Supplement of

APIFLAME v2.0 trace gas and aerosol emissions from biomass burning: application to Portugal during the summer of 2016 and evaluation against satellite observations of CO (IASI) and AOD (MODIS)

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S1   Emission factors list

The emission factors for the trace gases and aerosol species included in the distributed version of APIFLAMEv2 are provided in Tables S1 and S2, respectively.

S2   Contribution from small fires to the calculated burned area

Figure S1 shows the monthly burned area for the 5-year period 2013–2017, as calculated in APIFLAMEv2.0 based on the MODIS MCD64 dataset and including possible missed detection from small fires estimated using the MOD14 active fires product (Fire Radiative Power dataset).

S3   Long-range transport of dust from North Africa

Figure S2 shows dust simulations by the MERRA-2 model (including assimilation) plotted using the Giovanni NASA database (https://giovanni.gsfc.nasa.gov/giovanni/) to extract dust simulations (including assimilation).

Table S1. Emission factors (in g/kg DM) used for the gaseous species included in the inventory.

	Tropical Forest	Savanna	Crop residue	Pasture Maintenance	Boreal forest	Temperate forest	Peatland forest	Chaparral
Carbon Dioxide	1643.00	1686.00	1585.00	1548.00	1489.00	1637.00	1563.00	1680.00
Carbon Monoxide	93.00	63.00	102.0	135.00	127.00	88.00	182.00	67.40
Methane	5.07	2.00	5.82	8.71	5.96	3.36	11.8	3.0
Acetylene	0.44	0.24	0.27	0.21	0.18	0.26	0.14	0.21
Ethylene	1.06	0.88	1.46	1.28	1.42	1.17	1.79	1.00
Ethane	0.71	0.66	0.91	0.95	1.79	0.63	0.	0.42
Propadiene incl in propyne	0.016	0.012	0.	0.020	0.	0.	0.	0.0283
Propylene	0.64	0.70	0.68	0.85	1.13	0.61	2.30	0.481
Propyne	0.	0.	0.	0.	0.059	0.042	0.	0.
Propane	0.126	0.10	0.28	0.22	0.44	0.22	0.	0.5395
Isoprene	0.13	0.068	0.38	0.12	0.15	0.101	1.07	0.0465
Benzene	0.39	0.21	0.15	0.70	1.11	0.	2.46	0.451
Toluene	0.26	0.10	0.19	0.34	0.48	0.19	1.21	0.174
Xylenes	0.11	0.030	0.	0.11	0.18	0.127	0.	0.1
Terpenes	0.	0.031	0.	0.	3.09	1.822	0.	0.251
Ethanol	0.	0.	0.	0.	0.055	0.10	0.	0.055
Methanol	2.43	1.18	3.29	5.84	2.82	1.73	5.36	1.35
Phenol	0.45	0.44	0.52	1.68	2.96	0.3 (verif)	4.36	0.
Acetol	1.13	0.	3.766	6.18	0.0	0.0	1.92	0.0
Formaldehyde	1.73	1.18	2.08	1.90	1.86	2.08	1.69	1.33
Acetone	0.63	0.30	0.45	1.05	0.75	0.54	1.08	0.31
Methyl Vinyl Ether	0.	0.16	0.08	0.	0.	0.	0.85	0.
Acetic Acid incl formic acid	3.84	3.89	6.59	10.6	4.98	2.498	7.78	2.014
Hydrogen Cyanide	0.42	0.39	0.29	0.46	1.52	0.72	5.00	1.
Carbonyl Sulfide	0.025	0.	0.	0.	0.46	0.001 (verif)	1.20	0.
Ammonia	1.33	0.56	2.17	1.47	2.72	0.84	10.8	1.20
1,2,3-Trimethylbenzene	0.	0.042	0.	0.	0.051	0.	0.	0.
1,2,4-Trimethylbenzene	0.	0.	0.	0.	0.030	0.	0.	0.
Other Aromatics	3.1	0.321	0.355	0.079	0.071	2.930	0.	2.073
Butane and higher alkanes	0.073	0.171	0.133	0.064	0.348	0.26	0.	0.171
Butene and higher alkenes	0.258	0.037	0.351	0.37	0.339	0.56	0.	0.385
All non HCHO aldehydes	4.61	3.583	2.721	3.374	0.056	1.58	4.7313	0.1687
All non-acetone ketones	1.2	1.53	0.	2.555	0.424	1.49	0.	0.803
All Furans	2.374	0.869	0.132	2.85	0.965	0.73	1.82	0.693
Hydrogen	3.36	1.70	2.59	0.	0.	2.03	0.	0.
Sulfur Dioxide	0.40	0.9	0.4	0.32	1.	1.1	0.	1.
Nitrous Acid	1.18	0.36	0.	0.16	0.52	0.44	0.	0.54
Nitrogen Oxides (as NO)	2.55	3.9	3.11	0.75	0.90	1.91	0.8	3.65
Nitrous Oxide	0.	0.	0.	0.	0.41	0.16	0.	0.25

Table S2. Emission factors (in g/kg DM) used for the aerosol species included in the inventory.

