Supplementary Materials:

Sensitivity of Simulated PM$_{2.5}$ Concentrations over Northeast Asia to Different Secondary Organic Aerosol Modules during the KORUS-AQ Campaign

Hyo-Jung Lee [1], Hyun-Young Jo [1], Chang-Keun Song [2], Yu-Jin Jo [3], Shin-Young Park [1] and Cheol-Hee Kim [1,3,*]

[1] Institute of Environmental Studies, Pusan National University, Busan 46241, Korea; hyojung@pusan.ac.kr (H.-J.L.); hycho@pusan.ac.kr (H.-Y.J.); psy222@pusan.ac.kr (S.-Y.P.)

[2] School of Urban and Environmental Engineering, Ulsan National Institute of Science and Technology, Ulsan 44919, Korea; cksong@unist.ac.kr

[3] Department of Atmospheric Sciences, Pusan National University, Busan 46241, Korea; yujinjo@pusan.ac.kr

* Correspondence: chkim2@pusan.ac.kr

The five meteorological variables of 2 m temperature, 10 m wind speed, relative humidity, precipitation, and PBL height are generally considered as important meteorological controlling factors that can modulate the atmospheric concentrations. The three surface meteorological variables (2 m temperature, 10 m wind speed, relative humidity) simulated by the WRF-Chem models were validated against the measurements obtained from the data from Korean Meteorological Administration. All the measurements are quality-controlled during data processing before archived, thus it can give reliable confidence for the purpose of model validation.

The employed statistical parameters are correlation coefficient (R) and index of agreement (IOA), which are widely used to analyze model performance. High R values of 0.71~0.88 and 0.71~0.87 were found for Seoul and Baengnyeongdo, respectively, indicating low discrepancies between observations and simulations (Table S1).

Table S1. Performance statistics of the WRF-Chem simulation for 2 m temperatures, 10 m wind speeds and relative humidity at Seoul and Baengnyeongdo.

		Seoul	Baengnyeongdo
2 m Temperature (°C)	Mean (observed)	19.60	15.90
	Mean (predicted)	18.60	12.44
	Correlation Coefficient	0.88	0.71
	IOA	0.92	0.64
	RMSE	3.07	4.46
	NMB	-0.05	-0.22
10 m Wind Speed (m s^{-1})	Mean (observed)	2.39	4.71
	Mean (predicted)	3.16	4.71
	Correlation Coefficient	0.71	0.75
	IOA	0.76	0.86
	RMSE	1.66	2.28
	NMB	0.32	0.00
Relative Humidity (%)	Mean (observed)	56.19	64.96
	Mean (predicted)	53.78	79.45
	Correlation Coefficient	0.85	0.87
	IOA	0.91	0.81
	RMSE	13.54	19.93
	NMB	-0.04	0.22
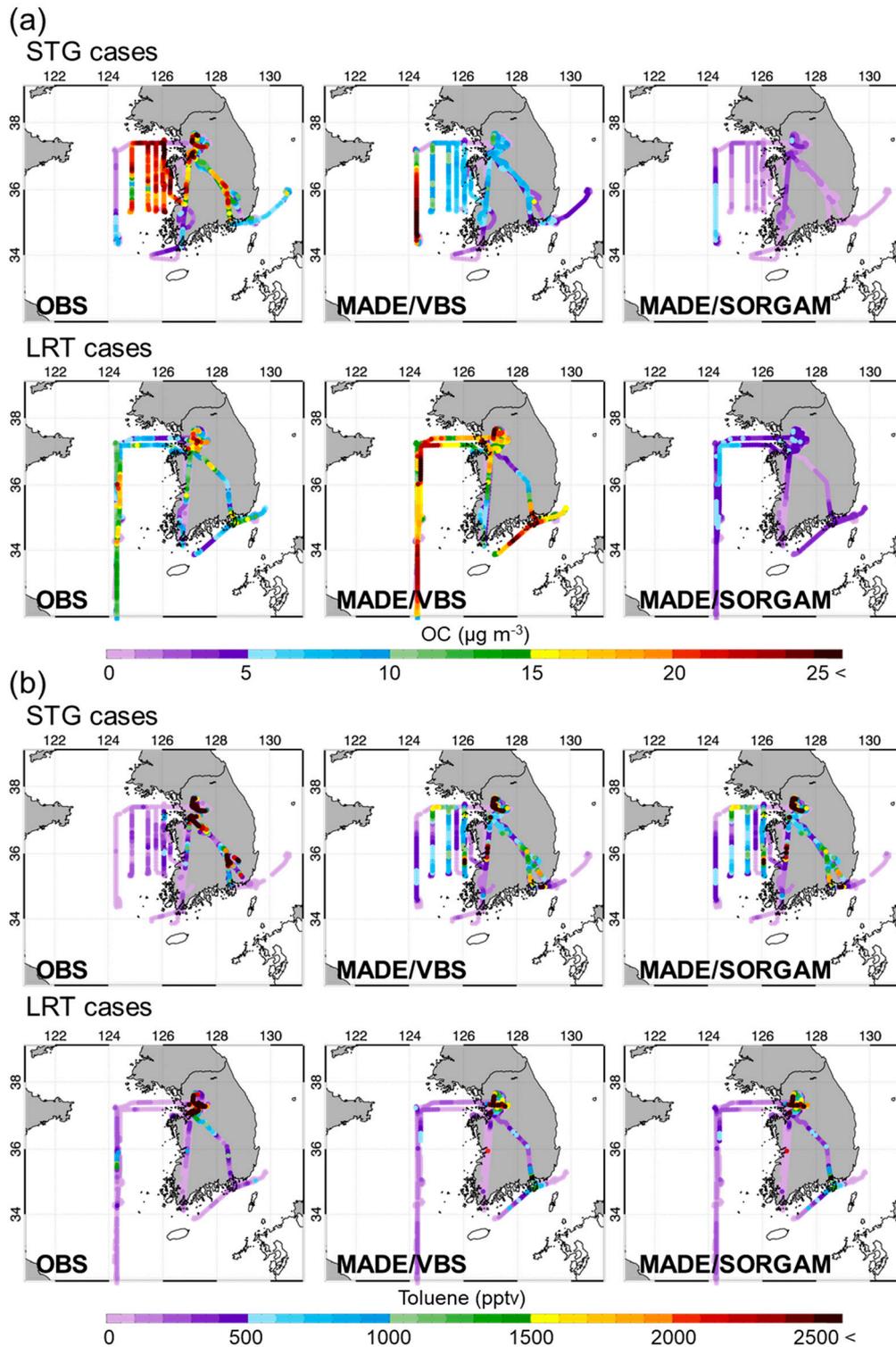
Figure S1. Spatial distributions of DC-8 observation and WRF-Chem results for (a) OC and (b) toluene concentrations along the DC-8 flight paths during STG cases (4 stagnant–dominant cases :17, 18, 20 and 22 May 2016) and LRT cases (4 long–range transport dominant cases: 25, 26, 30 and 31 May 2016).