



The impact of megacities on regional and global atmospheric composition: a modelling study

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Quantifying the effects of megacities on regional and global air quality remains a challenge due to the complexity and variation between cities, locations, local meteorology and atmospheric chemistry. As the number of megacities grows, so does their potential to influence atmospheric composition and climate on the global scale. The current representation of emissions from megacities in chemistry-climate models is reliant on regional or global inventories. The accuracy of these inventories, combined with grid resolution, determines how well models can capture the point sources of megacities that can contain high concentrations of damaging pollutants. This study shows how changes to these megacity emissions impact global air quality.

We present the results from a number of present-day simulations using a global chemistry-climate model, allowing us to analyze the impacts of megacities on global atmospheric composition. These simulations aim to quantify the effect of altering megacity emissions, by both reduction and redistribution scenarios, and also include an investigation into the effect of emission resolution on megacity representation in the model. One of the key studies consists of changing the spatial distribution of emissions on a regional scale, moving emissions out of the concentrated urban centers, to quantify the effects of megacity dilution on a global scale. Results are compared to both the model base run for the year 2005, and to satellite observations for the same year. The global significance of these scenarios is set against the significance of an annihilation scenario for the same year, where anthropogenic emissions from megacities are completely removed. These redistribution and annihilation studies allow us to investigate how future changes in megacities may influence the global scale.