

Interactive
Comment

Interactive comment on “Mid-latitude ozone changes: studies with a 3-D CTM forced by ERA-40 analyses” by W. Feng et al.

Anonymous Referee #1

Received and published: 10 August 2006

The paper gives a near up-to-date modelling assessment of the stratospheric ozone changes during the last 25 years by running a recent version of the SLIMCAT chemical transport model forced by the ECMWF ERA-40 meteorological analyses and interpreting the results of a set of experiments with different chemical forcings and treatments.

The use of the ERA-40 meteorology comes as an improvement to previous studies that used earlier re-analysis products (i.e. ERA-15) and this can be seen in the more realistic modelled inter-annual ozone variability in this work, especially during the 1990s. Less satisfactory agreement in the temporal variability still exists though (i.e. the large positive model ozone anomalies in the mid-1980s compared to the TOMS observations) or after 2002. These discrepancies (which this work usefully reveals) arise from the variable quality of the ERA-40 product in the 1980s or the change to operational

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ECMWF analyses in the last 3 years of the integration.

The main conclusion of this paper agrees with previous modelling studies that caution on the apparent recent total ozone N.H. recovery and point to dynamical contribution as an important driver of the recent changes and not on the chlorine loading levelling off/decrease. It also confirms the role of chlorine on the upper stratospheric ozone recovery. Another finding is the suggestion that the 5 ppt additional stratospheric bromine from short-lived species decreases total ozone by 10 DU but its contribution to the longer-term anomalies is small.

I find the paper well-written, thorough, interesting and enlightening and recommend publication to ACP subject to satisfactory dealing of the following issues:

1. The model ozone mid-latitude anomalies were constructed using the model output “saved once per month” (as caption in figure 4 states). Then: a) How much representative and trustworthy are the annual means of model ozone if they are derived only using the monthly snapshots? b) The satellite ozone annual mean data used in the anomalies in figure 4 are probably derived from the monthly averages of the merged TOMS/SBUV NASA/Stolarski total ozone dataset which presumably arise from the averaging of a population of daily values. How consistent the comparison with the model ozone data would then be? c) The de-seasonalised model time-series in figure 3 are again derived from monthly snapshots (please clarify in the figure 3 caption)? If yes, could that partly explain the apparent overestimation of the observed total ozone?

2. The “accentuated” N.H. ozone decreases in the 1993 anomalies in figure 4 do not seem consistent with the slight overestimation of the satellite data by the model ozone in the de-seasonalised time-series in figure 3 in 35-60N. Shouldn't the two figures give a more similar comparison with the observations? Is it due to the 12-smoothing? How do the anomalies look if a 24-month running were applied, like in previous studies of long-term ozone changes (WMO 2003)?

3. Does the modelled ozone feed back in the radiation scheme? Please clarify in the

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model description.

Technical Comments (Typos):

Page 6697, line 28: “alot” should be “a lot”

Page 6698, line 20: “decadel” should be “decadal”

Page 6704, line 4: did you want to write “although the maximum” instead of “through the maximum”?

Page 6704, line 16: “shows” should be “show”

Page 6706, line 11: “gives” should be “give”

Page 6706, line 16: “alot” should be “a lot”

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 6695, 2006.

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