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Will the role of intercontinental transport change in a changing climate?

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Table S1. Emissions Growth Factors for the Year 2050

Species	Source	Canada	USA	Central America	South America	North Africa	West Africa	East Africa	South Africa	OECP Europe	Eastern Europe	Former USSR	Middle East	South Asia	East Asia	Southeast Asia	Oceania	Japan
ALD2	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	BF	0.66	0.94	1.32	1.16	0.30	1.45	1.64	1.06	0.63	0.74	0.93	0.26	0.93	0.68	0.90	0.68	0.56
	AT	0.31	0.26	0.56	0.55	4.03	3.58	7.97	2.34	0.36	0.43	0.90	0.85	3.04	0.77	1.10	0.29	0.49
FORM	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	BF	0.66	0.94	1.32	1.16	0.30	1.45	1.65	1.06	0.63	0.74	0.93	0.26	0.93	0.68	0.90	0.68	0.56
	AT	1.44	1.68	3.68	3.40	7.45	12.65	20.42	6.41	1.55	4.79	5.17	2.48	13.62	7.26	5.88	1.30	1.61
ETOH	BB	0.24	0.47	0.33	1.05	0.44	0.42	0.55	0.18	0.37	0.35	0.24	0.36	0.33	0.11	0.68	0.64	1.08
and	BF	0.66	0.94	1.32	1.16	0.30	1.45	1.65	1.06	0.63	0.74	0.93	0.26	0.93	0.68	0.90	0.68	0.56
MEOH	AT	0.96	0.97	2.38	2.20	4.68	7.97	10.71	3.64	1.01	3.54	3.76	1.54	8.88	4.74	4.21	0.88	1.24
ETHA	BB	0.01	0.27	0.19	0.74	0.31	0.26	0.32	0.10	0.21	0.26	0.03	0.26	0.18	0.02	0.49	0.39	0.87
	BF	0.39	0.55	0.78	0.69	0.18	0.86	0.97	0.63	0.37	0.44	0.55	0.15	0.55	0.40	0.53	0.40	0.33
	AT	0.48	0.47	1.07	3.22	1.38	3.21	9.34	5.88	0.74	0.89	1.37	2.31	2.86	2.86	1.40	0.39	0.67
HC	Total	0.47	0.47	1.07	3.13	1.37	3.07	3.20	4.20	0.74	0.88	1.36	2.31	1.99	2.49	1.29	0.39	0.67
KET	BB	0.24	0.47	0.33	1.05	0.44	0.42	0.55	0.18	0.37	0.35	0.24	0.36	0.33	0.11	0.68	0.64	1.08
	AT	0.52	0.67	0.44	0.35	1.58	0.26	0.90	0.40	0.86	0.79	2.28	0.40	0.45	0.52	0.35	0.95	0.33
ETH	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	BF	0.66	0.94	1.32	1.16	0.30	1.45	1.65	1.06	0.63	0.74	0.93	0.26	0.93	0.68	0.90	0.68	0.56
	AT	1.05	0.86	3.22	2.96	5.15	12.38	14.87	4.92	1.01	4.40	5.52	1.39	17.94	9.55	6.87	0.97	1.22
OLE and	BB	0.02	0.31	0.26	1.00	0.38	0.36	0.44	0.14	0.24	0.31	0.04	0.33	0.22	0.02	0.64	0.52	1.02
IOLE	BF	0.66	0.94	1.32	1.16	0.30	1.45	1.65	1.06	0.63	0.74	0.93	0.26	0.93	0.68	0.90	0.68	0.56
