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## Evaluation of roadway Gaussian plume models with large-scale measurement campaigns

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Abstract. Gaussian models are commonly used to simulate atmospheric pollutant dispersion near sources because they provide an efficient compromise between reasonable accuracy and manageable computational time. The Gaussian dispersion

formula provides an exact solution to the atmospheric diffusion equation for the dispersion of a pollutant emitted from a point source. However, the Gaussian dispersion formula for a line source, which is convenient to model emissions from on-road traffic, is exact only when the wind is perpendicular to the line source. A novel approach that reduces the error in the line source formula when the wind direction is not perpendicular to the road was recently developed. This model is used to simulate NO<sub>x</sub> concentrations in a large case study (1371 road sections representing about 831 km). NO<sub>2</sub>, NO and O<sub>3</sub> concentrations are then computed using the photostationary-state approximation. NO<sub>2</sub> concentrations are compared with measurements made at 242 locations in the domain area. Model performance is satisfactory with mean normalised errors of 22% (winter month) to 31% (summer month). Results obtained here are also compared with those obtained with a previous formulation and with a standard model used for regulatory applications, ADMS-Urban. Discrepancies among the results obtained with those models are discussed.

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