



In situ Monitoring of Atmospheric Nitrous Acid based on Multi-pumping flow system and Liquid Waveguide Capillary Cell: development and field applications

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In the last four decades, various techniques including spectroscopic method, wet chemical method and mass spectrometric method, etc, had been developed and applied for the detection of ambient nitrous acid (HONO) concentrations. Followed the instrumental framework proposed by Heland et al., (2001), we developed a new version of LOnG Path Absorption Photometer (LOPAP) system which consists of three independent modules: the sampling module, the fluid propulsion module and the detection module. The major modification of our setup compared to previous LOPAPs is the replacement of the peristaltic pumps to be the solenoid pumps. With solenoid pumps the pulsed flow could be computer controlled both in terms of pump stroke volume and pulse frequency, which enable the attainment of a very stable flow rate. The other significant modification of our setup is the exploit of the customized Liquid Waveguide Capillary Cell (LWCC) manufactured by World Precision Instrument Inc, who offers a versatile path length between 50 and 500 cm. The customized LWCC pre-setup the optical fiber in-coupling with the liquid wave guide, providing us an option of fast startup and easy maintenance of the absorption photometry. With our new LOPAP system, we already performed ambient HONO measurements in three Chinese megacity regions – North China Plain, Yangtze River Delta and Pearl River Delta. In all those locations, we found strong diurnal variations of HONO. The typical daytime HONO concentrations were about several hundred ppbs while the nighttime concentrations were about several ppbs.