

EGU21-8970

<https://doi.org/10.5194/egusphere-egu21-8970>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Impact of excess diesel NO_x emissions upon NO₂ pollution in a compact city: the role of model resolution

Jaime Benavides¹, Marc Guevara¹, Michelle G. Snyder², Daniel Rodríguez-Rey¹, Albert Soret¹, Carlos Pérez García-Pando^{1,3}, and Oriol Jorba¹

¹Barcelona Supercomputing Center, Barcelona, Spain

²Elon University, Elon, NC, USA

³ICREA, Catalan Institution for Research and Advanced Studies, Barcelona, Spain

Diesel light-duty-vehicles (LDV) largely exceed the Euro emission standards of nitrogen oxides (NO_x) in real-world driving conditions. Air quality models at meso- and large-scale resolutions have recently been used to quantify the impact of such an emission excess upon air quality and human health. In this work, we argue that these approaches can significantly underestimate the impact of diesel LDV excess NO_x emissions upon NO₂ pollution in compact and heavily trafficked cities. We design two modeling scenarios for the study: a business-as-usual scenario where diesel LDV emit NO_x in excess, and a counterfactual scenario where emissions are compliant with the Euro emission standards. We compare then NO₂ concentrations of the air quality mesoscale model CALIOPE at both 4 km and 1 km resolution with the street-scale model CALIOPE-Urban in Barcelona city (Spain). The EU annual NO₂ limits are repeatedly exceeded in Barcelona where a large share of passenger cars are diesel (65 %). Results show that the street scale model is able to largely represent the observed NO₂ concentration gradients between traffic and background stations in the city in contrast to the mesoscale model. The mesoscale model strongly underestimates the impact of diesel LDV excess NO_x emissions upon NO₂ pollution both in absolute terms (by 38 to 48 %) and relative terms (by 10 to 35 %). Using the street scale model, we find that diesel LDV excess NO_x emissions are associated with about 20 % of NO₂ levels in the city, contributing to an increase of citizens exposed to levels above the EU annual NO₂ limits of 15%.