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Observations of the Hydroxyl radicals at Urban and Suburban sites in winter Beijing

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OH and HO_2 radicals were measured by the Laser Induced Fluorescence system in three recent field campaigns to explore the oxidizing capacity of the atmosphere in Beijing during wintertime, including the UCAS (University of Chinese Academy of the Sciences) campaign, the IAP (Institute of the Atmospheric Physics) campaign, and the PKU (Peking University) campaign. Therein, the UCAS site represents the suburban Beijing and was conducted January to March in 2016, and the other two sites are located in the city center of Beijing and was carried out November to December in 2016 and 2017, respectively.

Relatively small concentrations of OH and HO_2 were observed in these three winter campaigns when compared to values observed in summer. OH radical concentrations were quite similar for all these three campaigns, but the HO_2 radical concentrations varied quite significantly between the suburban and urban Beijing due to the much higher NO concentration (usually several tens of ppb) in both IAP and PKU. Simultaneous measurements of solar radiation, CO, NO_x, HONO, VOCs and OVOCs enable the further analysis of the HO_x budget and model-measurement comparison. HONO and carbonyls (including HCHO) photolysis as well as alkene ozonolysis were found to be the most important primary sources of radicals for all three campaigns but with different relative importance. Still, high correlation between OH and j(O1D) can be deduced despite the O_3 photolysis was not the major OH source. Radical losses were almost controlled by the reaction with NO_x, and radical self-reactions seemed negligible. A preliminary comparison between the simulated and observed HO_x radical concentrations and the dependence of model-measurement agreement on NO_x will be presented.