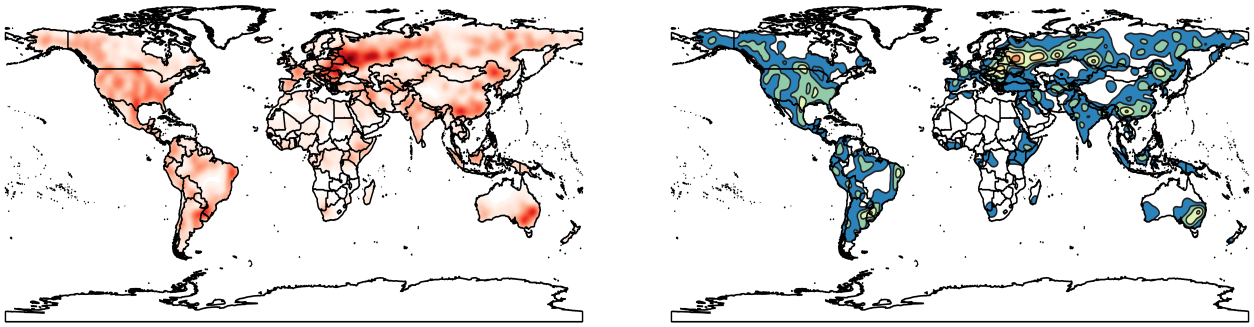
Supplementary Figs. 3-17: Spatial analysis and characterization. Gaussian kernels using a radius of 5° and bandwidth h that minimizes the mean integrated squared error – measuring the difference between the original function $f(x)$ and its kernel density estimator $\hat{f}_h(x)$ – are applied for the spatial characterization of subregimes. We determine the regions of the world with the most fire observations, based on the density of cells belonging to a particular regime. Contour lines are calculated for each local region (subregime) accounting for 10 (blue), 30 (green), 50 (yellow), 70 (orange), and 90% (red) of the local observations to determine the areas of the world where the fire regime is focused. Regions with at least 30% of the local observations are then ordered by area (largest to smallest), characterizing the top five or maximum numbers with a significant area in terms of demographic, climatic, and soil features.



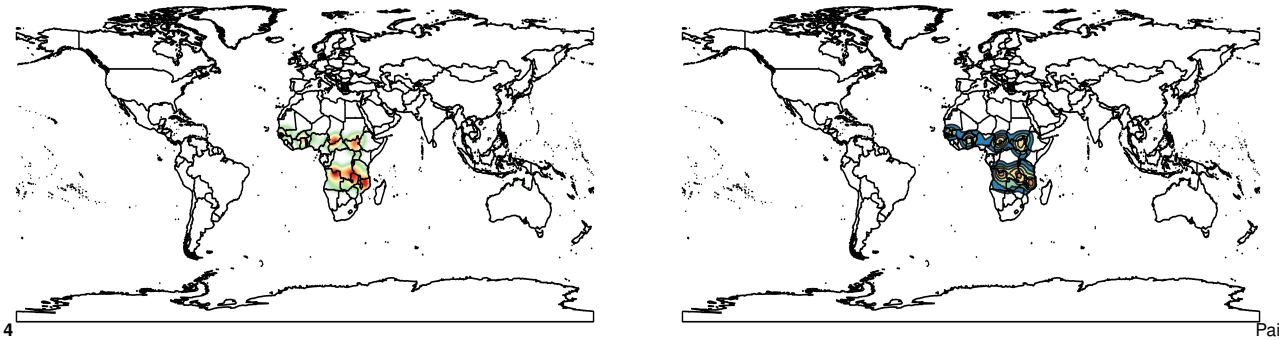
Supplementary Fig. 6. $\mathbf{Pyrome\ 3}$. R3 spatial distribution (left) and hot spots (right) representing local regimes.



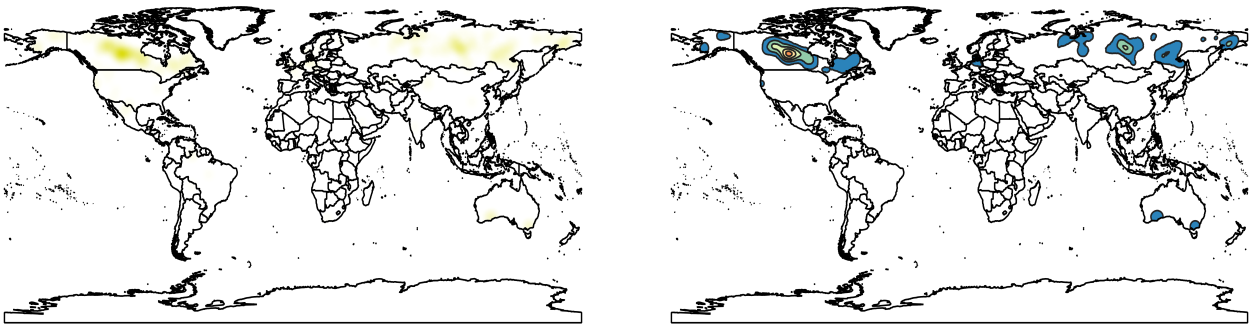
Supplementary Fig. 7. $\mathbf{Pyrome\ 4}$. R4 spatial distribution (left) and hot spots (right) representing local regimes.



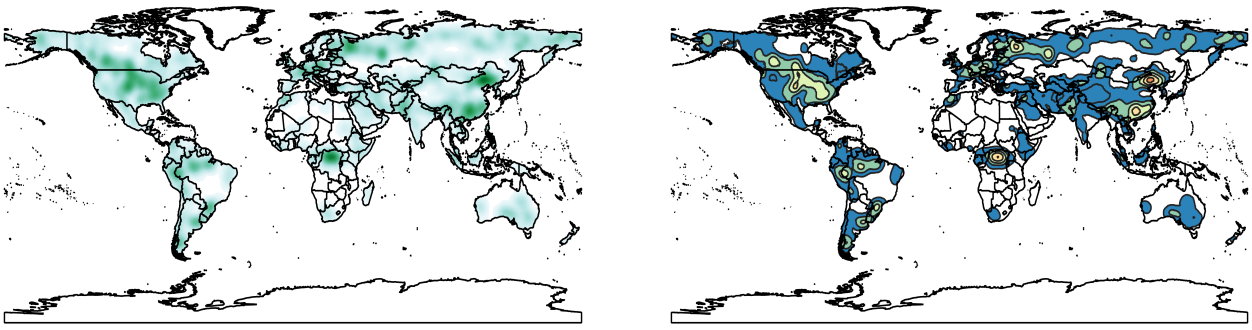
Supplementary Fig. 8. $\mathbf{Pyrome\ 5}$. R5 spatial distribution (left) and hot spots (right) representing local regimes.



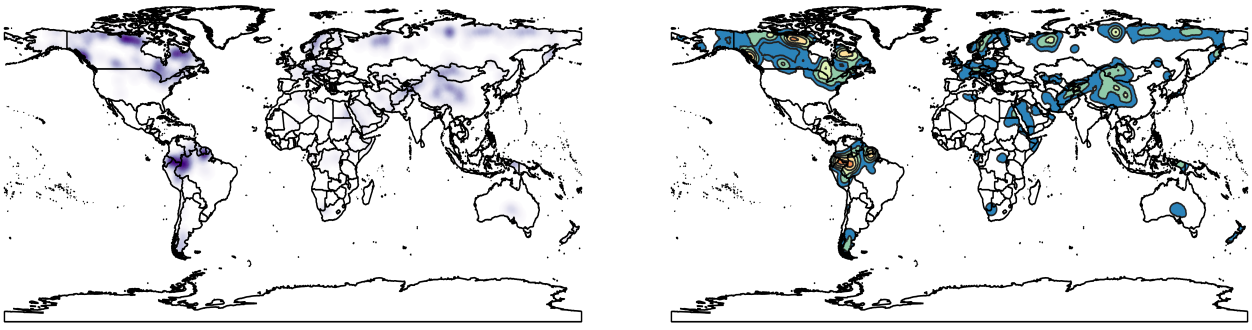
Supplementary Fig. 9. $\mathbf{Pyrome\ 6}$. R6 spatial distribution (left) and hot spots (right) representing local regimes.



