Geophysical Research Abstracts
Vol. 15, EGU2013-3056, 2013
EGU General Assembly 2013

Four Years of Ground-based MAX-DOAS Observations of HONO and NO_2 in the Beijing Area

Francois Hendrick (1), Jean-Francois Müller (1), Martine De Mazière (1), Caroline Fayt (1), Christian Hermans (1), Trissevgeni Stavrakou (1), Pucai Wang (2), and Michel Van Roozendael (1)

(1) Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium (franch@oma.be), (2) Institute of Atmospheric Physics, Chinese Academy of Science, Beijing, China

Nitrous acid (HONO) is an important trace gas in the atmosphere due to its significant role in the nitrogen oxides (NO_x) and hydrogen oxides (HO_x) cycles. For three decades, observations of HONO in the troposphere have been performed at many remote and heavily polluted locations. Although sparse in time because mainly based on field campaigns, they revealed that the HONO photolysis can be a major source of OH radicals, especially during the early morning, when other sources are of minor importance. Recent work has shown also the existence of a strong HONO source peaking around noon at several locations. However, owing to the current uncertainties and lack of knowledge regarding HONO sources, the atmospheric impact of HONO on the global scale, in particular its contribution to the production of OH radicals, remains an open issue.

We present four years of ground-based Multi-Axis (MAX-) Differential Optical Absorption Spectroscopy (DOAS) measurements of HONO and NO_2 in Beijing city center (39.98°N, 116.38°E) and at the suburban site of Xianghe (39.75°N, 116.96°E) located at 60 km East of Beijing. The periods covered by the observations are June 2008-April 2009 in Beijing and March 2010-December 2012 in Xianghe. Combining the MAX-DOAS remote sensing technique with an optimal estimation profiling method allows retrieving information on the vertical distribution of HONO and NO_2 in the 0-1 km altitude range. The HONO volume mixing ratio (vmr) at the surface ranges from about 1.2 ppb in the early morning to about 0.3 ppb in the afternoon at Beijing while smaller vmr values are obtained at Xianghe (0.8 and 0.1 ppb, respectively). These values are found to be consistent with in-situ surface measurements performed during the CAREBeijing 2006 campaign. For the first time, the diurnal, seasonal, and height variations of the HONO and NO_2 concentrations, HONO/NO_2 concentration ratios, and HONO versus NO_2 correlation are investigated in the Beijing area on a long-term basis. We also provide an estimate of the OH production from HONO based on the retrieved HONO concentration and photolysis rates calculated from ECMWF data. The impact of these results on our knowledge about the HONO and OH budgets is discussed.