Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 9, 7711-7723, 2009
www.atmos-chem-phys.net/9/7711/2009/

Rates and regimes of photochemical ozone production over Central East China in June 2006: a box model analysis using comprehensive measurements of ozone precursors

Y. Kanaya[1], P. Pochanart[1], Y. Liu[1], J. Li[1], H. Tanimoto[2], S. Kato[3], J. Suthawaree[3], S. Inomata[2], F. Taketani[1], K. Okuzawa[4], K. Kawamura[4], H. Akimoto[1], and Z. F. Wang[5]

[1]Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan
[2]National Institute for Environmental Studies, Tsukuba, Japan
[3]Tokyo Metropolitan University, Hachioji, Japan
[4]Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan
[5]LAPC/NZC, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

Abstract. An observation-based box model approach was undertaken to estimate concentrations of OH, HO_2, and RO_2 radicals and the net photochemical production rate of ozone at the top of Mount Tai, located in the middle of Central East China, in June 2006. The model calculation was constrained by the measurements of O_3, H_2O, CO, NO, NO_2, hydrocarbon, HCHO, and CH_3CHO concentrations, and temperature and *J* values. The net production rate of ozone was estimated to be 6.4 ppb h^{-1} as a 6-h average (09:00–15:00 CST), suggesting 58±37 ppb of ozone is produced in one day. Thus the daytime buildup of ozone recorded at the mountain top as ~23 ppb on average is likely affected by in situ photochemistry as well as by the upward transport of polluted air mass in the daytime. On days with high ozone concentrations (hourly values exceeding 100 ppb at least once), in situ photochemistry was more active than it was on low ozone days, suggesting that in situ photochemistry is an important factor controlling ozone concentrations. Sensitivity model runs for which different NO_x and hydrocarbon concentrations were assumed suggested that the ozone production occurred normally under NO_x-limited conditions, with some exceptional periods (under volatile-organic-compound-limited conditions) in which there was fresh pollution. We also examined the possible influence of the heterogeneous loss of gaseous HO_2 radicals in contact with aerosol particle surfaces on the rate and regimes of ozone production.

Final Revised Paper (PDF, 921 KB) Supplement (100 KB) Discussion Paper (ACPD)

Citation: Kanaya, Y., Pochanart, P., Liu, Y., Li, J., Tanimoto, H., Kato, S., Suthawaree, J., Inomata, S., Taketani, F., Okuzawa, K., Kawamura, K., Akimoto, H., and Wang, Z. F.: Rates and regimes of photochemical ozone production over Central East China in June 2006: a box model analysis using comprehensive measurements of ozone precursors, Atmos. Chem. Phys., 9, 7711-7723, 2009. Bibtex EndNote Reference Manager

News
New Alert Service available
Sister Journals AMT & GMD
Financial Support for Authors
Public Relations & Background Information

Recent Papers
01 | ACP, 09 Nov 2009: Exploiting the weekly cycle as observed over Europe to analyse aerosol indirect effects in two climate models
02 | ACP, 06 Nov 2009: Extreme Saharan dust event over the southern Iberian Peninsula in september 2007: active and passive remote sensing from surface and satellite
03 | ACP, 06 Nov 2009: Direct estimates of emissions from the megacity of Lagos