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Observation of N_2O_5 at an urban site in 2017 winter Beijing

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Dinitrogen pentoxide, N_2O_5, acts as a nocturnal NO_x reservoir during clean days whereas the fate of N_2O_5 determines the particulate nitrate formation and NO_x removal during polluted periods. To explore the atmospheric oxidation and the interaction of reactive trace gases with aerosols in wintertime, a comprehensive field campaign was performed at an urban site (in the campus of Peking University) in Beijing winter 2017. A field-deployable and portable system based on cavity-enhanced absorption spectroscopy was used to measure ambient N_2O_5, while simultaneous measurements of trace gases, OH radical and relevant properties of particles are available. Several clean and polluted episodes were observed during this campaign and our instrument kept working uninterruptedly for more than 40 days. Daily peak of N_2O_5 achieved around 500pptv in the clean episodes while the concentration was under the limit of detection during polluted periods because of the high NO level. A few pptv daytime N_2O_5 was observed during this campaign, which may be accounted by colder temperature, weaker radiation and fast formation of N_2O_5 at this urban site. Furthermore, the uptake coefficient of N_2O_5 can be derived from the iterative box model and steady state method. Combining with simultaneous particulate nitrate and OH radical measurements, nitrate formation potential during both the daytime and the nighttime can be estimated for comparison.