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Aerosol–meteorology feedback diminishes the transboundary transport of black carbon into the Tibetan Plateau

Yuling Hu et al.

Correspondence to: Haipeng Yu (yuhp@lzb.ac.cn) and Shichang Kang (shichang.kang@lzb.ac.cn)

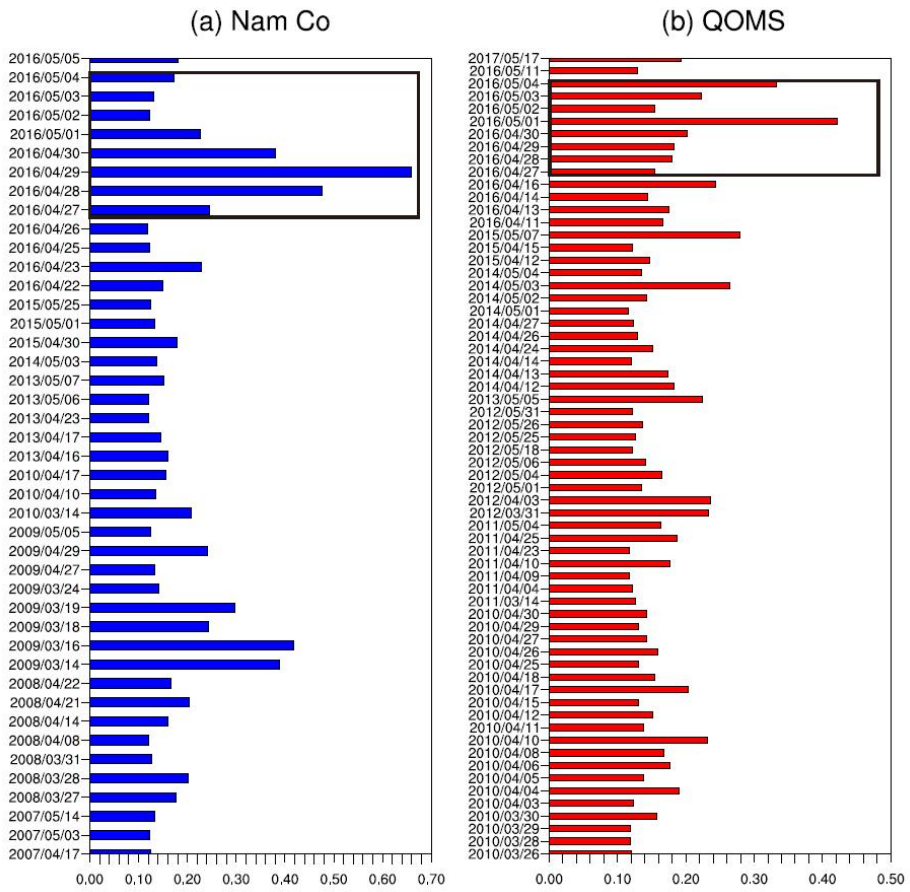

Figure S1. Daily mean AOD at 500 nm that lies above the 95th percentile at (a) Nam Co and (b) QOMS stations since 2006 and 2009, respectively.

