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Indoor aerosol particle deposition in an empty office

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Abstract

The size- and time-resolved indoor/outdoor aerosol concentration relationships were studied experimentally in an empty office without internal particle sources. Two Scanning Mobility Particle Sizers (SMPS) and an Aerodynamic Particle Sizer (APS) sampled alternately from indoor and outdoor, together covering the size range 3-10,000 nm. The results showed that the indoor aerosol concentration depends mainly on the air exchange and deposition rates, and the outdoor concentration. At higher air exchange rates the indoor aerosol concentration approaches the outdoor one. This was observed for the accumulation mode particles. The size-dependent deposition rates were estimated using a simple aerosol dynamics experiment. It was based on equilibration of the indoor/outdoor concentrations by opening windows and analyzing the concentration decay curves after the windows were closed. For this purpose a simple mass balance model was used. The overall loss rate and the asymptotic value of indoor concentration were found by applying a non-linear least squares method on the time dependence of the indoor concentrations. The air exchange rate was estimated from the overall loss rate and the steady state values of the indoor/outdoor concentration of the accumulation mode particles. © Springer 2005.

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Keywords

Air exchange rate, Deposition rate, Indoor aerosol dynamics, Indoor/outdoor aerosol concentrations, On-line particle size distribution measurements, Penetration factor