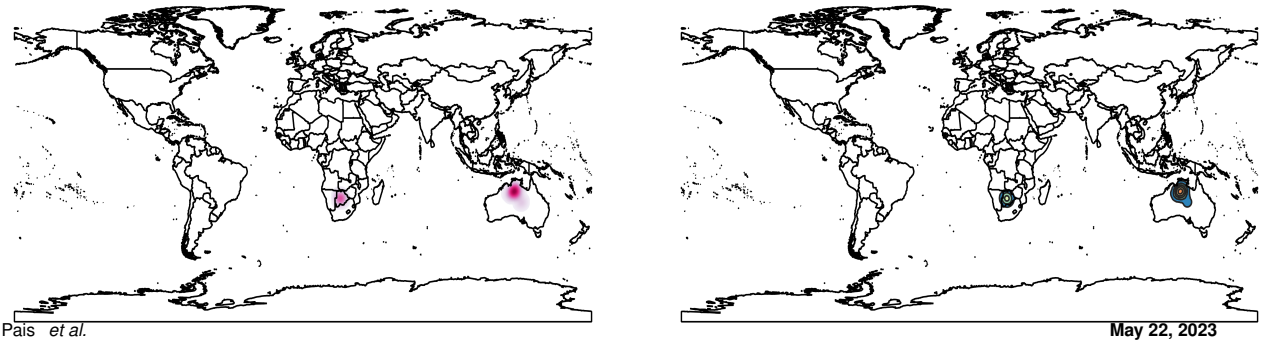
Supplementary Fig. 10. $\mathbf{Pyrome\ 7}$. R7 spatial distribution (left) and hot spots (right) representing local regimes.



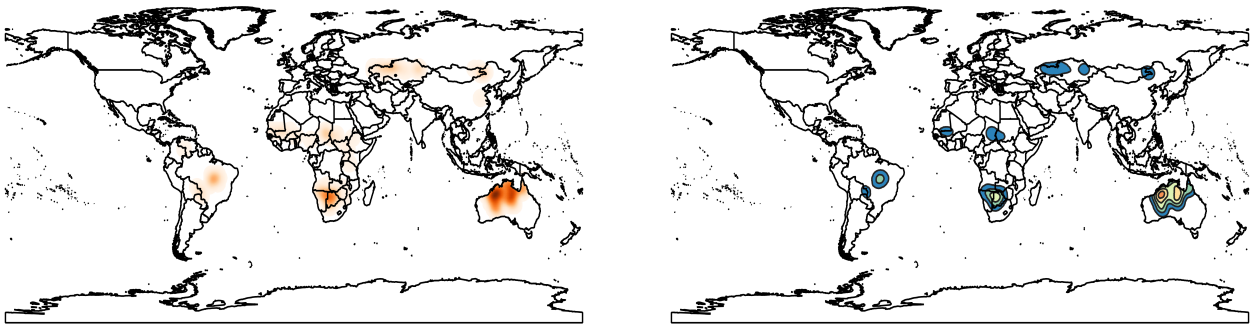
Supplementary Fig. 11. $\mathbf{Pyrome\ 8}$. R8 spatial distribution (left) and hot spots (right) representing local regimes.



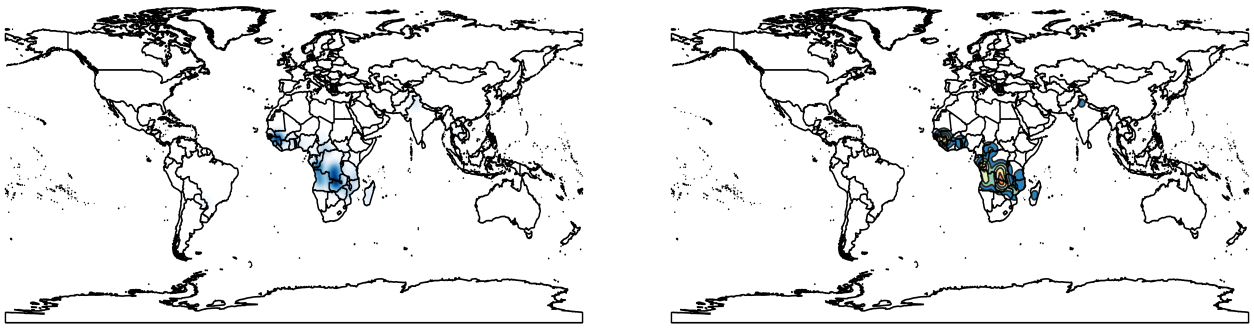
Supplementary Fig. 12. $\mathbf{Pyrome\ 9}$. R9 spatial distribution (left) and hot spots (right) representing local regimes.



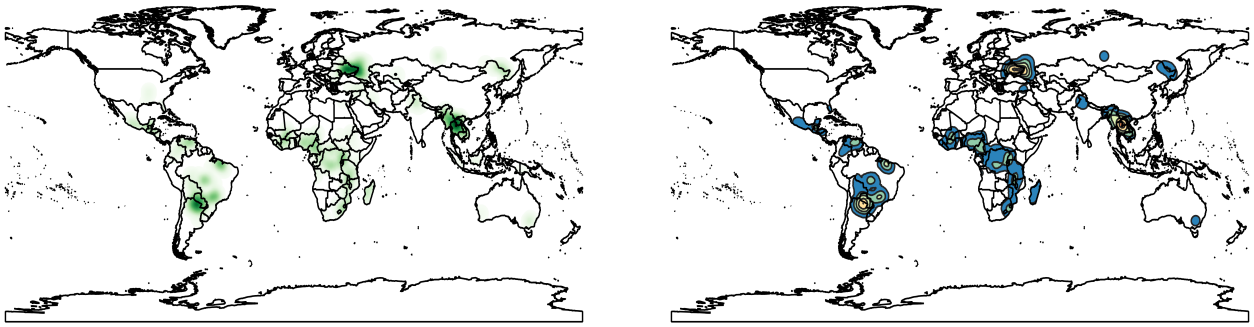
Supplementary Fig. 13. $\mathbf{Pyrome\ 10}$. R10 spatial distribution (left) and hot spots (right) representing local regimes.



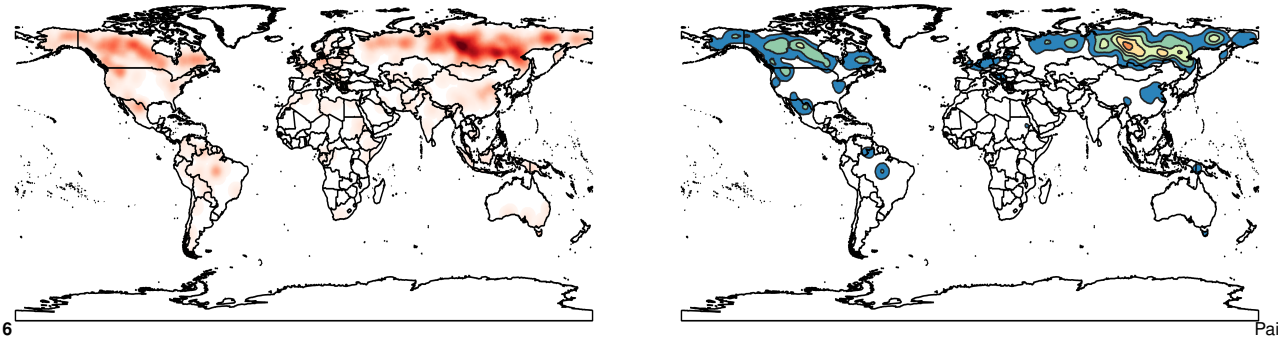
Supplementary Fig. 14. $\mathbf{Pyrome\ 11}$. R11 spatial distribution (left) and hot spots (right) representing local regimes.



Supplementary Fig. 15. $\mathbf{Pyrome\ 12}$. R12 spatial distribution (left) and hot spots (right) representing local regimes.



Supplementary Fig. 16. $\mathbf{Pyrome\ 13}$. R13 spatial distribution (left) and hot spots (right) representing local regimes.



Supplementary Fig. 17. $\mathbf{Pyrome\ 14}$. R14 spatial distribution (left) and hot spots (right) representing local regimes.