	AT	0.37	0.35	0.65	0.67	4.12	3.82	8.02	2.45	0.41	0.47	0.76	0.90	3.02	0.82	1.22	0.32	0.53
AACD	Total	0.94	0.97	2.23	2.02	4.10	3.71	3.27	2.29	1.00	3.46	3.53	1.49	3.91	3.32	3.11	0.87	1.23
TOL	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	AT	1.03	1.03	2.61	2.32	4.27	5.91	5.02	2.75	1.09	4.11	4.11	1.58	6.57	4.75	4.22	0.96	1.29
XYL	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	AT	0.97	0.92	2.56	2.25	4.49	5.84	5.27	2.91	1.03	4.10	4.13	1.38	6.72	4.73	4.16	0.93	1.25
CO	BB	0.03	0.72	0.50	1.83	0.71	0.62	0.79	0.22	0.58	0.57	0.07	0.59	0.48	0.03	1.26	0.96	2.56
	AT	0.54	0.44	0.94	1.05	3.82	1.82	2.19	1.72	0.53	0.57	1.10	1.04	1.38	0.81	1.11	0.46	0.69
CH_4	BB	0.03	0.78	0.30	2.13	0.75	0.72	0.80	0.22	0.67	0.66	0.07	0.54	0.39	0.04	1.27	1.10	3.58
	AT	0.78	0.39	1.82	3.87	1.97	4.86	1.91	9.15	0.84	0.42	2.18	6.99	1.75	1.73	1.86	1.74	0.44
CRES	Total	0.94	0.97	2.23	2.02	4.10	3.71	3.27	2.29	1.00	3.46	3.53	1.49	3.91	3.32	3.11	0.87	1.23
NO_x,	BB	0.04	0.98	1.30	1.50	1.23	0.47	0.67	0.18	0.75	0.82	0.10	1.02	0.89	0.04	1.69	0.76	2.88
and NO_3	AT	0.97	0.89	3.36	3.62	9.17	6.72	8.40	5.16	1.02	2.58	2.11	3.84	8.63	2.94	4.80	1.03	1.01
N_2O	Total	1.07	2.07	3.07	4.07	5.07	6.07	7.07	8.07	9.07	10.07	11.07	12.07	13.07	14.07	15.07	16.07	17.07
NH_3	BB	1.16	1.01	0.91	1.35	0.76	0.82	1.28	0.36	0.79	0.58	1.00	0.48	1.78	0.96	1.01	1.54	1.85
	AG	1.05	1.42	1.91	1.40	2.27	2.99	2.21	2.80	1.20	1.23	1.60	3.21	1.30	0.76	2.14	0.86	1.96
	AT	0.62	0.89	1.34	1.23	0.16	1.67	1.85	1.20	0.61	0.60	0.37	0.30	1.04	0.64	0.96	0.74	0.90
SO_2 and	BB	0.03	0.80	0.93	3.40	1.17	1.15	1.50	0.42	0.64	0.85	0.08	1.15	0.99	0.06	2.36	1.84	6.81
SO_4^{2-}	AT	0.26	0.25	1.81	7.46	7.26	9.09	14.81	6.87	0.37	0.23	0.37	1.09	3.93	0.89	3.59	0.43	0.26
BC	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13
	AT	0.58	0.49	1.70	1.01	2.99	0.93	1.97	1.42	0.57	1.06	1.63	1.69	1.88	0.76	1.10	0.85	0.26
OC	BB	1.12	0.96	0.80	1.40	0.98	0.79	1.27	0.40	0.72	0.75	1.04	0.51	1.42	0.93	0.96	1.51	1.63
	AT	0.52	0.67	0.44	0.35	1.58	0.26	0.90	0.40	0.86	0.79	2.28	0.40	0.45	0.52	0.35	0.95	0.33
OIN	BB	1.19	1.05	0.81	1.37	1.72	0.78	1.30	0.40	0.86	0.74	1.04	0.73	1.72	1.00	0.96	1.45	2.13

