Geophysical Research Abstracts, Vol. 9, 00942, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00942
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The Development of a Novel Method for the Quantification of the Hydroxyl Radical on local and regional scales

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A method has been developed to determine time-integrated OH concentrations that may be employed in a variety of locations such as urban or indoor environments. The technique is based upon the simultaneous and instantaneous release of two or more tracer gases into the surrounding air: a chemically inert tracer of which the resultant concentration distribution following release provides information on transport and dispersion, and a reactive tracer which, due to its selective reactivity, enables quantification of the OH radical in the gas-phase. This method has been used in an indoor office environment where a deuterated alkene and cyclic perfluorocarbon were chosen as reactive and inert tracers respectively. The tracers were detected by GC MS following pre-concentration on carbon-based adsorbents. Other species, such as ozone, were also monitored throughout the experiment. The results indicate that levels of OH indoors were lower than outdoor daytime values yet higher than predicted nighttime OH concentrations. This is in line with the current view that alkenes accumulating from both indoor sources and the penetration of outdoor pollution react with ozone producing significant amounts of OH. Once produced in the indoor environment the OH radical initiates a cycle of reactions that may produce compounds harmful to human health. A feasibility analysis of the reactive tracer method as applied to urban environments has been conducted yielding the requirement for specific meteorological conditions. Multiple reactive compounds can be used simultaneously to allow one to determine the oxidative capacity of a plume and the role of specific oxidants.