1.239 Modelling roadside NOx production and dispersion with a regional-scale coupled large-eddy simulation approach.

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Abstract:

Traffic emissions account for over 40% of anthropogenic NOx production in the European Union, and about 70% in urban environments. In addition, NOx serve as precursors to tropospheric ozone and particulate matter, which have adverse effects on human health, ecosystems and climate change. Thus it is the main objective of the present study is to model production and dispersion behaviors of NOx directly at the street level to better understand their formation and transport mechanisms. A representative set of road-side measurements obtained from the City of Berlin are used as the basis for the present study. Particular emphasis is placed on the period between June and August 2014, where corresponding meteorological and urban background concentration data are available from existing observations and regional model results as initial and boundary conditions. Detailed, seamless geometry of urban structures surrounding said measurement stations are constructed using building geographic information system (GIS) data. Using a large-eddy simulation (LES) approach, with a grid size of around 10 m at the finest level, complex flow structures in street canyons can be more effectively captured than, for instance, urban canopy models, hence providing a more accurate assessment of chemical dispersion behavior. The outcome of this work could be applied to the derivation of a more representative street canyon parameterization for regional models, or directly as guidance information for municipal- and region-level environmental policy makers.