Table Description

Table S1.

Growth factors applied to base year emissions to generate 2050 projected emissions. The emissions growth factors vary depending on the 17 world regions shown and based on the emissions sources. These sources include biomass burning (BB), bio-fuels (BF), agriculture (AG), anthropogenic sources (AT), or total non-source specific emissions (Total). * The GU-WRF/Chem emissions are generated based on the Regional Acid Deposition Model version 2 (RADM2) format and later mapped to the carbon bond 2005 with global extension (CB05GE) mechanism species as shown in the above table. As a result par emissions are calculated based on several species including those that are mapped to AACD, OLE, IOLE, and ALD2. However, PAR is also comprised of some other RADM2 species including HC3, HC5, and HC8 which are referred to as HC in the table and ketone (KET). The equation for PAR emissions is listed in Table 2 of Zhang et al., (2012).

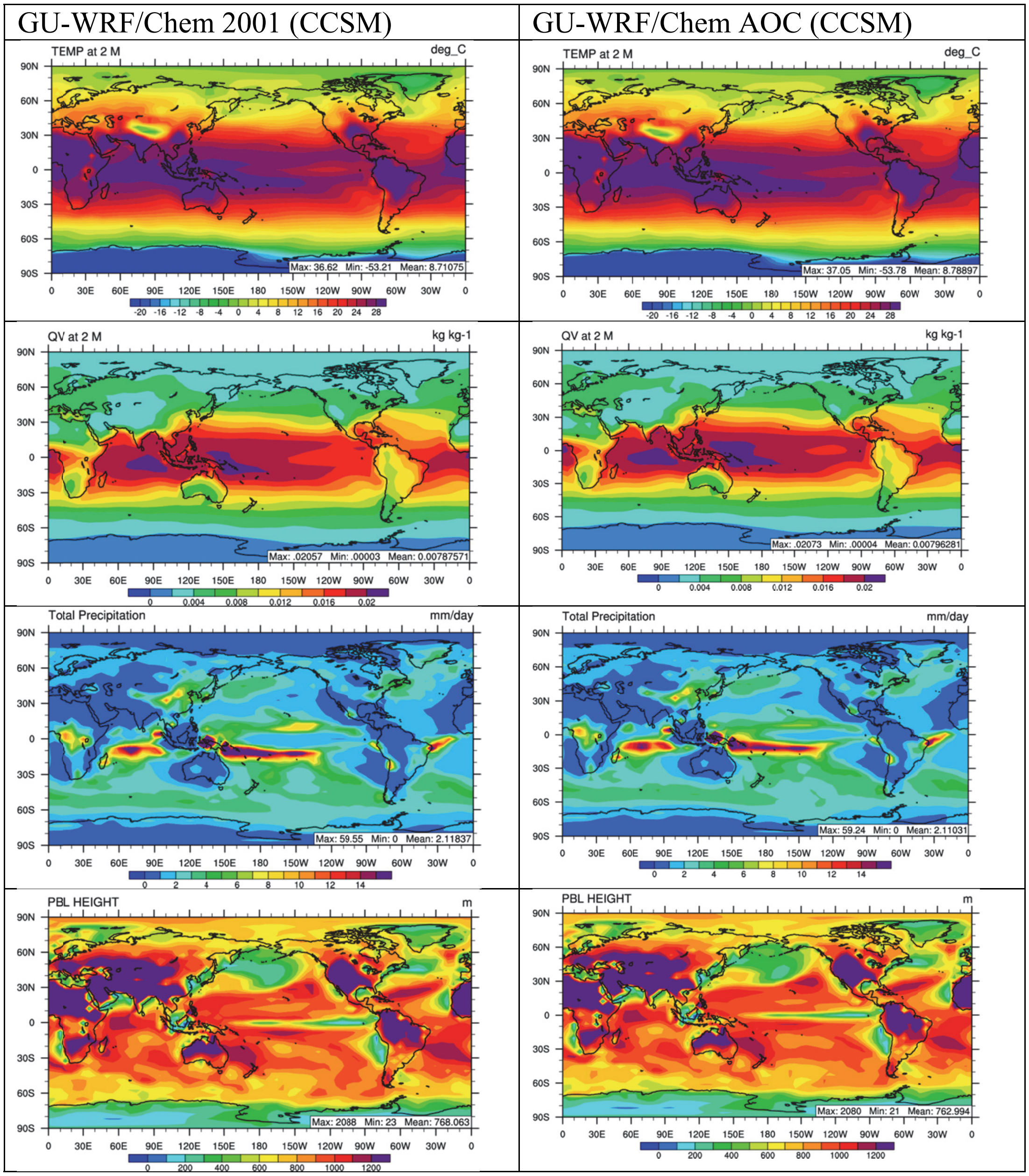

Figure S1. Average spring (MAM) 2-m temperature, 2-m water vapor, precipitation rate, and planetary boundary layer height fields from GU-WRF/Chem simulations of the year 2001 (left) and averaged current period consisting of 2001 and 2010 (AOC) (right). GU-WRF simulations are initialized with the CCSM3 data.

