Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04056, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04056
EGU General Assembly 2008

Surface ozone seasonal and inter-annual variability in the extra tropics: comparison of observations and model results

O. A. Tarasova (1,2), C. A. M. Brenninkmeijer (1), P. Jöckel (1), A. M. Zvyagintsev (3), G. I. Kuznetsov (2)

(1) Max Planck Institute for Chemistry, Mainz, Germany (tarasova@mpch-mainz.mpg.de), (2) Lomonosov Moscow State University, Faculty of Physics, Moscow, Russia, (3) Central Aerological Observatory, Dolgoprudny, Russia

The results of a climatological assessment of the surface ozone seasonal and inter-annual variability are presented. The analysis is based on the long-term (1990-2004) ozone records of EMEP and the World Data Center of Greenhouse Gases and therefore biased to the Northern Hemisphere. Seasonal variations are observed at most of the 114 locations considered. Six types of seasonal-diurnal variability are revealed by application of hierarchical agglomeration clustering, namely: clean/rural, semi-polluted non-elevated, semi-polluted semi-elevated, elevated and polar/remote marine sites. For the “clean background” cluster the seasonal maximum is observed in March-April, both for night and day. For those sites with a double maximum or a wide spring-summer maximum, the spring maximum appears both for day and night, while the summer maximum is more pronounced for daytime and hence can be attributed to photochemical processes. The analysis of the seasonal cycle dependence on the time of the day lead us to the conclusion that the spring seasonal maximum is more likely be caused by dynamical/transport processes, while the one in summer is caused by photochemical production. Using data from the 3D atmospheric chemistry general circulation model ECHAM5/MESSy1 covering the period of 1998-2005 a comparison with the observational clusters have been performed. At most of the sites the model simulates seasonal variability characterized by a spring maximum or a broad spring-summer maximum (with higher summer mixing ratios). For southern

hemispheric and polar remote locations the seasonal maximum in the simulation is shifted to spring, while the absolute mixing ratios are in good agreement with the measurements. For the model clusters which cover rural and semi-polluted sites the role of the photochemical production/destruction seems to be overestimated. The evolution of the seasonal cycles of all model and observational clusters was examined and quasi-biennial/four-years periodicities in the shape of the seasonal cycle were found both in the measurement data and in the model output. The relation of the detected periods with global dynamics is discussed. The work has been supported by the European Commission (Marie-Curie IIF project N 039905 - FP6-2005-Mobility-7) and the Russian Foundation for Basic Research (project 06-05-64427).