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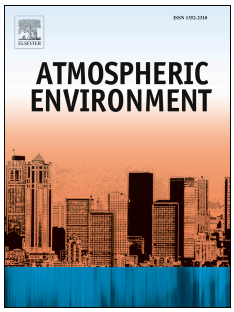

Aerosol particles during the Innsbruck Air Quality Study (INNAQS): Fluxes of nucleation to accumulation mode particles in relation to selective urban tracers

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Abstract

Despite the widely accepted implications of particulate matter on urban air quality, the knowledge of directly measured real-world emissions of particles from urban areas is highly uncertain. During the Innsbruck Air Quality Study (INNAQS), size-resolved particle number concentrations and fluxes for particles with diameters between 6 nm and 0.64 µm diameter were measured together with CO_2, NO_X and selective non-methane volatile organic tracers. With this unique dataset, exchange fluxes of eight different particle size bins were studied in relation to urban gas phase tracers. Particle number fluxes were almost completely dominated by ultrafine particles with diameters < 0.1 µm of which 50 % were smaller than 50 nm. Correlation analysis reveals that urban particles shared common sources with NO_X, benzene, and CO_2, which, based on footprint analysis, can mostly be attributed to traffic. Fluxes of particles with diameters between 0.03 µm to 0.1 µm were mostly positive and showed the best correlations with traffic and traffic associated tracer fluxes. Fluxes in the few-nanometer size-range showed more variability, which was caused by bidirectional flux patterns. Fluxes of particles larger than 0.25 µm correlated only poorly with traffic-related emissions. This manuscript demonstrates size-specific variability and bi-directionality in particle exchange and provides size-specific particle emission factors for traffic related tracers from the urban area of Innsbruck.