Supplementary material for: Improvement and evaluation of simulated global biogenic soil NO emissions in an AC-GCM

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Abstract

In this document you can find additional tables and figures, which were not included in the article, but are helpfull as supporting material.

Table 1: Adopted wet and dry emission factors of the soil biogenic NO emission algorithm based on the *Yienger and Levy (1995)* algorithm for different duration classes of the measurement (<15, <30, <60, <90, <180, <365 days). The number of simulated points and measured points (in brackets) is given below the emission factors. If no additional measurements were performed in the next class, we left the field empty.

LC	<15	<30	<60	<90	<180	<365
5		$0.07^{+0.03}_{-0.02}$ $0.55^{+0.20}_{-0.15}$ [11(1)]	$0.04^{+0.04}_{-0.02}$ $0.28^{+0.32}_{-0.15}$ [22(2)]			
6		$0.04^{+0.10}_{-0.03}$ $0.29^{+0.71}_{-0.21}$ [66(6)]	$0.04^{+0.12}_{-0.03}$ $0.32^{+0.87}_{-0.23}$ [198(18)]		$0.05^{+0.13}_{-0.04}$ $0.39^{+0.97}_{-0.28}$ [209(19)]	$0.09^{+0.31}_{-0.07}$ $0.65^{+2.24}_{-0.50}$ [220(20)]
8			$0.01^{+0.00}_{-0.00}$ $0.05^{+0.01}_{-0.01}$ [11(1)]			
10	$0.17^{+0.43}_{-0.12}$ $1.22^{+3.18}_{-0.88}$ [22(2)]		$0.83^{+2.33}_{-0.61}$ $6.09^{+17.26}_{-4.50}$ [55(5)]		$0.87^{+1.67}_{-0.57}$ $6.44^{+12.24}_{-4.22}$ [231(21)]	$0.84^{+1.42}_{-0.53}$ $6.18^{+10.43}_{-3.88}$ [242(22)]
11	$0.45^{+1.72}_{-0.36}$ $3.29^{+12.69}_{-2.61}$ [110(10)]	$0.16^{+2.17}_{-0.15}$ $1.21^{+15.98}_{-1.12}$ [220(20)]	$0.21^{+2.35}_{-0.19}$ $1.55^{+17.28}_{-1.42}$ [275(25)]	$0.24^{+1.71}_{-0.21}$ $1.76^{+12.56}_{-1.54}$ [308(28)]		
