AN UNCERTAIN FUTURE? MODELLING INTERACTIONS BETWEEN AIR POLLUTION AND CLIMATE CHANGE AT THE UK SCALE

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The interactions between climate change, concentrations of a range of atmospheric pollutants and targets set for the protection of human health and ecosystems, are receiving increasing attention from both scientists and policy makers (e.g. AQEG, 2005; EEA, 2006). Although climate modellers routinely present estimates of uncertainties in their scenario outputs, it is not standard practice for those involved in modelling long range transport (LRT) of air pollutants. As a result, it not clear whether the magnitude of changes in pollutant concentrations and depositions resulting from changing the climatic parameters in LRT models are genuinely different from the range of possible outcomes once model uncertainty is taken into account.

Here we use the Hull Acid Rain Model (HARM), a UK scale Lagrangian trajectory model, to explore the impact of planned emissions reductions and aspects of climatic change on a range of pollutants allowing for model uncertainty. These impacts are assessed in respect of two contrasting regions of the UK, in the south east and north west. The effect of uncertainties in HARM has been assessed using the Generalised Likelihood Uncertainty Estimation (GLUE) method which identifies acceptable parameter sets that can be described as behavioural based on their fit to observed data (Page et al., 2004; Whyatt et al., in press). Using this approach, error bounds can be identified for model outputs, usually focusing on the range between the 5th and 95th percentiles. Incorporating aspects of climate change forecasts for the UK into the model effectively increases the uncertainty in a number of model parameters and the interaction between emissions change and climate can be explored. Climate change inputs are taken from four GCMs for the 2020s, 2050s and 2080s for two emissions scenarios. These are used to generate climatological inputs (such as precipitation, wind direction and speed) to HARM. The impacts of climate change are assessed using a seasonal version of the model as the strongest effects are seen in winter and summer.

Scenario modelling where uncertainties and future estimates of climate change are included yields a range of outcomes to compare against environmental targets such as critical loads.

EXTENDED ABSTRACT NOT SUPPLIED