Oxidation Chemistry in the Atmospheres of Global Megacities

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Abstract

Air pollution is a significant human and environmental health challenge in global megacities worldwide, as a consequence of their concentration of emissions sources, and receptors. Much attention is paid to primary pollutant emissions and resultant loadings and impacts. However, these species undergo atmospheric chemical processing to form secondary pollutants and ozone, initiated primarily by reactions with a small number of key oxidant species, notably OH, NO_3 and Cl, with impacts upon air quality, health and climate. Over the past decade several international intensive field campaigns have been conducted measuring a variety of air pollutants during different seasons. We use extensive datasets of atmospheric radical precursors and co-reactants from London, Beijing, and Delhi field campaigns to constrain a numerical model, to explore the impacts of oxidant chemistry in the megacity atmosphere. The contrasting urban pollution climates in each megacity shows significantly different urban atmospheric chemistry. Our analysis implies chemically quiescent night-time environments dependent upon location and season and substantial secondary pollutant formation during daytime, affecting the abundance and chemical identity of gas and condensed-phase oxidation products, patterns, and extent of exposure, and hence effects on health.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

TOAR: Tropospheric Ozone Assessment Report, PACES: Air Pollution in the Arctic: Climate, Environment, and Societies, Allin-Wayra: Small Sensors for Atmospheric Science, ACAM: Atmospheric Chemistry and the Asian Monsoon