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Modelling the effects of megacities on global atmospheric chemistry

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In this study we examine the emissions from 32 of the largest cities worldwide, and analyze their effects on global atmospheric chemistry using the global Chemical Transport Model MATCH-MPIC. We compare the representation of these cities in a number of different global emissions inventories for the year 2000. Additionally, where available, we compare the city emissions from the global inventories with city- specific emissions inventories. All inventories show similar total emissions from cities, but differ markedly in their representation of individual cities. These differences arise due to the assumptions made during the construction of the inventory. The global effect of cities on ozone and hydroxyl radical is generally quite small, and restricted to similar spatial scales as the cities themselves, while the effect on reactive nitrogen is generally more widespread. Global effects of emissions from cities are captured similarly by both T21 and T62 configurations of the model. The geographical location of cities has a very large effect on the response of the atmosphere to their emissions. Whether a city is in the tropics, the northern extratropics or the southern extratropics seems to predict very well whether the emissions from the city lead to local ozone production or destruction. This factor seems more important than the magnitude of the emissions or any of the ratios of any of the emitted species.