	Tropical Forest	Savanna	Crop residue	Pasture Maintenance	Boreal forest	Temperate forest	Peatland forest	Chaparral
Black Carbon	0.52	0.37	0.75	0.91	0.56	0.56	0.20	1.31
Organic Carbon	4.71	2.62	2.30	9.64	9.2	4.75	6.23	3.7
Nitrate	0.11	0.016	0.	0.14	0.	0.	0.	0.
Sulfate	0.13	0.018	0.	0.19	0.	0.	0.	0.
Other PPM	1.04	2.61	1.83	0.	0.02	0.02	0.	4.62
PM2.5	9.1	7.17	6.26	14.8	15.3	12.8	10.2	11.9
PCO (PM10-PM25)	9.4	1.33	0.	14.1	2.3	4.9	0.	3.5
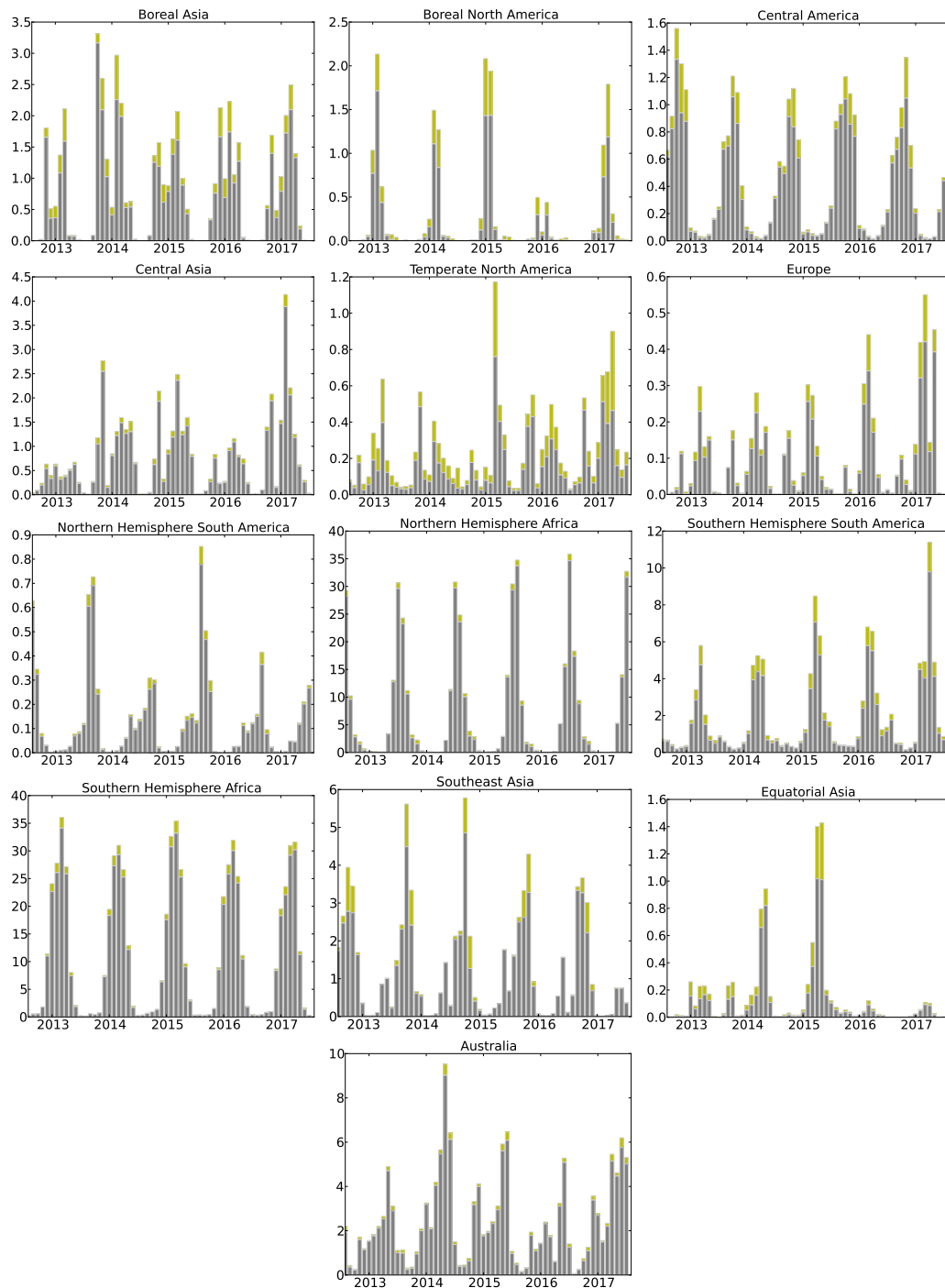
