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HONO and other trace gases in Shanghai

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An intensive field measurement study was conducted at a site within Fudan University (Shanghai) between 14th-29th October 2009. Ambient air pollutants measured included HONO, NO, NO2, O3, carbonyls. The purpose is to improve our understanding of the local air pollution in Shanghai in order to plan future campaigns for understanding the interplay among local and regional air pollutants in the Shanghai area, and the influence of regional transport on local air pollutants.
Nitrous acid (HONO) is an important source of hydroxyl radical (OH) in the polluted atmosphere. Although the atmospheric chemistry of HONO is qualitatively understood, only limited quantitative information exists. During this campaign, HONO has been measured using both a LOPAP (Long Path Absorption Photometer) and DOAS (Differential Optical Absorption Spectroscopy). The measured HONO mixing ratio values were typically in the range 0.5-2.2 ppb with maximum values observed during rush hours which reached up to 7 ppbv.
Formaldehyde, acetaldehyde and acetone were found to be the most predominant carbonyls with average concentrations of 8.1, 6.9 and 36.3, respectively. The high levels of the carbonyls were mainly observed at early morning and evening, and extremely low values occurred at noontime, indicating the carbonyls in the ambient air of Fudan University were strongly influenced by their primary sources. The correlation coefficients (R2) were 0.84 for formaldehyde and acetaldehyde, 0.71 for formaldehyde and acetone, and 0.80 for acetaldehyde and acetone, suggesting they had common sources during the investigated period. A serious pollution episode characterized by extremely high concentration of acetone (in the range of 166-248 mg m-3) was met during the period from midnight to early morning on 16th October. The average ratio of formaldehyde to acetaldehyde (F/A= 0.94) was in good agreement with those investigated in various cities in the world. The high acetone concentration observed has to be highlighted.