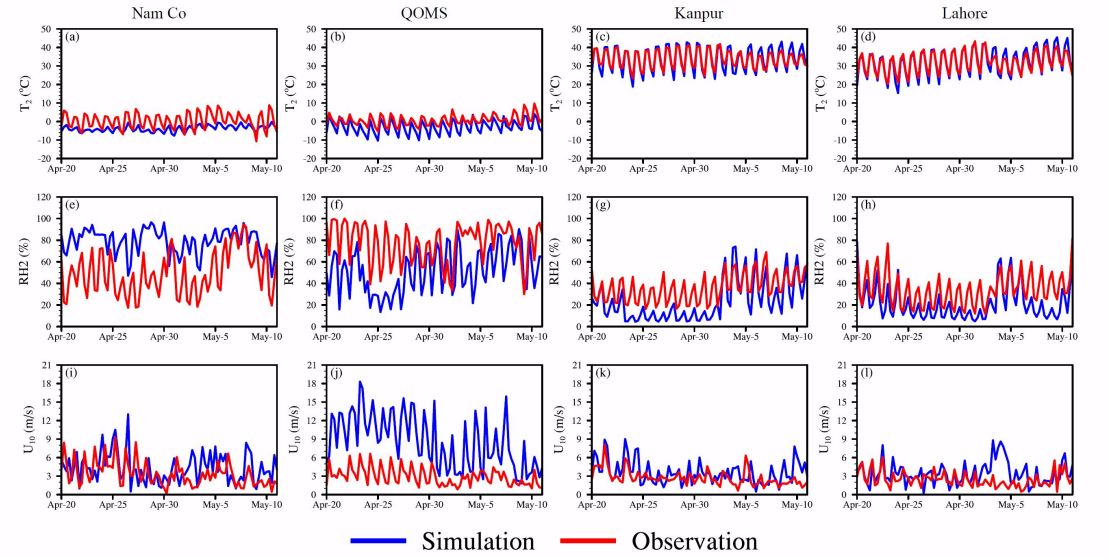

Figure S2. Temporal variations in simulated and reanalyzed daily mean (a–d) T_2 (ºC), (e–h) RH2 (%), and (i–l) U_{10} (m/s) at (a, e, i) Nam Co, (b, f, j) QOMS, (c, g, k) Kanpur, and (d, h, l) Lahore stations for the period from April 20 to May 10, 2016.

Table S1. Statistical description of simulated and reanalyzed T_2, RH2 and U_{10} at different stations during the period from April 20 to May 10, 2016.

Variable	Station	N	Simulated mean	Observed mean	MB	NMB (%)	RMSE	R
T_2 (ºC)	Nam Co	85	−3.81	0.45	−4.25	−951.27	5.49	0.69**
	QOMS	85	−2.89	0.73	−3.62	−494.11	4.09	0.87**
	Kanpur	85	33.77	33.74	0.03	0.10	2.75	0.94**
	Lahore	85	32.15	32.08	0.07	0.22	2.50	0.96**
RH2 (%)	Nam Co	85	79.02	49.34	29.68	60.15	34.48	0.51**
	QOMS	85	51.55	77.38	−25.82	−33.37	32.20	0.52**
	Kanpur	85	23.63	36.19	−12.56	−34.70	17.10	0.80**
	Lahore	85	21.45	34.45	−13.00	−37.75	16.72	0.78**
U_{10} (m/s)	Nam Co	85	4.30	3.39	0.91	26.98	2.79	0.30**
	QOMS	85	8.56	2.91	5.66	194.46	6.78	0.55**
	Kanpur	85	3.58	2.73	0.85	31.32	1.91	0.45**
	Lahore	85	3.43	2.47	0.96	38.79	2.20	0.22*

**represents the correlation coefficient exceeding the 99% confidence level, *represents the correlation coefficient exceeding the 95% confidence level.

