# Evaluation of performance of simulated secondary air pollutants by using air quality models for the Kanto area in summer 2011

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Emissions and concentrations of primary atmospheric pollutants (eg. NOx and VOCs) have been decreased in the Kanto area owing to conduct their emission regulations. Nevertheless, atmospheric pollutants such as particulate matters (PM) with aerodynamic diameter less than 2.5 μm (PM2.5) and photochemical oxidants (Ox) have still remained high concentration levels and their air quality standards of Japan have not been attained at most monitoring stations (Ministry of the Environment of Japan (MOE), 2015). For forming effective air pollution control strategies, currently, we raise expectations for applying air quality models reproducing complicated physical and chemical processes of both of primary and secondary pollutants.
The urban air quality model inter comparison study in Japan (UMICS) was started to improve performances of air quality models (eg. Chatani et al., 2014, Shimadera et al., 2014). UMICS showed some critical problems immanent in the air quality models. For example, the models tended to overestimate $NO_3^-$ but to underestimate OA, although simulated PM2.5 concentrations were reasonable with comparing to observations at Kanto area (Shimadera et al., 2014). In terms of $O_3$, the models reproduced well the diurnal and inter-diurnal variations in the $O_3$ concentrations at most observational stations in Kanto area but tended to overestimate nighttime $O_3$ and to underestimate daytime $O_3$ at several observational stations (Morino et al., 2010), therefore these models might have a risk failing to predict some of high pollution events.
In order to find the causes of discrepancies between the simulated and observed concentrations of secondary pollutants, constituents of PM2.5 and $O_3$, in this study, air quality simulations were performed using the Weather Research and Forecasting (WRF) model for a meteorological model and the Community Multi-scale Air Quality (CMAQ) model system for a chemical transport model under the following different model settings. Meteorological analysis data (FNL/NCEP and MSM/JMA) with both different temporal and spatial resolutions were used as for input data of meteorological simulations by the WRF model, respectively. Additionally, the updated JEI-DB (JATOP Emission Inventory Data Base) was used for input emission information for the CMAQ model. Performances of these models under different settings were evaluated by comparing with observed concentrations ($O_3$, PM2.5, and constituents of PM2.5) of secondary pollutants at Kanto area, which were provided by UMICS and MOE. These results are also compared with the previous studies (eg. Shimadera et al., 2014).

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