



## Supplement of

## Top-down estimates of benzene and toluene emissions in Pearl River Delta and Hong Kong, China

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21 Table S1. Performance comparison of simulating benzene and toluene mixing ratios at the

Heshan site using the gridded emissions estimated by RCP 3PD, Yin et al. 2015, REAS v1.1

REF, MEIC v1.2 and this study. *E* is the root mean square error (RMSE) for the bias between the

simulated and observed mixing ratios. *B* denotes the mean bias between the simulated and

observed mixing ratios.  $r^2$  represents the squared Pearson correlation coefficients between the

simulated and observed mixing ratios.

	Benzene simulation			Toluene simulation		
-	Ε	В	$r^2$	Ε	В	$r^2$
RCP 3PD	1.396	0.783	0.195	5.80	4.65	0.054
Yin et al. 2015	1.489	0.645	0.244	5.30	4.02	0.069
REAS v1.1	2.237	1.871	0.083	5.67	4.44	0.023
MEIC v1.2	1.491	0.941	0.198	5.00	1.56	0.042
This study	1.262	0.409	0.268	4.30	1.99	0.097
This study performed best?	Yes	Yes	Yes	Yes	No	Yes



Figure S1. Spatial distribution of the average benzene emission sensitivities a) from 10-day backward
simulation, b) from 20-day backward simulation, and c) the ratio of a to b for the observation period. Note
that the domain size in c) is not the same as in a) and b).



Figure S2. Spatial distribution of the average toluene emission sensitivities a) from 10-day backward
simulation, b) from 20-day backward simulation, and c) the ratio of a to b for the observation period. Note
that the domain size in c) is not the same as in a) and b).



Figure S3. Spatial distribution of the average benzene emission sensitivities a) from 20-day backward
simulation, b) from 40-day backward simulation, and c) the ratio of a to b for the observation period. Note
that the domain size in c) is not the same as in a) and b).



Figure S4. Spatial distribution of the average toluene emission sensitivities from a) with atmospheric
chemical loss, b) without atmospheric chemical loss, and c) the ratio of a to b for the observation period.



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Figure S5. Spatial distribution of the average toluene emission sensitivities from a) with atmospheric
chemical loss, b) without atmospheric chemical loss, and c) the ratio of a to b for the observation period.



Figure S6. Maps of toluene emissions for PRD, HK and surrounding regions from a)
inversion, b) RCP 3PD, c) Yin et al. (2015), d) REAS v1.1 REF, e) MEIC v1.2, and the
difference between inversion results (a) and the bottom-up inventories (b, c, d, e). Note that in
c) and g) only emissions within PRD are plotted since Yin et al. (2015) only estimated
emissions within PRD, and that in e) and i) emissions within HK are not plotted since MEIC

51 v1.2 has not estimated toluene emission in HK.



53 Figure S7. Time series of observed and simulated toluene mixing ratios at the Heshan site. The

simulations use emission fields from inversion in this study, RCP 3PD, REAS v1.1 REF, Yin et al. (2015)