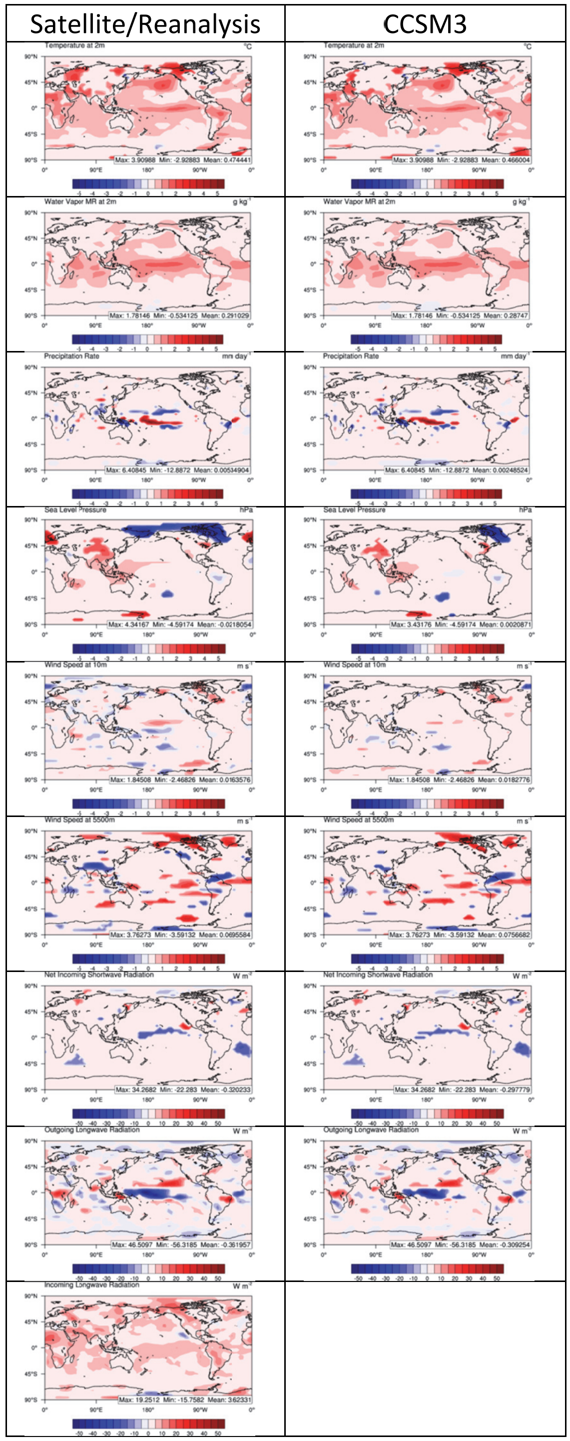

Figure S2. The statistically significant differences in T2, Q2, SLP, WSP10, WSP5500, PR, GSW, OLR, and GLW between MAM AOF and AOC that are greater than the variability in the current climate from reanalysis or satellite data (left) and greater than the variability in the current and future climate from CCSM3 (right). The GLW plot in the bottom row of the CCSM3 column was not generated since the CCSM3 GLW data was not readily available.

