Geophysical Research Abstracts, Vol. 8, 07720, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07720
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Quantification and analysis of primary anthropogenic fine particle emissions and abatement potentials in Germany

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Fine particulate matter became again an important issue of clean air policy entailed by recent findings from epidemiological studies since the beginning of the nineties. Health and other effects of particulate matter emissions seemed to be sufficiently abated due to technical measures implemented during the eighties and nineties. Atmospheric particle mass concentrations significantly decreased during the last decades. Meanwhile, currently measured concentrations in Germany that are relatively low in comparison to the former situation are associated with considerable health risks. To be able to choose potential and effective measures for a further emission reduction, comprehensive understanding of emission sources is required. In contrast to former studies the particle mass fractions PM_{10} and $PM_{2.5}$ are in focus. Thus the particle size distribution of emissions has an important influence on the assessment of the environmental relevance of source groups.

A detailed source inventory is the basis for quantifying and analysing the effectiveness and abatement potential of additional measures in the future. Main objective of the presented study was the development of an extensive data basis for such an analysis. Knowledge gaps were closed concerning the quantification of primary anthropogenic emissions and their characterisation with regard to particle size and selected substances of content. The current state of knowledge was reviewed and applied for the development of an emission data base for PM_{10} and $PM_{2.5}$ including all relevant source groups in Germany in the year 2000. Diesel engines, combustion of coal and wood and several processes in primary industries have been found to be the major

sources of fine particles in Germany. A trend scenario for future emissions in 2010 was developed using source specific temporal projections. Another essential basis for the study was a detailed analysis of possible technical abatement measures and their effectiveness regarding fine particle emissions. Effective options that are able to reduce emissions of fine as well as ultrafine particles are diesel particulate filters, natural gas engines, improved dust filters for stationary plants, low-emission combustion of wood and substitution of solid fuels. Finally, future abatement potentials were estimated for major emission sources and recommendations were derived for a future abatement strategy based on the developed data model.