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Urban Climate Effects on Air Pollution and Atmospheric Chemistry

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Tropospheric ozone, adversely affects the environment and human health. The presence of chlorine nitrate ($ClNO_2$) in the troposphere can enhance ozone (O_3) formation as it undergoes photolysis, releasing chlorine reactive atoms (Cl) and nitrogen dioxide (NO_2), both of which enhance tropospheric ozone formation. The importance of new sources of tropospheric $ClNO_2$ via heterogeneous processes has recently been highlighted. This study employed a box model, using the Master Chemical Mechanism (MCM version 3.2) to assess the effect of $ClNO_2$ on air quality in urban areas within the UK. The model updated to include $ClNO_2$ production, photolysis, a comprehensive parameterisation of dinitrogen pentoxide (N2O5) uptake, and $ClNO_2$ production calculated from bulk aerosol composition. The model simulation revealed the presence of $ClNO_2$ enhances the formation of NO_2, organic peroxy radical ($CH3O_2$), O_3, and hydroxyl radicals (OH) when compared with simulations excluding $ClNO_2$. In addition, the study examined the effect of temperature variation upon $ClNO_2$ formation. The response of $ClNO_2$ to temperature was analysed to identify the underlying drivers, of particular importance when assessing the response of atmospheric chemistry processes under potential future climates.