



# An Operational Evaluation of Air Quality forecasting System in Korea

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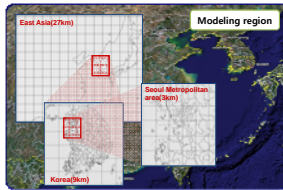
## 1. Introduction

- The modeling system using CMAQ<sup>1)</sup> was developed to forecast O<sub>3</sub>, NO<sub>2</sub>, and PM10 in Korea. The meteorological model was MM5<sup>2)</sup> and emission data were processed using SMOKE<sup>3)</sup>.
- The emission data<sup>4)</sup> of TRACE-P(Transport and Chemical Evolution over the Pacific) and ACE-Asia(Asian Pacific Regional Aerosol Characterization Experiment) were used for the East Asia of 27km domain and emission data of CAPSS(Clean Air Policy Support System) in Korea were used for 9 and 3km domains.
- The forecasted results were compared with measurements from ambient air quality monitoring stations in Korea and PM10 episode was analyzed.
- The System has been operated from January 1, 2008.

## 2. Forecasting System

### Modeling Region and Emission Data

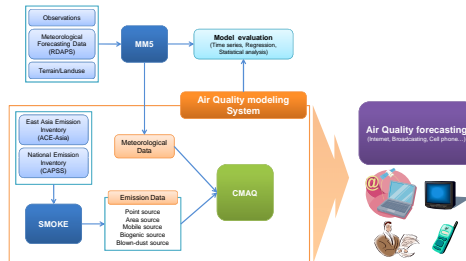
- Modeling region consists of 3 domains of 27km(East Asia), 9km(Korea), and 3km(Seoul Metropolitan Area).
- The emission data of TRACE-P and ACE-Asia of year 2000 were used for the East Asia 27km domain and emission data of CAPSS of year 2004 in Korea were used for 9 and 3km domains.



Country	SO <sub>2</sub>	NO <sub>x</sub>	CO	CH <sub>4</sub>	VOC	NH <sub>3</sub>	BC	OC	PM2.5	PM10
China	20,385	11,347	115,749	38,356	17,432	13,570	1,049	3,385	12,243	14,345
Japan	801	2,198	6,806	1,143	1,920	352	53	74	324	332
N. Korea	227	273	3,556	1,345	234	98	22	106	326	366
S. Korea	829	1,322	2,824	1,433	1,161	172	22	28	136	171
CAPSS (2003)	499	1,186	920	-	824	236	-	-	-	67

### Air Quality Forecasting Modeling System(<http://www.kaq.or.kr>)

- Air quality forecasting system predicts hourly/daily levels of air pollutants in East Asia as well as Korea for 48 hours at 09:00 and 21:00 LST every day.



## 3. Model Evaluation

### Monitoring Stations

#### Air Quality Monitoring Stations

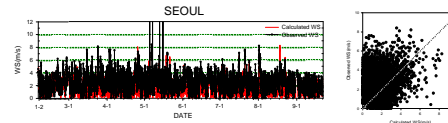
- Modeling results were compared with measurements of the ambient air quality monitoring stations in Seoul Metropolitan Area(SMA).



### Model Evaluation

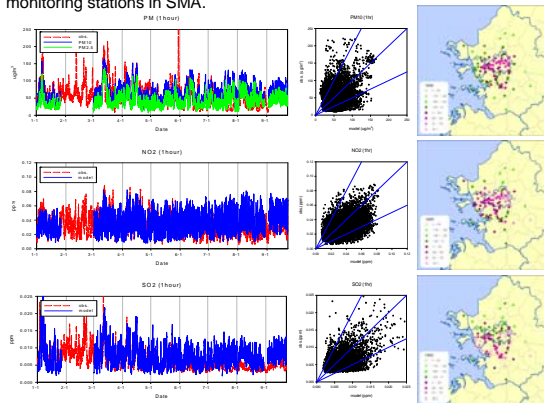
#### Meteorological Modeling(MM5) Results

- MM5 results were compared with meteorological observation data at Seoul station.



#### Air Quality Modeling(CMAQ) Results

- CMAQ results were compared with the data at 98 ambient air quality monitoring stations in SMA.

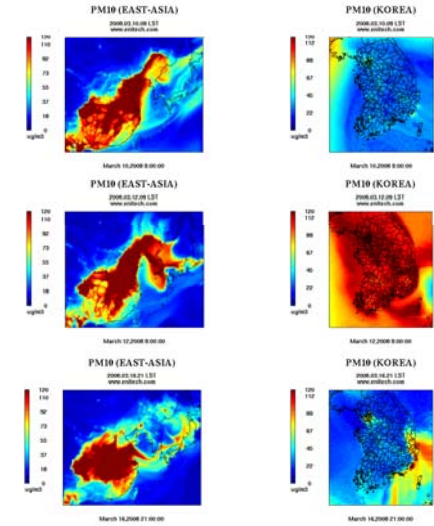


#### Statistical Analysis(μg/m<sup>3</sup>, ppm)

Pollutant	Obs. Average	Model Average	IOA	RMSE	Mean Bias	Mean Error
PM10	58.865	56.117	0.508	40.455	2.747	27.316
NO <sub>2</sub>	0.038	0.032	0.634	0.018	0.007	0.014
SO <sub>2</sub>	0.007	0.006	0.625	0.004	0.002	0.003

### PM10 Episode Analysis

- The PM10 transport from China to Korea was significant and its contribution reached up to 80% in the episode period<sup>5)</sup>.



## 4. Conclusion

- The Korea Air Quality Forecasting System (KAQFS) using MM5/SMOKE/CMAQ was developed and it is now in full operation to predict SO<sub>2</sub>, O<sub>3</sub>, NO<sub>2</sub> and PM10 for 48 hours at 09:00 and 21:00 LST every day([www.kaq.or.kr](http://www.kaq.or.kr)).
- The forecasting performance was evaluated by comparing with the measurements in SMA and the predictions were relatively in a good agreement with the easurements.
- The results also show that the PM10 transport from China to Korea was significant and its contribution reached up to 80% in the episode period.

### Acknowledgements

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