12	$0.27^{+1.19}_{-0.22}$ $1.97^{+8.75}_{-1.61}$ [187(17)]	$0.23^{+1.28}_{-0.19}$ $1.66^{+9.44}_{-1.41}$ [506(46)]	$0.15^{+0.93}_{-0.13}$ $1.12^{+6.82}_{-0.96}$ [682(62)]	$0.20^{+1.32}_{-0.17}$ $1.48^{+9.69}_{-1.28}$ [715(65)]	$0.55^{+5.67}_{-0.50}$ $4.02^{+41.72}_{-3.67}$ [803(73)]	$0.39^{+2.00}_{-0.33}$ $2.88^{+14.71}_{-2.41}$ [1019(94)]
13	$1.00^{+3.31}_{-0.77}$ $8.51^{+28.03}_{-6.53}$ [44(4)]	$0.63^{+1.05}_{-0.39}$ $5.34^{+8.87}_{-3.34}$ [55(5)]	$0.67^{+0.75}_{-0.35}$ $5.68^{+6.32}_{-2.99}$ [77(7)]	$0.35^{+0.58}_{-0.22}$ $2.97^{+4.88}_{-1.84}$ [88(8)]		$0.62^{+0.57}_{-0.30}$ $5.28^{+4.82}_{-2.52}$ [99(9)]
14	$0.03^{+0.23}_{-0.03}$ $0.25^{+1.68}_{-0.22}$ [44(4)]					
16		$0.53^{+1.32}_{-0.38}$ $3.53^{+8.78}_{-2.52}$ [55(5)]	$0.57^{+1.15}_{-0.38}$ $3.79^{+7.68}_{-2.54}$ [66(6)]	$0.56^{+0.88}_{-0.34}$ $3.71^{+5.88}_{-2.27}$ [77(7)]	$0.95^{+2.10}_{-0.65}$ $6.34^{+13.98}_{-4.36}$ [88(8)]	$0.34^{+0.85}_{-0.24}$ $2.23^{+5.65}_{-1.60}$ [198(19)]
18	$1.21^{+1.73}_{-0.71}$ $8.84^{+12.66}_{-5.21}$ [198(18)]	$1.17^{+1.66}_{-0.69}$ $8.60^{+12.20}_{-5.04}$ [319(29)]	$1.81^{+4.49}_{-1.29}$ $13.27^{+32.90}_{-9.46}$ [550(50)]	$2.12^{+6.05}_{-1.57}$ $15.52^{+44.34}_{-11.50}$ [583(53)]		$0.90^{+4.82}_{-0.76}$ $6.58^{+35.30}_{-5.55}$ [716(66)]
19	$0.17^{+0.16}_{-0.08}$ $1.21^{+1.18}_{-0.60}$ [66(6)]	$0.08^{+0.14}_{-0.05}$ $0.62^{+1.03}_{-0.39}$ [77(7)]				
20	$0.53^{+1.05}_{-0.35}$ $2.77^{+7.14}_{-2.00}$ [99(9)]	$0.73^{+0.65}_{-0.34}$ $2.66^{+2.60}_{-1.31}$ [132(12)]	$1.63^{+3.28}_{-1.09}$ $6.62^{+19.12}_{-4.92}$ [176(16)]	$2.43^{+4.45}_{-1.57}$ $12.32^{+35.83}_{-9.17}$ [198(18)]	$1.28^{+2.39}_{-0.84}$ $7.24^{+13.59}_{-4.72}$ [253(23)]	$0.64^{+1.41}_{-0.44}$ $3.51^{+6.68}_{-2.30}$ [561(52)]
21	$0.39^{+3.47}_{-0.35}$ [385(35)]	$0.26^{+3.37}_{-0.24}$ [616(56)]	$0.49^{+3.17}_{-0.42}$ [1133(103)]	$0.67^{+3.06}_{-0.55}$ [1397(127)]	$0.58^{+2.75}_{-0.48}$ [1814(165)]	$0.53^{+2.24}_{-0.43}$ [2158(199)]

