Numerical Studies on Ozone Source Apportionment and Formation Regime and Their Implications on Control Strategies

by

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Abstract

To understand the high ozone formation reasons and effectively control the high ozone pollution in Hong Kong (HK) and the Pearl River Delta (PRD) region, we investigate ozone “source” apportionments; and the temporal variation of the ozone formation regime in HK and the PRD region using the numerical air quality model of the Comprehensive Air-quality Model with extensions (CAMx).

We improve our modeling capability using latest available local emission inventory and validate the model performance by recent available air quality monitoring data of the PRD. This validated modeling system is applied to distinguish the local, regional, and super-regional source contributions from different source categories to the surface ozone of HK and the PRD by the Ozone Source Apportionment Technology (OSAT). The results show that the super-regional ozone can be treated as an important background, while the increase of the local and PRD regional contributions is the major cause for generating high ozone episode of HK and the PRD region.

The temporal variation, especially the diurnal trend, of the ozone formation regime is seldom considered in previous studies. However, our numerical results reveal that the ozone concentration is VOCs-limited dominated only in urban and downwind suburbs in the morning and night during ozone non-peak hours, but is under NOx-limited condition during ozone peak hours at most areas of HK and the PRD region, except some location that we define as “NOx-titration” area of extremely high NOx and low VOC/NOx ratio emissions (e.g. large point sources). NOx emission reduction from large point sources could increase ozone at NOx-titration areas, however, we find that the ozone increase generally happens at the locations with low ozone concentration, but at locations with high ozone levels, the ozone generally decreases. Therefore, NOx control could be important for reducing peak ozone concentrations to attain the health benefit.

Date: 18 May 2011 (Wednesday)
Time: 3:30 p.m. – 4:30 p.m.
Venue: Room 4480, (Lift 25-26), HKUST

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