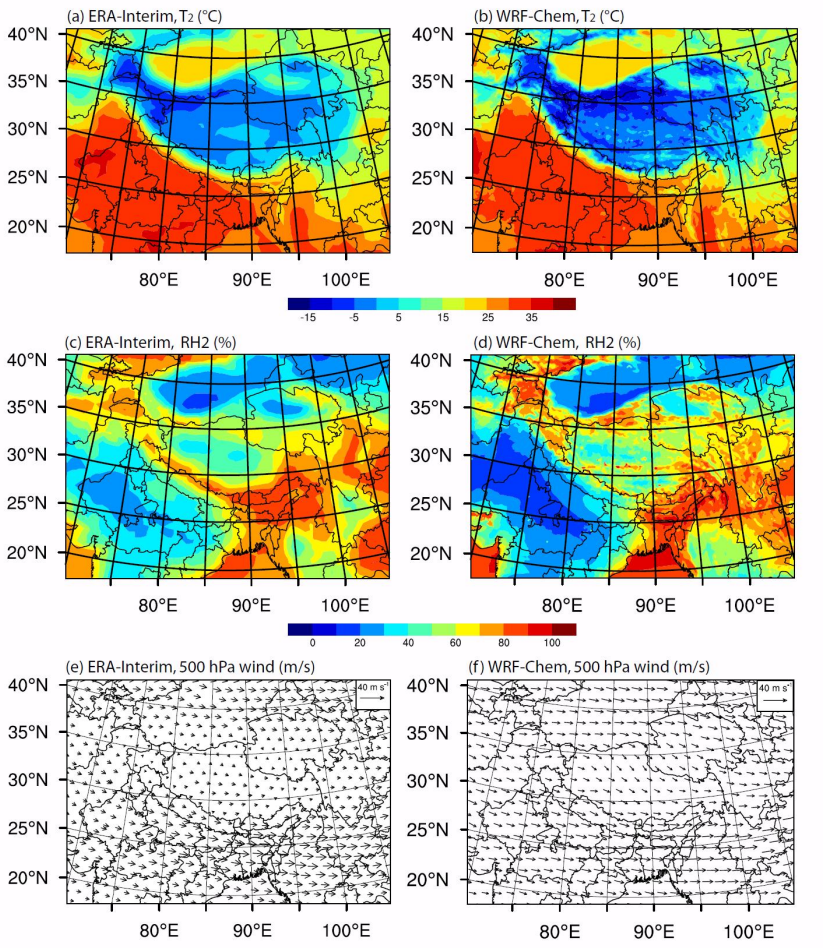

Figure S3. Spatial distributions of simulated and reanalyzed daily mean (a–b) T_2 (ºC), (c–d) RH2 (%), and (e–f) wind field (m/s) at 500 hPa averaged for the period from April 20 to May10, 2016.

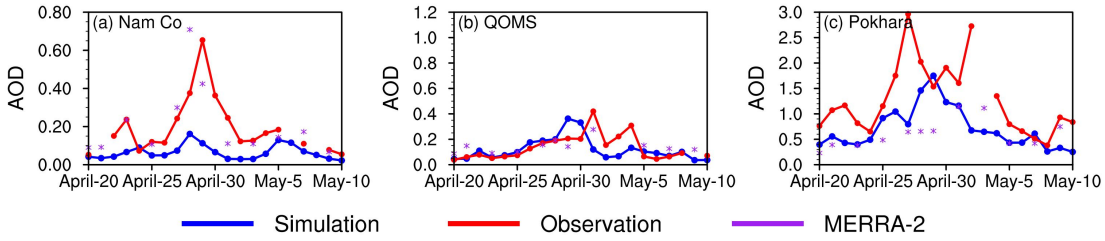

Figure S4. Inter-comparison of temporal variations in simulated, ground-based, and satellite-based daily mean AOD at (a) Nam Co, (b) QOMS, and (c) Pokhara stations for the period from April 20 to May 10, 2016.

Table S2. Statistical description of simulated and observed AOD and BC at different stations during the period from April 20 to May 10, 2016.

Variable	Station	N	Simulated mean	Observed mean	MB	NMB (%)	RMSE	R
AOD	Nam Co	18	0.06	0.19	−0.13	−66.77	0.18	0.58*
	QOMS	20	0.12	0.14	−0.01	−8.57	0.10	0.45*
	Pokhara	20	0.71	1.28	−0.57	−44.37	0.80	0.56*
BC	Nam Co	288	0.10	0.17	−0.07	−42.36	0.17	0.67**
	QOMS	288	0.60	0.45	0.14	31.92	0.55	0.43**
	Lhasa	288	0.19	0.22	−0.02	−10.92	0.23	0.47**
	NCO-P	288	0.57	0.58	−0.02	−2.69	0.41	0.50**
	Laohugou	288	0.10	0.08	0.02	26.47	0.04	0.25**
	Kanpur	288	2.61	1.89	0.72	37.91	1.48	0.61**

**represents the correlation coefficient exceeding the 99% confidence level, *represents the correlation coefficient exceeding the 95% confidence level.

