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Supplement of

Source contributions to sulfur and nitrogen deposition – an HTAP II multi-model study on hemispheric transport

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Fig. S1

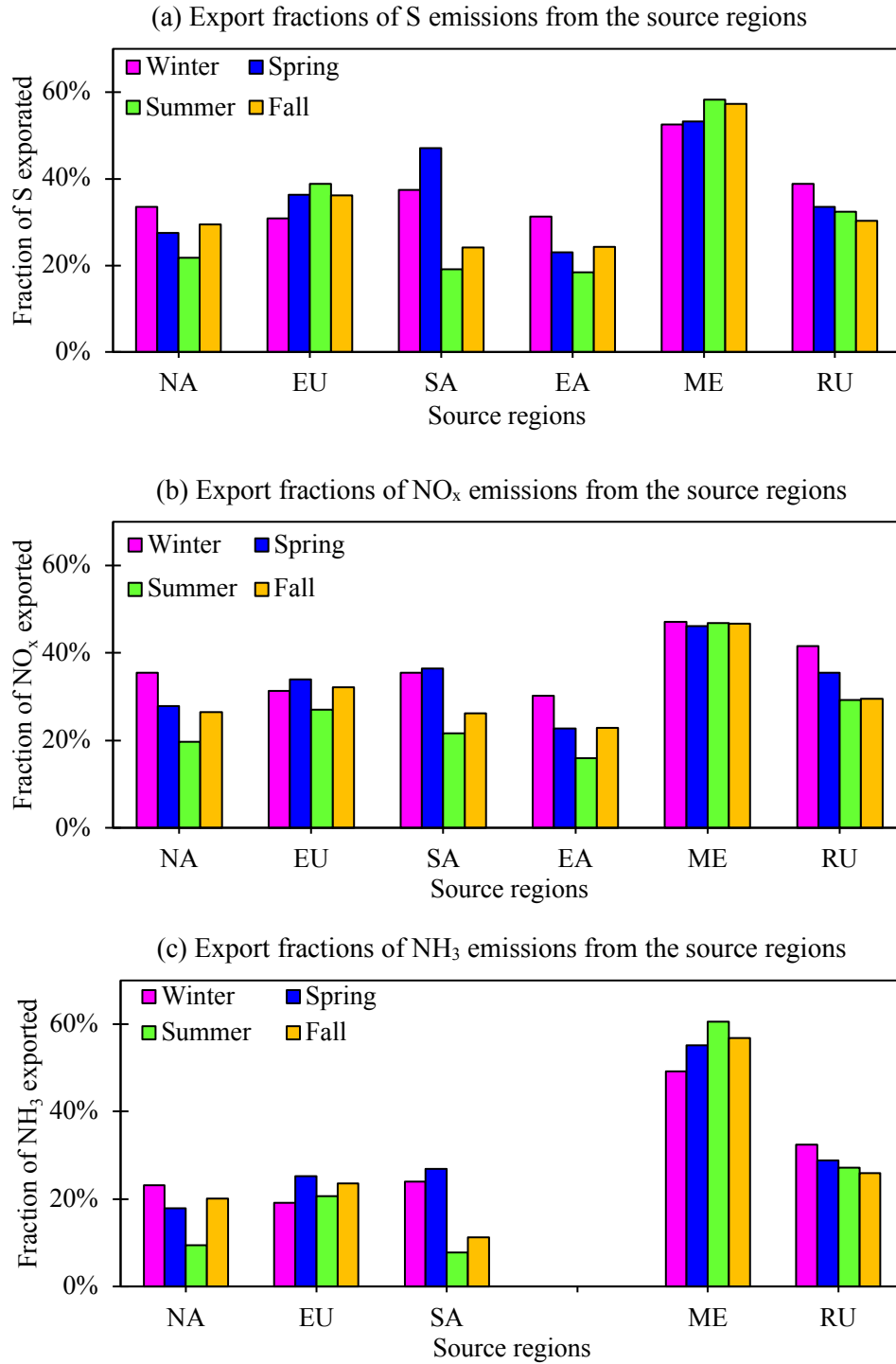


Figure S1 Export fractions of S, NO_x and NH₃ emissions from the source regions in four seasons.

