

## Response to Comments of Reviewer #2

I appreciate your careful reading of my manuscript and your comments about it. Below are my replies to them. Further, I am re-organizing and refining some the material for the revised manuscript in accordance with the suggested changes and comments of Reviewer #1.

1 and 2--Changes have been made.

3--Material has been added to the text to explain how the effects of sunrise (SR) versus sunset (SS) differences are handled for the time series analyses in this study. Occultation measurements are always made at a solar zenith angle near  $90^\circ$  and near 6 a.m. and 6 p.m. local time (at the low latitudes). The inclusion of both SR and SS measurements in an ozone time series for a given latitude bin is helpful because it provides twice as many points for resolving the annual and the semiannual terms, in particular. The semiannual terms have their largest amplitudes at the low latitudes. However, the small, but systematic SR/SS differences in the ozone often impart significant variations to the de-seasonalized time series residuals. In fact, those residuals are characterized by lag-1 autocorrelation coefficients that are slightly negative. The approach used herein for the time series of the SR plus SS data points is to analyze the time series of SR points and then that of the SS points. The constant terms of the MLR models are slightly different from the analyses of those two time series. Following that, the SR points and the SS points of the separate time series are adjusted by half that difference before combining both sets of points into a single time series for a final MLR analysis. Lag-1 autocorrelation coefficients are positive for the residuals of the de-seasonalized final time series, as expected because changes in zonal mean atmospheric ozone tend to occur slowly or over weeks rather than days. I have found that the mean, SR/SS difference profiles generated by this approach, as applied to the HALOE-retrieved and bin-averaged temperatures, show a close agreement with the expected variations from the diurnal temperature tide.

4--I agree that de-noxification is the likely explanation, although I have not conducted a separate study of that prospect. A sentence has been added, pointing out that likelihood.

5--The change has been made.

6--To be clearer, I now give an altitude range for the -4%/decade trend.

7--The change has been made.

8--The SR and SS data adjustments that I described in my reply above to point (3) also work reasonably well for the alternating periods of the SAGE II SR and SS measurements after about 2000. One difference, however, is that the time series of combined SR and SS data points no longer yields negative autocorrelation coefficients at lag-1 during the period after 2000.

9--The reference Dhomse et al. is added now.