B1. Supplementary Discussion

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R0	AVG Frequency	31.89	**R0-a** **Area 6,160,000** km^2	AVG PDSI	-56.03 $\pm$ 124.58	AVG GDP [US dollars]	17,929.78 $\pm$ 18,686.63	GRS 51.5%
				AVG Water deficit [mm]	221.91 $\pm$ 245.56			CRO 26.7%
				AVG Temperature [K]	274.21 $\pm$ 13.78	AVG Population density [ppl/km2]	19.34 $\pm$ 93.21	NV 10.3%
	AVG # of Fires	50,931		AVG Max temperature [K]	288.65 $\pm$ 13.33			OSL 4.7%
				AVG Precipitation [m]	0.05 $\pm$ 0.02	AVG Accessibility [min]	596.38 $\pm$ 637.59	
	AVG Size	5.22	**R0-b** **Area 4,004,000** km^2	AVG PDSI	-57.33 $\pm$ 111.78	AVG GDP [US dollars]	36,757.34 $\pm$ 11,899.11	GRS 58.5%
				AVG Water deficit [mm]	760.58 $\pm$ 439.65			OSL 13.8%
				AVG Temperature [K]	285.99 $\pm$ 7.86	AVG Population density [ppl/km2]	18.20 $\pm$ 89.4	SAV 8.2%
				AVG Max temperature [K]	299.52 $\pm$ 7.01			CRO 7.1%
	AVG Perimeter	9.66		AVG Precipitation [m]	0.05 $\pm$ 0.01	AVG Accessibility [min]	157.03 $\pm$ 93.74	WDS 6.3%
	AVG Duration	4.76	**R0-c** **Area 2,297,000** km^2	AVG PDSI	-106.56 $\pm$ 116.13	AVG GDP [US dollars]	10,103.61 $\pm$ 5149.5	GRS 51.5%
				AVG Water deficit [mm]	673.76 $\pm$ 639.56			CRO 26.7%
				AVG Temperature [K]	285.22 $\pm$ 9.63	AVG Population density [ppl/km2]	63.66 $\pm$ 174.69	NV 10.3%
				AVG Max temperature [K]	297.24 $\pm$ 9.97			OSL 4.7%
				AVG Precipitation [m]	0.05 $\pm$ 0.02	AVG Accessibility [min]	120.26 $\pm$ 98.91	
	AVG Expansion	0.77	**R0-d** **Area 2,125,000** km^2	AVG PDSI	-16.59 $\pm$ 150.45	AVG GDP [US dollars]	2,959.19 $\pm$ 1,179.19	CRO 77.2%
				AVG Water deficit [mm]	672.26 $\pm$ 532.95			GRS 6.6%
				AVG Temperature [K]	297.77 $\pm$ 4.08	AVG Population density [ppl/km2]	373.95 $\pm$ 403.7	WDS 4.9%
	AVG Perimeter/Area	3.06		AVG Max temperature [K]	306.8 $\pm$ 3.95			SAV 4.4%
				AVG Precipitation [m]	0.1 $\pm$ 0.12	AVG Accessibility [min]	66.98 $\pm$ 144.17	MFS 2.4%
	N° of cells (res 1°)	2,057	**R0-e** **Area 2,006,000** km^2	AVG PDSI	-95.95 $\pm$ 134.15	AVG GDP [US dollars]	1,285.5 $\pm$ 685.69	GRS 61.4%
				AVG Water deficit [mm]	981.16 $\pm$ 204.53			CRO 9.6%
				AVG Temperature [K]	297.6 $\pm$ 0.87	AVG Population density [ppl/km2]	65.09 $\pm$ 123.2	SAV 8.8%
				AVG Max temperature [K]	305.94 $\pm$ 1.2			NV 7.4%
	Total # of fires	814,896		AVG Precipitation [m]	0.07 $\pm$ 0.03	AVG Accessibility [min]	228.46 $\pm$156.81	OSL 6.1%

Supplementary Table 1. $\mathbf{Fire\ regimes\ and\ subregimes\ details}$. Tables 1-15 provide a comprehensive description of all regimes and subregimes. Regimes are characterized using the inter-annual averages of fire behavior features including frequency (AVG number of fires experienced by a $1\check{r} \times 1\check{r}$ regime cell), the number of fires (AVG number of fires during the study period), size (AVG size of the wildfires in km^2, perimeter (AVG perimeter of the experienced wildfires in km), duration (AVG duration in days), expansion (AVG daily expansion of the wildfires in km^2/day), perimeter per area ratio (AVG ratio to characterize the shape of the wildfires); and the total number of cells and fires classified as part of the regime. Areas of the subregimes within the 30% hot-spots thresholds are characterized by their (1) spatial location (five largest hot-spots); (2) climatic conditions considering AVG Palmer drought severity index (PDSI), AVG water deficit [mm], AVG temperature [K°], AVG max temperature [K°], and AVG total precipitation [m]; and (3) socio-economic descriptors including the AVG gross domestic product (GDP) in US dollars, AVG population density (total population per km^2, AVG accessibility (land-based travel time in minutes to the nearest densely-populated areas with 1,500 or more inhabitants per square kilometer), and land-use configuration. Land use includes the following categories: Closed shrublands (CSL), Croplands (CRO), Deciduous broadleaf forests (DBF), Evergreen broadleaf palmate (EBP), Evergreen needleaf conifer (ENC), Grasslands (GRS), Mixed Forest (MFS), Non-vegetated (NV), Open shrublands (OSL), Permanent wetlands (PWL), Savannas (SAV), Water bodies (WBS), and Woody Savannas (WDS).

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R1	AVG Frequency	1.63	R1-a Area 2,851,000 km^2	AVG PDSI	-44.22 ± 112.27	AVG GDP [US dollars]	42,948.77 ± 9,999.68	WDS 22.2%
				AVG Water deficit [mm]	123.02 ± 169.04			GRS 15.6%
				AVG Temperature [K]	271.34 ± 11.07	AVG Population density [ppl/km2]	2.90 ± 33.48	ENC 15.1%
	AVG # of Fires	5,324.68		AVG Max temperature [K]	284.45 ± 10.41			SAV 12.8%
				AVG Precipitation [m]	0.07 ± 0.02	AVG Accessibility [min]	1,266.64 ± 1,118.64	OSL 11.6%
			R1-b Area 2,640,000 km^2	AVG PDSI	75.39 ± 159.71	AVG GDP [US dollars]	9,339.71 ± 2,859.48	
	AVG Size	0.79		AVG Water deficit [mm]	51.76 ± 56.7			EBP 95.3%
				AVG Temperature [K]	298.62 ± 0.61	AVG Population density [ppl/km2]	3.31 ± 22.08	
				AVG Max temperature [K]	306.29 ± 0.92			SAV 2.7%
	AVG Perimeter	3.66		AVG Precipitation [m]	1.23 ± 0.06	AVG Accessibility [min]	2,327.39 ± 1,471.56	
			R1-c Area 1,784,000 km^2	AVG PDSI	82.67 ± 172.89	AVG GDP [US dollars]	41,295.28 ± 4,414.2	
				AVG Water deficit [mm]	116.08 ± 164.43			CRO 35.9%
	AVG Duration	2.70		AVG Temperature [K]	279.64 ± 10.86	AVG Population density [ppl/km2]	37.72 ± 147.89	MFS 16.8%
				AVG Max temperature [K]	293.64 ± 9.69			WDS 13.9%
				AVG Precipitation [m]	0.08 ± 0.02	AVG Accessibility [min]	334.84 ± 616.89	WBS 11.1%
	AVG Expansion	0.30	R1-d Area 1,351,000 km^2	AVG PDSI	-116.55 ± 236.67	AVG GDP [US dollars]	37,944.20 ± 9,218.88	
				AVG Water deficit [mm]	47.38 ± 116.56			OSL 74.8%
				AVG Temperature [K]	264.27 ± 15.14	AVG Population density [ppl/km2]	0.06 ± 0.02	GRS 16.4%
	AVG Perimeter/Area	6.59		AVG Max temperature [K]	278.32 ± 13.26			WBD 5%
				AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	4,555.78 ± 1594.01	SAV 3.3%
			R1-e Area 1,205,000 km^2	AVG PDSI	19.34 ± 177.1	AVG GDP [US dollars]	5,244.49 ± 4,634.23	GRS 53%
	N° of cells (res 1°)	1,335		AVG Water deficit [mm]	415.79 ± 388.96			NV 33.5%
				AVG Temperature [K]	274.29 ± 11.54	AVG Population density [ppl/km2]	21.17 ± 97.56	MFS 4.6%
				AVG Max temperature [K]	286.77 ± 11.25			CRO 3.8%
	Total # of fires	85,195		AVG Precipitation [m]	0.05 ± 0.02	AVG Accessibility [min]	505.12 ± 380.83	WDS 2.5%