Table 2: Adopted wet and dry emission factors of the soil biogenic NO emission algorithm based on the *Yienger and Levy (1995)* algorithm for the regions of Fig. 1 with the number of simulated points and measured points (in brackets).

LC	EUR wet dry	NAM wet dry	SAM wet dry	ASA wet dry	AFR wet dry
5				$0.07^{+0.03}_{-0.02}$ $0.24^{+0.11}_{-0.07}$ 31(3)	
6		$0.05^{+0.13}_{-0.04}$ $0.39^{+0.97}_{-0.28}$ 209(19)		$0.58^{+0.11}_{-0.10}$ $4.27^{+0.84}_{-0.70}$ 11(1)	
8		$0.01^{+0.00}_{-0.00}$ $0.05^{+0.01}_{-0.01}$ 11(1)			
10	$1.28^{+1.43}_{-0.68}$ $9.47^{+10.60}_{-5.00}$ 110(10)	$0.62^{+1.14}_{-0.40}$ $4.58^{+8.41}_{-2.96}$ 132(12)			
11			$0.15^{+2.31}_{-0.14}$ $1.10^{+16.99}_{-1.04}$ 121(11)		$0.28^{+1.36}_{-0.23}$ $2.06^{+10.04}_{-1.71}$ 187(17)
12	$2.52^{+15.40}_{-2.17}$ $18.57^{+113.34}_{-15.96}$ 381(35)	$0.37^{+1.15}_{-0.28}$ $2.69^{+8.49}_{-2.04}$ 314(29)	$0.32^{+0.64}_{-0.21}$ $2.35^{+4.70}_{-1.57}$ 244(23)	$3.69^{+3.03}_{-1.66}$ $27.17^{+22.29}_{-12.24}$ 97(9)	$0.46^{+0.21}_{-0.15}$ $3.42^{+1.56}_{-1.07}$ 33(3)
13			$0.79^{+0.21}_{-0.17}$ $6.66^{+1.78}_{-1.40}$ 44(4)		$0.30^{+0.47}_{-0.18}$ $2.58^{+3.97}_{-1.56}$ 55(5)
14	$0.20^{+0.56}_{-0.15}$ $1.50^{+4.08}_{-1.09}$ 22(2)	$0.00^{+0.00}_{-0.00}$ $0.01^{+0.00}_{-0.00}$ 11(1)		$0.07^{+0.03}_{-0.02}$ $0.51^{+0.24}_{-0.16}$ 11(1)	
16	$0.35^{+1.11}_{-0.27}$ $2.36^{+7.37}_{-1.79}$ 172(17)	$0.61^{+1.42}_{-0.42}$ $4.04^{+9.45}_{-2.83}$ 55(5)			
18	$1.70^{+7.69}_{-1.39}$ $12.29^{+54.73}_{-10.03}$ 745(69)		$0.54^{+0.05}_{-0.04}$ $3.96^{+0.35}_{-0.32}$ 11(1)		
19			$0.08^{+0.12}_{-0.05}$ $0.58^{+0.91}_{-0.36}$ 55(5)		$0.39^{+0.53}_{-0.22}$ $2.85^{+3.87}_{-1.64}$ 22(2)
20			$0.46^{+2.81}_{-0.39}$ $2.66^{+13.81}_{-2.23}$ 496(46)	$0.35^{+0.30}_{-0.16}$ $1.15^{+1.00}_{-0.54}$ 52(5)	$0.74^{+0.33}_{-0.23}$ $2.46^{+1.09}_{-0.75}$ 33(3)
21	$0.22^{+1.86}_{-0.20}$ 601(55)	$0.33^{+0.45}_{-0.19}$ 500(46)	$0.28^{+1.09}_{-0.22}$ 143(13)	$0.81^{+2.80}_{-0.63}$ 976(92)	$1.28^{+1.04}_{-0.58}$ 22(2)

Table 3: Measured SNOx for selected landcovers, classified by region (in $\mathrm{ng\,m^{-2}\,s^{-1}}$).

ID	EUR	NAM	SAM	ASA	AFR
10	$4.40^{+5.38}_{-2.42}$	$3.62^{+7.14}_{-2.40}$			
11			$7.29^{+123.90}_{-6.88}$		$2.28^{+11.43}_{-1.90}$
12	$5.22^{+31.72}_{-4.48}$	$0.73^{+3.71}_{-0.61}$	$3.51^{+8.51}_{-2.48}$	$6.69^{+14.06}_{-4.54}$	$4.53^{+3.48}_{-1.97}$
13			$14.90^{+32.74}_{-10.24}$		$2.37^{+5.53}_{-1.66}$
16	$1.11^{+3.43}_{-0.84}$	$2.51^{+6.92}_{-1.84}$			
20			$2.49^{+11.26}_{-2.04}$	$1.36^{+1.92}_{-0.80}$	$2.02^{+1.79}_{-0.95}$
21	$2.47^{+29.07}_{-2.28}$	$6.06^{+19.45}_{-4.62}$	$2.55^{+13.55}_{-2.15}$	$5.88^{+21.14}_{-4.60}$	$15.21^{+19.40}_{-8.52}$

Table 4: Mean measured (number of measurements in brackets) and simulated (LC and YL95/SL10) SNOx for each landcover type with measurements for the exactly corresponding yearly period and for unperturbed as well as anthropogenically alterd conditions.