Fig. S2

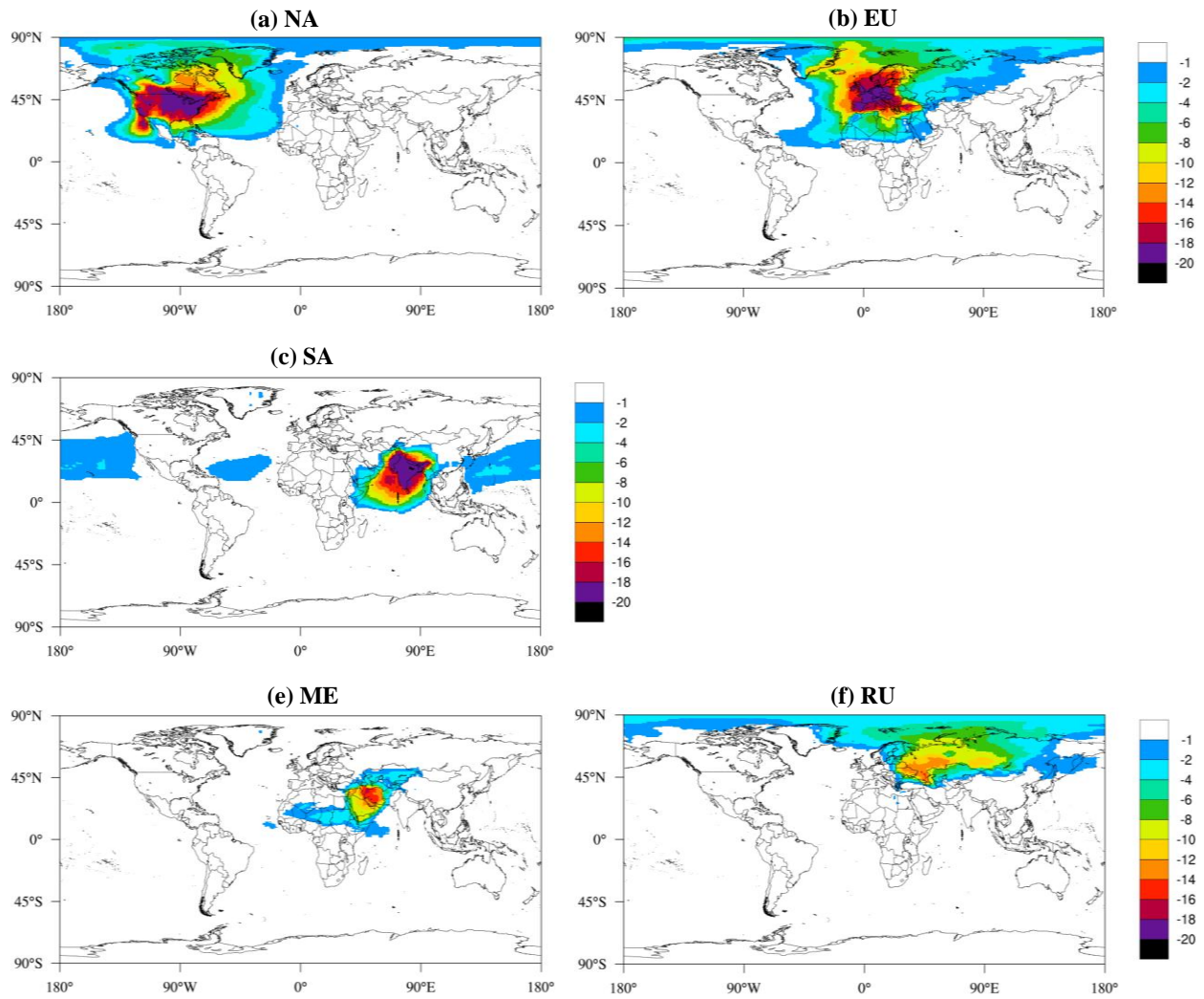


Figure S2 The response of NH_x deposition to 20% emission reduction in the source regions. The values are the percentage changes (%) in deposition calculated as (changes in deposition with 20% emission reduction) / (base case deposition) $\times 100\%$. The unit is % per $0.1 \times 0.1^\circ$ grid box.