Supplementary Table 2. $\mathrm{Pyrome}\ 1$. R1 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R2	AVG Frequency	398.99	R2-a Area 1,375,000 km^2	AVG PDSI	-213.83 ± 220.22	AVG GDP [US dollars]	1,928.77 ± 872.34	SAV 43.4%
	AVG # of Fires	64,393.3		AVG Water deficit [mm]	777.56 ± 603.69			GRS 41.8%
	AVG Size	34.03		AVG Temperature [K]	300.37 ± 1.86	AVG Population density [ppl/km2]	12.75 ± 18.45	EBP 5.2%
	AVG Perimeter	24.22		AVG Max temperature [K]	309.19 ± 2.8			MFS 3.2%
	AVG Duration	6.24		AVG Precipitation [m]	0.08 ± 0.07	AVG Accessibility [min]	500.11 ± 377.59	WDS 3.1%
			R2-b Area 404,000 km^2	AVG PDSI	244.03 ± 261.56	AVG GDP [US dollars]	6,029.77 ± 2,413.07	GRS 74.7%
	AVG Expansion	2.28		AVG Water deficit [mm]	915.52 ± 621.05			SAV 9%
	AVG Perimeter/Area	0.94		AVG Temperature [K]	295.61 ± 3.04	AVG Population density [ppl/km2]	2.75 ± 5.16	CSL 6.8%
	N° of cells (res 1°)	93		AVG Max temperature [K]	305.98 ± 2.95			OSL 4.2%
	Total # of fires	965,900		AVG Precipitation [m]	0.07 ± 0.09	AVG Accessibility [min]	587.89 ± 273.43	WDS 3.1%

Supplementary Table 3. $\mathrm{Pyrome}\ 2$. R2 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R3	AVG Frequency	616.62	R3-a Area 4,202,000 km^2	AVG PDSI	-196.97 ± 152.14	AVG GDP [US dollars]	2,035.66 ± 1,089.43	GRS 36.3%
				AVG Water deficit [mm]	676.12 ± 518.87			SAV 35%
				AVG Temperature [K]	300.1 ± 1.72	AVG Population density [ppl/km2]	57.9 ± 153.67	CRO 12.6%
	AVG # of Fires	398,406		AVG Max temperature [K]	308.7 ± 2.48			EBP 7.7%
				AVG Precipitation [m]	0.09 ± 0.07	AVG Accessibility [min]	256.18 ± 292.03	WDS 3.4%
			R3-b Area 3,176,000 km^2	AVG PDSI	-17.18 ± 105.5	AVG GDP [US dollars]	2,307.22 ± 1,579.92	SAV 45.5%
	AVG Size	3.37		AVG Water deficit [mm]	536.48 ± 450.1			GRS 25.7%
				AVG Temperature [K]	295.68 ± 1.58	AVG Population density [ppl/km2]	25.94 ± 118.55	WDS 15.8%
				AVG Max temperature [K]	304.49 ± 1.72			DBF 3.1%
	AVG Perimeter	7.79		AVG Precipitation [m]	0.09 ± 0.09	AVG Accessibility [min]	283.22 ± 210.73	MFS 2.8%
			R3-c Area 960,000 km^2	AVG PDSI	-95.69 ± 248.4	AVG GDP [US dollars]	3,480.65 ± 3,402.52	CRO 34%
				AVG Water deficit [mm]	329.22 ± 326.19			EBP 27.2%
	AVG Duration	4.30		AVG Temperature [K]	298.61 ± 2.07	AVG Population density [ppl/km2]	86.35 ± 125.48	WDS 15.2%
				AVG Max temperature [K]	307.02 ± 2.09			SAV 10.7%
				AVG Precipitation [m]	0.15 ± 0.12	AVG Accessibility [min]	180.41 ± 154.04	MFS 4.9%
	AVG Expansion	0.58	R3-d Area 531,000 km^2	AVG PDSI	19.18 ± 221.84	AVG GDP [US dollars]	7,532.68 ± 2,720.27	
				AVG Water deficit [mm]	368.59 ± 282.76			SAV 63.6%
				AVG Temperature [K]	295.93 ± 3.85	AVG Population density [ppl/km2]	17.3 ± 79.8	WDS 12.9%
	AVG Perimeter/Area	2.72		AVG Max temperature [K]	308.33 ± 2.95			GRS 11.9%
				AVG Precipitation [m]	0.11 ± 0.06	AVG Accessibility [min]	170.68 ± 129.09	CRO 10.5%
			R3-e Area 463,000 km^2	AVG PDSI	-135.18 ± 114.28	AVG GDP [US dollars]	1,420.92 ± 0.0	
	N° of cells (res 1°)	333		AVG Water deficit [mm]	585.16 ± 421.72			GRS 76.4%
				AVG Temperature [K]	295.98 ± 2.03	AVG Population density [ppl/km2]	31.96 ± 88.41	WDS 8.2%
				AVG Max temperature [K]	304.34 ± 1.95			SAV 6.4%
	Total # of fires	6,374,490		AVG Precipitation [m]	0.12 ± 0.13	AVG Accessibility [min]	486.82 ± 265.72	EBP 5.2%

Supplementary Table 4. $\mathrm{Pyrome}\ 3$. R3 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R4	AVG Frequency	39.56	**R4-a** **Area 3,400,000** km^2	AVG PDSI	-58.95 ± 165.48	AVG GDP [US dollars]	15,839.66 ± 9,630.03	GRS 84.5% CRO 11.8%
				AVG Water deficit [mm]	584.34 ± 641.65			
				AVG Temperature [K]	279.82 ± 12.85	AVG Population density [ppl/km2]	10.05 ± 60.17	
	AVG # of Fires	73,720		AVG Max temperature [K]	293.71 ± 13.12			
				AVG Precipitation [m]	0.03 ± 0.01	AVG Accessibility [min]	370.1 ± 274.41	
	AVG Size	23.63	**R4-b** **Area 3,139,000** km^2	AVG PDSI	42.32 ± 146.38	AVG GDP [US dollars]	1,921.12 ± 820.93	GRS 53.4% NV 38.1% CRO 6.9%
				AVG Water deficit [mm]	1,659.69 ± 500.25			
				AVG Temperature [K]	301.79 ± 3.61	AVG Population density [ppl/km2]	25.75 ± 52.72	
				AVG Max temperature [K]	312.36 ± 2.75			
	AVG Perimeter	21.39		AVG Precipitation [m]	0.02 ± 0.03	AVG Accessibility [min]	643.57 ± 769.82	
	AVG Duration	5.30	**R4-c** **Area 2,954,000** km^2	AVG PDSI	-70.67 ± 156.95	AVG GDP [US dollars]	9,158.96 ± 4,351.73	SAV 43.9% GRS 23.1% EBP 21% WDS 4.6% MFS 3.7%
				AVG Water deficit [mm]	368.94 ± 348.53			
				AVG Temperature [K]	298.81 ± 1.05	AVG Population density [ppl/km2]	7.27 ± 43.16	
				AVG Max temperature [K]	307.52 ± 1.62			
				AVG Precipitation [m]	0.12 ± 0.1	AVG Accessibility [min]	316.61 ± 326.88	
	AVG Expansion	2.60	**R4-d** **Area 2,459,000** km^2	AVG PDSI	40.01 ± 156.95	AVG GDP [US dollars]	7,982.99 ± 3,642.01	GRS 53.1% OSL 34.3% NV 4.4% CSL 2.8% SAV 2.8%
				AVG Water deficit [mm]	1,063.12 ± 355.01			
				AVG Temperature [K]	293.67 ± 3.89	AVG Population density [ppl/km2]	18.9 ± 89.74	
	AVG Perimeter/Area	1.70		AVG Max temperature [K]	305.88 ± 3.4			
				AVG Precipitation [m]	0.04 ± 0.04	AVG Accessibility [min]	232.51 ± 187.33	
	N° of cells (res 1°)	1,236	**R4-e** **Area 2,191,000** km^2	AVG PDSI	47.11 ± 152.9	AVG GDP [US dollars]	45,082.77 ± 5,033.36	OSL 94.9% CSL 2.2%
				AVG Water deficit [mm]	1,644.23 ± 627.61			
				AVG Temperature [K]	296.37 ± 5.88	AVG Population density [ppl/km2]	0.07 ± 1.22	
				AVG Max temperature [K]	309.2 ± 5.8			
	Total # of fires	1,179,505		AVG Precipitation [m]	0.02 ± 0.02	AVG Accessibility [min]	1,361.62 ± 552.15	

