Geophysical Research Abstracts, Vol. 9, 07912, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07912

Assessing the Role of Air Pollution in Extreme Climate Events by means of its Potential Contribution to the 2003 Heatwave over Europe

G.A. Folberth (1), I. Bey (1), L. Pozzoli (1), S. Rast (2) and M. Schultz (3)

(1) Laboratoire de Modélisation de la Chimie Atmosphérique (LMCA), EPFL (Lausanne, Switzerland), (2) Max-Planck-Institut für Meteorologie (Hamburg, Germany), (3) Forschungszentrum Jülich, ICG-II: Troposphäre (Jülich, Germany)

The increase in the concentration of greenhouse gases (GHG) is known to play a major role in the interannual variability of climate. One expression of such an enhancement in the climate variability is the observed rise in the occurrence of extreme climate events (ECE). In recent years, Europe has repeatedly experienced such extreme events when the continent was afflicted by a heat wave in 2003 while cool summers with heavy precipitation and severe inundation occurred in 2002 and 2005.

These extreme climate events are, in principal, consistent with predictions by simulations with climate models that were driven by scenarios of increasing GHG emissions (e.g., ICPP). Such studies have projected, for instance, a significant rise in the interannual variability of European summer climate associated with higher risks of droughts and heavy precipitation events. Even though the models which have been applied in said studies represent state-of-the-art representations of the Earth's atmospheric dynamics and the climate, they mostly do not include a comprehensive representation of the atmosphere's chemical composition and the processes that control the key GHG, such as, for instance, ozone, and the distribution of aerosols as well as their numerous feedbacks with climate. Consequently, they do not yet allow for an in-depth analysis of the interaction between chemistry and aerosols with the climate system and its variability.

We present first results of a modeling study that applies the recently developed model of chemistry, aerosols, and climate, the ECHAM5-HAMMOZ model which allows for a detailed study of the feedbacks between climate and atmospheric chemistry and

aerosols in terms of their influence on atmospheric radiative transfer. In this study, we address the specific question whether air pollution can have a significant impact on the formation and spatial and temporal extension of extreme events of climate on a continental scale. In particular, we examine the role of continental scale air pollution, e.g., ozone and aerosols, in the 2003 summer heatwave over Europe. The distribution of ozone and aerosols is decisively controlled by air pollution but these key components can also exert an important impact on climate in terms of the ozone's radiative forcing potential and of the aerosols' ability to scatter back or absorb solar insolation ("dimming"). We focus on the region bounded by 10°W and 40°E and 30°-50°N, this being a region addressed in previous studies that investigated the summer 2003 heat wave.