Geophysical Research Abstracts, Vol. 7, 08820, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08820

Incremental 4D-var assimilation of ozone profiles in a comprehensive chemistry and transport model

H. Manzoni (1), S. Massart (2), V.-H. Peuch (1), D. Cariolle (2)
(1) Meteo-France (helene.manzoni@cnrm.meteo.fr), (2) Cerfacs

Atmospheric chemistry data assimilation is a fast developing field, with the increasing availability of remote-sensing columns and profiles for key atmospheric constituents. Chemical data assimilation is specific compared to assimilation in meteorology or oceanography, principally because the complexity and dimension of the atmospheric chemical system is well over what is possible to monitor from space or with in-situ devices. Methodological and technical developments are needed to build operational chemical assimilation systems, in order to reach the goals of the European Global Monitoring for Environment and Security program and of the international GEO iniative. Mto-France and CERFACS are jointly involved in the European project ASSET (FP 5), which focuses on the assimilation of chemical measurements from ENVISAT (SCIAMACHY, MIPAS, GOMOS). Our assimilation system comprises the MOCAGE comprehensive chemistry and Transport Model (CTM) of Mto-France and the PALM coupling and data assimilation software of CERFACS.

The 4D-var assimilation technique is of particular interest for remote-sensing chemical measurements, with a potential ability to give insight on atmospheric dynamics from the detected motions in some constituent fields, like ozone. However, the use of a full-bloom 4D-var assimilation system is not necessary an objective, because both of the under-determination of the chemical system and of the computational cost of minimizations. Already, 4d-var assimilation of ozone has been successfully achieved in some centers, but generally the forward model for chemical evolution is a simple linearised scheme, initially developed at Mto-France for climate-chemistry applications (Cariolles scheme). Though providing a satisfactory climatological behaviour, this linear scheme is a limitation in the trajectory calculation, compared to existing sophisticated chemistry and transport models that account quite nicely of homogeneous and heterogeneous chemistry in the lower stratosphere. The idea is here to develop an incremental 4D-var for the assimilation of ozone : the trajectory comes from the CTM MOCAGE, while an updated version of Cariolles scheme is used for the 4d-var minimization. The objective is to combine advantages : with the linear scheme for minimizations, the computational burden is acceptable, while the trajectory is computed with a state-of-the-art CTM. Comparisons of incremental 4d-var assimilation of ozone profiles (GOME, MIPAS) with 3d-fgat assimilation of the same data will be presented and discussed.