Author comment on ACP-2017-575 "The Impact of Non-uniform Sampling on Stratospheric Ozone Trends Derived from Occultation Instruments" currently in discussion.

We have been giving a great deal of thought on the best practice for evaluating derived trend uncertainties as they pertain to the two orthogonal EESC components. Currently, the paper says the following on this topic:

> "*We compute trends and uncertainties using the resulting two orthogonal EESC-proxy functions. Unlike a piecewise linear trend term, the EESC-proxy terms are comprised of two separate temporal coefficients and uncertainties with functional shapes that are nonlinear, making a simple determination of the resulting overall trends and uncertainties impossible. Instead, we take the EESC-proxy component of the fit evaluated at 10 points per year over a desired time period and their uncertainties and compute a simple weighted linear fit to this data. The resulting slope and uncertainty in the slope yield the trend and uncertainty values.*"

Unfortunately this method is somewhat flawed, as the resulting uncertainties will scale with the square root of the number of points in the generated time-series that was used to compute the linear fit. It was by pure coincidence that the choice of N here (i.e., 10 points per year) produced uncertainties that were approximately reasonable. Ultimately, the uncertainties in the reconstructed EESC-fit are only the result of the two EESC coefficient uncertainties. As such, we decided the best way to relate a linear fit to the EESC-fit was to draw a corollary to the uncertainties associated with a straight line fit.

Consider that the EESC-fit is a time-series of values and uncertainties created from the EESC coefficients and uncertainties:

$$y(t) = C_{EESC1} f_{EESC1}(t) + C_{EESC2} f_{EESC2}(t)$$

$$\sigma_y(\mathrm{t}) = \sqrt{\sigma^2_{EESC1} f^2_{EESC1}(t) + \sigma^2_{EESC2} f^2_{EESC2}(t)}$$

and we fit a straight line to that data (over a select time period) with the following functional form:

$$y'(t) = c_0 + c_1(t - t_0),$$

$$\sigma_{y'}(t) = \sqrt{\sigma_0^2 + \sigma_1^2 (t - t_0)^2},$$

where y' is the best fit to y and c_0 and c_1 come from the linear fit but the difficulty is determining σ_0 and σ_1. It is worth noting that, for the linear fit to the EESC-fit, the choice of t_0 is somewhat arbitrary when we only care about c_1. It is from these equations that we draw the correlation between the linear equation and its functional uncertainties (i.e., $\sigma_{y'}$ that are unknown) and the actual uncertainties from the EESC-fit (i.e., σ_y). From the above we have

$$\sigma_{y'}(\mathrm{t_0}) = \sigma_0$$

to which we draw the corollary

$$\sigma_0 = \mathrm{MINIMUM}\{\sigma_y(\mathrm{t})\} = \sigma_y(\mathrm{t_0})$$

that yields σ_0 and t_0. From there, we can look at σ_1:

$$\sigma_1 = \sqrt{\frac{\sigma_{y'}^2(\mathrm{t}) - \sigma_0^2}{(t - t_0)^2}}$$

to which we draw the corollary

$$\sigma_1 = \mathrm{AVERAGE}\left\{\sqrt{\frac{\sigma_{y}^2(\mathrm{t}) - \sigma_0^2}{(t - t_0)^2}}\right\}.$$

Thus, using a direct correlation between the EESC-fit and the functional form of the linear fit, we can use the uncertainties in the EESC-fit to derive the uncertainty in the fitted slope.

In addition to the uncertainties, we also need to add a correction to the submitted discussion paper. Upon initial submission, the figures that were compiled with the LaTeX file were correct. However, between the initial submission (viewed only be reviewers) and the submission for discussion, a code change was made that introduced a bug and resulted in the wrong images being accidentally uploaded. The now correct versions of figures 10, 11, and 14 are below, which fix the bug and also include the updated uncertainty analysis from above. We need to point out that while these corrections do slightly modify the trend and uncertainty values, they do not change the overall message of the paper in any way. These corrections will be incorporated into the next revision of the paper.

