

1.157 Trends of PM pollution and health effects in Europe during the 1990s and 2000s: multi-model and observational assessment.

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Abstract:

Particulate matter (PM) pollution in Europe has, during the last decades, shown a significant decrease, mainly due to emission reduction of its gaseous precursors as regulated by the Protocols under the Convention on Long-range Transboundary Air Pollution (LRTAP). In 2012 primary PM emissions were included in the revised Gothenburg Protocol. The Eurodelta-Trends multi-model experiment, coordinated by the Task Force on Monitoring and Modelling of EMEP (European Monitoring and Evaluation Programme), has a twofold objective: to assess the efficiency of emissions mitigation measures in improving air quality in Europe and to evaluate the ability of chemical transport models (CTMs) to reproduce observed pollution trends. Eight CTMs have performed harmonized simulations for the period 1990-2010. We focus on trend analyses of PM₁₀ and PM_{2.5} for the 2000-2010 period (for which EMEP measurements of PM are available), based on results from the EMEP MSC-W, CHIMERE, LOTOS-EUROS, MATCH, MINNI and Polair3D models and observed trends. In general, the models show a fair agreement and ability to reproduce measured trends; they identify significant PM trends at more sites though the mean modelled trends tend to be smaller than the observed trends, e.g. for PM₁₀ -2.0 vs -2.3 % yr⁻¹. Considerable differences are found in PM trends across Europe, and also in different seasons (largest in summer and smallest in winter). The models do not always agree about the relative contribution of individual components to PM trends. For the relatively short period of 2000-2010, the effect of inter-annual meteorological variability appears rather important compared to emission changes, resulting in non-significant trends in many European regions/sites. Finally, we present the trends in population exposure to PM_{2.5} and related health effects. According to our estimates, nearly 14000 premature deaths were avoided every year (or 20% reduction in health effects) between 2000 and 2010.