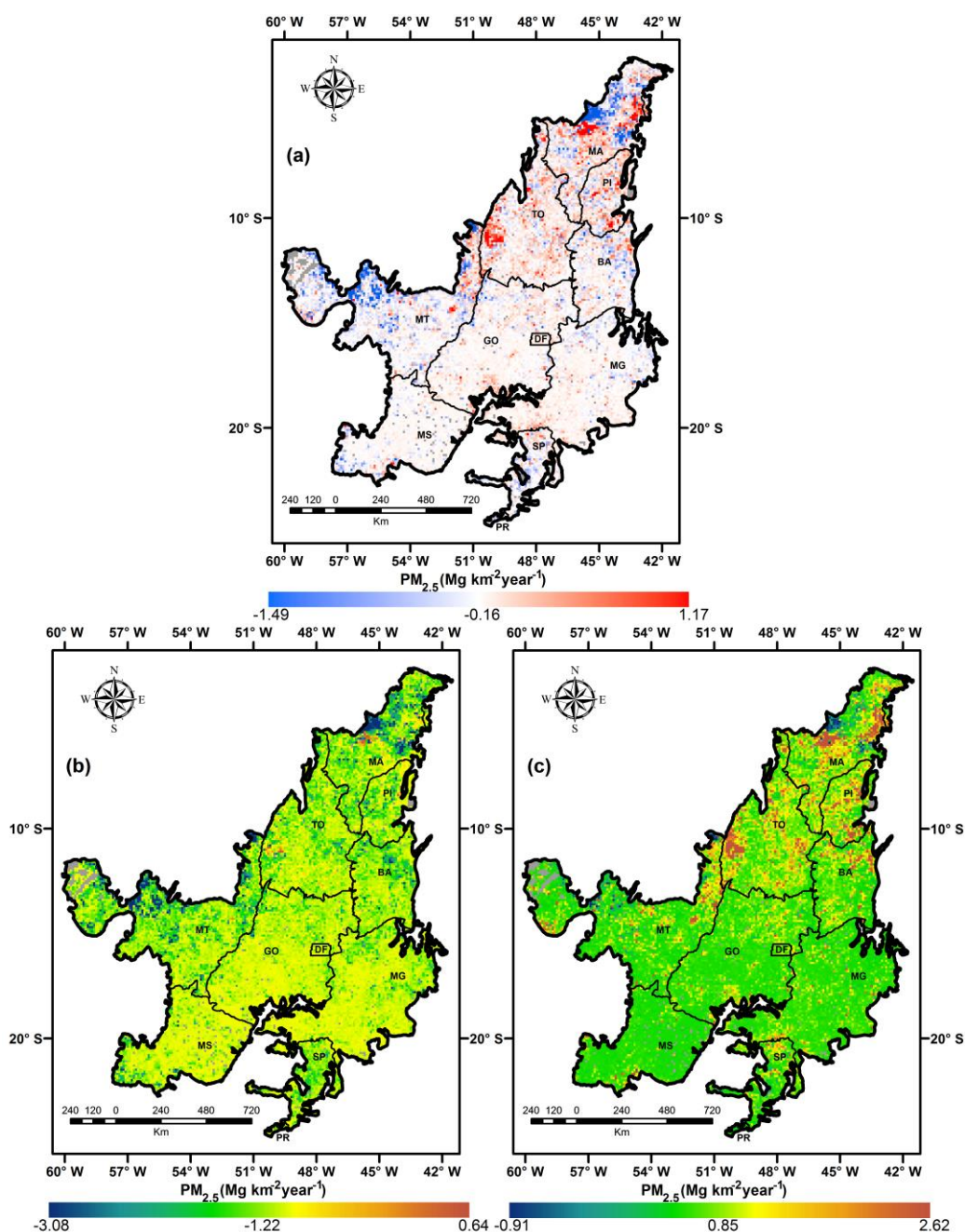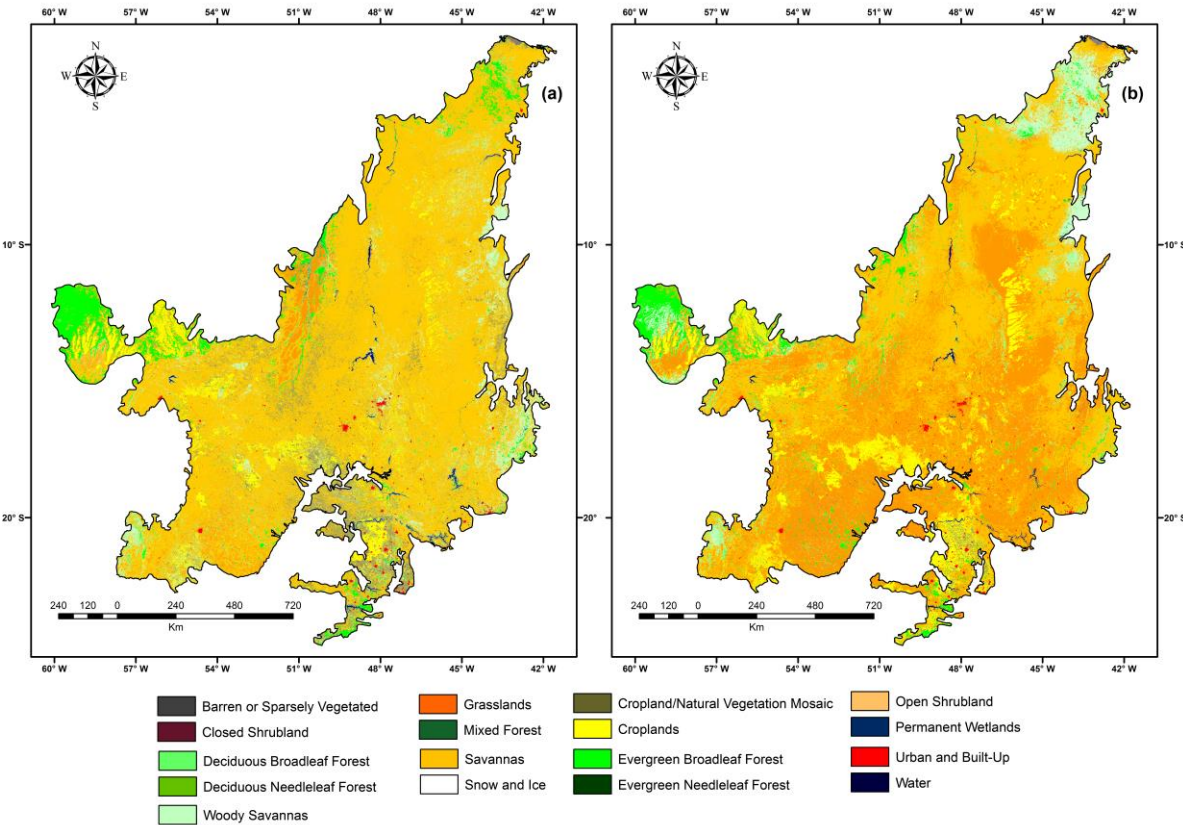1   *Article*