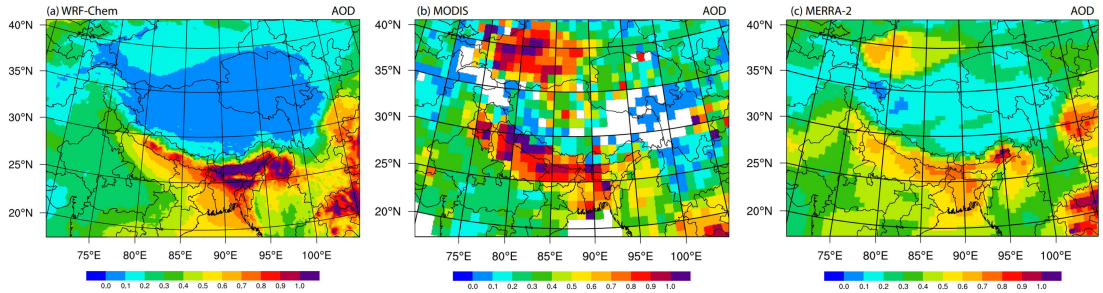

Figure S5. Inter-comparison of spatial distribution of simulated, satellite-based, and reanalyzed mean daily AOD averaged for the period from April 20 to May 10, 2016 over the study area.

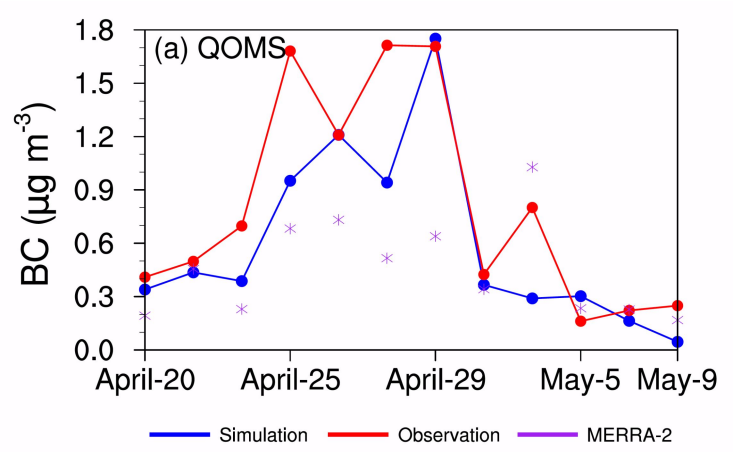

Figure S6. Inter-comparison of temporal variations in simulated, in-situ observed, and reanalyzed mean daily BC concentrations at the QOMS station for the period from April 20 to May 10, 2016.

