



## **High resolution vertical profiles of HONO and NO<sub>2</sub> measured by means of IBBCEAS from a tall meteorological tower in Beijing**

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Nitrous acid (HONO), as a major precursor of the hydroxyl radical (OH), plays an important role in tropospheric photochemistry. Due to the low OH concentration, the heterogeneous conversion of NO<sub>2</sub> is known as the primary source of HONO at night. Nevertheless, the conversion process primarily occurs on ground surface or aerosol surface is still controversial. Therefore, we measured simultaneously vertical profiles of HONO and NO<sub>2</sub> using the incoherent broadband cavity enhanced absorption spectroscopy (IBBCEAS) which was mounted on a mobile carriage of the 325-m meteorological observation tower in winter in Beijing [116°23'05"N, 39°58'55"E]. The carriage ascended and descended at a rate of 0.16 ms<sup>-1</sup> with a height limit of 240m at night, and the full vertical profiles were measured within 1h. The time resolution of IBBCEAS was 15s (vertical resolution of 2.4m for this work) and measured the mean concentration within 2.4m. For comparison with HONO at the ground, another IBBCEAS with measurement time resolution of 30s was mounted in a temperature-stabilized container on the ground.

During the entire measurement periods, based on the level of PM<sub>1.0</sub>, four different meteorological conditions were characterized including the clean period (P2), the transitional period (P3) and the haze periods (P1 and P4). The vertical distribution of HONO is consistent with stratification in several hundred meters of atmosphere at night. The analysis of vertical profiles of HONO and the contribution of aerosol surface to the production of nocturnal HONO revealed that the heterogeneous conversion of NO<sub>2</sub> on ground surface is primary source of nocturnal HONO, and the significant HONO production on aerosol surfaces could be excluded at the measurement site.

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