2   # Characterization and trends of fine particulate matter

3   # (PM$_{2.5}$) fire emissions in the Brazilian Cerrado during
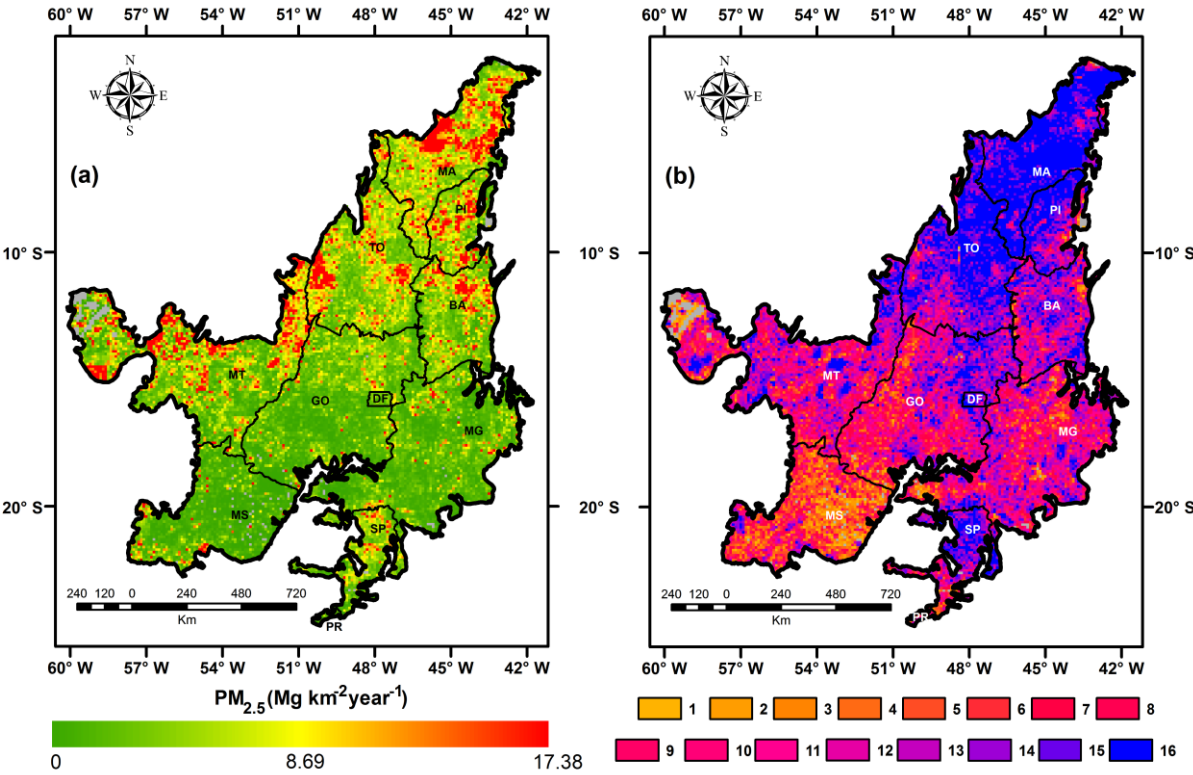
4   # 2002-2017