Supplementary Table 5. $\mathrm{Pyrome}\ 4$. R4 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R5	AVG Frequency	21.36	**R5-a** **Area 4,940,000** km^2	AVG PDSI	-69.13 ± 89.58	AVG GDP [US dollars]	29,667.85 ± 33,568.92	MFS 30.3% CRO 28.5% SAV 12.5% WDS 9.5% PWL 4.4%
				AVG Water deficit [mm]	130.74 ± 170.44			
				AVG Temperature [K]	277.5 ± 10.69	AVG Population density [ppl/km2]	43.7 ± 196.36	
	AVG # of Fires	33,982.25		AVG Max temperature [K]	289.83 ± 11.0			
				AVG Precipitation [m]	0.06 ± 0.02	AVG Accessibility [min]	324.7 ± 603.62	
	AVG Size	2.58	**R5-b** **Area 3,804,000** km^2	AVG PDSI	64.43 ± 144.38	AVG GDP [US dollars]	38,280.27 ± 9,084.44	CRO 33.7% GRS 24.6% WDS 20.7% DBF 7.9% SAV 7.6%
				AVG Water deficit [mm]	361.25 ± 224.51			
				AVG Temperature [K]	286.85 ± 8.67	AVG Population density [ppl/km2]	37.34 ± 181.84	
				AVG Max temperature [K]	300.43 ± 6.74			
	AVG Perimeter	6.92		AVG Precipitation [m]	0.07 ± 0.02	AVG Accessibility [min]	98.03 ± 78.04	
	AVG Duration	4.64	**R5-c** **Area 1,750,000** km^2	AVG PDSI	-159.3 ± 155.6	AVG GDP [US dollars]	4,139.49 ± 1,723.21	WDS 38.4% SAV 31.7% EBP 8.2% GRS 5.8% CRO 5.4%
				AVG Water deficit [mm]	140.68 ± 96.48			
				AVG Temperature [K]	289.24 ± 6.43	AVG Population density [ppl/km2]	194.05 ± 322.13	
				AVG Max temperature [K]	299.53 ± 5.29			
				AVG Precipitation [m]	0.14 ± 0.08	AVG Accessibility [min]	207.65 ± 248.61	
	AVG Expansion	0.45	**R5-d** **Area 1,220,000** km^2	AVG PDSI	-71.78 ± 122.66	AVG GDP [US dollars]	41,856.29 ± 5800	GRS 56.8% OSL 11.8% WDS 10.2% ENC 9.6% NV 5%
				AVG Water deficit [mm]	651.34 ± 558.56			
				AVG Temperature [K]	281.98 ± 8.85	AVG Population density [ppl/km2]	8.71 ± 58	
	AVG Perimeter/Area	4.15		AVG Max temperature [K]	295.39 ± 9.38			
				AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	185.27 ± 97.05	
	N° of cells (res 1°)	2,735	**R5-e** **Area 1,194,000** km^2	AVG PDSI	-65.74 ± 216.61	AVG GDP [US dollars]	35,297.79 ± 1661.34	GRS 38.7% OSL 36.3% CRO 10.4% SAV 7.5% WDS 2.5%
				AVG Water deficit [mm]	985.2 ± 595.58			
				AVG Temperature [K]	291.46 ± 5.78	AVG Population density [ppl/km2]	2.62 ± 18.13	
				AVG Max temperature [K]	305.02 ± 7.02			
	Total # of fires	543,716		AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	323.16 ± 193.05	

Supplementary Table 6. $\mathrm{Pyrome}\ 5$. R5 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R6	AVG Frequency	790.48	R6-a Area 3,645,000 km^2	AVG PDSI	-70.53 ± 122.12	AVG GDP [US dollars]	2,013.19 ± 1,628.09	SAV 51.6%
				AVG Water deficit [mm]	475.75 ± 412.76			WDS 18.9%
				AVG Temperature [K]	296.09 ± 1.14	AVG Population density [ppl/km2]	27.13 ± 75.47	CRO 13.8%
	AVG # of Fires	325,829.5		AVG Max temperature [K]	304.62 ± 1.35			EBP 4.4%
				AVG Precipitation [m]	0.1 ± 0.09	AVG Accessibility [min]	270.93 ± 189.36	DBF 4.3%
	AVG Size	7.79	R6-b Area 1,155,000 km^2	AVG PDSI	-121.99 ± 242.76	AVG GDP [US dollars]	2,180.17 ± 773.76	GRS 48.7%
				AVG Water deficit [mm]	828.77 ± 585.09			SAV 40.9%
				AVG Temperature [K]	300.43 ± 1.82	AVG Population density [ppl/km2]	23.73 ± 32.46	CRO 3.2%
	AVG Perimeter	12.38		AVG Max temperature [K]	309.32 ± 2.66			EBP 2.6%
				AVG Precipitation [m]	0.08 ± 0.06	AVG Accessibility [min]	283.09 ± 196.99	WDS 2.1%
	AVG Duration	5.39	R6-c Area 885,000 km^2	AVG PDSI	-278.46 ± 172.61	AVG GDP [US dollars]	1,391.22 ± 597.51	GRS 39.5%
				AVG Water deficit [mm]	929.5 ± 651.82			SAV 32.2%
				AVG Temperature [K]	300.48 ± 2.14	AVG Population density [ppl/km2]	17.27 ± 32.07	CRO 16.4%
				AVG Max temperature [K]	309.92 ± 2.89			DBF 5.2%
				AVG Precipitation [m]	0.08 ± 0.08	AVG Accessibility [min]	372.31 ± 266.18	MFS 4.9%
	AVG Expansion	0.95	R6-d Area 582,000 km^2	AVG PDSI	-110.08 ± 160.06	AVG GDP [US dollars]	1,880.84 ± 762.73	GRS 62.7%
				AVG Water deficit [mm]	721.82 ± 545.48			SAV 22%
				AVG Temperature [K]	301.27 ± 1.89	AVG Population density [ppl/km2]	51.8 ± 86.96	CRO 12.2%
	AVG Perimeter/Area	1.70		AVG Max temperature [K]	309.51 ± 2.45			WDS 2%
				AVG Precipitation [m]	0.07 ± 0.07	AVG Accessibility [min]	118.02 ± 66.93	
	N° of cells (res 1°)	188	R6-e Area 359,000 km^2	AVG PDSI	111.43 ± 353.81	AVG GDP [US dollars]	1,878.83 ± 618.68	
				AVG Water deficit [mm]	1,073.64 ± 682.41			GRS 77.2%
				AVG Temperature [K]	302.52 ± 2.62	AVG Population density [ppl/km2]	21.87 ± 29.55	SAV 14.6%
				AVG Max temperature [K]	312.19 ± 2.88			CRO 6.1%
	Total # of fires	5,213,272		AVG Precipitation [m]	0.05 ± 0.07	AVG Accessibility [min]	262.77 ± 177.33	

Supplementary Table 7. $\mathrm{Pyrome}\ 6$. R6 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R7	AVG Frequency	3.50	R7-a Area 1,280,000 km^2	AVG PDSI	-14.11 ± 123.77	AVG GDP [US dollars]	39,666.61 ± 10,112.52	SAV 41.4%
	AVG # of Fires	964.2		AVG Water deficit [mm]	96.65 ± 164.08			WDS 41.3%
	AVG Size	33.94		AVG Temperature [K]	270.6 ± 14.06	AVG Population density [ppl/km2]	0.17 ± 2.19	OSL 6.9%
	AVG Perimeter	33.61		AVG Max temperature [K]	285.63 ± 12.61			WBS 5.1%
	AVG Duration	12.81		AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	1630.55 ± 1,065.22	ENC 3.9%
	AVG Expansion	1.54	R7-b Area 313,000 km^2	AVG PDSI	-74.79 ± 257.57	AVG GDP [US dollars]	22,476.51 ± 3,260.94	WDS 47.7%
	AVG Perimeter/Area	2.10		AVG Water deficit [mm]	68.22 ± 142.32			SAV 38.7%
	N° of cells (res 1°)	358		AVG Temperature [K]	267.59 ± 16.61	AVG Population density [ppl/km2]	0.07 ± 0.17	MFS 9.4%
	Total # of fires	13,500		AVG Max temperature [K]	282.9 ± 14.95			DNF 3.6%
				AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	3,260.62 ± 1761.49	

