We thank the reviewers for the positive and constructive reviews. We include below detailed responses to the individual comments. One important change to the paper in response to the reviewer comments is that we now focus on the (T/O3) ratios rather than the (O3/T) ratios, which allows direct evaluation of the ozone feedback onto temperature. This is a straightforward change in our calculations and presentation of results, with corresponding changes to Figs. 1c, 5, 8 and 9. We have also revisited our calculations of T-O3 phase difference from observations and have corrected a previous sign error, resulting in better agreement with the idealized model (new Fig. 8b).

Reviewer 2

Review of Randel et al. "A Simple model of ozone-temperature coupling in the tropical lower stratosphere"

This study examines the strong correlations between ozone and temperature variations in the tropical lower stratosphere over a range of time scales using both ground-based ozone/temp. from SHADOZ balloon measurements and satellite based measures combining MLS ozone with GPSRO temperature measurements. Noting the strong in-phase relationship largely driven by circulation variations. The authors work through the process of developing a simple model for this relationship and discuss the timescales, locations, and feedbacks that are operating. The paper is well organized and clearly written and would be a very welcome addition and certainly of interest to the readership. I think the paper could be published as is but I have a couple very minor comments that the authors might consider.

Thanks for the positive comments.

There is discussion (page 8) of the photochemical control becoming dominant above 27 km, I would imagine that there is still some significant contribution at 24 km since it is in the transition region, how much of the O3/T relationship is begin impacted by photochemistry (might be opposite direction, i.e. increased T decreased O3) at that level.

The ozone photochemical lifetime at 24 km is >100 days, and photochemical changes are small compared to dynamic variations. Furthermore, the O3/T results at 24 km agree quantitatively with the model with no photochemistry (aside from ozone damping). From Fig. 9, the idealized model (transport only) works quantitatively well up to 27 km.

Lines 275-277 and figure 8 related to the unexplained difference in the semi-annual - annual (X sigma/T sigma) magnitude, this is referenced to 24 km, although lines 284-285 mention similar behavior over a range of altitudes. Does the vertical behavior provide any additional information? Is there any way to look at SHADOZ beyond just the QBO periodicity, do the SHADOZ profiles have to be deseasonalized.

We've looked carefully at the vertical structure of the observed and modeled spectra, but the behavior is similar at other levels and we decided to focus on one level. We examined various

vertical profile diagnostics but could not find anything additional to add. The annual cycle and QBO signals are the dominate variability in SHADOZ data, and we focus on those signals.

For Figure 9 why does the SHADOZ amplitudes only go to 24 km and in this figure there is SHADOZ data for annual cycle so is it not deseasonalized for this figure. From the levels that are shown the amplitude of the annual response from SHADOZ is a bit smaller than the model with MLS/GPSRO showing much larger amplitudes and a growing difference above 22 km, any thoughts if the difference in vertical resolution between the relatively lower resolution ozone and higher vertical resolution GPSRO temperatures could be playing a role or something else.

The large annual cycle in ozone and temperature occur over altitudes ~16-22 km in the lower stratosphere, and variability is primarily semi-annual above ~24 km. Hence we focus the annual cycle comparisons over altitudes up to 23 km in Fig. 9b, and do not include SHADOZ or MLS/GPS above that level (changed from the previous version). There are some small differences between the SHADOZ and MLS/GPS annual cycle results (due to vertical resolution and very different sampling, among other things), but overall there is quite reasonable agreement with the model calculations up to 23 km.

Have you considered looking at what the MLS Ozone/MLS Temperature amplitudes would produce?

The MLS temperatures agree well with GPS data, but have somewhat lower vertical resolution. We have not redone the calculations using MLS temperatures.