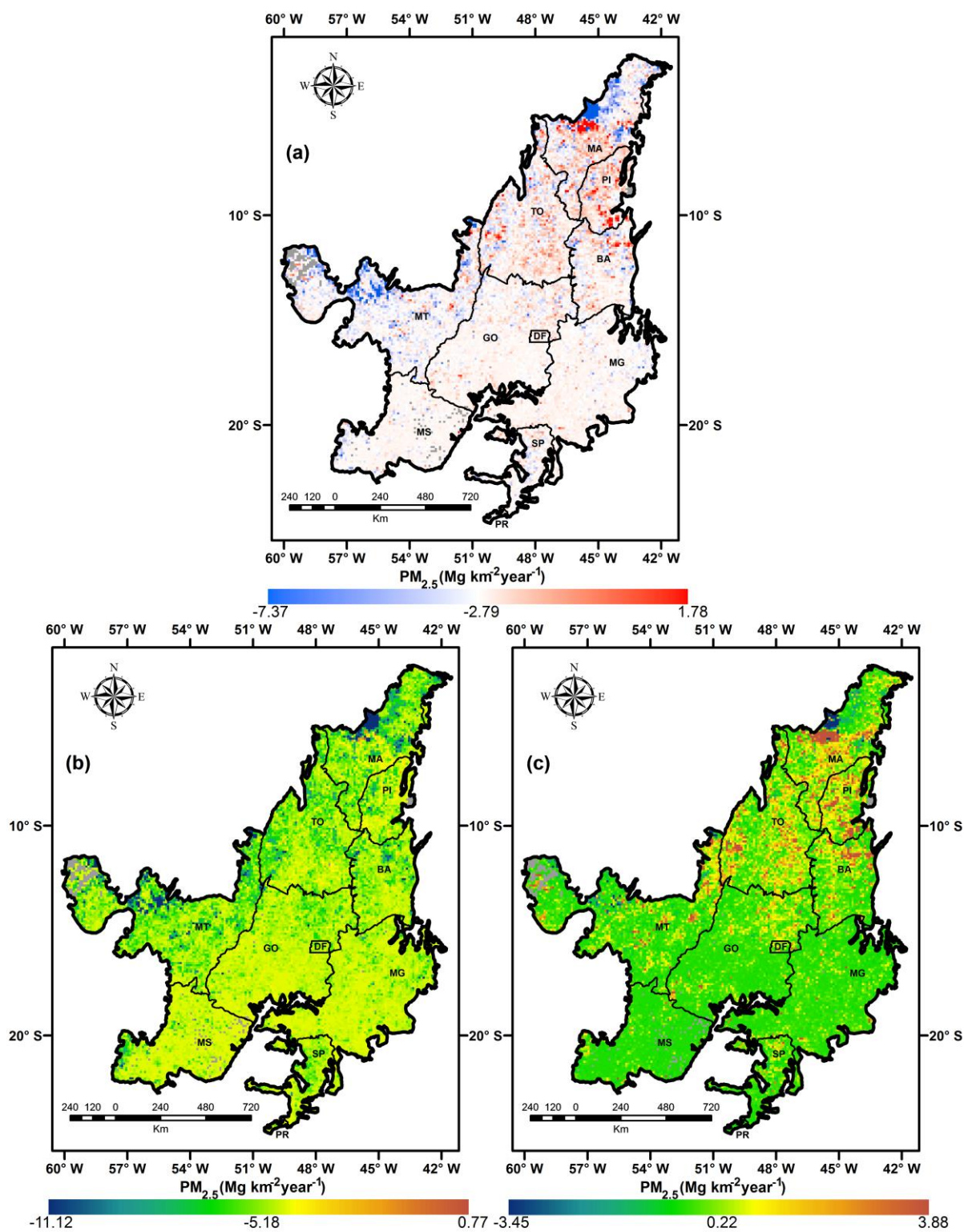5   **Supplementary Materials**

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7   **Figure S1.** (a) Average slope from the 10,000 bootstrap iterations, (b) Value of the 10th percentile, and (c) Value

8   of the 90th percentile based on PREP-CHEM-SRC 1.8.3 annual PM$_{2.5}$ fire emission estimates for the Cerrado

9   biome considering the 2002-2017 period. Gray pixels presented zero PM$_{2.5}$ emission associated with fires during

10   the entire 2002-2017 period.