Figure S1. *Monthly regional burned area (10^4 km^2 or Mha) derived from MODIS MCD64 data (grey) and additional contribution from small fires, as detected in the MODIS MOD14 product (light green). Ticks on the abscissa correspond to the month of June of each year.*
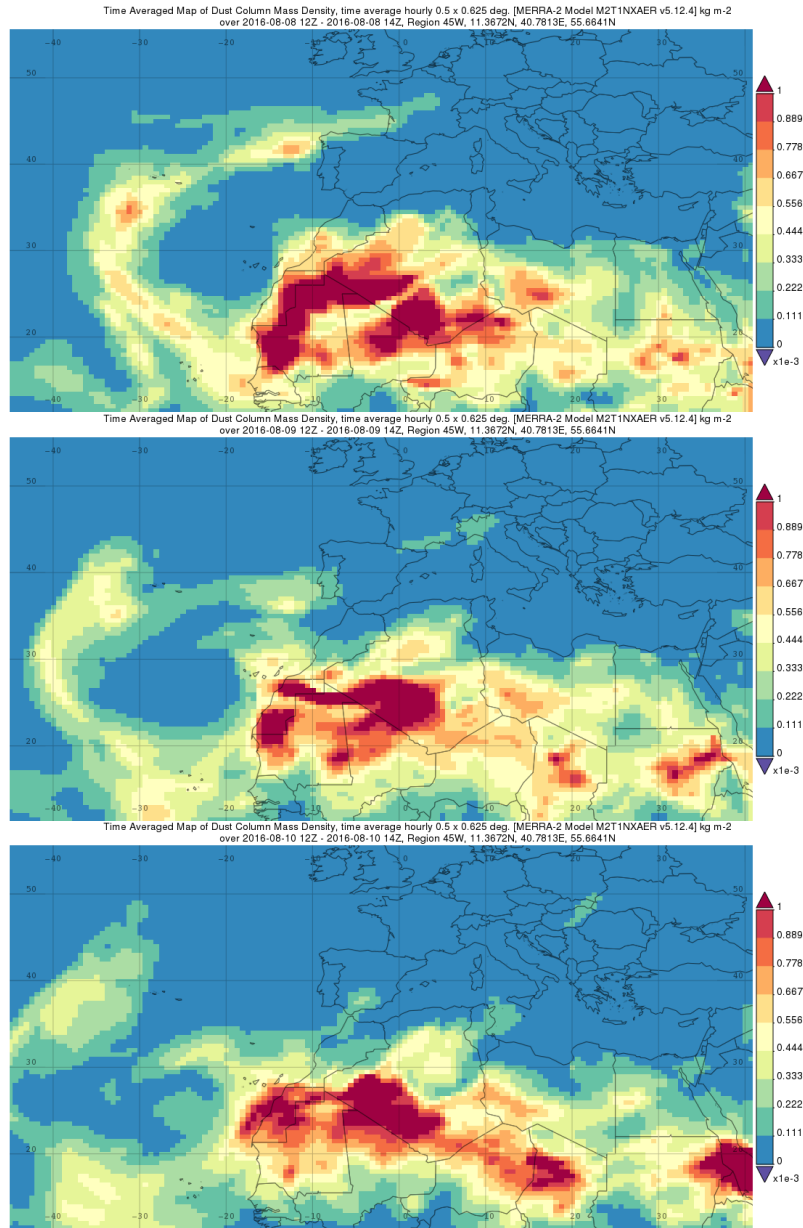
Figure S2. *Mineral dust total mass density from the global databases displayed with Giovanni (https://giovanni.gsfc.nasa.gov/giovanni/; MERRA-2 model simulations including data assimilation).*