Geosci. Model Dev. Discuss., 3, C371–C373, 2010
www.geosci-model-dev-discuss.net/3/C371/2010/

Geoscientific Model Development Discussions

Interactive comment on "The Lagrangian chemistry and transport model ATLAS: simulation and validation of stratospheric chemistry and ozone loss in the winter 1999/2000" *by* I. Wohltmann et al.

Anonymous Referee #2

Received and published: 22 September 2010

This paper aims at describing a new lagrangian CTM with focus on the stratospheric chemistry modules, including calculations of homogeneous and heterogenous processes and of microphysical processes associated with PSC formation. This type of model (totally lagrangian) is not that widespread in the stratospheric scientific community and it is interesting to see its behaviour since it has been mainly developed with independent modules. This newly developed tool mainly differs from other lagrangian CTM by its calculation of the denitrification and sedimentation associated processes. One understands that the scope of the paper is not at this stage to make some sensitiv-

ity studies about the denitrification and heterogeneous chemistry modules. The results given in the manuscript and principally in a large supplementary material part are more than encouraging, though the reader may be impatient to see the potential advances theses modules will bring to the comparisons of HNO3 in the gas phase and amplitude of denitrification once thorough sensitivity tests will be made (in a subsequent paper?). A very positive point is the effort made by the authors to adequately use an extensive set of data (satellite, aircraft and balloons) both to force the model and to make some consistent comparisons for almost the measurable chemical compounds of the stratosphere. The plots provided as supplementary material could be used as a reference for those who are interested in the points that are well comprehended by CTMs and their limitations. Given the success of these first investigations using a new and independent tool I agree with the authors' comment that the CTMs overall skills and weaknesses are understood by the scientific community.

This manuscript being well-written, both concise and well-detailed with consistently associated references, I recommend its publication in GMD once the mostly minor revisions described hereafter have been addressed.

Specific comments:

-Table 5: I think it would be interesting and easier for the reader to add briefly in the table the technique used by the various described instruments (e.g. chromatography, tunable laser diode, UV-photometer, fluorescence, CIMS, ...). It would be also helpful to indicate the dates of observations and the locations of the measurements relative to the vortex: outer-vortex or inner-vortex.

-P780 lines 22-25: the way the authors infer HCl (to derive ClONO2 from the difference between Cly and HCl) is not clear. Please explain.

-P781 line 4: you mention about a contribution from short-lived source gases to stratospheric Bry which was discussed in the Salawitch et al. (2005) GRL paper. This leads me to the following question: why the ATLAS model does not take basically into account

this additional contribution of bromine (as an offset) which is estimated to be around 6 pptv? This could avoid some scaling of Bry at the beginning of each simulation.

- P781 lines 3 to 12 is described the method of comparison between measurements and model outputs. However it is to me not clear from which type of field chemical species mixing ratios are interpolated before calculating the chemical evolution forward in time. Similarly, I see in the supplementary material that some global comparisons are made between the species observed by HALOE and used to initialize the model. As a general question about the initialization process, please explain whether the model is initialized at a global scale for species that cannot be forced by satellite data, and if so how (I mean do you use general climatologies or outputs from other CTMs?). Comparisons with high-resolution aircraft data require a lot of trajectory calculations (example on figure 6). Could you remind the reader in this part of the manuscript some information about the typical rate of trajectory calculations (for example, one trajectory per 30 seconds or each 10-km along the aircraft path)?

- P784 line 2: suppress “in”

Interactive comment on Geosci. Model Dev. Discuss., 3, 769, 2010.