Figure S2. Comparison of the Cerrado land use and land cover (LULC) maps for the year 2013 from (a) MCD12Q1 collection 5.1 and (b) MCD12Q1 collection 6. Both maps follow the International Geosphere-Biosphere Program (IGBP) classification scheme.

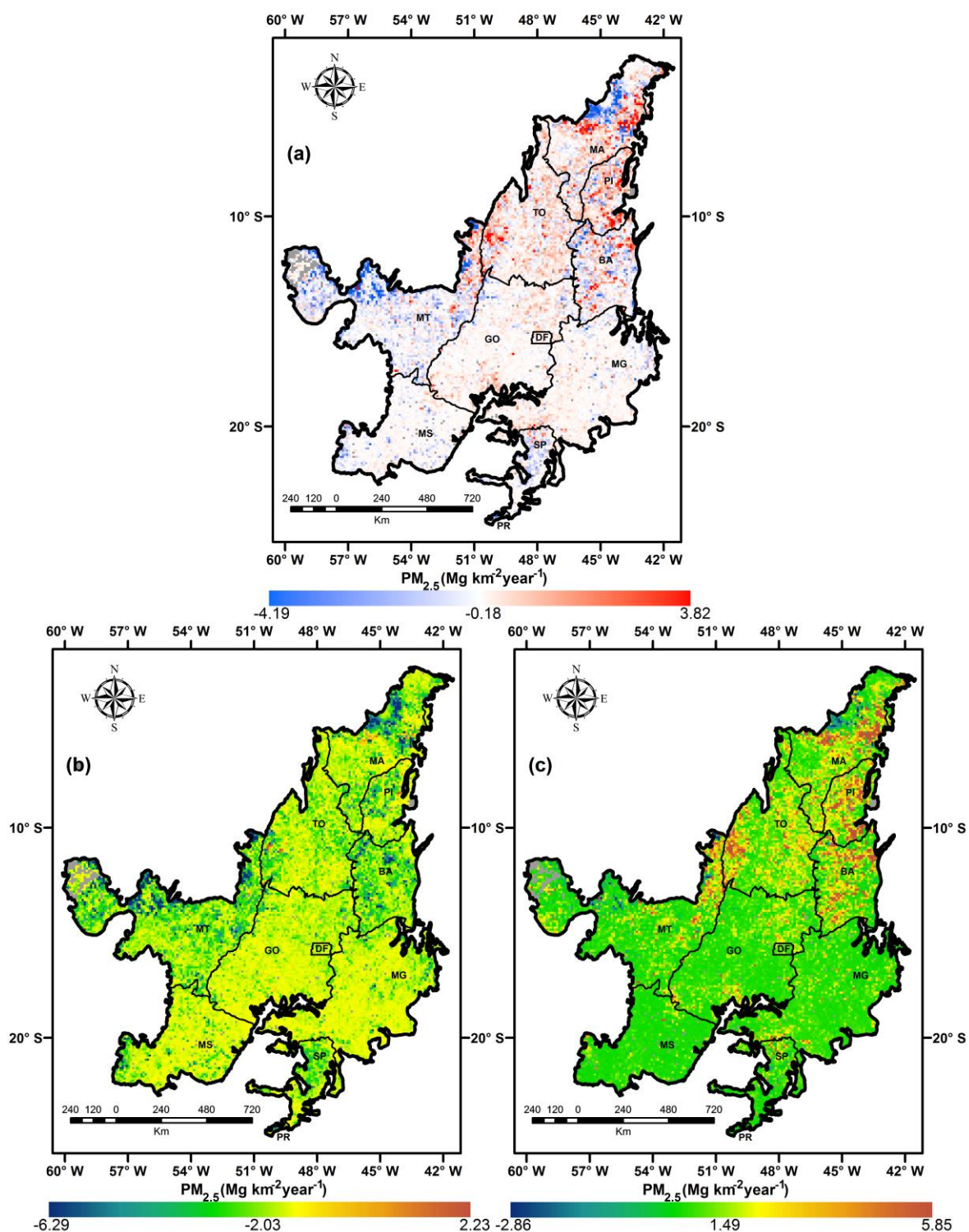**Figure S3.** (a) Standard deviation of the annual average $PM_{2.5}$ associated with fires in the Cerrado biome and (b) Number of years presenting non-zero $PM_{2.5}$ fire emissions in the Cerrado biome. Estimates were obtained using PREP-CHEM-SRC 1.8.3 and considered the 2002-2017 period. Gray pixels presented zero $PM_{2.5}$ emission associated with fires during the entire 2002-2017 period.

