Characteristics of ambient air quality in a west-coastal city of Korea: Case study analysis by using CMAQ modeling system

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Approach and Methods

A multi-level nested air quality modelling system (MM5-CMAQ) was applied to assess the effect of emissions on urban air quality in the west-coast of Korea with emission source from the Clean Air Policy Support System of the Korea NIER. The MM5 meteorological model was used to simulate the atmospheric circulation for the CMAQ [1].

Results and Discussion

Hourly averages of O_3 and PM_{10} (2004-2006) at Kunsan (coastal) and Jeonju (inland) were analyzed. On each year a high O_3 and a high PM_{10} day were selected, and their back trajectories were analyzed by HYSPLIT model (Figure 1). High PM_{10} days mainly occurred on middle of March during Asian dust season. The air-masses mainly came from the northern China and Mongolia. On the contrary, high O_3 days occurred in other months and air masses mainly traveled over inland region. Typical diurnal pattern (peak during afternoon) was found in observation data, and CMAQ results fairly well follow the measurement pattern. Further complete discussion will be made after examining results from comparison analysis between measurements and modelled values for rest of the episodes.

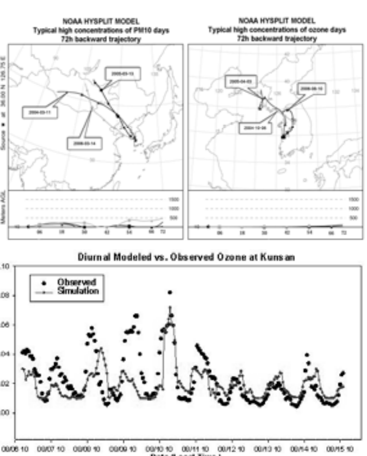

Figure 1: Back trajectory analysis for PM_{10} and O_3, and comparison between observations and CMAQ results (2006).

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[1] Sokhi *et al.*, (2006) *Environmental Modelling & Software*, **21**, 566-576.

Transformation of schwertmannite to geothite and related behavior of heavy metals

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Transformation of Schwertmannite

Although schwertmannite is a common Fe(Ⅲ)-oxyhydroxysulfate mineral in acid mine drainage, it has not been reported as a new mineral until 1994 [1]. It is kinetically unstable and easily transformed to geothite. There have been several studies reagrding this transformation and related trace metal behaviors in the laboratory [2]. However, a study focusing on the behavior of trace metals in the field has not been systematically conducted [3].

Sampling and Methods

The water and solid samples were collected at 3 points along the wetland for the Dalsung Mine, Korea. Solid samples were collected at 1cm intervals down to about 10cm from surface using auger. The pH, Eh and EC values of water samples were measured in the field. XRD and ICP-MS and AES were mainly used for the mineral identfication and chemical composition of precipitates.

Results and Discussion

The pH values decreased (from 3.61 to 3.24) dwonstream probably due to precipitation of schwertmannite, while Eh and EC values increased slightly. XRD result shows that schwertmannite exists mainly at the surface and with increasing depth (starting from 2-3cm) the fraction of goethite increased, indicating that schwertmannite is gradually transformed to goethite. The concentrations of trace metals in the precipitates were as follows: Cu>Zn>Co>Pb>Cd>Ni. There is no noticeable trend in the concentration of metals with depth at point 1. However, at lower stream site, the concentrations of most metals increased with increasing depth with the exception of Pb. These results probably indicate longer reaction time for the goethie in downstream site. Further experiments will be conducted to investigate the changes of heavy metals in the surface and lattice of each minerals during mineral transformation.

[1] Bigham *et al*. (1994) *Mineral Mag* **58**, 641-648. [2] Acero *et al*. (1996) *GCA* **70**, 4130-4130. [3] Schroth and Parnell Jr. (2005) *Appl Geochem* **20**, 907-917.