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

B. Jianhui, W. Gengchen and W. Pucai

Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China; 86-10-82995079, E-mail: bjh@mail.iap.ac.cn

During 22 May, 2005 to 31 December, 2007, continuous measurements of some trace gases at Xinglong station (150 km northeast of Beijing city), atmospheric background observation network of Chinese Academy of Sciences were carried out. Some basic characteristics and variation regularities of O_3, NOx (NO,NO_2), CO_2, SO_2, and their concentrations were obtained. In general, O_3 displayed a higher concentration in June and September, and the lowest concentration in December. NOx indicated the lowest concentration in August, and slowly increased during August to December, the ratio of NO to NOx is very low. SO_2 showed the lowest concentration in July, and then increased gradually. CO_2 exhibited the lowest concentration in August. During September 10 to November 11 of 2005, solar spectral radiation was measured at Xinglong Station. UV radiation, the important energy source to control ozone production and depletion, displayed obvious diurnal and daily variations. Though UV and O_3 have some similar diurnal and daily variations, no good correlation can be found between them during the period of September to November, which showed their relationship is complicated. In more detail, daily maximum of hourly averages of UV was earlier than that of O_3 for most conditions, which indicated 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 of NOx, VOCs (Volatile Organic Compounds), and aerosols should be measured synthetically.

Based on the measurements, good air quality at Xinglong Station is in July and August. Recently, the fast developments in industry, agriculture, economy and traffic in Beijing city and its surrounding cities will bring changes to trace gases in these areas. Xinglong Station can be considered as a good and unique atmospheric background station for the comprehensive study on solar radiation, atmospheric chemistry & photochemistry, aerosols (especially secondary organic compounds), and how and in what extent the human activities influence the atmospheric environments, solar radiation and its spectrum at the Earth's surface, and so on. Thus, it's important to carry out a long-term monitoring of trace gases, VOCs, solar radiation, aerosols, meteorological parameters, and study the basic physical and chemical & photochemical processes in the real atmosphere deeply and thoroughly, some unimportant processes may become more important than we thought before. Meanwhile, reliable and long-term integrated dataset is very valuable for models data input and models validation. So, the collaboration especially international collaboration is a better way for us to understand basic physical, chemical & photochemical processes in North China/different sites in the world.

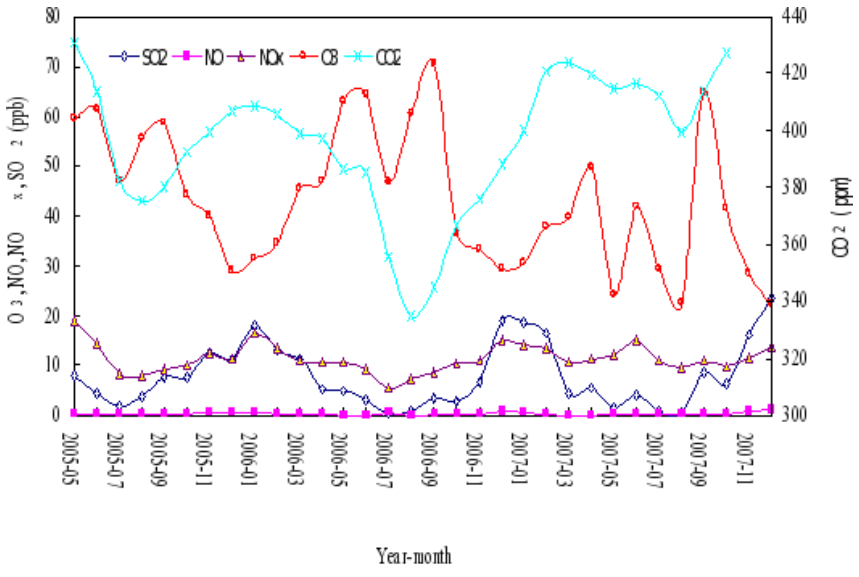

Figure 1. Monthly variations of trace gas concentrations at XingLong Station.