

**Supplementary material to Global soil NO emissions for Atmospheric Chemical Transport Modelling:
CAMS-GLOB-SOIL v2.2, by David Simpson and Sabine Darras**

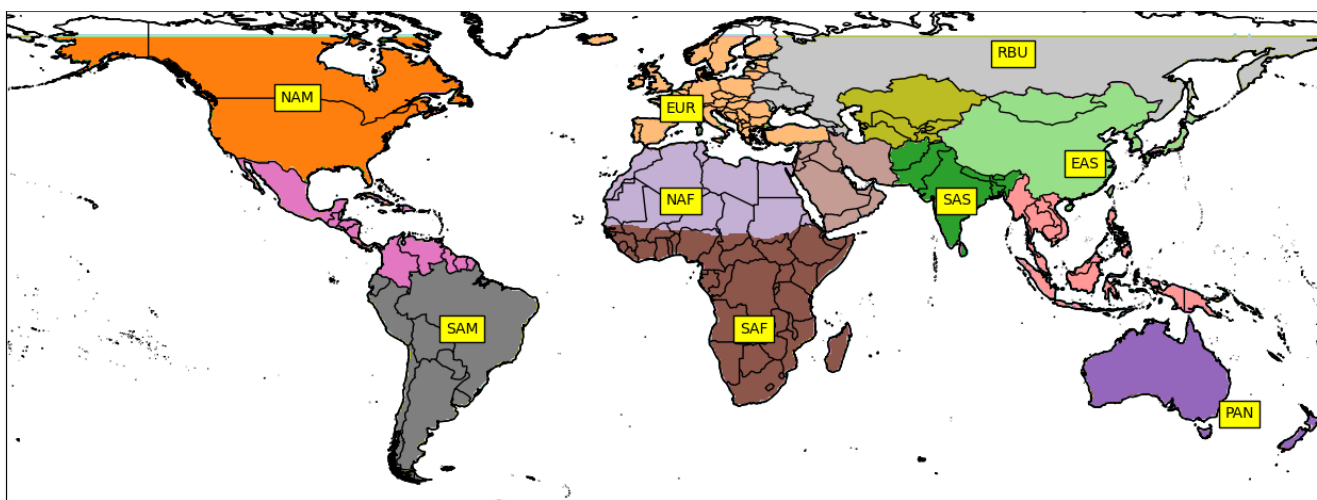


Figure S1. Selected regions used in this study. Regions and their codes are from the HTAP ‘Tier 1’ definitions (<https://htapold.kaskada.tk>, under workplan/source-receptor modelling, last accessed 25 Mar 2021). Regions are: NAM: N. America, to 66°N; EUR = Western & Eastern Europe + Turkey, up to 66°N, SAS: South Asia, EAS: East Asia; SEA: South East Asia; PAN: Pacific, Australia & New Zealand; NAF: northern Africa, Sahara, Sahel; SAF: sub-Saharan/sub-Sahel Africa; SAM; S. America; RBU: Russia, Belarus, Ukraine.

Table S1. Emission sectors with soil NO emissions in EMEP/EEA Guidebook

NFR code	Emissions source
3Da1	Inorganic N-fertilizers (includes also urea application)
3Da2a	Animal manure applied to soils
3Da2b	Sewage sludge applied to soils
3Da2c	Other organic fertilisers applied to soils (including compost)
3Da3	Urine and dung deposited by grazing animals
3Da4	Crop residues applied to soils
3Db	Indirect emissions from managed soils

