



Aerosol and NO_x emission factors and submicron particle number size distributions in two road tunnels with different traffic regimes

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Measurements of aerosol particle number size distributions (18-700 nm), mass concentrations (PM₁, PM_{2.5} and PM₁₀) and NO_x mixing ratios were performed in the Plabutsch tunnel, Austria, and in the Kingsway tunnel, United Kingdom. The submicron particle size distributions contained a soot mode in the diameter range $D = 80$ -100 nm and a nucleation mode in the range of $D = 20$ -40 nm. In the Kingsway tunnel a clear diurnal variation of nucleation and soot mode particles correlated to the traffic density was observed. In the Plabutsch tunnel, soot mode particles also revealed a diurnal variation, whereas no substantial variation was found for the nucleation mode particles. During the night a higher number concentration of nucleation mode particles were measured than soot mode particles and vice versa during the day. In this tunnel with very high soot emissions during daytime semivolatile species condense on the pre-existing soot particles rather than forming new particles by homogeneous nucleation. With the low concentration of soot mode particles in the Kingsway tunnel, also the nucleation mode particles exhibit a diurnal variation. From the measured parameters real-world traffic emission factors were estimated for the whole vehicle fleet as well as differentiated into the two categories LDV and HDV. Emission factors determined in this work were in good agreement with results from other studies.