



The Simulation of Asian Dust Transportation using WRF-Chem: The Distributions of Particulate Matters with Geographic Effects in Korea

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“Asian dust” is one of well-known meteorological phenomena which represents massive transportations of dust from the dry desert regions in the Asia to the other parts. Recent studies on the Asian dust have been focused on 1) analyzing the chemical and optical characteristic of dust particles, 2) studying health significance, and 3) identifying transporting mechanism. At least few studies announced that the complexity of terrain affects the dispersion of aimed particles. The terrain in Korea is characterized by the complex mountains covers more than 70% of the total area. The authors believe that the complexity can change the mean flow around the terrain which interferes the advection of dusts significantly.

A representative case can be the Asian dust arrived in Korea on 20 March 2010, which is the heaviest transportation of the dusts ever observed historically. For example, PM10 concentration in the Huksan Island recorded 2712 $\mu\text{g}/\text{m}^3$ at 2300 LST on 20 March 2010, indicated as observation: the hourly measurements of an air quality monitoring network maintained by Ministry of Environment in Korea.

The purposes of this study are: 1) to simulate the Asian dust transportation on 20 March 2010 using the Weather Research and Forecasting model coupled with Chemistry (WRF-Chem), and 2) to analyze sensitivity of the model output (transported PMs) on the complex topography (focused on Korea). The authors designed the experimental simulation as adjusting the altitudes of terrain in Korea with respect to the original heights (i.e. multiple control runs). The analysis contains the back trajectories analysis, weather chart and satellite images were used to identify the sources of dust.

The evaluation of the simulated concentration of PMs includes statistical scores employed in the fields of numerical weather prediction in various temporal- and spatial- resolution. The ground truth will be the hourly recorded data in the Korean peninsula. Also a number of aerosol concentration based on in-situ measurement using aerosol particle counter. It is expected for the result in this study to helpful for prediction and management of air pollution over Korea.

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