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Impact of chemistry scheme complexity on UK air quality modelling

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AQUM (Air Quality in the Unified Model) is an on-line air quality modelling system which is used to provide the operational Met Office air quality forecast for the UK. The model uses the 'Regional Air Quality' (RAQ) chemistry scheme, which includes 40 advected tracers and 18 non-advected species. In this study we have developed and evaluated a new model configuration which uses the 'Extended Tropospheric Chemistry Scheme' (EXTTC), with around 20 more chemical species than RAQ. This scheme has a greater level of sophistication than RAQ and allows the interactive emission of biogenic ozone precursors dependent on meteorological conditions. We have conducted model simulations for the EXTTC and RAQ configurations and compared model ozone predictions against surface observations for different periods, with a focus on an ozone episode in July 2006. Our results show there is a significant improvement in modelling ozone concentrations using the interactive biogenic emissions of isoprene employed in EXTTC, and that the model performance is more sensitive to the treatment of biogenic emissions than to the increased complexity of the chemistry scheme. In an extension to this study we have developed an experimental configuration of AQUM which employs a simplified RAQ chemistry scheme emitting a reduced number of volatile organic compounds (VOCs). We will present some initial results from simulations with this simplified scheme and examine the contribution of processes other than chemistry to surface ozone.