

## ***Interactive comment on* “Stratospheric ozone interannual variability (1995–2011) as observed by Lidar and Satellite at Mauna Loa Observatory, HI and Table Mountain Facility, CA” by G. Kirgis et al.**

### **Anonymous Referee #1**

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This paper presents an analysis of long records (16 years) of lidar stratospheric ozone measurements at two locations. These data represent the state-of-the-art in lidar ozone observations; they are valuable for their high vertical resolution and continuity, and are highly complementary to ozonesondes and satellite measurements. A useful part of this study is the direct comparisons with co-located satellite data, and the results look similar in many aspects. The analyses focus on examining interannual variability based on standard multivariate regression analyses, which in theory would be useful for comparison with many previous studies. However, I find that the results are difficult to interpret and understand, as almost everything is presented as statistical reconstructions of the data, and there is very little discussion of the statistical signifi-

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cance of the individual terms (in other words, critically identifying components actually present in the data). The overall variability of the individual terms are small ( $\sim \pm 5\%$  monthly variations), and in my opinion it is important to quantify exactly where the individual regression fits are statistically significant before attempting to interpret the results. As the paper stands now, I cannot determine what signals are truly captured in the measurements vs. what are simply reconstructions from the regression model.

While I think this study is valuable, I suggest a slightly different analysis highlighting the vertical profile of the regression fits along with the statistical uncertainties, for both the lidar and satellite results. The results can be discussed and interpreted for altitudes where the fits are significant (are similar results seen for the lidar and satellite data? do the patterns make physical sense?). I suspect that some of the smaller terms (solar, ENSO, transport) are not significant over much of the domain for one station or the other. Identifying the vertical structure of the terms that are significant would be a strong contribution for this paper, and allow straightforward comparisons to other studies.

Minor comments:

- 1) I don't really understand the details of Section 3.3 (perhaps I need to digest Mader et al, 2007). A straightforward method to select terms for the regression is to determine if the individual terms are statistically significant in the results (as discussed above).
- 2) Trying to separate trends based on ODGI vs. linear trends seems like nonsense to me, given that the ODGI time series in Fig. 4 is nearly a straight line.
- 3) I very much like the lidar-satellite comparisons in this work, although comparing the regression fit time series is an obscure way to examine these results. Are there any systematic patterns to the differences in the time series in Fig. 1?

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