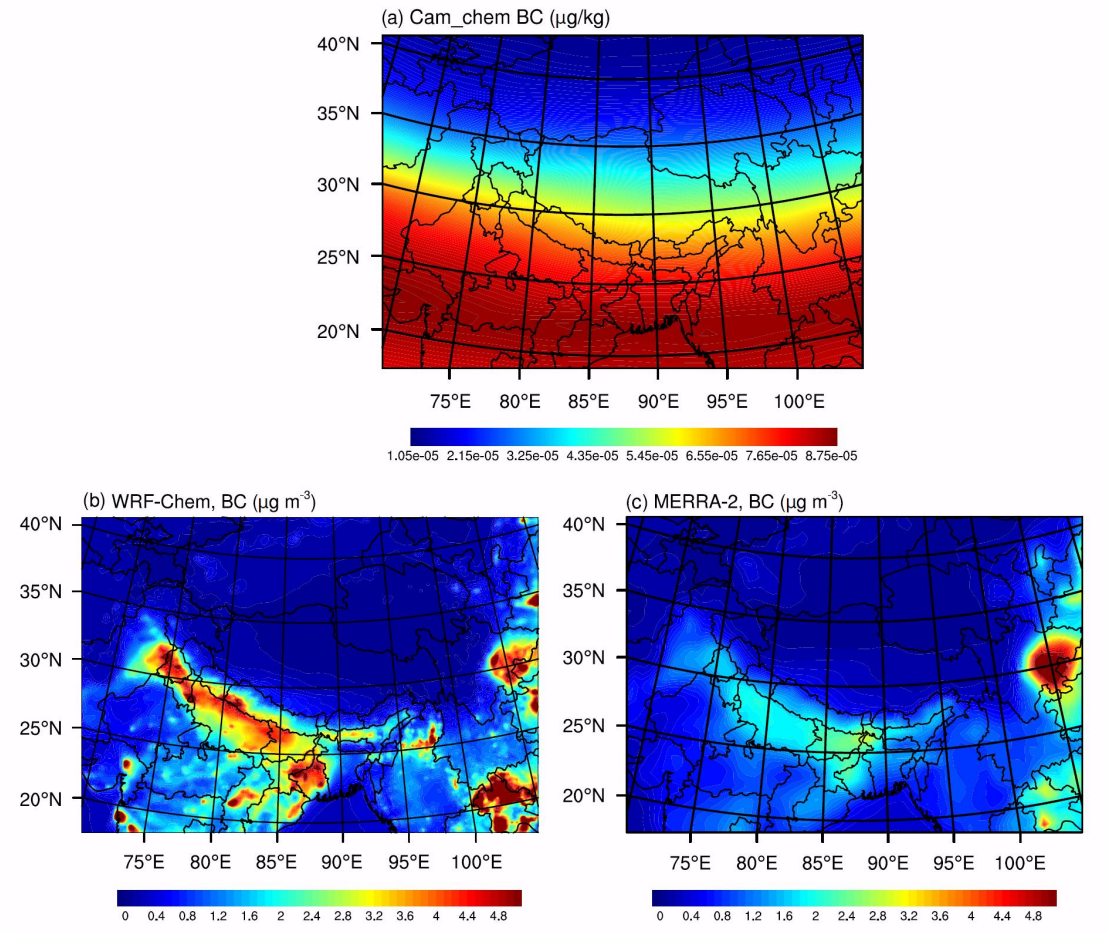

Figure S7. Spatial distribution of (a) WRF-Chem simulated, (b) reanalyzed, and (c) CAM-Chem based BC concentrations over the domain averaged for the period from April 20 to May 10, 2016.

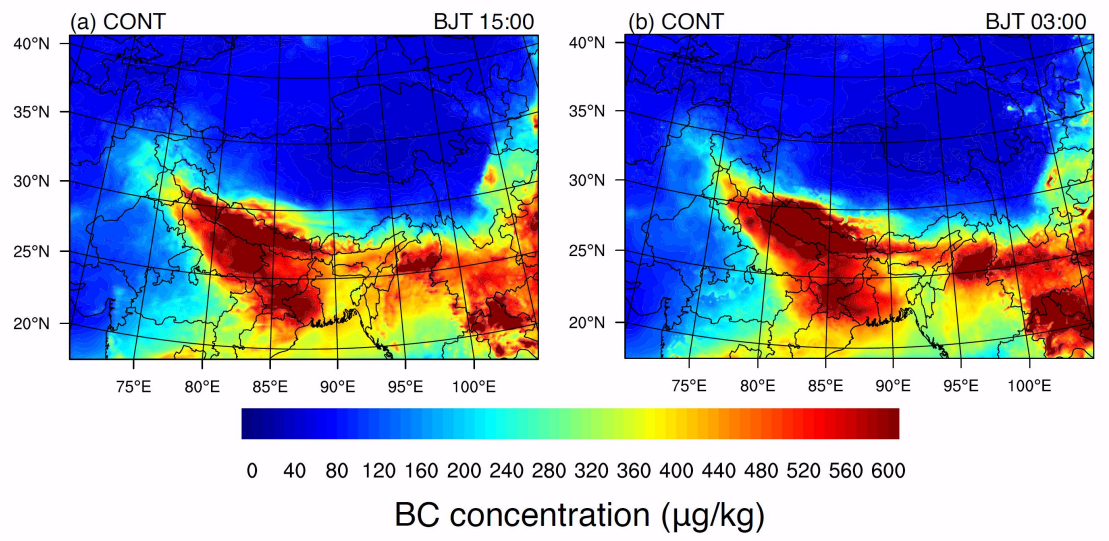

Figure S8. Spatial distribution of integrated BC mass concentration over the study area from the simulation with aerosol-meteorology feedback at 15:00 and 03:00 BJT averaged for the period from April 27 to May 4, 2016.