ID	N	measured	LC	YL95/SL10
5	31(3)	$0.52^{+0.44}_{-0.24}$	0	$0.57^{+0.16}_{-0.12}$
6	220(20)	$0.74^{+2.25}_{-0.56}$	0	$0.77^{+0.32}_{-0.23}$
8	11(1)	0.03	$0.23^{+0}_{-0.04}$	$0.05^{+0.01}_{-0.01}$
10	242(22)	$3.28^{+5.04}_{-1.99}$	$0.27^{+0.41}_{-0.13}$	$3.63^{+2.78}_{-1.57}$
11	308(28)	$2.27^{+19.77}_{-2.04}$	$4.84^{+42.16}_{-2.08}$	$2.07^{+1.53}_{-0.88}$
12	1069(99)	$4.18^{+22.86}_{-3.53}$	$2.75^{+15.03}_{-1.3}$	$2.8^{+2}_{-1.17}$
13	99(9)	$7.85^{+23.84}_{-5.9}$	$3.1^{+9.41}_{-0.73}$	$9.93^{+3.63}_{-2.66}$
14	44(4)	$0.31^{+2.36}_{-0.27}$	$0.3^{+2.34}_{-0.18}$	$0.48^{+0.49}_{-0.24}$
16	227(22)	$1.11^{+3.29}_{-0.83}$	$0.1^{+0.28}_{-0.06}$	$1.06^{+1.58}_{-0.64}$
18	748(70)	$6.3^{+25.72}_{-5.06}$	$0.1^{+0.42}_{-0.08}$	$4.75^{+12.63}_{-3.45}$
19	77(7)	$0.97^{+1.54}_{-0.59}$	$0.77^{+1.22}_{-0.22}$	$0.8^{+0.35}_{-0.24}$
20	581(54)	$1.75^{+6.71}_{-1.39}$	$5.78^{+22.11}_{-1.88}$	$0.95^{+0.67}_{-0.39}$
21	2242(208)	$4.8^{+26.63}_{-4.06}$	$10.9^{+60.52}_{-7.71}$	$7.7^{+11.12}_{-4.55}$
All	5899(547)	$3.32^{+17.91}_{-2.8}$	$2.25^{+11.7}_{-1.96}$	$3.16^{+7.11}_{-2.19}$