Table S2. Comparison of soil NO emissions (Gg(N)/a) from CAMS-GLOB-SOIL, CAMS-GLOB-ANT and EMEP/WebDab, year 2015

cc	CAMS-GLOB-SOIL v2.2						GLOB-ANT ^(a)	EMEP/WebDab ^(b)							
	Biome	Ndep	Fert	Pulse	Total	nonFert ^(c)	ags (v5)	3Da1	3Da2a	3Da2b	3Da2c	3Da3	3Da4	3Db	Sum-3D
AL	1.14	0.16	0.88	0.16	2.34	1.46	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	2.62	0.72	2.66	0.13	6.14	3.48	1.51	1.47	1.53	0.02	0.14	0.00	0.00	0.00	3.2
AZ	4.14	0.56	1.08	0.59	6.37	5.29	0.84	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.3
BE	0.86	0.40	3.26	0.12	4.64	1.38	2.00	1.85	1.83	0.02	0.03	0.00	0.00	0.00	3.7
BG	5.15	0.60	0.87	0.75	7.36	6.49	2.42	4.16	0.00	0.01	0.00	0.00	0.00	0.00	4.2
BY	8.19	1.13	5.00	1.12	15.44	10.44	4.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
CH	1.01	0.39	1.36	0.07	2.83	1.47	0.83	0.24	0.47	0.00	0.03	0.12	0.00	0.00	0.9
CY	0.22	0.03	0.00	0.03	0.29	0.29	0.08	0.08	0.17	0.00	0.00	0.03	0.00	0.00	0.3
CZ	3.07	0.69	3.55	0.42	7.72	4.17	2.97	5.41	1.18	0.03	0.01	0.29	0.00	0.00	6.9
DE	12.22	4.34	29.75	1.48	47.79	18.04	15.28	20.83	11.74	0.22	3.65	1.61	0.00	0.00	38.1
DK	0.93	0.38	3.55	0.02	4.88	1.33	2.64	2.57	2.54	0.05	0.05	0.00	0.00	0.00	5.2
EE	1.14	0.19	0.43	0.09	1.84	1.42	0.44	0.44	0.17	0.00	0.02	0.03	0.00	0.00	0.7
ES	19.41	2.75	18.97	3.08	44.21	25.25	9.86	12.95	5.00	0.24	0.13	3.67	0.00	0.00	22.0
FI	10.32	0.67	2.64	0.00	13.62	10.99	1.33	1.75	0.91	0.03	0.00	0.17	0.00	0.00	2.9
FR	19.99	4.52	45.19	2.59	72.28	27.09	21.46	12.88	2.26	0.11	0.14	3.63	0.00	0.00	19.0
GB	4.70	1.45	14.15	0.31	20.61	6.45	11.43	4.72	1.09	0.26	0.20	0.86	1.88	0.00	9.0
GE	2.42	0.45	0.94	0.33	4.14	3.20	0.29	0.93	2.89	0.00	0.00	0.00	0.00	0.00	3.8
GR	5.13	0.66	3.28	0.72	9.79	6.52	1.83	2.00	0.61	0.01	0.00	2.37	0.00	0.00	5.0
HR	2.24	0.40	1.21	0.30	4.16	2.95	0.79	0.69	0.57	0.00	0.00	0.83	0.00	0.00	2.1
HU	4.75	0.68	3.72	0.67	9.81	6.10	2.94	4.61	1.25	0.01	0.05	0.21	0.00	0.00	6.1
IE	1.32	0.32	6.46	0.00	8.10	1.64	4.07	3.86	2.03	0.03	0.00	3.23	0.00	0.00	9.2
IS	0.74	0.04	0.00	0.05	0.84	0.83	0.06	0.14	0.09	0.00	0.00	0.11	0.00	0.00	0.3
IT	11.56	2.81	12.43	1.39	28.19	15.76	5.74	6.30	5.59	0.10	0.71	1.80	0.00	0.00	14.5
KG	4.66	0.74	1.01	0.59	7.00	5.99	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
KZ	22.72	1.09	0.31	3.37	27.49	27.18	0.71	1.11	1.52	0.00	0.00	6.29	0.00	0.00	8.9
LI	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LT	2.88	0.37	0.96	0.36	4.57	3.61	1.65	2.04	0.41	0.00	0.00	0.22	0.00	0.00	2.7
LU	0.07	0.03	0.22	0.01	0.33	0.11	0.08	0.16	0.10	0.00	0.00	0.06	0.02	0.00	0.3
LV	2.19	0.31	0.55	0.27	3.32	2.77	0.81	0.92	0.28	0.00	0.02	0.07	0.00	0.00	1.3
MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
MD	1.93	0.16	0.33	0.29	2.72	2.39	0.50	0.03	0.00	0.00	0.20	0.05	0.09	0.18	0.6
ME	0.45	0.05	0.41	0.03	0.94	0.53	0.19	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.0
MK	1.00	0.13	0.43	0.14	1.70	1.27	0.22	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.1
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.0
NL	0.91	0.58	6.43	0.14	8.05	1.62	3.26	3.02	4.45	0.01	0.07	1.20	0.72	0.00	9.5
NO	6.83	0.55	1.33	0.09	8.80	7.46	0.95	1.27	0.69	0.02	0.01	0.29	0.00	0.00	2.3
PL	13.90	2.62	16.79	1.84	35.15	18.36	8.27	12.18	5.20	0.06	0.00	1.97	0.00	0.00	19.4
PT	3.89	0.37	2.57	0.61	7.44	4.87	1.27	0.44	0.12	0.01	0.01	0.34	0.00	0.00	0.9
RO	11.60	1.46	5.08	1.59	19.73	14.65	5.53	4.35	2.82	0.01	0.00	0.00	0.00	0.00	7.2
RS	4.12	0.55	4.08	0.55	9.29	5.22	1.67	2.54	0.00	0.00	0.00	0.00	0.00	0.00	2.5
RU	115.09	9.40	13.92	11.94	150.36	136.44	15.22	21.33	0.00	0.00	0.00	0.00	0.00	0.00	21.3
SE	14.70	1.08	2.60	0.03	18.42	15.82	1.88	2.32	0.89	0.03	0.10	0.51	0.00	0.00	3.9
SI	0.62	0.18	0.47	0.03	1.29	0.82	0.30	0.34	0.29	0.00	0.00	0.06	0.00	0.00	0.7
SK	1.88	0.37	1.30	0.22	3.76	2.46	1.02	1.40	0.35	0.00	0.05	0.26	0.00	0.00	2.1
TR	36.58	4.02	23.01	5.05	68.66	45.65	10.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
UA	31.37	2.96	7.96	4.38	46.68	38.71	12.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Notes:(a) CAMS-GLOB-ANT v5 "ags" emissions; (b) data provided by Sabine Schindlbacher, EMEP CEIP, 2021; (c) nonFert derived as Total - (Biome+Ndep+Fert+Pulse) from

