Atmos. Chem. Phys. Discuss., 5, S291–S293, 2005
www.atmos-chem-phys.org/acpd/5/S291/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fall vortex ozone as a predictor of springtime total ozone at high northern latitudes" *by* S. R. Kawa et al.

S. R. Kawa et al.

Received and published: 1 April 2005

We thank reviewer #3 for his/her clear interest in the manuscript. We will incorporate the comments in a revised version. Here we respond to several questions raised in the discussion.

General: We have tried correlating the March and November ozone time series with the monthly NAO index (http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii) as well as J-F-M and S-O-N three-monthly averages. No significant correlations are found. For example, r = 0.26 for November POAM O3 at 600 K with S-O-N NAO and 0.36 with Nov NAO. Correlation of March total O3 with J-F-M NAO is slightly negative.

Specific comments:

1. We assert that no one can predict NH high latitude O3 better than about 50 DU because this is the approximate annual variation for 1990-2004 as measured by +/- 1 standard deviation from the mean (7.2%). We know of no reliable predictor of spring ozone on a time scale of 4 months or more (prior to the present work).

2. SBUV is sampled in the vortex in the same way as POAM except that only one potential temperature level (600 K) is used for SBUV.

3. The correlation goes to 0 above 1000 K.

4. The separate model test referred to here is a pair of runs of the Goddard off-line CTM using GCM winds. One realization holds Cl and Br fixed at 1979 mixing ratios. This is contrasted to a meteorologically parallel run with Cl and Br increasing according to observed trends.

5. The residual influence of halogens from the aforementioned run is the difference in O3 between the fixed Cl/Br run and the increasing Cl/Br run. Since the dynamics are identical and uncoupled to the chemistry, the difference after removing the annual trend is the second-order, non-linear chemical effect of Cl and Br on O3 loss.

6. November total O3 here is from TOMS, so the comparison is between November and March TOMS. TOMS is the best data set for column O3, and no additional information would be gained by integrating POAM or SBUV.

7. The correlation coefficient between March and prior November TOMS averaged for samples in the vortex at 650 K is 0.5 for 1992-2003. This is consistent with Figure 6 and the fact that total O3 in general is very well correlated with O3 near 500 K.

8. At the reviewer's suggestion, we tried the J-F-M average heat flux in correlation with the November O3 data and found the maximum correlation to be about 0.4 over a small area, which is comparable to that of the individual months. We did not pursue different combinations of months further since there does not seem to be any physical basis to

ACPD

5, S291–S293, 2005

expect a correlation that would not appear in any individual month.

i. We agree that diagnosing correlations in models with more realistic variability could be a useful tool, but that is beyond the scope of the present study.

ii. We have not looked for similar correlations in the Antarctic since the dynamical variability is much smaller there; perhaps in a separate study as suggested by the reviewer.

iii. More of the data description could be included in an appendix, but we feel that it is important to recognize the limitations and strengths of the measurements with respect to the observed phenomenon, and, thus, that the description is more appropriate for the main text.

iv. Technical corrections will be addressed in the revised manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 155, 2005.