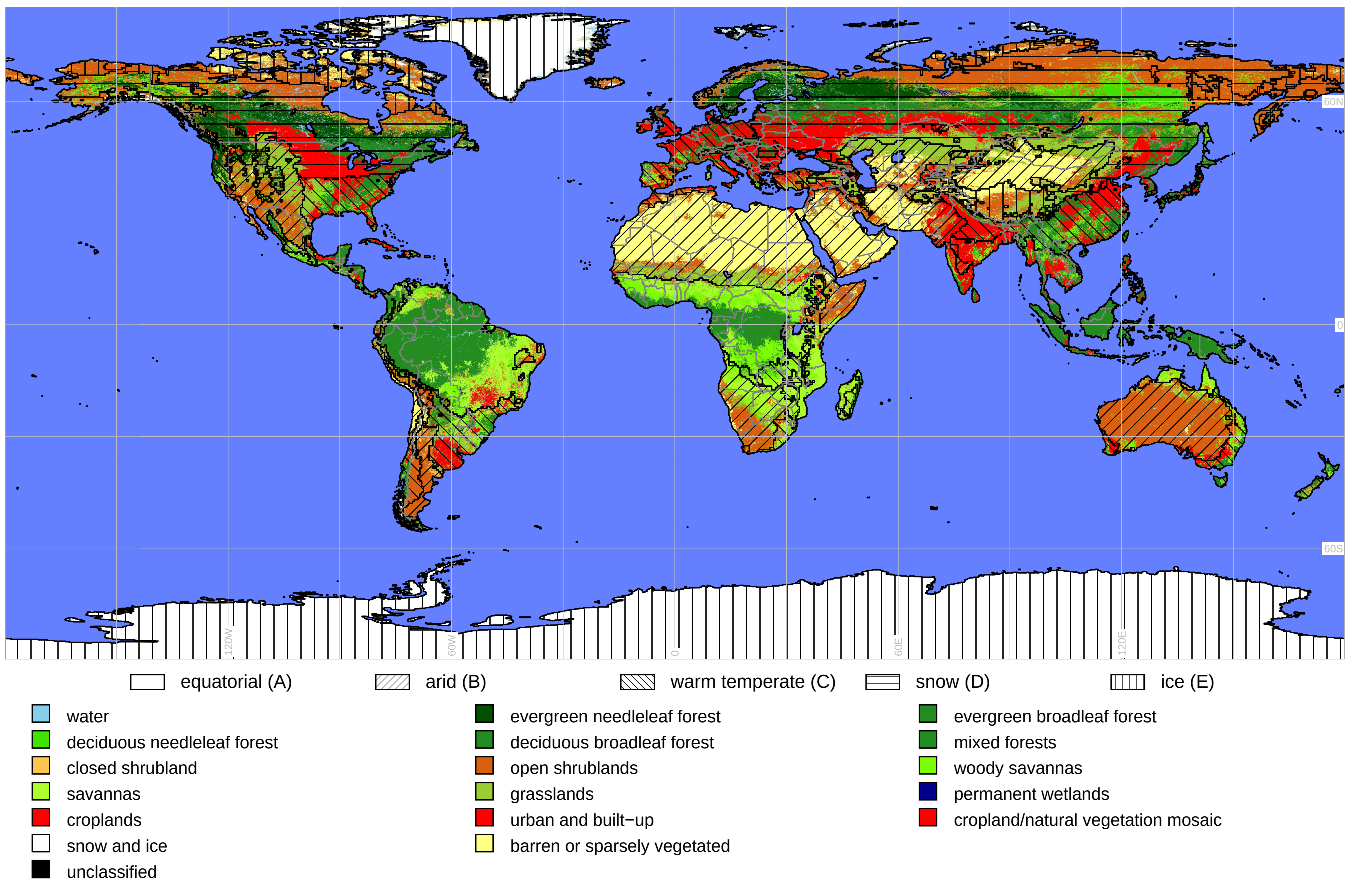

Figure 1: MODIS landcover (colors) overlaid with the Koeppen main climate classes (hashes).