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Figure S4. (a) Average slope from the 10,000 bootstrap iterations, (b) Value of the 10th percentile, and (c) Value of the 90th percentile based on FEERv1.0-G1.2 annual PM2.5 fire emission estimates for the Cerrado biome considering the 2003-September/2015 period. Gray pixels presented zero PM2.5 emission associated with fires during the entire 2003-September/2015 period.

Figure S5. (a) Average slope from the 10,000 bootstrap iterations, (b) Value of the 10th percentile, and (c) Value of the 90th percentile based on QFEDv2.5r1 annual $PM_{2.5}$ fire emission estimates for the Cerrado biome considering the 2002-2017 period. Gray pixels presented zero $PM_{2.5}$ emission associated with fires during the entire 2002-2017 period.
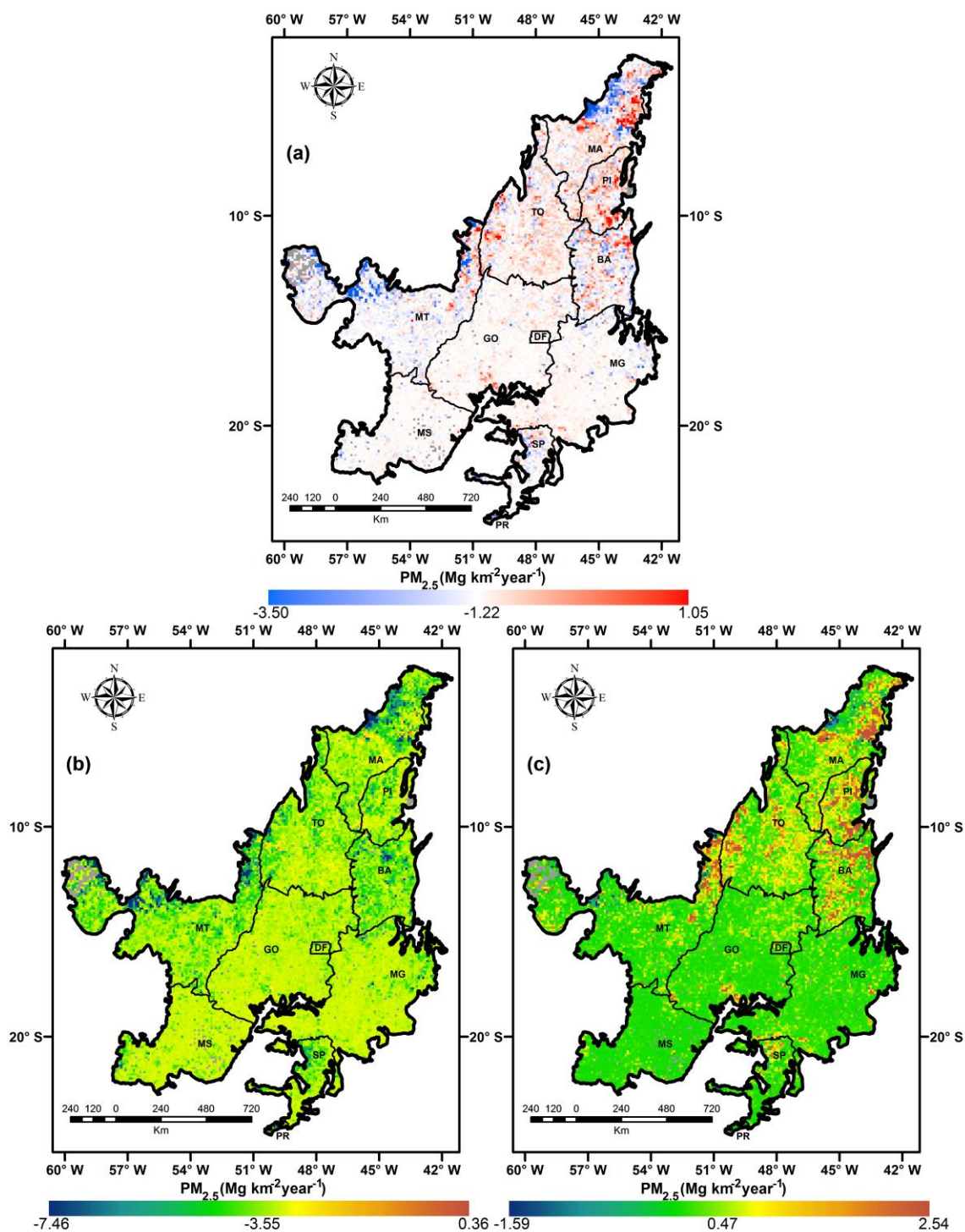
Figure S6. (a) Average slope from the 10,000 bootstrap iterations, (b) Value of the 10th percentile, and (c) Value of the 90th percentile based on GFASv1.3 annual $PM_{2.5}$ fire emission estimates for the Cerrado biome considering the 2003-2016 period. Gray pixels presented zero $PM_{2.5}$ emission associated with fires during the entire 2003-2016 period.