Supplementary Table 8. $\mathrm{Pyrome}\ 7$. R7 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R8	AVG Frequency	9.44	R8-a Area 5,558,000 km^2	AVG PDSI	41.15 ± 120.84	AVG GDP [US dollars]	41,532.5 ± 5,512.08	CRO 30.6%
				AVG Water deficit [mm]	296.31 ± 266.14			GRS 24.7%
				AVG Temperature [K]	281.53 ± 9.67	AVG Population density [ppl/km2]	22.48 ± 89.22	WDS 18.4%
	AVG # of Fires	15,612		AVG Max temperature [K]	295.74 ± 8.45			ENC 7.4%
				AVG Precipitation [m]	0.06 ± 0.02	AVG Accessibility [min]	213.42 ± 313.19	DBF 6.6%
	AVG Size	1.68	R8-b Area 2,984,000 km^2	AVG PDSI	-115.7 ± 111.05	AVG GDP [US dollars]	4,227.29 ± 2,063.82	WDS 28.7%
				AVG Water deficit [mm]	134.54 ± 81.68			SAV 23.7%
				AVG Temperature [K]	288.20 ± 6.3	AVG Population density [ppl/km2]	218.65 ± 419.32	GRS 13.1%
				AVG Max temperature [K]	298.21 ± 5.11			EBP 12.6%
	AVG Perimeter	5.36		AVG Precipitation [m]	0.15 ± 0.09	AVG Accessibility [min]	247.83 ± 294.98	CRO 7.1%
	AVG Duration	3.91	R8-c Area 1,681,000 km^2	AVG PDSI	-27.41 ± 169.16	AVG GDP [US dollars]	17,577.18 ± 6,671.45	MFS 53.7%
				AVG Water deficit [mm]	68.16 ± 118.52			WDS 15.4%
				AVG Temperature [K]	276.99 ± 9.98	AVG Population density [ppl/km2]	21.49 ± 157.34	ENC 10.5%
				AVG Max temperature [K]	288.22 ± 10.63			CRO 6.6%
				AVG Precipitation [m]	0.06 ± 0.02	AVG Accessibility [min]	221.36 ± 161.5	SAV 5.1%
	AVG Expansion	0.36	R8-d Area 1,348,000 km^2	AVG PDSI	-155.53 ± 188.71	AVG GDP [US dollars]	5,275.18 ± 1,795.85	GRS 64.2%
				AVG Water deficit [mm]	442.91 ± 426.27			CRO 19.9%
				AVG Temperature [K]	278.53 ± 13.21	AVG Population density [ppl/km2]	129.87 ± 463.14	DBF 9.2%
	AVG Perimeter/Area	5.28		AVG Max temperature [K]	292.92 ± 12.21			NV 2.5%
				AVG Precipitation [m]	0.04 ± 0.04	AVG Accessibility [min]	222.1 ± 229.9	
	N° of cells (res 1°)	1952	R8-e Area 1,255,000 km^2	AVG PDSI	-141.85 ± 153.42	AVG GDP [US dollars]	30,478.88 ± 10,477.64	CRO 45.8%
				AVG Water deficit [mm]	138.76 ± 194.18			MFS 17.6%
				AVG Temperature [K]	282.38 ± 6.83	AVG Population density [ppl/km2]	174.59 ± 270	SAV 13.3%
				AVG Max temperature [K]	293.85 ± 8.09			GRS 6.5%
	Total # of fires	249,797		AVG Precipitation [m]	0.08 ± 0.03	AVG Accessibility [min]	33.94 ± 22.04	ENC 6.2%

Supplementary Table 9. $\mathrm{Pyrome}\ 8$. R8 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R9	AVG Frequency	0.30	R9-a Area 2,650,000 km^2	AVG PDSI	63.87 ± 97.66	AVG GDP [US dollars]	37,566.63 ± 6,259.65	SAV 19.5%
				AVG Water deficit [mm]	50.78 ± 86.34			MFS 18.1%
				AVG Temperature [K]	274.72 ± 11.41	AVG Population density [ppl/km2]	20.82 ± 108.71	WDS 12.7%
	AVG # of Fires	2,058.87		AVG Max temperature [K]	288.27 ± 10.21			WBS 11.8%
				AVG Precipitation [m]	0.08 ± 0.02	AVG Accessibility [min]	1536.29 ± 1,724.4	DBF 9.3%
	AVG Size	0.28	R9-b Area 2,593,000 km^2	AVG PDSI	-59.09 ± 129.16	AVG GDP [US dollars]	4,616.73 ± 2071.9	GRS 46.6%
				AVG Water deficit [mm]	452.79 ± 404.37			NV 44.6%
				AVG Temperature [K]	275.5 ± 11.04	AVG Population density [ppl/km2]	28.35 ± 158.99	WDS 2.3%
				AVG Max temperature [K]	288.89 ± 10.22			CRO 2.1%
	AVG Perimeter	2.25		AVG Precipitation [m]	0.03 ± 0.03	AVG Accessibility [min]	760.26 ± 789.5	
	AVG Duration	1.34	R9-c Area 2,293,000 km^2	AVG PDSI	71.96 ± 143.75	AVG GDP [US dollars]	9,299.38 ± 3,967.94	EBP 95% SAV 3.2%
				AVG Water deficit [mm]	49.13 ± 48.23			
				AVG Temperature [K]	297.78 ± 0.59	AVG Population density [ppl/km2]	6.18 ± 41.8	
				AVG Max temperature [K]	305.55 ± 0.86			
				AVG Precipitation [m]	0.24 ± 0.05	AVG Accessibility [min]	2,416.05 ± 1,541.81	
	AVG Expansion	0.23	R9-d Area 790,000 km^2	AVG PDSI	-89.95 ± 248.22	AVG GDP [US dollars]	43,428.7 ± 1,990.3	OSL 55.4% GRS 39.5% WBS 5.1%
				AVG Water deficit [mm]	63.44 ± 153.06			
				AVG Temperature [K]	262.81 ± 15.48	AVG Population density [ppl/km2]	0.01 ± 0.84	
	AVG Perimeter/Area	8.45		AVG Max temperature [K]	277.26 ± 13.87			
				AVG Precipitation [m]	0.03 ± 0.02	AVG Accessibility [min]	5,468.78 ± 1,330.9	
	N° of cells (res 1°)	730	R9-e Area 666,000 km^2	AVG PDSI	-43.72 ± 198.5	AVG GDP [US dollars]	43,526.02 ± 0	OSL 36.9% SAV 32% GRS 22.7% WBS 7.3%
				AVG Water deficit [mm]	94.4 ± 181.04			
				AVG Temperature [K]	265.16 ± 14.5	AVG Population density [ppl/km2]	0.01 ± 0.21	
				AVG Max temperature [K]	278.92 ± 13.26			
	Total # of fires	32,942		AVG Precipitation [m]	0.03 ± 0.02	AVG Accessibility [min]	3,413.65 ± 975.07	

Supplementary Table 10. $\mathrm{Pyrome}\ 9$. R9 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R10	AVG Frequency	30.50	R10-a Area 723,000 km^2	AVG PDSI	94.2 ± 185.97	AVG GDP [US dollars]	43,430.03 ± 1,721.87	OSL 57.3% GRS 42.6%
	AVG # of Fires	780,738		AVG Water deficit [mm]	1,347.91 ± 494.79			
	AVG Size	511.61		AVG Temperature [K]	299.31 ± 4.44	AVG Population density [ppl/km2]	0.03 ± 0.27	
	AVG Perimeter	102.79		AVG Max temperature [K]	310.12 ± 3.83			
	AVG Duration	43,896		AVG Precipitation [m]	0.05 ± 0.07	AVG Accessibility [min]	1,043.62 ± 500.85	
	AVG Expansion	18.23	R10-b Area 336,000 km^2	AVG PDSI	10.12 ± 171.38	AVG GDP [US dollars]	11,115.88 ± 620.48	OSL 52% GRS 46.7%
				AVG Water deficit [mm]	1,336.27 ± 432.84			
	AVG Perimeter/Area	0.78		AVG Temperature [K]	295.31 ± 4.43	AVG Population density [ppl/km2]	1.93 ± 3.71	
	N° of cells (res 1°)	37		AVG Max temperature [K]	307.06 ± 3.75			
	Total # of fires	60,567		AVG Precipitation [m]	0.04 ± 0.05	AVG Accessibility [min]	409.38 ± 188.37	