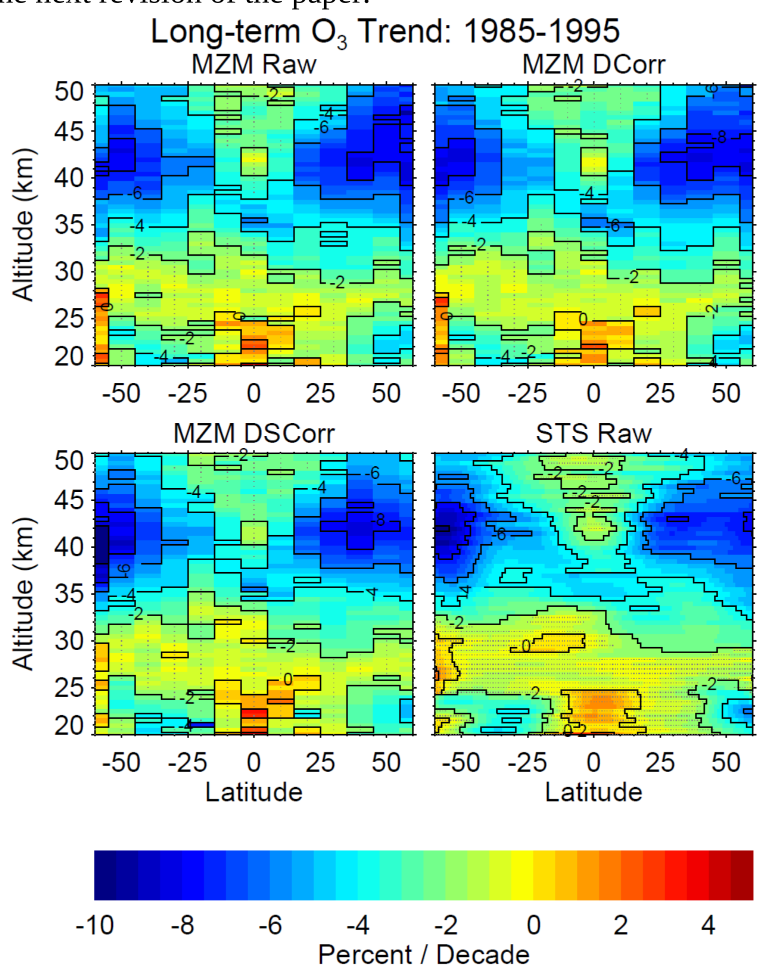

Figure 10: Corrected version for the discussion paper.

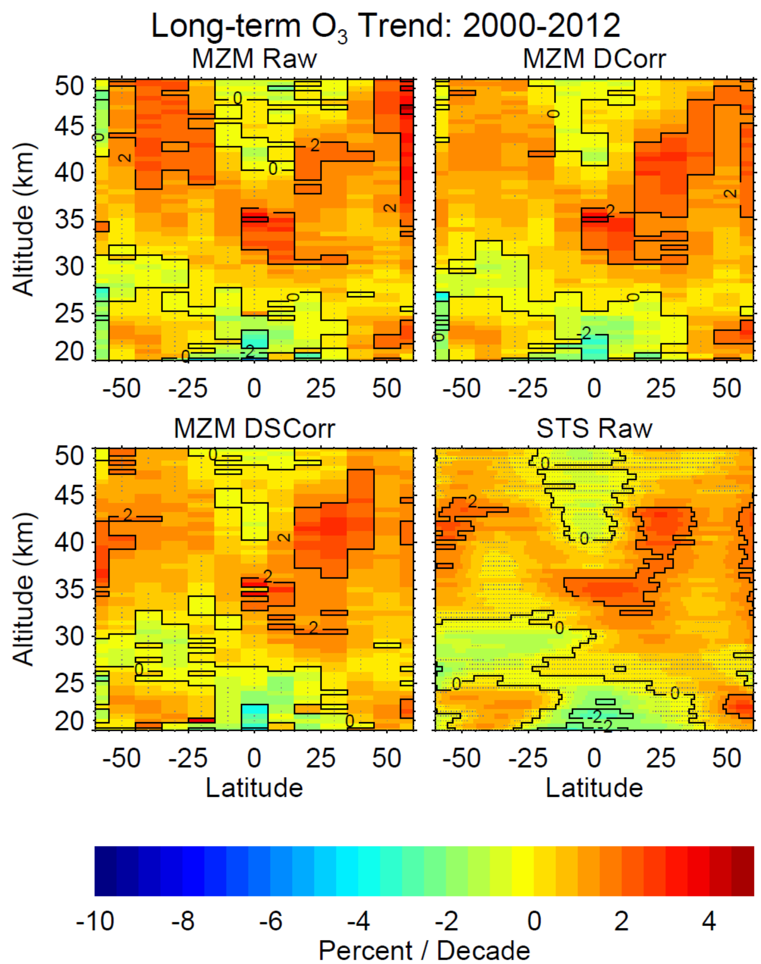

Figure 11: Corrected version for the discussion paper.

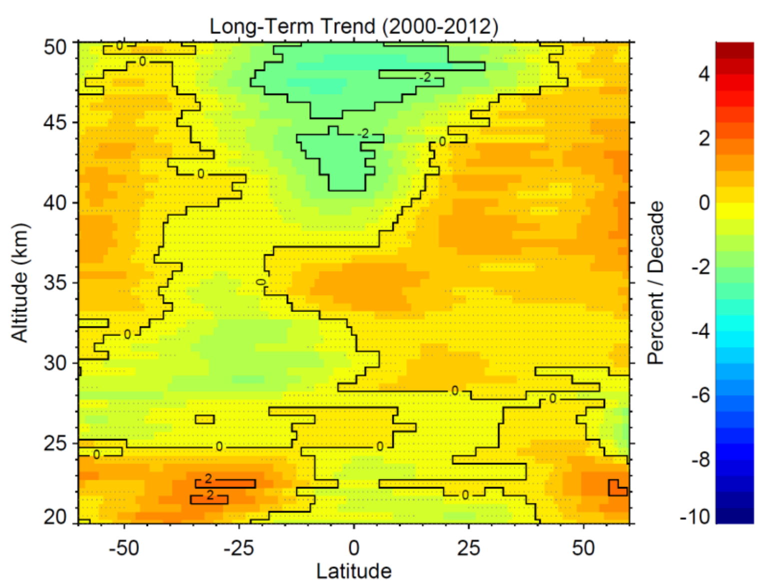

Figure 14: Corrected version for the discussion paper.