# 1A1) A Numerical Study on the Vertical Distribution of PM concentration during Asian Dust

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## 1. Introduction

A numerical study on PM using a dispersion and deposition model which can analyze for both quantity and quality would not only offer us to understand our environment more easily, but also make it easy that we can make a plan in order to prevent air pollution. The U.S. EPA has proposed the CALPUFF modeling system as a guideline model for regulatory applications involving long-range transport and on a case-by-case basis for near-field applications where non-steady-state effects which consider situations such as spatial variability in the meteorological fields, calm winds, fumigations, re-circulation or stagnation, and terrain or coastal effects may be important. This research objective is to simulate and interpret the vertical distribution of PM using CALPUFF modeling system during Asian dust over Busan (Latitude of 34.75-35.65 °N and the longitude of 128.51-129.61 °E).

## 2. Methodology

CALPUFF had been ran by dividing into three cases named as the before, the during, and the after Asian dust. Through comparing with a temporal and local variation of PM of three cases, this research have found the vertical characteristic of PM concentration over Busan.

As input data requesting from CALPUFF modeling system, Korea Meteorological Administration (KMA)'s upper-air weather station database, weather stations database, Automatic Weather Stations (AWS) database, marine observation station (BUOY) database, and airport weather station database were used into CALMET. Also, United States Geological Survey (USGS)'s 30 arc second (900m) Digital Elevation Model (DEM) database and 30 arc second (900m) Global Land Cover Characterization (GLCC version 1) were used for geophysical data requesting from CALMET. As a diagnostic meteorological model, Pennsylvania State University/ National Center for Atmospheric Research (PSU/NCAR) mesoscale model (MM5V3) was used into CALMET.

For initial PM emission data over Busan, PM emission data of PNU which had been calculated in 1998 were inputted into CALPUFF. Because it was hard difficult to determine Asian dust emission, data assimilation regulating similarity between simulated and ground observed PM10 concentration was accomplished. So, this research mainly concentrated to understand a quality of vertical distribution of PM during Asian Dust.

## 3. Conclusions

To vertical distribution of PM, most concentration peaks in those profiles is shown in the level below 500 m. PM concentration rapidly increases and rapidly decreases after peak to 1000 m. Especially, there is a little bit change of PM concentration at the level above 1000 m. The shape of concentration curve is similar to other cases during Asian dust except for 0600 LST. However, there is no rapid variation which other cases shows. The vertical profile during Asian dust on 1200

and 1800 LST shows the highest concentration than other times in the before and the after Asian dust case.

Eastern area rarely changes with height and is the lowest area than others. Western area and central area are shown the highest concentration than others.

The difference of average PM10 concentration during Asian dust at a high level above 1000 m is to be evident, and various concentration patterns unlike the before and after case are shown. It can be considered that Asian dust has a vertical and horizontal heterogeneous form.

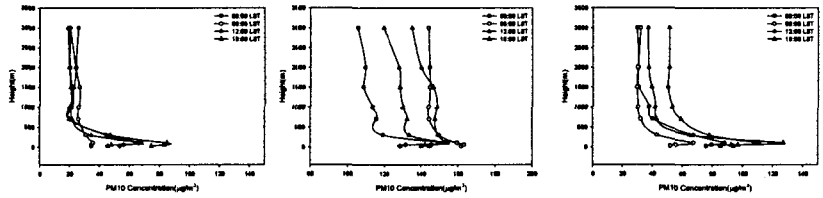

Fig. 1. Time series with vertical variation of simulated PM10 concentration on (a) before, (b) during, and (c) after Asian dust event, respectively.

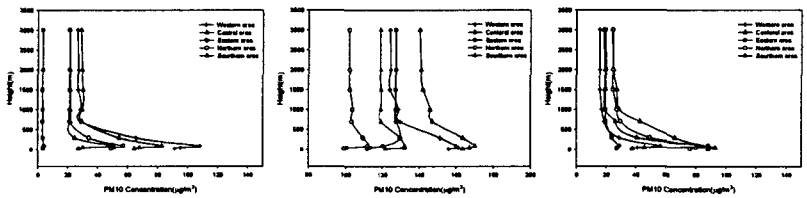

Fig. 2. Same as Fig. 1 except for local characteristic.


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## References


Scire, J. S., D. G. Strimaitis, and R. J. Yamartino, 2000 : A User's Guide for the CAL-PUFF Dispersion Model. Earth Tech. Inc.

Scire, J. S., F. R. Robe, M. E. Fernau, and R. J. Yamartino, 2000 : A User's Guide for the CALMET Meteorological Model, Earth Tech, Inc.