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Applying a relational database on global observations and simulations of chemical tracers in combination with ECMWF analysis data

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Atmospheric chemical tracers and meteorological parameters like temperature and pressure interact in many ways. Radiative transfer which is a key variable for meteorological parameters is affected by chemical tracers. For example the radiation balance in the stratosphere depends strongly on the ozone profile. On the other hand atmospheric conditions like e.g. the temperature determine the speed of chemical reactions.
We take three different data sets to compare data from satellite observations, meteorological parameters and model simulations on a global scale: (1) The database of the satellite measurements by GOME, GOME2 and SCIAMACHY which contains BrO, OClO and NO2 total columns (nadir, since 1995) and vertical profiles (limb, since 2002). (2) The global three-dimensional data of a nudged ECHAM5/MESSy1 atmospheric chemistry (EMAC) model simulation are available at the same time as the satellite measurements to get a better comparability between these two datasets. (3) The meteorological data we use is provided by the European Center of Medium-Range Weather Forecasts (ECMWF) analysis on a grid with a longitudinal and latitudinal resolution of 1.125° and a varying vertical resolution of model levels. We use the data at twelve o'clock each day between the 1st November 1995 and today. The following basic parameters are interesting for our comparisons: Temperature, pressure, height, potential vorticity, potential temperature and wind in all directions.
With this combination of global data sets over a timerange of more than ten years we are able to investigate differences between measurement and simulation data in order to estimate our understanding of chemical processes in the atmosphere. Additionally we can investigate possible correlations between chemical tracers and meteorological parameters for a long periode of time. In this presentation we want to show some examples and first results on these investigations.