Supplementary Table 11. $\mathrm{Pyrome}\ 10$. R10 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R11	AVG Frequency	77.37	R11-a Area 2,798,000 km^2	AVG PDSI	70.02 ± 178.9	AVG GDP [US dollars]	43,651.49 ± 4,498.78	OSL 64.8% GRS 29.6% SAV 3.1%
				AVG Water deficit [mm]	1,389.33 ± 433.11			
	AVG # of Fires	24,574.9		AVG Temperature [K]	298.76 ± 4.6	AVG Population density [ppl/km2]	0.09 ± 12.63	
				AVG Max temperature [K]	309.74 ± 4.1			
	AVG Size	106.54		AVG Precipitation [m]	0.05 ± 0.06	AVG Accessibility [min]	1,252.88 ± 635.63	
	AVG Perimeter	45.93	R11-b Area 898,000 km^2	AVG PDSI	116.07 ± 200.22	AVG GDP [US dollars]	8,835.03 ± 2,773.3	GRS 55.2% OSL 36.8% CSL 6.6%
				AVG Water deficit [mm]	1,187.18 ± 476.4			
	AVG Duration	5.56		AVG Temperature [K]	295.44 ± 3.94	AVG Population density [ppl/km2]	2.19 ± 6	
				AVG Max temperature [K]	306.74 ± 3.42			
	AVG Expansion	7.11		AVG Precipitation [m]	0.05 ± 0.06	AVG Accessibility [min]	424.13 ± 235.29	
	AVG Perimeter/Area	0.98	R11-c Area 223,000 km^2	AVG PDSI	-64.84 ± 265.02	AVG GDP [US dollars]	13,733.36 ± 3,175.58	SAV 79.2% EBP 11.6% GRS 9.2%
				AVG Water deficit [mm]	353.09 ± 443.5			
	N° of cells (res 1°)	294		AVG Temperature [K]	300.01 ± 1.22	AVG Population density [ppl/km2]	3.41 ± 11.7	
				AVG Max temperature [K]	308.4 ± 1.89			
	Total # of fires	368,624		AVG Precipitation [m]	0.14 ± 0.13	AVG Accessibility [min]	271.37 ± 166.42	

Supplementary Table 12. $\mathrm{Pyrome}\ 11$. R11 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R12	AVG Frequency	1175.74	R12-a Area 3,224,000 km^2	AVG PDSI	-3.94 ± 123.62	AVG GDP [US dollars]	2,770.2 ± 2,727.32	SAV 42.9%
				AVG Water deficit [mm]	397.09 ± 356.39			WDS 20.3%
	AVG # of Fires	250394.75		AVG Temperature [K]	296.28 ± 0.96	AVG Population density [ppl/km2]	25.27 ± 127.8	GRS 16.1%
				AVG Max temperature [K]	304.89 ± 1.17			EBP 13.2%
	AVG Size	2.94		AVG Precipitation [m]	0.11 ± 0.08	AVG Accessibility [min]	297.41 ± 231.97	DBF 3.2%
	AVG Perimeter	7.61	R12-b Area 721,000 km^2	AVG PDSI	-20.19 ± 184.98	AVG GDP [US dollars]	1,425.04 ± 543.39	GRS 44.4%
				AVG Water deficit [mm]	639.13 ± 505.56			SAV 42.1%
	AVG Duration	4.34		AVG Temperature [K]	300.45 ± 1.9	AVG Population density [ppl/km2]	35.17 ± 165.24	WDS 7.2%
				AVG Max temperature [K]	309.05 ± 2.46			EBP 2.8%
	AVG Expansion	0.55		AVG Precipitation [m]	0.11 ± 0.11	AVG Accessibility [min]	160.91 ± 96.86	
	AVG Perimeter/Area	2.82	R12-c Area 80,000 km^2	AVG PDSI	-421.3 ± 214.02	AVG GDP [US dollars]	786.45 ± 102.88	SAV 70.6%
				AVG Water deficit [mm]	381.25 ± 437.14			EBP 12.7%
	N° of cells (res 1°)	179		AVG Temperature [K]	299.22 ± 1.36	AVG Population density [ppl/km2]	22.14 ± 75.8	MFS 6.9%
				AVG Max temperature [K]	307.64 ± 2.18			DBF 5.9%
	Total # of fires	4,006,316		AVG Precipitation [m]	0.1 ± 0.07	AVG Accessibility [min]	343.77 ± 145.15	WDS 3.9%

Supplementary Table 13. $\mathrm{Pyrome}\ 12$. R12 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R13	AVG Frequency	307.14	R13-a Area 1,734,000 km^2	AVG PDSI	9.25 ± 147.84	AVG GDP [US dollars]	9,319.79 ± 4,606.4	SAV 41.5%
				AVG Water deficit [mm]	470.94 ± 258.03			GRS 27.1%
	AVG # of Fires	132,845		AVG Temperature [K]	295.7 ± 3.37	AVG Population density [ppl/km2]	19.27 ± 65.94	CRO 10.7%
				AVG Max temperature [K]	307.75 ± 2.79			WDS 9.4%
				AVG Precipitation [m]	0.11 ± 0.06	AVG Accessibility [min]	205.14 ± 216.19	MFS 7.5%
	AVG Size	1.83	R13-b Area 1,727,000 km^2	AVG PDSI	-92.44 ± 202.42	AVG GDP [US dollars]	3,313.1 ± 3,820.58	EBP 34.8%
				AVG Water deficit [mm]	296.33 ± 287.1			CRO 24.4%
				AVG Temperature [K]	297.33 ± 2.54	AVG Population density [ppl/km2]	101.9 ± 254.31	WDS 16.3%
				AVG Max temperature [K]	305.89 ± 2.23			SAV 11.9%
	AVG Perimeter	5.81		AVG Precipitation [m]	0.16 ± 0.13	AVG Accessibility [min]	206.65 ± 186.37	MFS 5%
	AVG Duration	4.15	R13-c Area 1,044,000 km^2	AVG PDSI	-84.67 ± 188.12	AVG GDP [US dollars]	8,842 ± 3,102.56	CRO 78.4%
				AVG Water deficit [mm]	295.76 ± 373.63			GRS 9.5%
				AVG Temperature [K]	282.36 ± 9.88	AVG Population density [ppl/km2]	59.86 ± 133.37	SAV 2.6%
				AVG Max temperature [K]	294.29 ± 10.51			WBS 2.6%
				AVG Precipitation [m]	0.05 ± 0.02	AVG Accessibility [min]	83.9 ± 49.82	MFS 2.5%
	AVG Expansion	0.38	R13-d Area 700,000 km^2	AVG PDSI	-269.19 ± 174.99	AVG GDP [US dollars]	2,783.33 ± 837.05	SAV 34.6%
				AVG Water deficit [mm]	432.78 ± 407.55			GRS 21.5%
				AVG Temperature [K]	298.92 ± 1.64	AVG Population density [ppl/km2]	75.06 ± 116.44	CRO 20.7%
	AVG Perimeter/Area	3.66		AVG Max temperature [K]	307.15 ± 2.53			EBP 17.9%
				AVG Precipitation [m]	0.11 ± 0.09	AVG Accessibility [min]	131.01 ± 120.99	WDS 2.6%
	N° of cells (res 1°)	503	R13-e Area 436,000 km^2	AVG PDSI	-224.77 ± 298.02	AVG GDP [US dollars]	906.25 ± 303.03	EBP 38.8%
				AVG Water deficit [mm]	260.06 ± 212.24			SAV 22.3%
				AVG Temperature [K]	295.07 ± 0.65	AVG Population density [ppl/km2]	120.46 ± 179.98	NV 13.1%
				AVG Max temperature [K]	302.64 ± 1.12			WBS 9.4%
	Total # of fires	2,125,520		AVG Precipitation [m]	0.16 ± 0.06	AVG Accessibility [min]	316.26 ± 410.3	GRS 8%

Supplementary Table 14. $\mathrm{Pyrome}\ 13$. R13 pyrome and regimes description.

