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Evaluation of vertical ozone profiles from GEMS coupled IFS-CTM modelling system

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The EU-funded research project GEMS (Global Environmental Monitoring using Satellite and in-situ data) (http://www.ecmwf.int/gems/research/EU_projects/GEMS) is developing comprehensive monitoring and forecasting systems for trace atmospheric constituents important for climate and air quality. The global reactive gases subproject (GRG) is setting up a modelling framework for monitoring and forecast of tropospheric and stratospheric ozone and its precursor species (CO, NOx, Formaldehyde). For that, the chemistry transport models MOZART and TM5 have been coupled to ECMWF's integrated forecast system IFS. These models have been run in reanalysis simulations covering the year 2003, and since November 2007, the coupled MOZART model is running in an operational forecast mode. Observational datasets are employed for quality control and improving the forecasts by statistical analyses and process studies lead to continuous model adjustments.

Here we focus on the evaluation of ozone vertical distribution from the reanalyses and forecast runs. Ozone profiles measured by balloon sondes are compared to the model output. The comparison results are discussed in terms of seasonal and regional differences as well as model versions, demonstrating improvements resp. deficiencies of the various model runs.

Generally, all model versions overestimate the ozone distribution in the stratosphere, and underestimate it in the troposphere. With the implementation of ozone assimilation into the MOZART model the results improved in the stratosphere. Largest biases are found in the UT/LS (upper troposphere/lower stratosphere) region during winter and spring. The ozone hole conditions in the Antarctic are not yet reproduced sufficiently by the models, although large improvements from the first model runs to the latest versions took place.