Fig. S3

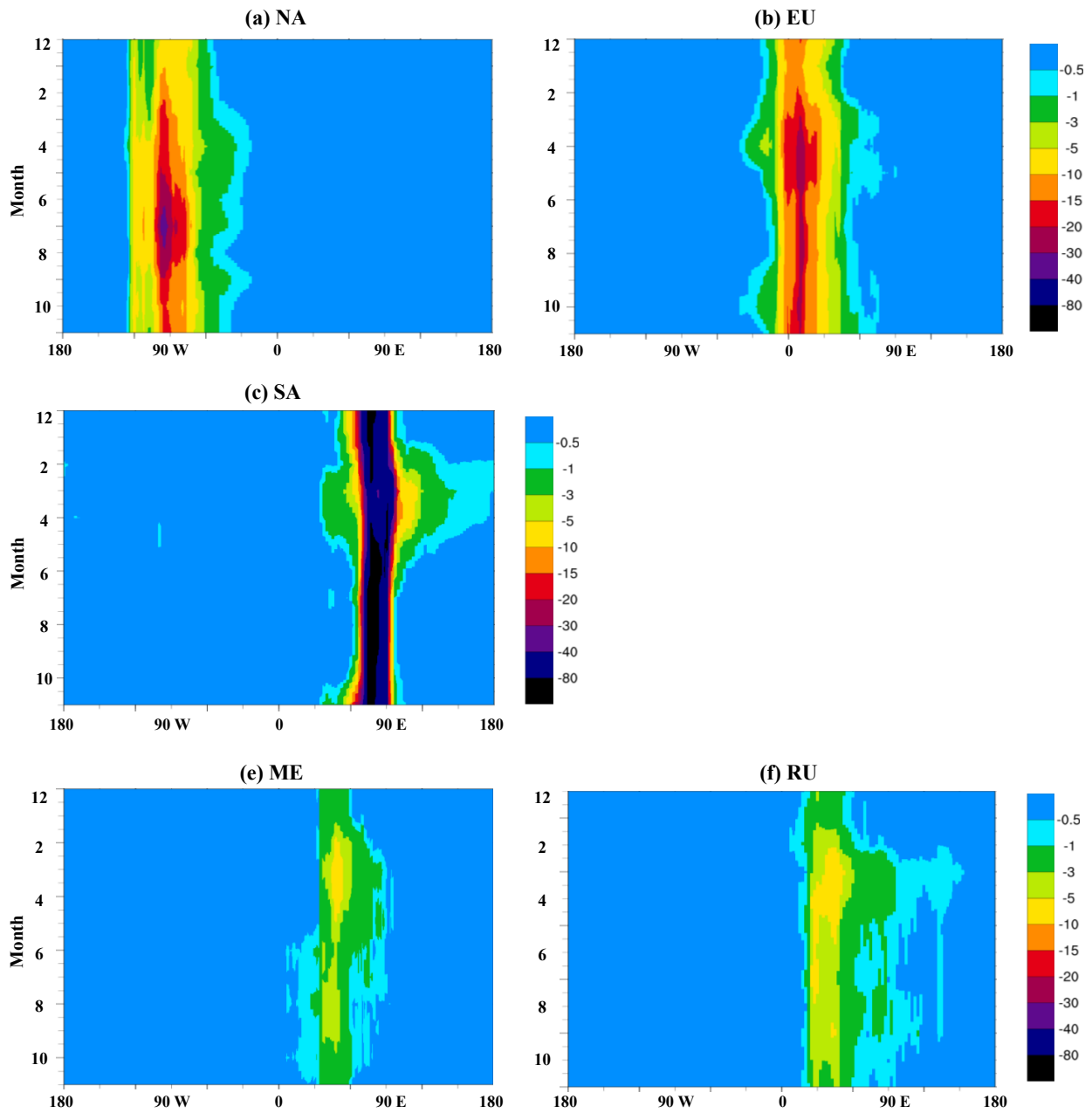


Figure S3 The monthly changes of NH_x deposition with 20% emission reduction in the source regions. The x-axis values are meridional total values versus time (y-axis) with a west-east resolution of 0.1° . The unit is $\times 10^4 \text{ kg(N) month}^{-1}$ per 0.1° longitude. Negative values indicate decline in deposition with reduction in emissions.