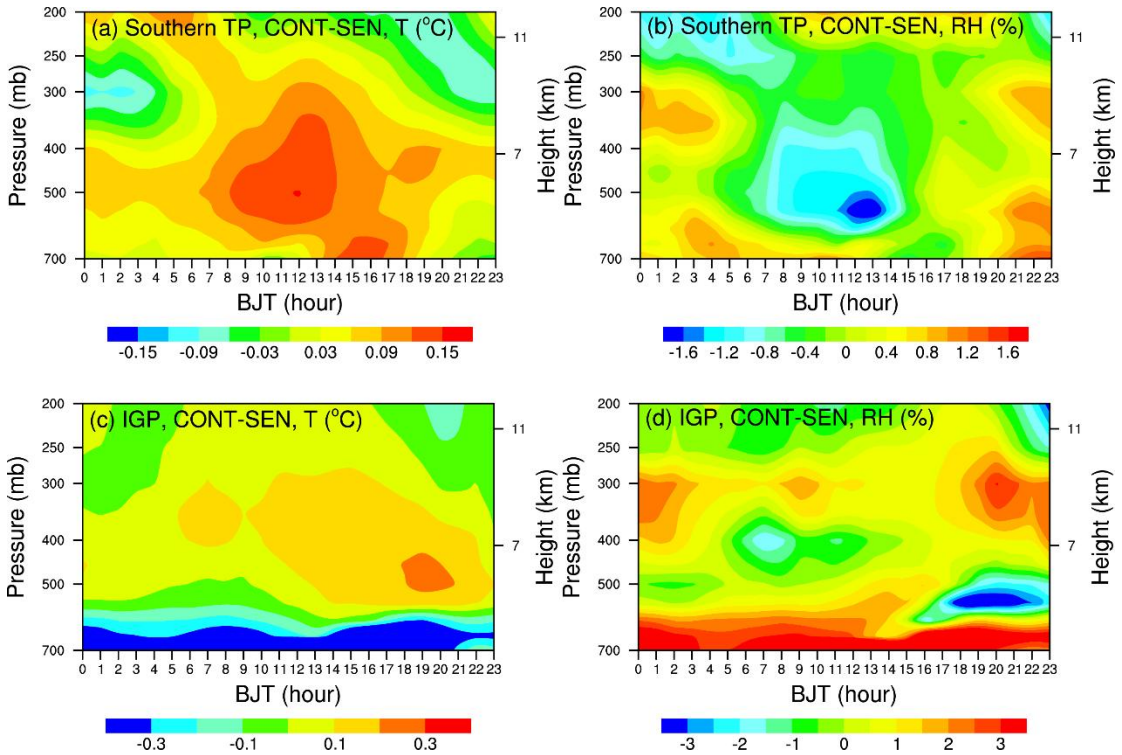

Figure S9. Time–altitude distribution of aerosol-induced diurnal change in (a) temperature (°C) and (b) RH (%) averaged for the southern TP and IGP and the period from April 27 to May 4, 2016.

