



Evaluation of the performance of global chemistry transport models during the European heat wave of summer 2003

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The ability of global chemistry transport models (CTMs) to reproduce the severe Europe air pollution episode of August 2003 is being evaluated within the Global Reactive Gases (GRG) subproject of GEMS. Three CTMs (MOZART3, TM5 and MOCAGE) driven by ECMWF operational analysis and using monthly emissions specific for 2003 have been run.

In this analysis, CTM output is compared with MOZAIC vertical profiles above several European airports (Frankfurt, Vienna, Paris and Munich) during July-August 2003. A focus is given to Frankfurt due to the optimal data coverage at that airport. Three periods are distinguished: before the heat wave (16-31 July), during the heat wave (2-14 August) and after the heat wave (16-31 August).

The ECMWF analysis and the CTMs correctly reproduce the meteorological conditions prevailing during the heat wave (high temperatures, low relative humidity and low wind speed) within the variability of the measurements. MOZART3 and TM5 generally reproduce the O₃ and CO levels outside the heat wave as well as their evolution during the 6-week period, although TM5 tends to underestimate CO. CTMs are able to capture the time of the peaks in these species during the heat wave, but they underestimate the magnitude of the measured peaks. Particularly, modelled CO is underestimated from the mid- to the lower troposphere and O₃ for the lower troposphere. After the heat wave, a somewhat lower underestimation of CO is still present in the models for some airports. The reasons for the discrepancies during the warmest

period of 2003 are being investigated. For this purpose, model sensitivity runs will be performed in the near future. Runs at higher horizontal resolution will allow testing the impact of the model resolution on the anticyclonic re-circulation and therefore on the accumulation of pollutants during the heat wave. The importance of regional emissions and emissions outside Europe will also be evaluated. The performance of a 2-way coupled system of the ECMWF Integrated Forecast System (IFS) with one of the CTMs will be assessed in the future.