Title:	Investigation of radicals and oxidant chemistry in north-west India using in-situ trace gas measurements and box modeling
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Abstract:	Atmospheric oxidants control the lifetime and abundance of atmospheric con- stituents. The most important atmospheric oxidant is the hydroxyl (OH) radical, which is also called the ‘detergent of the atmosphere’. OH oxidizes the vast majority of the trace gases present in the troposphere such as VOCs to form water-soluble products that can be washed out by rain or undergo dry deposition due to lowering of volatility. In this study I have focused on daytime oxidants that is O 3 and OH radical and the fate of different rad- icals such as alkyl peroxy (RO 2) and hydro peroxy (HO 2) radicals formed from the oxidant chemistry in north-west India. Due to very short lifetime (< 1s), experimental measurements of these radicals in ambient air are very challenging and are unavailable for Indian region till date. To investigate ox- idant chemistry at a representative suburban site in north-west India, in-situ measurement of 38 VOCs and trace gases were performed at IISER Mohali. A detailed 0-D chemical box model was set up and constrained by the in- -situ data for investigating the photochemical production of oxidants such as O 3 and OH radical and determining radical concentrations. Using box model I was able to calculate average daytime (06:00 - 17:00) concentrations of radicals such as OH, HO 2 , RO 2 which were 5.0×10 6 , 5.8×10 8 , 6.7×10 8 molecules cm −3 respectively. The peak concentrations of OH, HO 2 and RO 2 were 7.3×10 6 , 9.5×10 8 , 1.1×10 9 molecules cm −3 . Box model simulated ozone overestimated the measured peak ozone by circa 15 ppbv suggesting the ab- sence of important ozone loss processes in the model. Our analysis pointed to a major role for isoprene oxidation via the high NOx regime isoprene ni- trate formation pathway resulting in production of HOx. This thesis has provided new insights pertaining to role of VOCs on oxidant chemistry in the atmospheric environment of north-west India.
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