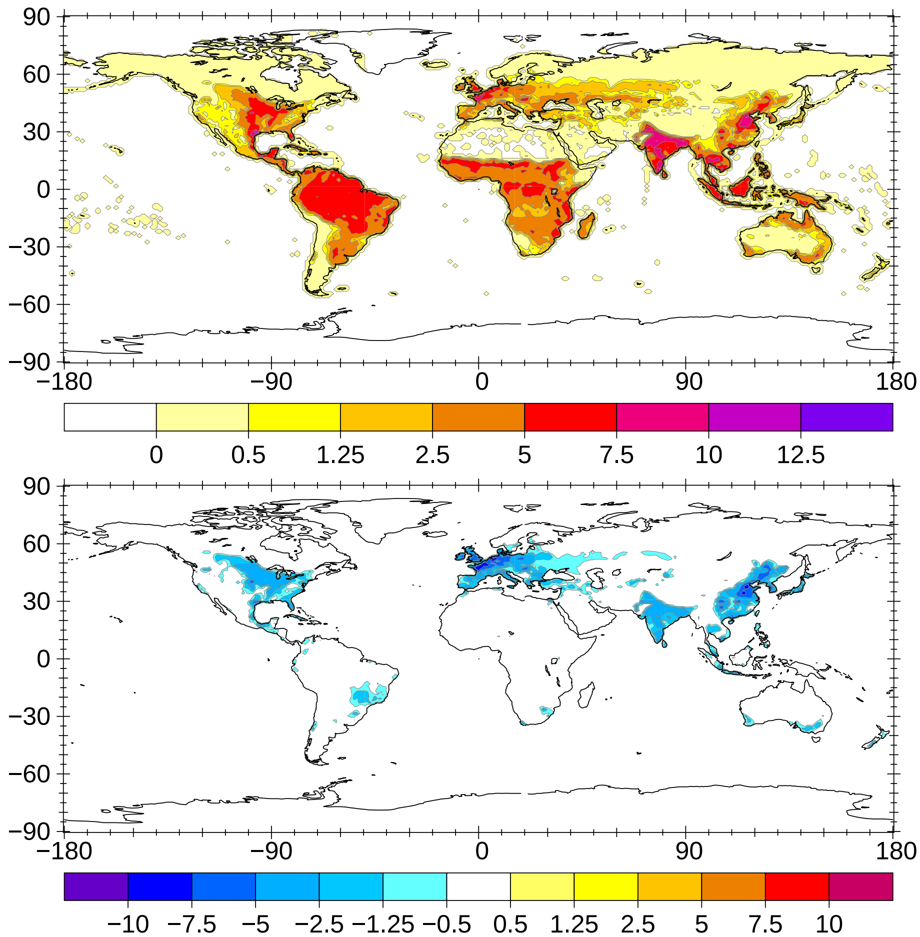

Figure 2: Averaged SNOx flux in the whole simulation period (in $\mathrm{ng\,m^{-2}\,s^{-1}}$) for the LC+FIE simulation (upper panel) and the change compared to the LC simulation (lower panel).

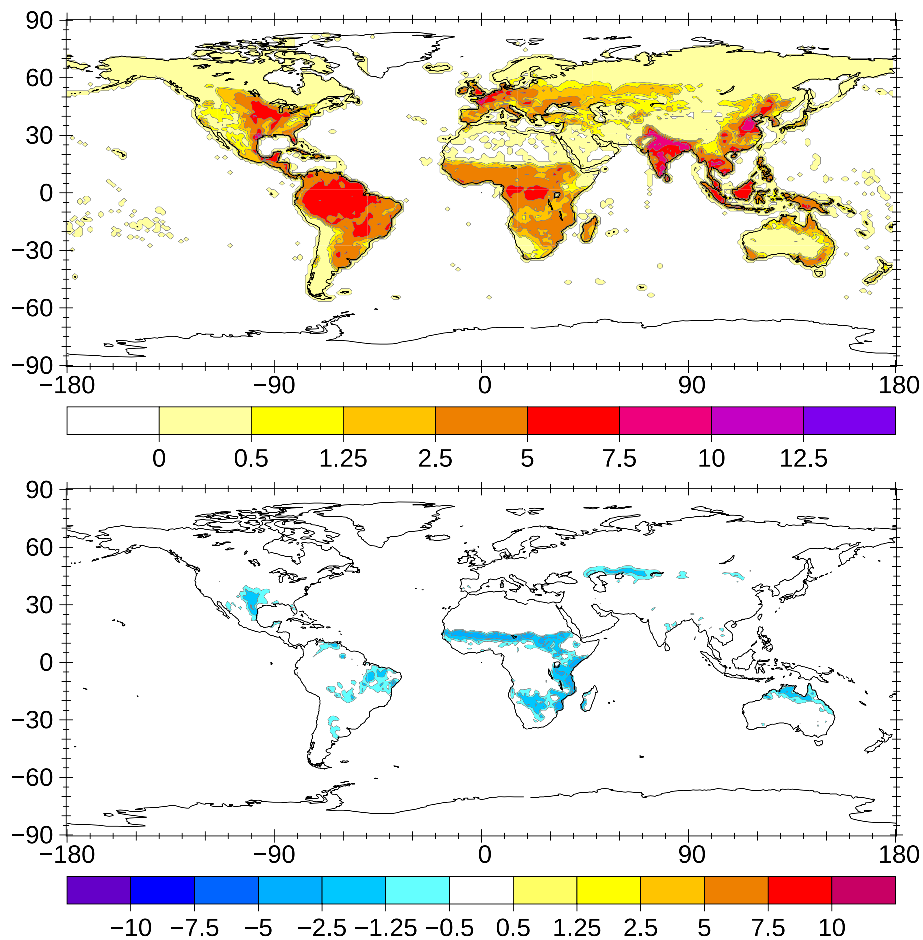

Figure 3: Averaged SNOx flux in the whole simulation period (in $\mathrm{ng\,m^{-2}\,s^{-1}}$) for the LC+FIE+VSM simulation (upper panel) and the change compared to the LC+FIE simulation (lower panel).