

6.044 Air pollutants in the lower troposphere over two rural sites in the North China Plain: results from ground-based and unmanned aircraft observations.

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Abstract:

Air pollution problem in the North China Plain (NCP) has been one of hot environmental issues for many years. Severe haze occurs frequently under unfavorable meteorological conditions, endangering human health and traffic safety in the densely populated region. The local authorities have been struggling against the high PM_{2.5} level. Meanwhile, the photochemical pollution has emerged in the warm seasons, as indicated by high O₃ levels in the surface air. Air quality in the countryside of the NCP region can be also poor due to emissions from agricultural activities and transport of air pollutants from urban and industrial areas. Previous atmospheric chemistry studies in the NCP region have paid more attention to urban than to rural areas. To better characterize the major air pollutants and understand chemical and physical processes related to photochemical pollution in the rural areas, we performed field campaigns at the rural sites Gucheng (39°08'N, 115°40'E, 15 m asl) and Raoyang (115°44'E, 38°14'N, 20 m asl) in summer

2013 and 2014, respectively. We observed photochemical pollutants and related species in the surface layer, including O_3 , PAN, NO_x , NO_y , VOCs, HCHO, CO, SO_2 , NH_3 , PM, etc. We also made profile measurements of O_3 , black carbon, and aerosol number concentration using devices attached to an unmanned aerial vehicle and a tethered balloon. Here we present and discuss the observational results. The variations of the ground-level gases are interpreted in terms of meteorology. The measurements of O_3 , NO_x and NO_y are used to estimate ozone production efficiency. The vertical profiles of O_3 and particulate matter are discussed in relation to boundary layer evolution. Furthermore, the impact of convection process on surface O_3 is quantified.