1.058 Quantifying uncertainties in multi-pollutants health impacts in urban/rural regions across the UK.

Early Career Scientist

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Abstract:

The adverse impacts of air pollution on human health due to exposure to ozone (O_3), and $PM_{2.5}$ are well established. However, there are numerous uncertainties in quantifying region-wide health impacts e.g. due to uncertainties in simulating urban air pollutant concentrations and for coefficients that determine exposure-response relationships. Previous studies using chemical transport model simulations outline the importance of model resolution for simulating O_3 concentrations to be used in health impacts studies. However there are very few studies that discuss the effects of uncertainty in model resolution for determining PM-related health impacts. In this study we have used the UK chemistry and aerosol (UKCA) model to quantify the impact of model resolution and uncertainty in concentration-response coefficients on simulated pollutant concentrations and associated health impacts.

Two model configurations were used: a global resolution (~ 150 km) and a regional resolution (~ 50 km) over Europe. Our regional configuration shows similar results to previous studies for O_3 concentrations, in particular better agreement with measurements for the diurnal cycle for O_3 compared to global model results. In addition, the regional simulation better captures the lower O_3 levels associated with high NO_x levels in large cities (due to higher emission resolution). In contrast, differences in model performance for $PM_{2.5}$ for the two resolutions are not as evident. However the regional configuration gives a better representation of hotspots whereas the global configuration underestimates high $PM_{2.5}$ levels. These results are being linked to population and baseline mortality data to predict uncertainty ranges for $PM_{2.5}$ health impacts over Europe due to long-term exposure.

UKCA simulations at the local scale (~ 12 km) will also be utilised to assess health impacts due to $PM_{2.5}$ episodes across the UK. Future work will consider how health burdens will change in urban areas due to higher population density and climate change.