Long-Term Primary Study on the Characteristics of Trace Gases in a Clean Area of North China

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From 22 May, 2005 to 30 June, 2006, continuous measurements of some trace gases were conducted at the Xinglong station (150 km northeast of Beijing, China) of the Atmospheric Background Observation Network of Chinese Academy of Sciences. Some basic characteristics on the concentrations and variations in O_3, NO_x , CO_2 , and SO_2 were obtained. In general, O_3 displayed highest concentrations in June and September and lowest concentrations in December. NO_x was lowest in August and slowly increased from August to December with the ratio of NO to NO_x being very low. SO_2 showed the lowest concentrations in July, and then increased gradually. CO_2 exhibited the lowest concentration in August.

From 10 September to 11 November, 2005, solar spectral radiation was measured at the Xinglong station. UV radiation, the important energy source controlling ozone production and depletion, displayed obvious diurnal variations. Although UV and O_3 have some similar diurnal and daily variations, no good correlation was found between them during the period of September to November. In more detail, daily maximum hourly average UV was measured earlier than that of O_3 under most weather conditions which indicates that UV energy is the triggering energy for O_3 formation. In order to better understand O_3 chemistry and photochemistry, solar radiation, O_3 and its precursors, NO_x, VOCs (Volatile Organic Compounds), and aerosols should be measured simultaneously.

Based on these present observations, the air quality at Xinglong station is relatively good in July and August. But, the fast economic developments in Beijing and its surrounding cities will probably bring changes to trace gas and aerosol concentrations in this area. At present, Xinglong station can be considered as a unique atmospheric background station for the comprehensive study off solar radiation, atmospheric chemistry, aerosols (especially secondary organic compounds) and how and in what extent human activities will further influence the local atmospheric environment. Thus, it's important to carry out a long-term monitoring of trace gases, VOCs, solar radiation, aerosols, meteorological parameters to develop long-term, integrated datasets for model validation. The station invites international collaborations to better understand basic physical, chemical & photochemical processes in North China related to other international monitoring sites.

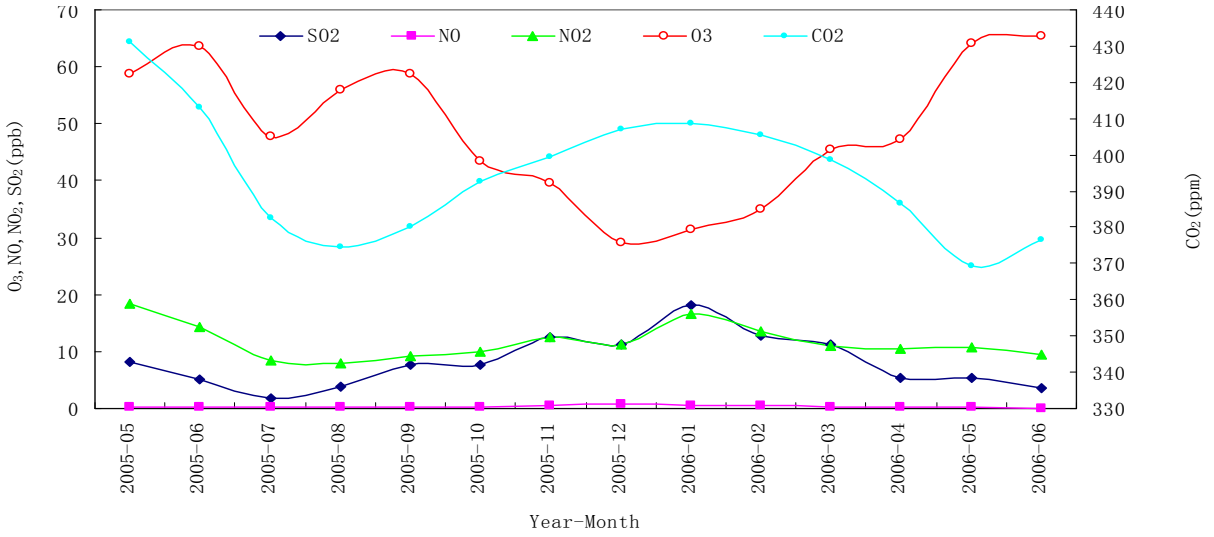

Figure 1. Monthly average trace gas concentrations at the Xinglong atmospheric monitoring station.