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Multi-model assessment of health impacts of air pollution in Europe and the U.S.

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According to the World Health Organization (WHO), air pollution is now the world's largest single environmental health risk. Assessments of health impacts and the associated external costs related to air pollution are estimated based on observed and/or modelled air pollutant levels. Chemistry and transport models (CTMs) are useful tools to calculate the concentrations of health-related pollutants taking into account the non-linearities in the chemistry and the complex interactions between meteorology and chemistry. However, the CTMs include different chemical and aerosol schemes that introduce differences in the representation of the processes. Likewise, will differences in the emissions and boundary conditions used in the models add to the overall uncertainties. These uncertainties are introduced also into the health impact estimates using output from the CTMs. Multi-model (MM) ensembles can be useful to minimize these uncertainties introduced by the individual CTMs. In the present study, the simulated surface concentrations of health related air pollutants for the year 2010 from fifteen modelling groups participating in the AQMEII exercise, serve as input to the Economic Valuation of Air Pollution model (EVA), in order to calculate the impacts of these pollutants on human health and the associated external costs in Europe and U.S. In addition, the impacts of a 20% global emission reduction scenario on the human health and associated costs have been calculated. Preliminary results show that in Europe and U.S., the MM mean number of premature deaths due to air pollution is calculated to be ∼400 000 and 160 000, respectively. Estimated health impacts among different models can vary up to a factor of 3 and 1.2 in Europe and U.S., respectively. PM is calculated to be the major pollutant affecting the health impacts and the differences in models regarding the treatment of aerosol composition, physics and dynamics is a key factor. The total MM mean costs due to health impacts of air pollution are estimated to be 400 and 170 billion € in Europe and U.S., respectively. Finally, the scenario with a 20% reduction in global anthropogenic emissions leads to a decrease of 18% of all health outcomes.