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Identification of cost-effective abatement strategies for primary and secondary aerosol precursors to reduce ambient PM_{10} and $PM_{2.5}$ levels in Europe

- Application and Results of the MERLIN project -

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Typically, emission control scenarios are developed on a highly detailed level for individual sources or pollutants, or using rather coarse approaches distinguishing little more than sectoral emissions splits. Currently observed levels of ambient concentrations of particulate matter (PM_{10} and $PM_{2.5})$ and the frequent exceedances of thresholds and limit values set by European Commission legislation present a serious problem for the design of effective and efficient air pollution control strategies. This is even more difficult, as several components may contribute differently to ambient levels of PM_{xx}, e.g. nitrates, sulphates and primary PM (PPM). Hence, emission control options include several sectors and pollutants/precursors, mainly road transport and other mobile sources (NO_x, PPM_{10}, $PPM_{2.5}$), stationary combustion (NO_x, SO_2, PPM_{10}, $PPM_{2.5}$) and agriculture (NH_3).

This paper will present results obtained with the OMEGA integrated assessment model system, which was developed within the frame of the EC 5^{th} Framework Programme research project MERLIN[1]. With regard to the session topic, the paper focuses on cost-effective emission control options for ambient concentrations of PM10 and PM2.5, briefly discussing as well synergies of joint strategies for air pollution control and climate change.

[1] MERLIN Project website: http://www.merlin-project.info

The methodology applied is based on a detailed sectoral representation of all relevant source sectors by activity rates (AR) and emission factors (EF) and thus a bottom-up emission (E) calculation within the assessment model as $E = AR \times EF$. Using the newly developed 'measure-matrix approach' (see *Reis et al. 2005*), emission control options are introduced and based on a genetic algorithm, the optimisation model identifies the bundle of measures that is able to achieve the preset targets (i.e. concentrations, limit value compliance, emission targets etc.) at least costs. In addition to that, a full cost-benefit optimisation is possible, but this will not be discussed in detail here. The results from selected scenario assessments will demonstrate which measures and target sectors are identified for emission control depending on the targets set for optimisation. Furthermore, the individual contributions of individual primary and secondary PM precursors in relation to the emission reductions achieved for these are discussed. Finally, conclusions are drawn with regard to the implications of these findings for the further development of approaches to model emissions and emission control of particulate matter with even more detail, for instance taking non-exhaust emissions and (re)suspension of road dust into account and suchlike.

Reference

Reis S, Nitter S, Friedrich R (2005) Innovative Approaches in Integrated Assessment Modelling of European Air Pollution Control Strategies – Implications of Dealing with Multi-pollutant Multi-effect Problems. J. Environmental Modelling and Software 20 (12), Elsevier Science, pp 1524–1531