PA61) Implication of the Meteorological Fields on Models-3/CMAQ Performances

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1. Introduction

There are several studies featuring on comparisons of chemical characteristics from different meteorological models and different air quality models. Hogrefe et al. (2001) evaluated two popular meteorological models, namely MM5 and RAMS3b and Colle et al. (2003) described the multiseason verification of MM5and the National Centers for Environmental Protection Eta Model. Sistla et al. (2001) examined two Eulerian photochemical modeling systems, namely, RAMS/UAM-V and MM5/SAQM. However, the studies about the impact of different meteorological fields on the CMAQ results are not carried out. In this study, the impact of sea surface temperature (SST) and surface wind fields on MM5/CMAQ performances are explored.

2. Methodologies

Three different meteorological datasets (Table 1) over East Asia were used to run Fifth-Generation NCAR/Penn State Mesoscale Model (MM5) that generates the meteorological inputs for CMAQ. Then comparisons between the distributions of nitrate and sulfate concentrations obtained from CMAQ with the different three meteorological fields are conducted and the models performances are evaluated through the comparison with the airborne measurements.

Table 1. Summary of the three meteorological datasets for MM5.

	Descriptions of Meteorological Datasets
Dataset Ⅰ	NCEP/DOE AMIP-Ⅱ (Reanalysis-2) data CMAQ simulation with dataset Ⅰ is labeled as Case Ⅰ
Dataset Ⅱ	Dataset from Case Ⅰ merged with sea surface temperature originated from NOAA Optimum Interpolation Sea Surface Temperature Analysis CMAQ simulation with dataset Ⅱ is labeled as Case Ⅱ.
Dataset Ⅲ	Dataset from Case Ⅱ assimilated with the wind data measured from AWS in South Korea CMAQ simulation with dataset Ⅲ is labeled as Case Ⅲ.

3. Results and Discussion

The modeling results (Fig. 1A) show that over the land, nitrate concentration is higher than that over the open sea area. But the nitrate concentration over the Japanese Sea is higher. Nitrate concentration becomes lower as the distance away from seashore grows farther. The difference of nitrate concentration between Case Ⅱ and Case Ⅰ is the contribution from SST to the nitrate concentration while the difference between Case Ⅲ and Case Ⅱ represent the impact of wind. Averagely speaking, both average nitrate concentrations for the whole domain are lowered from that in Case Ⅰ by 6.2% and 0.2%, respectively. It is obvious that SST exerts dominant influence on the nitrate concentration compared to wind. But wind still affects nitrate concentration much, though not

averagely, in some areas, indicating by the red and blue small spots in the leftmost figure in Fig. 1C. Even if not so distinct and with lower concentration, similar spots exist in Fig. 1B, too. SST and wind increase or decrease nitrate concentration unevenly, that is nitrate concentration in some parts are enhanced while reduced in other parts. In the near future, the comparisons between the modeling results and the aircraft measurements will be conducted to judge which dataset would help CMAQ produce more credible results.

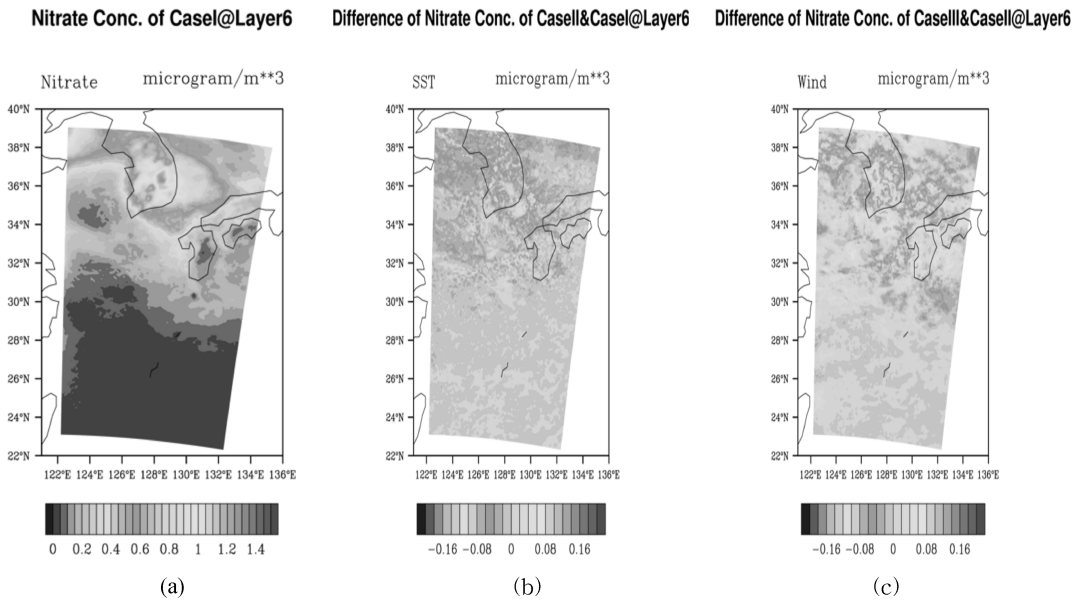

Fig. 1. CMAQ modeling results for nitrate. A is the nitrate concentraion of Case I ar layer 6; B is the difference of nitrate concentration between Case II and Case I at layer 6; C is the difference of nitrate concentration between Case III and Case II at the same layer.

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