Pyrome	Fire characterization		Regimes	Climate features		Demographic features		Land Cover %
R14	AVG Frequency	6.25	R14-a Area 4,603,000 km^2	AVG PDSI	3.82 ± 150.84	AVG GDP [US dollars]	28,143.75 ± 2,0148.3	WDS 36.7%
				AVG Water deficit [mm]	61.32 ± 113.06			SAV 27%
	AVG # of Fires	6,090.4		AVG Temperature [K]	267.57 ± 16.27	AVG Population density [ppl/km2]	1.03 ± 11.34	MFS 13.7%
				AVG Max temperature [K]	282.27 ± 15.07			ENC 4%
				AVG Precipitation [m]	0.05 ± 0.03	AVG Accessibility [min]	2,135.49 ± 1,716.49	GRS 3.7%
	AVG Size	8.98	R14-b Area 1,551,000 km^2	AVG PDSI	11.07 ± 114.86	AVG GDP [US dollars]	40,326.96 ± 10,420.81	SAV 36.8%
				AVG Water deficit [mm]	86.8 ± 146.9			WDS 34.5%
				AVG Temperature [K]	270.02 ± 14.04	AVG Population density [ppl/km2]	0.09 ± 0.9	OSL 10.9%
				AVG Max temperature [K]	284.98 ± 12.57			ENC 9.3%
	AVG Perimeter	14.98		AVG Precipitation [m]	0.04 ± 0.02	AVG Accessibility [min]	1,973.91 ± 1,230.63	WBS 3.7%
	AVG Duration	8.32	R14-c Area 344,000 km^2	AVG PDSI	114.4 ± 267.16	AVG GDP [US dollars]	28,543.96 ± 2,858	
				AVG Water deficit [mm]	77.08 ± 175.35			SAV 50%
				AVG Temperature [K]	262.82 ± 18.09	AVG Population density [ppl/km2]	0.1 ± 0.09	OSL 45.2%
				AVG Max temperature [K]	277.25 ± 18.24			GRS 4.3%
				AVG Precipitation [m]	0.04 ± 0.03	AVG Accessibility [min]	1,999.31 ± 824	
	AVG Expansion	0.66	R14-d Area 192,000 km^2	AVG PDSI	-98.05 ± 245.25	AVG GDP [US dollars]	87,872.49 ± 26,410.96	WDS 43.7%
				AVG Water deficit [mm]	61.83 ± 142.58			ENC 24.1%
	AVG Perimeter/Area	3.03		AVG Temperature [K]	272.09 ± 13.09	AVG Population density [ppl/km2]	2.64 ± 0.8	MFS 12.1%
				AVG Max temperature [K]	285.89 ± 12.54			SAV 10.2%
				AVG Precipitation [m]	0.05 ± 0.03	AVG Accessibility [min]	698.02 ± 452.16	WBS 7.5%
	N° of cells (res 1°)	967	R14-e Area 186,000 km^2	AVG PDSI	-120.31 ± 209.21	AVG GDP [US dollars]	31,883.99 ± 1,565.96	SAV 69.6%
				AVG Water deficit [mm]	17.06 ± 80.44			WDS 21.6%
				AVG Temperature [K]	270.41 ± 12.6	AVG Population density [ppl/km2]	0.07 ± 0.7	PWL 5%
				AVG Max temperature [K]	284.37 ± 11.01			WBS 3.3%
	Total # of fires	91,356		AVG Precipitation [m]	0.08 ± 0.04	AVG Accessibility [min]	1,610.7 ± 697.28	

Supplementary Table 15. $\mathrm{Pyrome}\ 14$. R14 pyrome and regimes description.

Driving factor	Description
Per capita GDP[1,2]	There is evidence to suggest that higher per capita GDP is associated with a decrease in the number of fires and the area burned by fires. This can be explained due to increased access to firefighting resources, better land management practices, and more effective fire prevention measures in wealthier areas, among other reasons.
Population Density[3]	Higher population density is generally associated with more frequent fires and greater area burned. This is because densely populated areas are more likely to have ignition sources such as power lines, cigarettes, and campfires, and there are more people to accidentally start fires. Additionally, urban areas often contain flammable materials and structures that can facilitate fire spread.
Accessibility[4]	Areas that are easily accessible from dense inhabited locations may experience more frequent and intense fires. This is because human activity in these areas, such as camping, hunting, and off-road vehicle use, can increase the likelihood of ignition. In addition, access to these areas makes firefighting efforts easier, which may encourage more aggressive fire suppression and lead to an accumulation of fuel over time.
Temperature[3,5]	Higher temperatures are generally associated with more frequent and severe fires. This is because high temperatures can increase fuel dryness and promote fire spread, as well as increase the likelihood of lightning strikes.
Precipitation[3,4]	Precipitation can have a complex effect on fire patterns, depending on its timing, amount, and distribution. In general, wetter conditions can reduce the likelihood and severity of fires, while prolonged droughts can increase fuel dryness and promote fire spread.
Water Deficit[6,7]	Water deficit, which is the difference between precipitation and evapotranspiration, can increase the likelihood of fires by drying out vegetation and making it more flammable. Drought conditions can also reduce the amount of available water for firefighting efforts.
PDSI[3,8]	The Palmer Drought Severity Index (PDSI) is a measure of long-term drought intensity that takes into account precipitation, temperature, and soil moisture. Higher PDSI values indicate wetter conditions, while lower values indicate drier conditions. Low PDSI values can increase the likelihood of fires by reducing fuel moisture and increasing flammability.

Supplementary Table 16. $\mathrm{Driving\ factors}$. Description of the main driving factors used in the analysis of the pyromes and fire regimes in the study.

Metric/Method	Definition
Intra/Inter distance between groups[9,10]	This method involves comparing the distance between points within a cluster (intra-cluster distance) and the distance between clusters (inter-cluster distance). If the intra-cluster distance is small compared to the inter-cluster distance, it indicates that the data points in a cluster are tightly packed and well-separated from the points in other clusters. Therefore, this method can be used to optimize the selection of the total number of clusters by selecting the number of clusters that minimizes the intra-cluster distance and maximizes the inter-cluster distance.
Silhouette value[11,12]	It is a measure of how similar an object is to its own cluster (cohesion) compared to other clusters (separation). It ranges from -1 to 1, where a value of -1 indicates that the object is assigned to the wrong cluster, 0 indicates that it is on the border of two clusters, and 1 indicates that it is well-matched to its own cluster. To optimize the selection of the total number of clusters, we can calculate the average silhouette value across all data points for different numbers of clusters and choose the number of clusters with the highest average silhouette value.
Elbow method[13,14]	The elbow method involves plotting the total within-cluster sum of squares (WSS) as a function of the number of clusters. WSS is defined as the sum of the squared distance between each data point and its assigned cluster centroid. The plot will typically have an "elbow" shape, where the WSS initially decreases rapidly with an increase in the number of clusters and then levels off. The number of clusters where the rate of decrease in WSS starts to level off can be chosen as the optimal number of clusters. This method is called the elbow method because the optimal number of clusters often corresponds to the "elbow point" in the plot where the WSS starts to level off.
Optimal epsilon (DBSCAN)[15]	This method involves plotting the distance to the k-th nearest neighbor against k and selecting the value of k at which the graph has a sharp drop. The corresponding distance is chosen as the optimal epsilon value.
Reachability plot (DBSCAN/OPTICS)[16]	A reachability plot is a visualization of the cluster hierarchy generated by the algorithm. It shows the distance between each point and its nearest core point, which can be used to identify the optimal number of clusters.
Ordering plot (OPTICS)[17]	An ordering plot shows the ordering of points based on their reachability distance. The plot can be used to identify the points where the ordering changes significantly, which can indicate the presence of a cluster.
Quantization error (SOM)[18]	This method involves calculating the distance between each data point and its assigned cluster centroid and summing these distances across all data points. The optimal number of clusters is the number that minimizes the quantization error.
Topographic error (SOM)[19]	This method involves calculating the proportion of neighboring data points that are assigned to a different cluster. The optimal number of clusters is the number that minimizes the topographic error.

Supplementary Table 17. $\mathrm{Clustering\ metric/methods}$. Summary of clustering metrics/methods used to evaluate the unsupervised learning algorithms in the study.

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