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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.

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We thank reviewer #1 for his/her interest in the manuscript and positive comments. We will incorporate the specific recommendations in a revised version. Here we respond to several questions raised in the discussion.

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%) as seen in Figure 1. We know of no reliable predictor of spring ozone on a time scale of 4 months or more. The statement does not directly refer to WMO (2003). The reference to WMO (2003) for Cl and Br trends is to

Chapter 1.6-1.8.

2. We will enhance the caption to better illuminate the heritage of Figure 1. This is not the first time the greater variability of March total O3 through the 1990s has been noted. The cited Waugh et al. reference, Randel and Wu [1999], and others have noted this in the context of wintertime dynamical variability.

3. 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. Since the dynamics are identical and uncoupled to the chemistry, the difference after removing the annual trend allows us to quantify the contribution of Cl/Br in enhancing the low O3 during cold years in the model.

4. The point of this paragraph is that both transport and chemistry contribute to the variability of March O3 in concert, and that both are driven by dynamical variability as noted. The apportionment of O3 variability to chemistry or transport is not at issue here. We simply recognize that both respond to dynamical forcing which produces the observed variability in O3.

5. The variability of November vortex O3 near 650 K (3.3+/-0.3 ppmv) is small compared to the overall range of O3 observed at this level at high latitudes, approximately 2.5 to 7.5 ppmv (Kawa et al. [2002] Figure 5). The statement in the text is intended to convey this perspective. On the other hand the range of average column O3 observed in March, 350 to 465 DU, covers a substantial portion of the overall observed range at high northern latitudes, approximately 200 to 520 DU [Newman et al., 1997].

6. The 50-year run under discussion was run off-line with winds from a GCM; ozone in the GCM radiation was fixed to climatology. Neither model discussed produces a QBO similar to observations.

7. The possible role of tropical dynamical forcing is discussed at some length in the

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comment by Dr. Lon Hood and the authors' reply. Please refer to these discussions.

8. The dashed line in Figure 5 is a least squares linear fit to all data points. Although neglecting the 1993 data point improves the correlation coefficient significantly, the fit line changes very little (m=118.2 and 127.6 DU/ppmv while b=24.7 and -4.3 DU, respectively).

Technical corrections will be addressed in the revised manuscript.

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