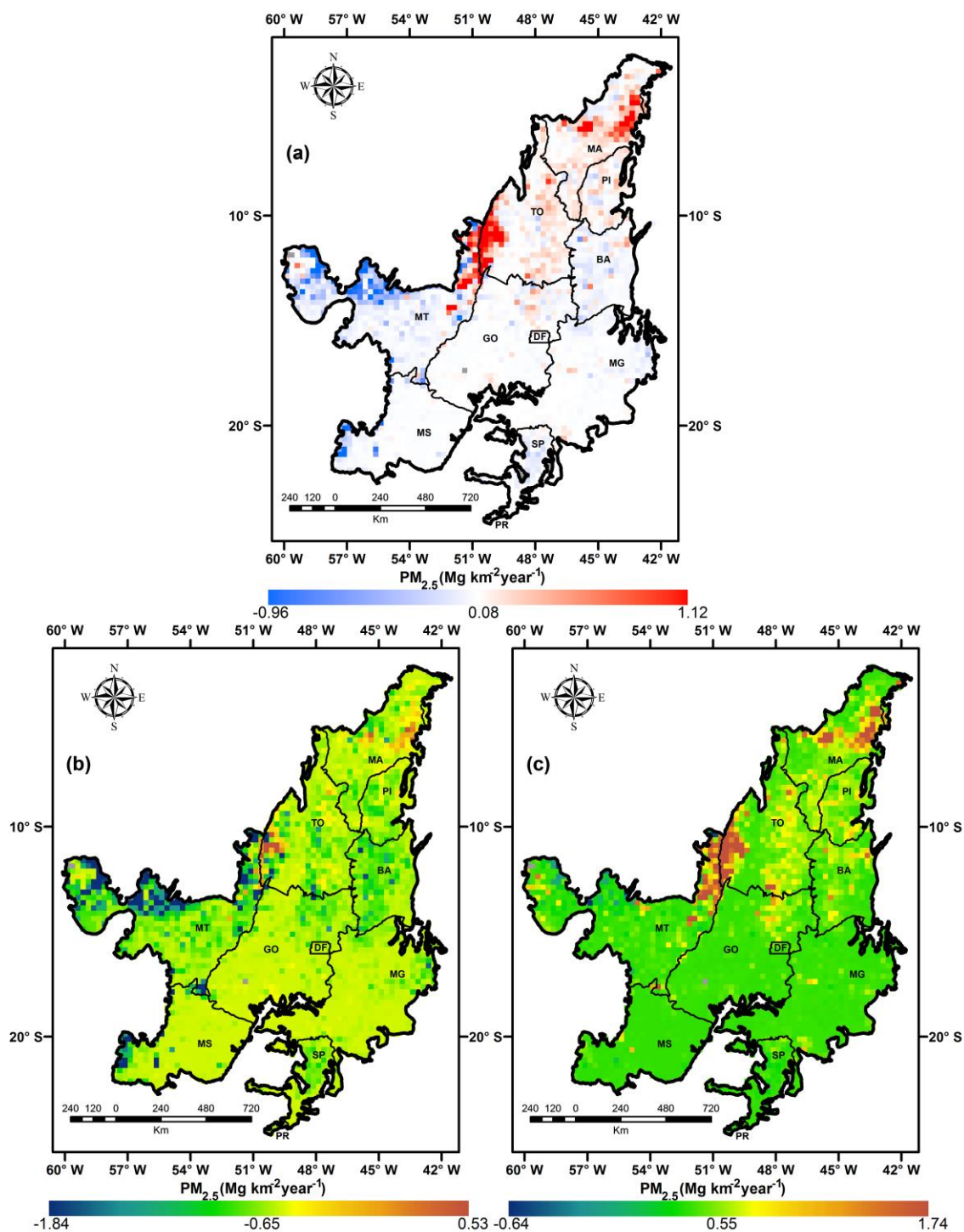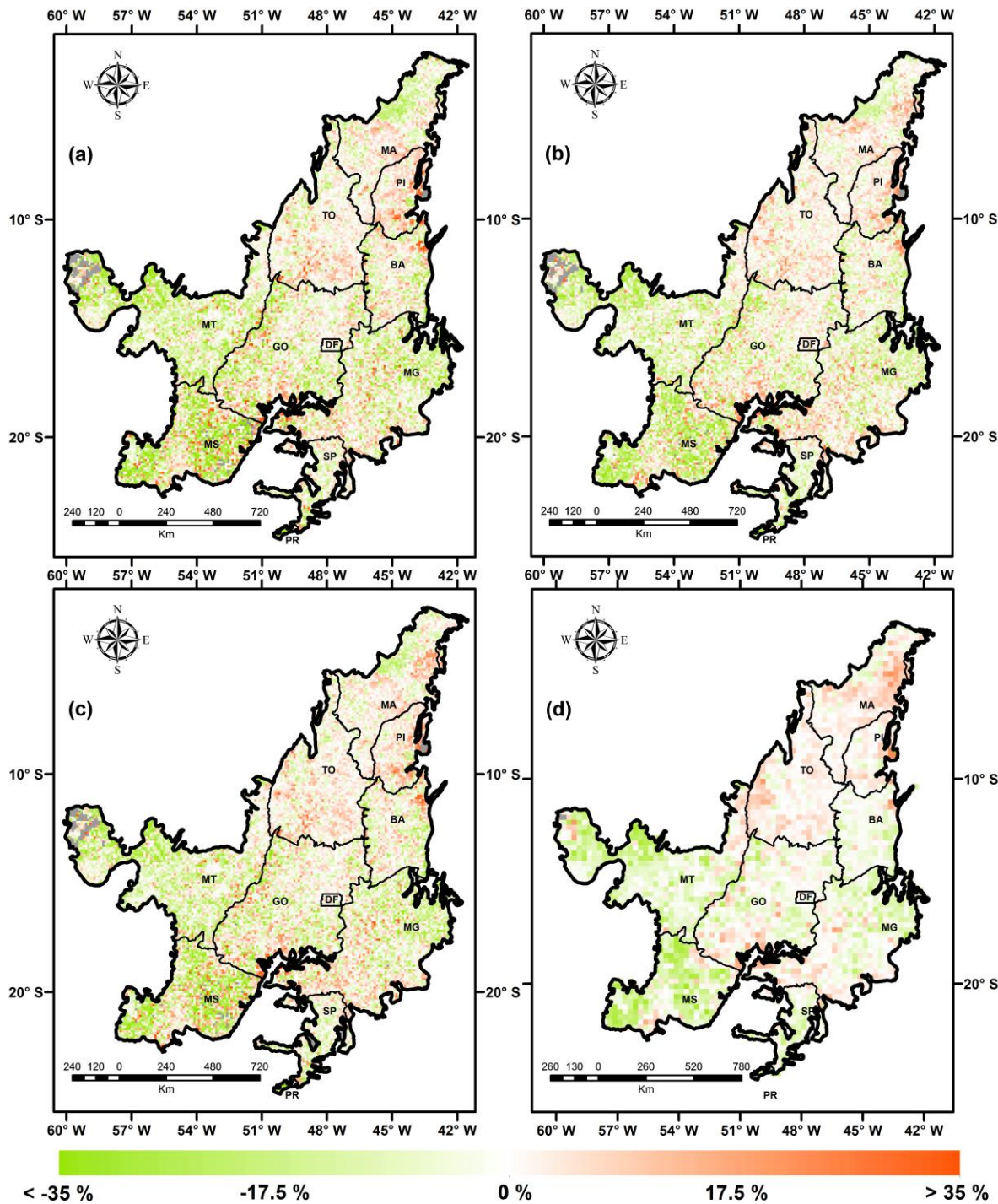
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Figure S7. (a) Average slope from the 10,000 bootstrap iterations, (b) Value of the 10th percentile, and (c) Value of the 90th percentile based on GFED4.1s annual PM2.5 fire emission estimates for the Cerrado biome considering the 2002-2017 period (2017 estimates are preliminary). Gray pixels presented zero PM2.5 emission associated with fires during the entire 2002-2017 period (2017 estimates are preliminary).