Fig. S4

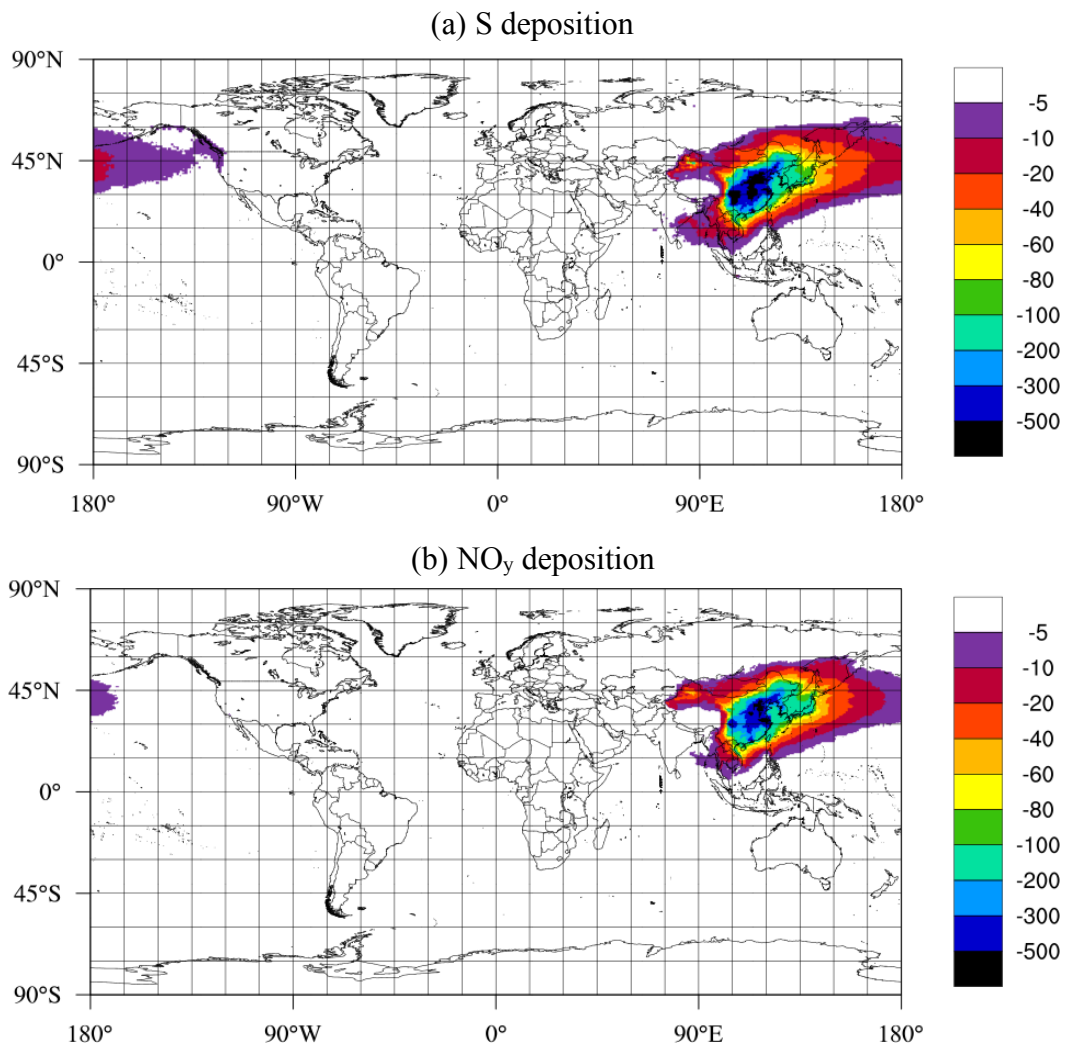


Figure S4 Changes of S and NO_y deposition under 20% emission reduction in EA (unit: mg(S or N) m⁻² yr⁻¹)

Table S1

Table S1. Global changes of emissions (Δ Emis) and deposition (Δ Depo) under emission perturbation experiments (unit: Tg(S or N) yr⁻¹)

		Regions of emission perturbation						
		NA	EU	SA	EA	MD	RU	GLO
S	Δ Emis	-1.2	-0.7	-1.1	-2.9	-0.7	-0.5	-10.5
	Δ Depo	-1.1	-0.6	-1.0	-2.8	-0.6	-0.4	-10.1
NO _y	Δ Emis	-0.9	-0.6	-0.7	-1.8	-0.3	-0.3	-7.0
	Δ Depo	-0.9	-0.6	-0.6	-1.8	-0.3	-0.2	-6.8
NH _x	Δ Emis	-0.7	-0.7	-2.1	-1.6	-0.1	-0.2	-8.0
	Δ Depo	-0.7	-0.7	-2.2	-*	-0.1	-0.2	-8.2

* Lack of NH₄⁺ wet deposition under EA emission perturbation experiment.

Table S2

Table S2. Median deposition fluxes under base case and under 20% emission perturbation in the source regions (unit: mg(S or N) m⁻² yr⁻¹)

