

Field study in Beijing, Shanghai and Lanzhou



Impact of mega-cities on regional air quality: Field measurements were carried at sites downwind of Beijing, Shanghai, and Lanzhou to improve the understanding of emission, chemical transformation, and impacts on regional air quality of urban plumes from large and mega-cities in China with different

energy use and/or meteorological conditions. We measured ozone and ozone precursors (NO, NO_y, NMHCs), other gases (CO, SO₂, PAN, NH₃), and aerosols physical and chemical properties, including particle size distribution, time-resolved water soluble ions, filter-based aerosol chemistry, and absorption and scattering coefficients. We also measured PAN in China using a state-of-the-art GC with an online calibration system. The field studies in Beijing and Shanghai were in the summer of 2005 and in summer 2006 in Lanzhou. This study was conducted in collaboration with Shandong University. The study in Lanzhou received collaboration from Lanzhou University.

Beijing 2008 summer Olympics: In the summer of 2008, trace gases and aerosols were measured at three surface sites in and around Beijing before and during the 2008 Olympics to assess the impact of pollution-control measures on air quality, ozone and aerosol chemistry. The 2008 study was conducted with collaboration of Shandong University and Chinese Research Academy of Environmental Sciences. Analyses of the data collected from the study are on-going.

The results show:

- (1) Very serious ozone pollution, with 1-hr O₃ reaching 286 ppbv, was observed downwind Beijing (Wang et al., 2006).
- (2) We found that the formation of significant amount of fine nitrate aerosol in ammonia-poor atmosphere in Shanghai and Beijing, which is different from previous studies in other places in the world, and it is hypothesized that this was due to the enhanced hydrolysis in the presence of large aerosol surface areas and high aerosol acidity (Pathak et al., 2009).
- (3) We found the problem of a semi-continuous ion instrument under the condition of high loading aerosols and SO₂ in China. Positive and negative bias in the real-time instrument was found when comparing with conventional filter-based method (Wu and Wang, 2007).
- (4) We also analyzed ozone data collected near Beijing from the MOZAIC program to provide the first ozone climatology over Beijing (Ding et al., 2008).
- (5) The large BC/CO ratio in Shanghai than in Beijing is attributed to the large consumption of diesel by vehicles and marine vessels in Shanghai. The latter results have been used to estimate the emission of BC from the two mega-cities (Zhou et al., 2009).
- (6) Formation and growth of new particles was observed under conditions of high concentrations of sulfur dioxide and aerosol near Shanghai (Gao et al., 2009).

Related References:

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