# European research effort improves understanding of impacts of aerosols on climate

June 29 2011

Atmospheric aerosol particles (otherwise known as Particulate Matter) have been masking the true rate of greenhouse gas induced global warming during the industrial period. New investigations show that the aerosol cooling effect will be strongly reduced by 2030, as air pollution abatements are implemented worldwide and the presently available advanced control technologies are utilized. These actions would increase the global mean temperature by ca. 1 degree Celsius. This is one of the main research outcomes of the recently concluded EU EUCAARI (European Integrated project on Aerosol Cloud Climate and Air Quality Interaction) project.

The positive impacts of aerosols are partially off-setting global warming, but at the same time aerosol particles have a negative effect on public health, causing thousands on premature deaths in Europe annually. Identification of efficient strategies for air pollution control in Europe was another key outcome of EUCAARI. It was found that the reduction in ammonia emissions is one of the most effective ways to reduce aerosol mass concentrations and thus improve air quality in Europe.

Reduction in nitric oxides is also effective, but might lead to higher ozone levels, thereby leading to another negative impact on air quality. Reduction in sulphur dioxide emissions will reduce particulate air pollution especially in the Eastern Mediterranean area. Reduction of organic aerosol concentrations is a lot more challenging and will require

reductions of gas and aerosol emissions from transportation and biomass burning. Furthermore, it is now shown that a large fraction of organic aerosols in Europe is of modern origin (as opposed to fossil fuel origins), for which the main sources are biogenic secondary organic aerosol (boreal forests), biomass burning and primary biogenic aerosol particles. All these emission sources are expected to respond to climate change, although the exact magnitude and nature of these responses remains uncertain.

The EUCAARI project, coordinated by Professor Markku Kulmala from University of Helsinki, Finland, has been the most extensive aerosol research project in Europe so far. The total budget of the project was 15 million Euros, of which 10 million Euros was provided by the European Commission FP6 Programme. In all, 48 research institutes from 24 countries participated in this project, carried out in 2007-2010.The project has led to significantly more information on the whole physical background related to aerosol formation and impacts at all scales; from nanoscale to global, from milliseconds to centuries. The quantification of the effect of aerosols on the radiative balance (cooling or heating) of the planet has been one of the most urgent tasks to underpin more informed projections of future climate change.

The project performed extensive studies from ground-based, aircraft and satellite platforms not only in Europe, but also in China, South-Africa, Brazil and India. These studies improved the theoretical understanding of the aerosol life-cycle, enabling us to make major improvements in climate and air pollution models and present new air pollution scenarios over Europe. The project outcome has been targeted to reinforce European political decision-making to develop new strategies and implementation plans for global air quality monitoring and to take Europe a leading role in developing and applying environmental technologies.

**More information:** EUCAARI project and photographs
www.atm.helsinki.fi/eucaari/

EUCAARI main results, overview paper
www.atmos-chem-phys-discuss.ne … pd-11-17941-2011.pdf

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