Figure S8. Annual trend (%) calculated as the average slope from the 10,000 bootstrap iterations with respect to the average PM$_{2.5}$ fire emissions in the Cerrado biome based on (a) FEERv.1.0-G1.2 (2003-September/2015 period), (b) QFEDv2.5r1 (2002-2017 period), (c) GFASv1.3 (2003-2016 period), and (d) GFED4.1s (2002-2017 period; 2017 estimates are preliminary) estimates. Gray pixels presented zero PM$_{2.5}$ emission associated with fires.

49   **Table S1**. Total of PM$_{2.5}$ emitted and active fires per land cover, average PM$_{2.5}$ emitted and standard deviation

50   per land cover for the Cerrado considering the 2002-2017 period. Estimates were obtained using

51   PREP-CHEM-SRC 1.8.3.

Land cover	Total PM$_{2.5}$ Fire Emitted (Tg)	Total Active fires	Average PM$_{2.5}$ Emitted (Tg active fire^{-1})
Evergreen Broadleaf forest	1.25	107,637	0.0000116
Woody savannas	1.52	222,477	0.0000068
Savannas	11.29	1,627,007	0.0000069
Grasslands	0.87	106,206	0.0000082
Croplands	0.69	90,564	0.0000076
Cropland/Natural vegetation mosaic	0.95	119,645	0.0000079
Other land covers	0.50	60,317	0.0000083

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Table S2. Lowest and highest values of PM$_{2.5}$ fire emissions annual trends, and percentage of positive trends and negative trends in the Cerrado biome for PREP-CHEM-SRC 1.8.3 (2002-2017 period), FEERv1.0-G1.2 (2003-September/2015 period), QFEDv2.5r1 (2002-2017 period), GFASv1.3 (2003-2016 period), and GFED4.1s (2002-2017 period; 2017 estimates are preliminary) estimates. Trends were calculated as the average slope from the bootstrap 10,000 iterations.

Inventory	Lowest Value (Mg km^{-2} year^{-1})	Highest value (Mg km^{-2} year^{-1})	Positive trends (%)	Negative trends (%)
PREP-CHEM-SRC 1.8.3	-1.49	1.17	41.5	58.5
FEERv1.0-G1.2	-7.37	1.78	40.7	59.3
QFEDv2.5r1	-4.19	3.82	42.5	57.5
GFASv1.3	-3.50	1.05	43.4	56.6
GFED4.1s	-0.96	1.12	40.9	59.1

Table S3. Fine particulate matter (PM2.5) emission factors used in the previous versions of PREP-CHEM-SRC, PREP-CHEM-SRC 1.8.3, GFAS, QFED, FEER, and GFED.

PM2.5 Emission Factors (g kg⁻¹)							
Land cover	PREP-CHEM-SRC (Previous Versions)[a]	PREP-CHEM-SRC 1.8.3 Global[b]	PREP-CHEM-SRC 1.8.3 South America[b]	GFAS[c]	QFED[d]	FEER[e]	GFED[f]
Tropical Forest	9.1	8.3	9.4	9.1	9.1	9.1	9.1
Extratropical Forest	13	15.7	15.7	13.8	13.0	13.8	15.3[g] 12.9[h]
Savanna / Grassland	4.9	7.5	4.0	4.9	5.4	4.9	7.2
Peat	-	-	-	9.1	-	9.1	9.1
Pasture / Croplands	4.9	7.5	4.0	8.3	-	8.3	6.3

[a] Reference: [1]

[b] References: [2-4]

[c] Reference: [5]

[d] Reference: [6]

[e] Reference: [7]

[f] Reference: [8]

[g] Boreal forest

[h] Temperate forest

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