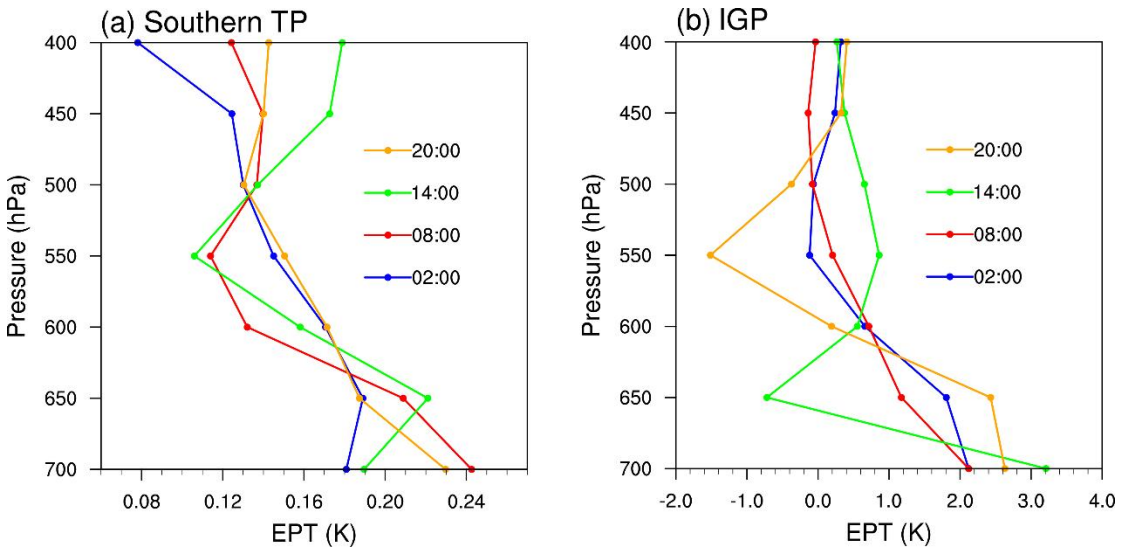

Figure S10. Aerosol-induced changes in equivalent potential temperature (EPT, K) profiles at 02:00, 08:00, 14:00, and 20:00 BJT averaged for the (a) Southern TP and (b) IGP and the period from April 27 to May 4, 2016.

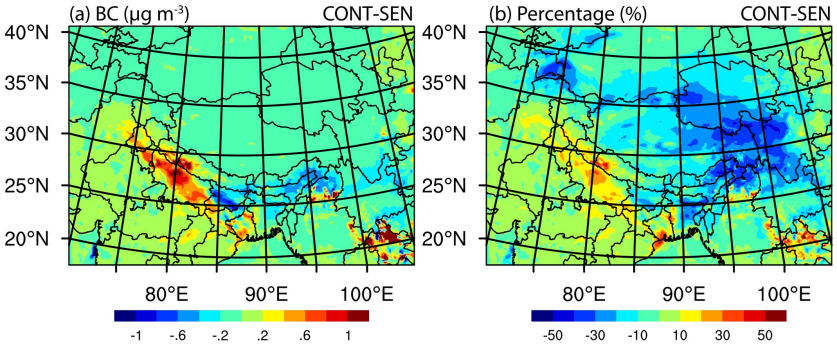

Figure S11. (a) Spatial distribution of changes in surface BC concentration (μg m^{-3}) induced by meteorological variable changes averaged 09:00–20:00 BJT during the period from April 27 to May 4, 2016. (b) The change in percentage terms compared to surface BC concentration from the model results of SEN.

Table S3. The mean zonal and meridional wind speeds at two typical valley channels within 2000 m above the ground at 15:00 and 03:00 BJT averaged for the period from April 27 to May 4, 2016 between the CONT and SEN experiments. The differences in zonal and meridional wind speeds between the two experiments are also shown. Positive value denotes a westerly or a southerly and negative value denotes an easterly or a northerly.

2000 m		15:00		03:00	
		Valley-1	Valley-2	Valley-1	Valley-2
CONT	U component	2.58	−1.80	−0.80	−1.01
	V component	4.49	1.05	−1.46	−1.54
SEN	U component	3.02	−1.33	−0.59	−0.93
	V component	4.73	1.24	−1.37	−1.95
CONT−SEN	U component	−0.44	−0.47	−0.21	−0.08
	V component	−0.24	−0.19	−0.09	0.41