

Observation and modelling of the OH, HO₂ and RO₂ radicals at a suburban site of Beijing (Huairou) in winter 2016

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A comprehensive field campaign was carried out in winter 2016 in Huairou, a small town located 60 km northeast of Beijing downtown. Concentrations of OH, HO₂ and RO₂ radicals were measured by a laser induced fluorescence instrument. Radical concentrations were smaller than during summer because of reduced solar radiation. Maximum hourly averaged OH, HO₂ and RO₂ radical concentrations were $(3\pm 2)\times 10^6\text{cm}^{-3}$, $(8\pm 6)\times 10^7\text{cm}^{-3}$ and $(7\pm 5)\times 10^7\text{cm}^{-3}$, respectively. Chemical modulation measurements were applied on a few days showing no significant OH interference for different chemical conditions. HONO and HCHO photolysis were found to be the most important primary source of RO_x radicals. OH reactivity, the inverse of the OH radical lifetime, was also measured by a laser-photolysis and laser induced fluorescence instrument. In general, CO and NO_x were the dominated OH reactants which contributed more than half of the total OH reactivity. The relative high OH concentrations in polluted episode enabled a fast oxidation of fresh emitted pollutants and the formation of secondary products. The observed radical concentrations were compared with the results from a chemical box model. The model is capable of reproducing radical concentrations in the moderate NO_x conditions but has difficulty in both the low and high NO_x regimes. The underestimation of RO₂ radical concentrations in the high NO_x conditions indicate a missing RO₂ source.