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Supplement of

Impacts of climate change and emissions on atmospheric oxidized nitrogen deposition over East Asia

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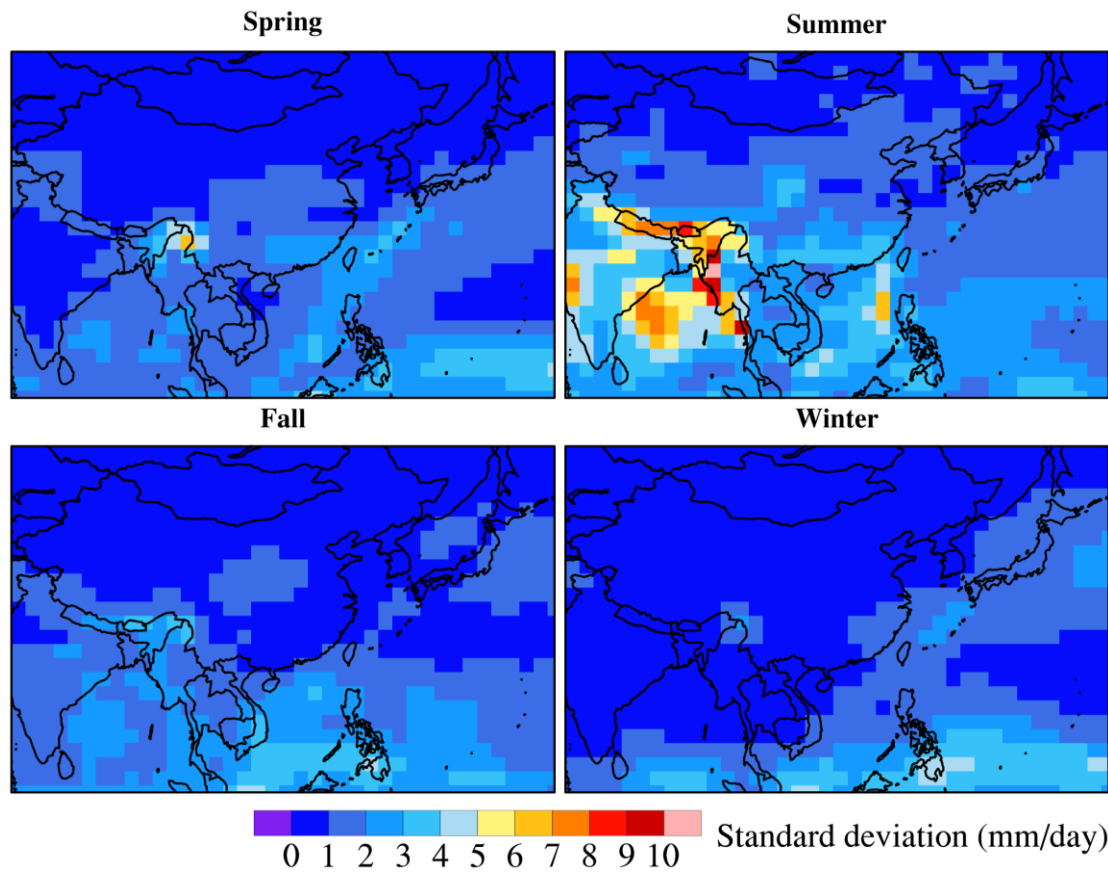


Fig. S1. Spatial distribution of inter-model standard deviation among ACCMIP models for historical precipitation over East Asia.

