AIR QUALITY SIMULATION USING CMAQ IN THE SEOUL METROPLITAN AREA

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1. INTRODUCTION

The CMAQ with MM5 was applied to simulate O_3 and PM10 in the Seoul Metropolitan Area (SMA). This study was initiated to estimate the model performance to depict the ozone episode period and to make air quality improvement plan. The modeling procedure and model comparisons with measurements in ambient air monitoring sites and PAMS (Photochemical Assessment Monitoring Stations) will be presented and discussed in this paper.

2. MODELING PROCEDURE

MM5 and CMAQ were run with a configuration of three nested domains as shown in Figure 1. The horizontal resolutions were 30km over the Eastern Asia, 10 km over Korea peninsula, 3.3 km over the SMA. The number of vertical layers of MM5 and CMAQ were 15.

The emission rate for 30 km was estimated based on the Asia Ace emission data, and those of 10 and 3.3 km were calculated from the Korea emission data of CAPSS (Clean Air Policy Support System). CAPSS emission data has been prepared for 5 years in National Institute of Environmental Research in Korea. The VOC and PM-10 emission data were speciated to 11 CB-IV chemical species and 8 particulate species by using SMOKE system.

The simulation was run over ozone episode days of June 1-10, 2004.

3. RESULTS AND DISCUSSIONS

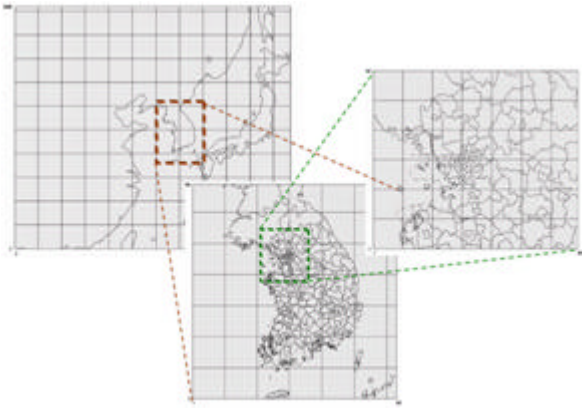

Fig. 1. The modeling domains of MM5 and CMAQ.

The emission rates of NOx and VOCs were shown in Figure 2. The emission rate in SMA was higher than the other regions due to large population density and industrial activities including mobile sources.

Model predictions were compared with observed data of PAMS and air monitoring sites. The comparison maps of predicted and observed O_3 with wind and temperature fields were shown in Figure 3. The maps was at 16:00 LST, June 2, 2004 when the ozone was peak in the day. The calculated spatial distribution of ozone depicted the observed pattern. The diurnal patterns of O_3 and other species were good in agreement with the measurements but the peak value of ozone was underestimated in the predictions.

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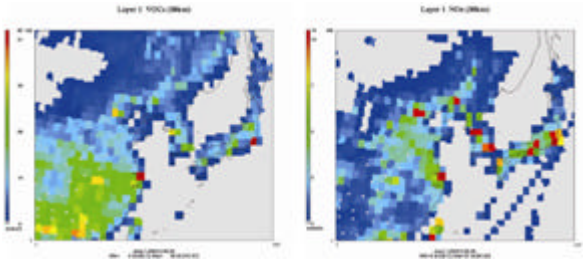
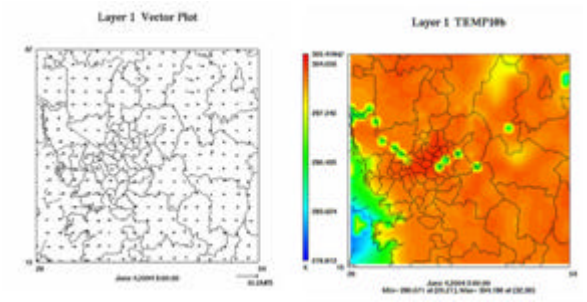


<VOC> <NOx>

Fig. 2. The spatial distributions of emission rates of NOx and VOCs



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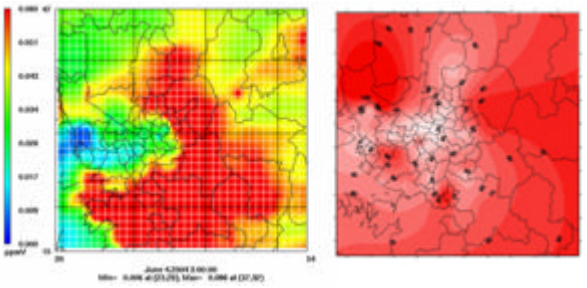

<predicted O_3> <observed O_3>

Fig. 3. The maps of predicted wind filed and temperature and comparison maps of predicted and observed O_3.

4. CONCLUSIONS AND FUTURE WORKS

Air quality modeling system using CMAQ was developed for the SMA. The initial test showed that general performance of the model was acceptable but the prediction underestimated ozone peak. The future work should be focused on the improvement of spatial and temporal resolutions of emission data and modeling parameters including chemical mechanisms.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

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