Atmos. Chem. Phys. Discuss., 10, C3483–C3486, 2010
www.atmos-chem-phys-discuss.net/10/C3483/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Forecasts and assimilation experiments of the Antarctic Ozone Hole 2008" *by* J. Flemming et al.

I. Stajner (Referee)

ivanka.stajner@noaa.gov

Received and published: 2 June 2010

This manuscript reports on forecast and assimilation experiments performed for the ozone hole season in 2008 using nadir and limb-viewing satellite instruments into models with three chemistry options. Sensitivity to the choice of assimilated data sets and to the choice of chemistry options is investigated. This investigation contributes to understanding of observational requirements for adequate constraint of ozone profiles and helps evaluate complexity of chemical representation that is needed for longer-term forecasting.

Specific comments are given below.

P. 9175, l. 24: MLS limb-viewing geometry may be the most important factor: Due to

unique meteorology of the polar vortex even assimilation of very sparse POAM data was shown to substantially improve fidelity of ozone hole representation (Stajner and Wargan 2004).

P. 9176, l. 24: Please give full names for MOZART-3, TM5, KNMI, GEMS. Also, P9181, l. 1: CBM4

P. 9178, l. 9: Stajner et al (2006) showed improvements in prediction of ozone in middle latitudes over several days from well-captured dynamical variability and improved initialization of ozone values in the polar vortex due to assimilation of ozone data from solar occultation instruments.

P. 9178, l. 11: Ozone chemical lifetime in the lower stratosphere can be on the order of several months (e.g. Coy et al 2007)

P. 9178, l. 20-24: Biases may not be due to chemistry. Note other common dynamical error contributions: excessive downwelling in the polar vortex, "leaky tropical pipe", excessive mixing across the polar vortex boundary, excessive stratosphere-troposphere exchange... Suggest rewording to: Biases in simulated ozone concentrations are due to accumulation of chemical and dynamical biases.

P. 9179, l. 13: Please provide model horizontal and vertical resolution and vertical extent.

P. 9180, l. 11: Clarify if c1, ..., c5 are global constants. How is the dependence on T<195K and sunlight needed for ozone destruction expressed in this formula?

P9181, l. 13: Provide a brief description of the 4D-Var method and a reference to a full description.

P9182, l. 19: Describe horizontal and vertical resolution of the assimilated observations.

P9182, l. 26: What kind of algorithm is used for the pseudo-random thinning?

ACPD

10, C3483–C3486, 2010

P9183, l. 9: How does data resolution compare to model resolution? Why were only OMI and SBUV observation errors changed to account for representativeness error?

P9183, l. 19: Please explain what is meant by ”without retrospective corrections”.

P9184, l. 7: Quantify the missing tropospheric column.

P9184, l. 12: Is the “diurnal variation” due to zonal asymmetry of ozone in the collar region around the ozone hole, with a climatological ozone maximum south of Australia?

P9184, l. 13: Were “faulty data” eliminated by the quality control prior to assimilation?

P9184, l. 20: What partial columns are integrated for the comparisons in Figs. 2 and 3?

P9185, l. 3, l. 6: Quantify low and larger

P9187, l. 13: How does 1 ppbv underestimation of stratospheric humidity compare with estimated errors of MLS humidity?

P9187, l. 25: Is 5% expected from missing upper part of the column based on climatology?

P9187, l. 27: Quantify good correlation.

P9189, l. 12: Does this scheme produce ozone loss in the dark?

P9190, l. 4: Suggest replacing “ozone hole” by “extent of the ozone loss”.

P9190, l. 11: Quantify “maintaining the positive impact”.

P9195, l. 10: How do weights given to observations differ from Greer’s? What observation and forecast errors are used here vs Greer et al or Coy et al 2007?

P9195, l. 24: Add Stajner and Wargan (2004).

References

ACPD

10, C3483–C3486, 2010

Interactive Comment

Coy, L., D. R. Allen, S. D. Eckermann, J. P. McCormack, I. Stajner, T. F. Hogan (2007), Effects of model chemistry and data biases on stratospheric ozone assimilation, Atmos. Chem. Phys., 7, 2917–2935, 2007.

Stajner, I., and K. Wargan (2004), Antarctic stratospheric ozone from the assimilation of occultation data, Geophys. Res. Lett, 31, L18108, doi:10.1029/2004GL020846.

Stajner, I., K. Wargan, L.-P. Chang, H. Hayashi, S. Pawson, and H. Nakajima (2006), Assimilation of ozone profiles from the Improved Limb Atmospheric Spectrometer-II: study of Antarctic ozone, J. Geophys. Res., 111, D11S14, doi:10.1029/

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9173, 2010.