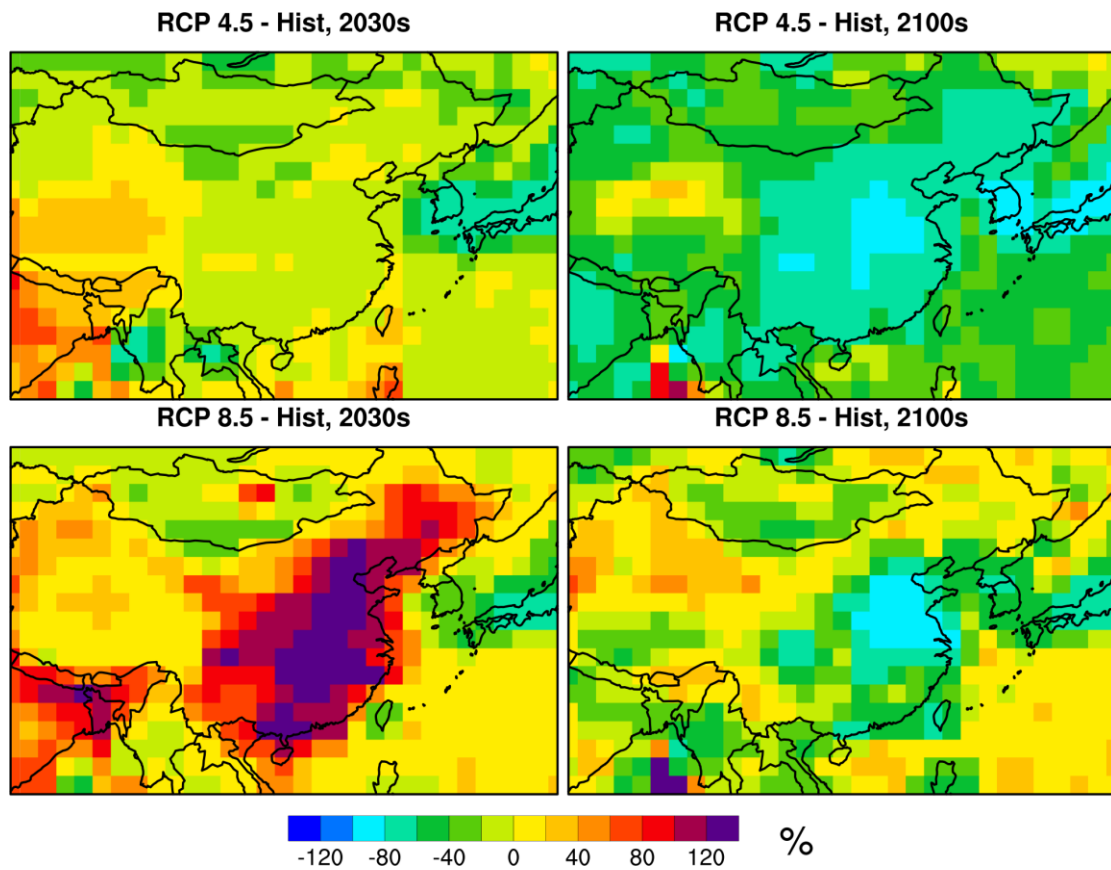


Fig. S2. Spatial distribution of multi-model mean annual surface NO_x emission (considered as shipping emission over the ocean areas) change under RCP 4.5 and RCP 8.5 in relative to historical period (2001-2010).

Table S1. The ACCMIP model used in this study as well as the simulation years over each period, including historical, 2030 and 2100 in RCP 4.5/RCP 8.5 and climate change only: Em2000Cl2030 and Em2000Cl2100.

Model	Historical	RCP 4.5/RCP 8.5		Em2000Cl2030	Em2000Cl2100
CICERO-OsloCTM2	2000	2030	2100	/	/
EMAC	2000-2009	2031-2039	2101-2109	/	/
GFDL-AM3	2001-2009	2031-2039	2101-2109	2031-2039	2101-2109
GISS-E2-R	2000-2005	2030-2039	2100	2030	2100
CESM-CAM-superfast	2000-2009	2030-2039	2100-2109	2030-2039	2100-2109
MOCAGE	2000-2003	2030-2033	2100-2103	2030-2033	2100-2103
NCAR-CAM3.5	2002-2009	2032-2039	2102-2109	2032-2039	2102-2109
MIROC-CHEM	2000-2009	2030-2034	2100-2104	2030-2034	2100-2104
UM-CAM	2000-2005	2030-2036	/	2030-2036	/
STOC-HadAM3	2000-2009	2030-2039	/	2030-2039	/
HadGEM2	2000-2009	2030-2039	2100-2109	/	2100-2109

Table S2. Standard deviation of regional future changes (%) of dry NO_y deposition over Bohai Sea (BS), Yellow Sea (YS) and East China Sea (ES).

