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### 大气NO<sub>x</sub>测量准确性问题分析

### An comparative analysis of the accuracy of atmospheric NO<sub>x</sub> measurements

关键词: [大气](#) [NO<sub>x</sub>](#) [NO<sub>y</sub>](#) [监测技术](#)

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摘要: 采用美国热电公司的NO-NO<sub>2</sub>-NO<sub>x</sub>分析仪(Model 42i TL)和NO<sub>y</sub>分析仪(Model 42i NO<sub>y</sub>),在2011年1月-10月期间,对北京城市大气中的NO、NO<sub>x</sub>和NO<sub>y</sub>进行了连续在线测量.两台仪器对NO的测量结果具有较高的一致性( $r>0.998, p<0.01$ ),说明两台仪器测量精度基本一致.将NO<sub>y</sub>分析仪(Model 42i NO<sub>y</sub>)采样口处安装和不安装颗粒物过滤膜两种条件下测量的NO<sub>y</sub>结果与NO-NO<sub>2</sub>-NO<sub>x</sub>分析仪所测的NO<sub>x</sub>结果分别进行了相关性分析( $[NO_y]=0.989 \times [NO_x], R^2=0.993$ ;  $[NO_y]=1.134 \times [NO_x], R^2=0.959$ ),得出以下两个结论:1以颗粒态硝酸盐为代表的颗粒物是造成NO<sub>x</sub>与NO<sub>y</sub>偏差的主要原因,其所占比例在10%左右;2目前Model 42i-TL所测NO<sub>x</sub>的浓度水平较真实值偏高,其测量值更接近气态NO<sub>y</sub>的浓度水平.为估算NO<sub>2</sub>测值被高估的程度(以2011年8月6日-15日观测数据为例),用扣除部分气态NO<sub>2</sub>物种(HONO、HNO<sub>3</sub>、PAN、PPN)的修正方法,推论出在夏季NO<sub>2</sub>被高估约7%( $R^2=0.968$ ).

**Abstract:** An intercomparison of atmospheric measurements was conducted using the mainstream instruments of NO<sub>x</sub> (Model 42i-TL NO-NO<sub>2</sub>-NO<sub>x</sub>) and NO<sub>y</sub> (Model 42i NO<sub>y</sub> analyzers), both by Thermo Fisher Scientific Inc., at an urban site in Beijing. During the study, concentrations of NO, NO<sub>x</sub> and NO<sub>y</sub> were continuously monitored from January to October 2011. Good correlation ( $r>0.998, p<0.01$ ) of NO measurements produced by the two instruments was obtained, which confirms measurement accuracy of the two devices. By comparing the NO<sub>y</sub> measurement results obtained under the conditions of attaching and removing a particulate filter from the sample inlet of the Model 42i NO<sub>y</sub> analyzer with that of the NO<sub>x</sub> measurements using the NO-NO<sub>2</sub>-NO<sub>x</sub> analyzer, the following correlation results are obtained:  $[NO_y]=0.989 \times [NO_x], R^2=0.993$  and  $[NO_y]=1.134 \times [NO_x], R^2=0.959$ . Two conclusions are drawn from this study: 1 The difference between NO<sub>x</sub> and NO<sub>y</sub> is caused by particulate nitrate which accounts for around 10 percent of the total NO<sub>x</sub>. 2 Concentration of NO<sub>x</sub> measured using the current Model 42i-TL analyzer is higher than its real values, and is closer to concentration of NO<sub>y</sub>. Using the correction method of subtracting concentrations of the main NO<sub>y</sub> components (e.g. HONO, HNO<sub>3</sub>, PAN, PPN) from that of NO<sub>2</sub> (based on data collected during August 6-15, 2011), it could be concluded that concentration of NO<sub>2</sub> in summer are overestimated by 7 percent ( $R^2=0.968$ ).

**Key words:** [atmosphere](#) [NO<sub>x</sub>](#) [NO<sub>y</sub>](#) [monitoring techniques](#)

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