Environment Agency

Evidence

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Comparison of Simple and Advanced Regional Models (CREMO)

Project SC060037

The parties to the UNECE Air Pollution Convention agreed on 4 May 2012 to a new emission reduction commitment for the main air pollutants in Europe (revision of the Gothenburg Protocol). The revised Protocol requires emissions reductions in SO_2, NOx, NH_3 and NMVOC between 2005 and 2020, and for the first time a limit on primary $PM_{2.5}$ emissions. For the UK the reductions are 59% for SO_2, 55% for NOx, 8% for NH_3, 32% for NMVOC and 30% for $PM_{2.5}$. The reductions in emissions expected over this period from the large stationary sources which the Environment Agency regulate are approximately similar fractions based on the assumption that all processes will operate with new technology.

The Environment Agency needs to be able to assess the air quality outcomes of these measures in order to evaluate their benefits and to anticipate alternative measures if the expected emission trends are not followed. Moreover international discussions of the revised EU Air Quality Directive involve the use of models in support of air quality policy. The focus will be on $PM_{2.5}$ because of its important health effects. $PM_{2.5}$ is a complex pollutant, whose atmospheric concentrations depend partly on primary emissions, but also on the chemical transformations of SO_2 and NOx in the atmosphere. This project is an important step in making available the advanced chemical transport model CMAQ, which is thought to be the most appropriate tool to do these 2020 predictions. However the CMAQ model has to be tested and evaluated in order for the Environment Agency determine the reliability of its future air quality estimates. This would also enable analyses to be made of the proportionate contribution from different source sectors e.g. power industry, chemicals, agriculture, road transport emissions etc. to air quality in 2020.

Considerable progress has been made and CMAQ has been shown to play an essential role when assessing secondary pollutants, such as ozone and particulate matter. However conclusions from evaluation studies, completed both as part of CREMO and internationally, remain provisional and further work is required. Moreover in the absence of an objective basis for setting acceptance criteria for models, the underlying pragmatic principle should be to use whatever has comparable accuracy with best existing international practice. In regulatory applications, the error expected in current types of models should be accepted and this uncertainty built into any decisions made on the basis of models. On-going Environment Agency work following CREMO involves predictions of UK air quality in 2020 using the CMAQ model.

The conclusions from the CREMO project are summarised as answers to a series of questions in a 'Main outcomes for the Environment Agency' report. Five further reports have been produced as supporting information, and describe (1) the CREMO model evaluation protocol, (2) the CREMO evaluation report, (3) ozone diagnostics, (4) model evaluation report: ground-level ozone, and (5) chemical mechanism choice.

This summary relates to information from the CREMO project SC060037, reported in detail in the following outputs:

Report: SC060037/R and reports SC060037/Ra to Re
Title: Comparison of Simple and Advanced Regional Models (CREMO)

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