CAMS-GLOB-SOIL data

Differences between CAMS-GLOB-SOIL versions

The first version of CAMS-GLOB-SOIL emissions, v1.1, was provided in August 2018. The methods were updated, and version 2.1 finalised in August 2020. Version 2.2 corrected some bugs found in v2.1, and also updated some of the data inputs and methods. Here we briefly summarise the changes.

From v2.1 to v2.2, the main changes are:

1. Higher resolution $0.5^{\circ} \times 0.5^{\circ}$ degree atmospheric N-input data (from the AMAP project) were used to replace the earlier $1^{\circ} \times 1^{\circ}$ degree.
2. Simple growing-seasons are applied for crop emissions, see Sect. 4.1
3. Fixed bug in scaling factor used for fertilizer-induced emissions
4. Fixed bug to remove Ndep-induced oceanic emissions
5. The percentage of N-inputs released as NO emissions were reduced from 1% (v1.1,v2.1) to 0.7% for the Ndep and Fert components.

From v1.1 to v1.2, the main changes are:

1. The emissions are now provided directly as above-canopy, rather than above soil, see Sect. 4.5
2. The underlying landcover database has been changed, see Sect. 3.2
3. The estimation of soil temperature was dropped, see Sect. 4.7
4. A simple mechanism to account for ‘pulsing’ has been added, see Sect. 4.4
5. Rainforests are now treated explicitly, see Sect. 4.6
6. The dataset has been extended to 2018