	Receptor Regions	Base case	Source regions					
			NA	EU	SA	EA	ME	RU
Median S Deposition	NA	112.6	99.3	112.3	112.3	110.5	112.3	112.5
	EU	338.2	336.9	297.5	338.2	337.7	337.9	333.4
	SA	641.4	640.7	640.2	533.8	638.7	635.7	641.2
	EA	331.1	331.1	330.0	321.7	286.3	329.1	328.4
	ME	221.8	221.6	219.7	221.3	221.6	191.4	221.3
	RU	184.8	184.6	182.1	184.7	180.0	183.9	170.7
Median NO _y Deposition	NA	138.3	122.4	138.2	138.2	137.6	138.3	138.3
	EU	347.2	346.4	310.7	347.1	346.8	346.8	342.2
	SA	565.2	565.0	565.2	492.0	563.5	562.3	565.1
	EA	213.3	213.0	213.0	210.0	188.6	212.9	212.9
	ME	197.2	196.8	195.3	196.6	196.9	172.6	197.0
	RU	102.8	102.6	101.6	102.8	99.9	102.5	96.1
Median NH _x Deposition	NA	109.4	94.7	109.3	109.1	-	109.3	109.3
	EU	354.1	353.7	294.8	353.8	-	352.3	350.7
	SA	1638.0	1637.8	1637.4	1329.7	-	1636.8	1637.5
	EA	255.2	255.1	254.4	245.2	-	254.1	254.3
	ME	63.7	63.6	63.0	62.1	-	57.1	63.4
	RU	93.7	93.6	91.5	93.6	-	93.5	86.3

Table S3

Table S3. Changes of emissions under emission perturbation experiments for 12 months (unit: $\times 0.1 \text{ Tg(S or N) month}^{-1}$).

Emission changes	Seasons	Regions of emission perturbation					
		NA	EU	SA	EA	ME	RU
S emission	Jan	-0.913	-0.646	-0.860	-2.575	-0.505	-0.463
	Feb	-0.886	-0.609	-0.789	-2.119	-0.477	-0.433
	Mar	-0.955	-0.657	-0.876	-2.421	-0.477	-0.428
	Apr	-0.942	-0.591	-0.822	-2.173	-0.452	-0.395
	May	-0.956	-0.483	-0.840	-2.188	-0.436	-0.360
	Jun	-0.996	-0.476	-0.800	-2.249	-0.415	-0.332
	Jul	-1.009	-0.449	-0.805	-2.231	-0.411	-0.323
	Aug	-1.007	-0.392	-0.799	-2.184	-0.425	-0.322
	Sep	-0.961	-0.452	-0.792	-2.168	-0.423	-0.343
	Oct	-0.971	-0.512	-0.834	-2.234	-0.459	-0.385
	Nov	-0.956	-0.514	-0.826	-2.521	-0.472	-0.398
	Dec	-0.911	-0.602	-0.877	-2.820	-0.496	-0.443

Emission changes	Seasons	Regions of emission perturbation					
		NA	EU	SA	EA	ME	RU
NO _x emission	Jan	-0.698	-0.424	-0.536	-1.434	-0.228	-0.236
	Feb	-0.697	-0.427	-0.484	-1.249	-0.228	-0.231
	Mar	-0.730	-0.462	-0.533	-1.435	-0.227	-0.227
	Apr	-0.729	-0.446	-0.512	-1.362	-0.227	-0.219
	May	-0.728	-0.407	-0.525	-1.369	-0.221	-0.202
	Jun	-0.767	-0.408	-0.505	-1.400	-0.217	-0.195
	Jul	-0.768	-0.388	-0.516	-1.399	-0.210	-0.186
	Aug	-0.768	-0.366	-0.514	-1.389	-0.215	-0.191
	Sep	-0.730	-0.391	-0.492	-1.365	-0.215	-0.194
	Oct	-0.731	-0.424	-0.527	-1.374	-0.229	-0.217
	Nov	-0.730	-0.415	-0.505	-1.494	-0.231	-0.224
	Dec	-0.698	-0.424	-0.537	-1.587	-0.229	-0.232

Emission changes	Seasons	Regions of emission perturbation					
		NA	EU	SA	EA	ME	RU
NH ₃ emission	Jan	-0.391	-0.423	-2.102	-1.122	-0.080	-0.130
	Feb	-0.437	-0.487	-1.805	-1.026	-0.146	-0.235
	Mar	-0.591	-0.780	-2.098	-1.205	-0.246	-0.412
	Apr	-0.694	-0.850	-1.996	-1.487	-0.187	-0.338
	May	-0.719	-0.742	-2.097	-1.765	-0.117	-0.224
	Jun	-0.933	-0.627	-1.996	-1.920	-0.110	-0.200

Jul	-1.077	-0.571	-2.096	-1.904	-0.113	-0.199
Aug	-0.903	-0.574	-2.096	-2.038	-0.126	-0.215
Sep	-0.676	-0.606	-1.996	-1.531	-0.121	-0.214
Oct	-0.632	-0.642	-2.097	-1.312	-0.094	-0.178
Nov	-0.592	-0.617	-1.998	-1.360	-0.074	-0.146
Dec	-0.344	-0.517	-2.109	-1.263	-0.074	-0.133
