



On the variability in the impacts of the London and Mexico City metropolitan areas on regional air quality

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Megacities may have significant impacts on both atmospheric (thermo) dynamics and air quality over a broad range of scales. The characteristics of urban emission sources of pollution which affect regional air quality can be different from one megacity to another. In addition, the impacts of such large cities on their surrounding environment strongly depend on atmospheric dynamics, which varies in space and time. Currently, there are only limited studies on the inter-relating factors between megacity and their impacts on regional air quality. Hence, detailed case studies are crucial information to understand and quantify the impacts of megacities on regional or meso- scales. One way to investigate such impacts would be to examine how megacity plumes mix with regional background concentrations. The overall aim of our study is thus to estimate the range of variability in this mixing with regional background pollution for the London and Mexico City metropolitan areas. Though networks of observations are invaluable to locally 'map' pollutant concentrations, measurements are inevitably site-dependent. Therefore, results from air quality modelling systems are used to detail pollutant dispersion at regional scales. Model results for selected periods corresponding to different atmospheric situations over both megacities are analysed and discussed in terms of mixing of precursor gases with regional background pollution. Long-range transport, as well as recirculation, contributions are also estimated by switching off any inward pollutant flux within the domains. The study suggests that the contribution of megacity plumes to regional-scale background pollution can vary within a significant range and that this variability needs to be carefully taken into account to estimate impacts up to the global scale (for instance by global models for which the

variability is smoothed by rather coarse resolution). Finally, the paper discusses the implication of this work to other megacities and how such regional air quality modelling approaches can be used to investigate the interaction between climate and regional air quality including feedback processes.