



Modelling the Impacts of Climate Change on Tropospheric Ozone over three Centuries

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So far reduction of the anthropogenic emissions of chemical species to the atmosphere has been profoundly investigated. However, new research indicates that climate change on its own also has a significant impact on the future air pollution levels. Climate Change and its impact on air pollution levels are currently studied by a number of research groups using, global, hemispherical and regional modelling systems. In the Department of Atmospheric Environment, National Environmental Research Institute (NERI), Aarhus University, in Denmark, we have developed a hemispherical model system which is based on the DEHM model (Christensen, 1997; Frohn et al., 2002a; Frohn et al., 2002b). In the DEHM modelling system an option for modelling the impacts of climate change has been included by using meteorological input from global climate models. Here we present results by using climate data that are provided by the ECHAM5/MPI-OM Atmosphere-Ocean General Circulation Model (May, 2008; Roeckner et al., 2003). In the current experiment the anthropogenic emissions in the chemistry model DEHM are kept constant on a 2000 level to separate out the signal of climate change on air pollutants while the meteorological drivers simulated by the ECHAM5/MPI-OM climate model is based on the IPCC SRES A1B Scenario. To save computing time the experiment is carried out in time-slices representing four centuries (1890s, 1990s, 2090s and the 2190s). The results show that the dominating impacts from climate change on a large number of the chemical species are related to the predicted temperature increase. This temperature affects chemistry as well as emissions from nature. The largest changes in both meteorology and air quality is found to happen in the 21st century. However, significant changes are also found in some parameters including tropospheric ozone in the following century. In general the background ozone concentrations is predicted to decrease at surface level however in the densely populated areas with high NO_x concentrations the ozone concentration will increase significantly in the future solely due to climate change and the resulting changes in biogenic emissions.

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