Region	Season	RCP 4.5		RCP 8.5		Em2000C12030	Em2000C12100
		2030s	2100s	2030s	2100s		
BS	Spring	15	6	32	9	3	10
	Summer	11	6	41	10	4	22
	Fall	12	3	33	10	6	14
	Winter	10	5	22	26	10	21
YS	Spring	14	3	28	7	4	12
	Summer	12	8	23	6	2	8
	Fall	9	1	25	5	3	8
	Winter	13	9	34	22	5	18
ES	Spring	10	2	19	6	8	3
	Summer	12	6	10	13	6	15
	Fall	9	2	15	8	7	11
	Winter	8	3	32	4	4	11

Table S3. Standard deviations of regional future changes (%) of wet NO_y deposition over Bohai Sea (BS), Yellow Sea (YS) and East China Sea (ES).

Region	Season	RCP 4.5		RCP 8.5		Em2000Cl2030	Em2000Cl2100
		2030s	2100s	2030s	2100s		
BS	Spring	12	4	68	8	20	13
	Summer	12	5	45	14	11	11
	Fall	39	9	45	11	24	50
	Winter	39	12	51	53	19	57
YS	Spring	13	1	33	9	19	14
	Summer	26	5	42	12	11	16
	Fall	11	8	22	6	11	30
	Winter	11	4	34	28	7	49
ES	Spring	11	2	12	10	5	10
	Summer	12	7	19	15	12	29
	Fall	9	3	19	13	10	16
	Winter	12	3	17	9	6	16

Table S4*. Summary of multi-model mean shipping NO_x emission (emisnox, Gg/day) and lightning NO_x emission (emilnox, Gg/day) over Yellow Sea (YS) and East China Sea (ES) under all scenarios studied.

Region	Season	Emission	Historical	RCP4.5		RCP8.5		Em2000	Em2000
				2030s	2100s	2030s	2100s	CI2030	CI2100
YS	Spring	emisnox	0.086	0.114	0.052	0.162	0.049	0.085	0.085
		emilnox	0.001	0.001	0.001	0.001	0.002	0.001	0.002
	Summer	emisnox	0.099	0.129	0.062	0.176	0.058	0.098	0.099
		emilnox	0.005	0.005	0.008	0.005	0.010	0.005	0.007
	Fall	emisnox	0.080	0.107	0.050	0.156	0.046	0.079	0.079
		emilnox	0.001	0.001	0.002	0.001	0.003	0.001	0.002
	Winter	emisnox	0.084	0.112	0.052	0.161	0.049	0.083	0.083
		emilnox	0.000	0.000	0.001	0.000	0.001	0.000	0.001
ES	Spring	emisnox	0.633	0.711	0.428	0.657	0.489	0.627	0.630
		emilnox	0.008	0.010	0.014	0.008	0.012	0.007	0.010
	Summer	emisnox	0.704	0.787	0.483	0.733	0.558	0.699	0.701
		emilnox	0.023	0.028	0.042	0.030	0.037	0.028	0.030
	Fall	emisnox	0.675	0.754	0.457	0.702	0.537	0.671	0.673
		emilnox	0.010	0.013	0.020	0.014	0.023	0.014	0.016
	Winter	emisnox	0.660	0.739	0.438	0.689	0.515	0.655	0.655
		emilnox	0.003	0.002	0.002	0.002	0.003	0.002	0.002

*Please note that under climate change only scenarios (Em2000CI2030 and Em2000 CI2100), the lightning emission slightly changes. The shipping emission should maintain the same as historical case, however, subtle changes were observable in the right two columns (in relative to the fourth column) in Table S4. The multi-model mean changes are mainly due NO_x emission changes in GISS-E2-R model, which should have negligible impact considering the very small amount of change.