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Megacity ozone air quality under four alternative future scenarios

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The impact of the megacities of the world on global tropospheric ozone, and conversely, the extent to which megacities are influenced by emissios of ozone precursors from outside of the megacities is examined under the four alternative RCP ("Representative Concentration Pathway") emissions scenarios. Despite accounting for about 6% of present-day anthropogenic emissions of ozone precursor species, the contribution of emissions from megacities to global tropospheric ozone is calculated to be 0.84%. By 2100 this contribution falls to between 0.18% and 0.62% depending on the scenario, with the lower value being for the most-polluting of the four future emissions scenarios due to stringent controls on ozone precursor emissions from highly populated areas combined with a stronger tropospheric background ozone field. The higher end of this range is from the least-polluting of the four emissions scenarios, due lower background tropospheric ozone combined with the use of a different downscaling methodology in the construction of the scenario. Although the absolute impact of megacities on global ozone is small, an important result of this study is that under all future scenarios, future air quality in megacities is expected to be less influenced by local emissions within the cities, but instead more influenced by emission sources outside of the cities. Air quality trends in the megacities of the developing world are projected to be similar to observed trends in developed world megacities over the last few decades. Assumptions made when downscaling the emissions scenarios onto the grids used in such modelling studies can have a large influence on these results. Future work should concentrate on the creation of spatially explicit scenarios of urban development for use in global chemical transport models.