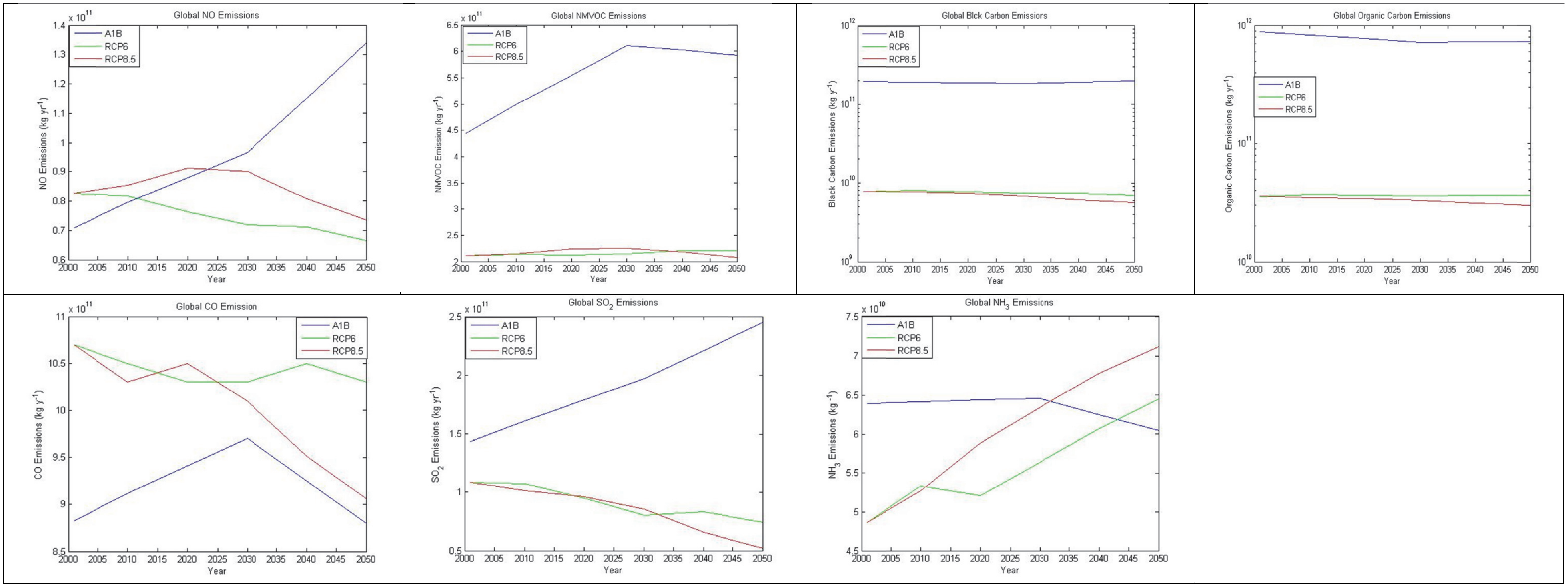

Figure S3. The time evolution of NO, volatile organic compound, black carbon, organic carbon, CO, SO_2, and NH_3 emissions in the GU-WRF/Chem A1B, RCP6, and RCP8.5 emission scenarios on a global scale.

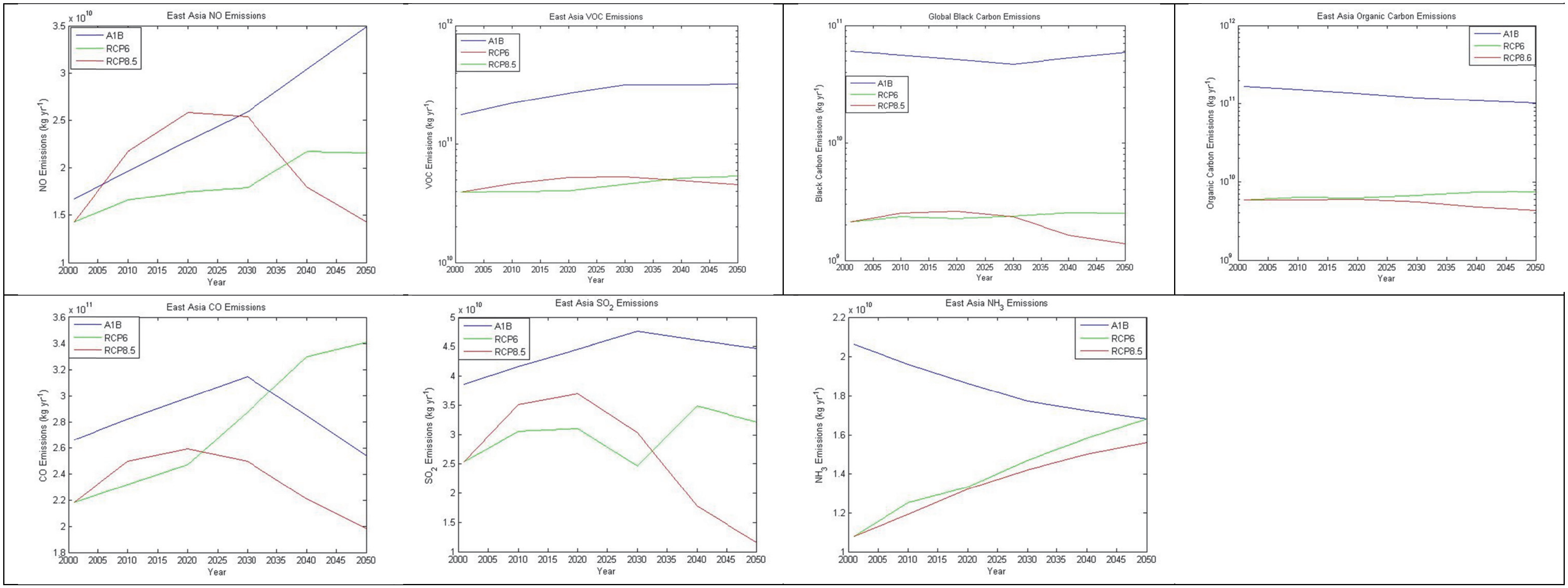

Figure S4. The time evolution of NO, volatile organic compound, black carbon, organic carbon, CO, SO_2, and NH_3 emissions in the GU-WRF/Chem A1B, RCP6, and RCP8.5 emission scenarios in East Asia.

Reference

Zhang, Y., P. Karamchandani, T. Glotfelty, D. G. Streets, G. Grell, A. Nenes, F. Yu, and R. Bennartz (2012), Development and initial application of the global-through-urban weather research and forecasting model with chemistry (GU-WRF/Chem), *J. Geophys. Res.*, *117*, D20206, doi:10.1029/2012JD017966