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Atmospheric Chemistry and Physics Discussions

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.

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We thank referee #1 for his positive constructive comments and in particular on his suggestions to represent and emphasize the statistical significance of our results. We therefore added a full paragraph to discuss those, and a couple of new figures (Figs. 6a and 6b in the revised manuscript). The details are reported below.

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).

We agree that it is crucial to show the statistical significance of our results. We therefore added a full paragraph as well as two new figures (figure 6a and 6b). The new paragraph reads: " Statistical significance and seasonal dependences of the main proxies used in the model (SC11, ENSO, ODGI and INTEQL-H) are presented on figures 6(a) and 6(b). The figures show the seasonally dependent responses calculated by the regression analysis for the lidar and satellite time series. The shaded regions indicate that the results are not significant at the 2σ confidence level. As the most commonly used proxy, QBO results are significant enough not to be presented here. The EPf proxy is not shown either, this time due to its low significance, possibly due to the fact that ozone is only transported through midlatitudes and that vertical transport is restricted to lower and higher latitudes (Wohltmann et al., 2007). For both stations, similar degrees of significance are observed at the same range of altitude. On exception is for TMF and SC11. In this case, similar positive patterns are observed only between October and December. The lack of measurements at TMF during the solar cycle 23 does not allow us to use lidar results for this proxy. We used the plots of figure 6 to select representative altitudes for our subsequent results. At MLO, for SC11, a positive response is observed between 30 and 40 km from spring to fall and opposed to a negative response between 20 and 25 km in winter. QBO responses are clear and very similar from one dataset to another. A strong negative response is observed in summer in the middle stratosphere as well as a positive response in winter in the lower and upper stratosphere. ENSO responses are in average positive from spring to fall for both stations in the middle stratosphere and in winter in the upper stratosphere. At MLO, the response in the lower stratosphere is negative early in spring and characterized by a strong negative perturbation. For ODGI, at MLO, a positive response is shown in winter in the middle stratosphere (from January to April at 30 km). Above 30 km, a negative response is shown from September to December. Nevertheless, the strong negative response in the lower stratosphere found with lidar time series is confined to January, May and December on the satellite plot. For horizontal transport, the results obtained from the satellite time series show a higher degree of statistical

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significance, but the responses are lower in magnitude. At MLO, two negative similar patterns are observed between 24 and 34 km from January to April. At TMF, a positive response is seen from February to May from 28 to 34 km, followed by a negative one from June to December. The same responses are observed between 20 and 24 km. For each explanatory variable except EPf (low statistical significance), the lidar and satellite responses will now be detailed and the correlation between these responses will be presented."

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.

We agree with referee #1 that the ODGI slope looks like nearly a straight line. Our emphasis here is indeed on the “nearly” ", i.e., we take into account four (small) breaks in the slope.

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?

The time series showed in Figure 1 are also compared using the correlation coefficient values noted on the right hand side of the figure. They are also compared by the RMS on top of figure 2. There is no real systematic patterns common to both site. There is a negative then positive bias between TMF time series and Aura/MLS values at 40km, which is mentioned in the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 30825, 2012.

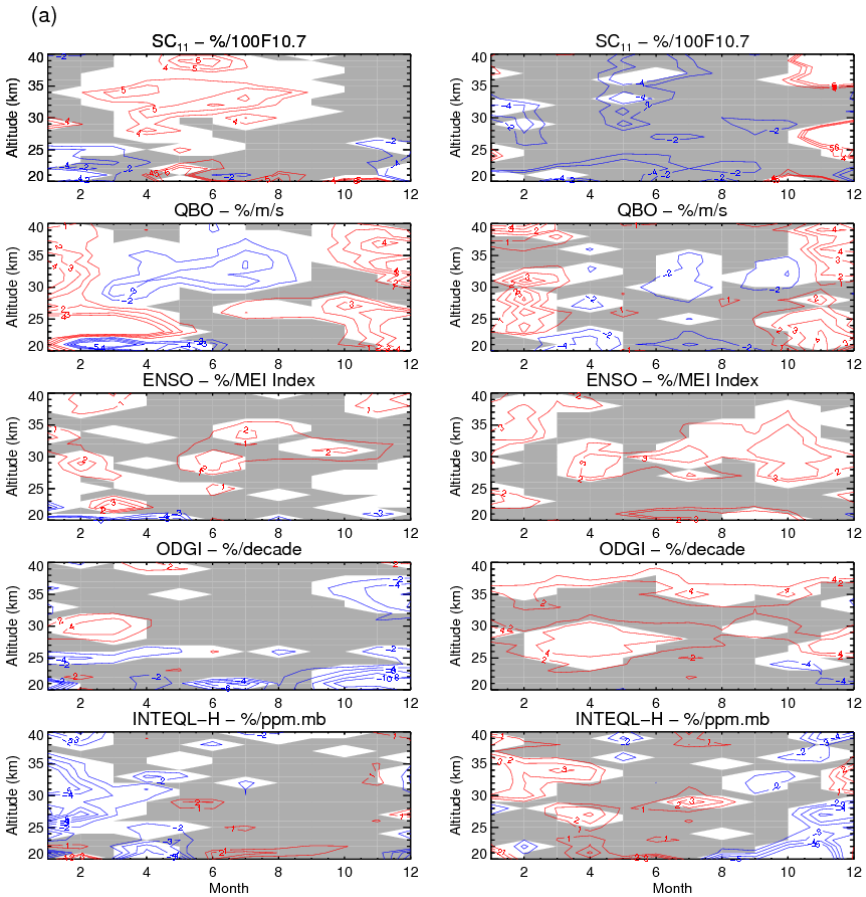

Fig. 1. Seasonally dependent response to the most influent proxies as calculated by the regression analysis with lidar (a) and merged satellite (b) time series. MLO (TMF) results are on the left (right).

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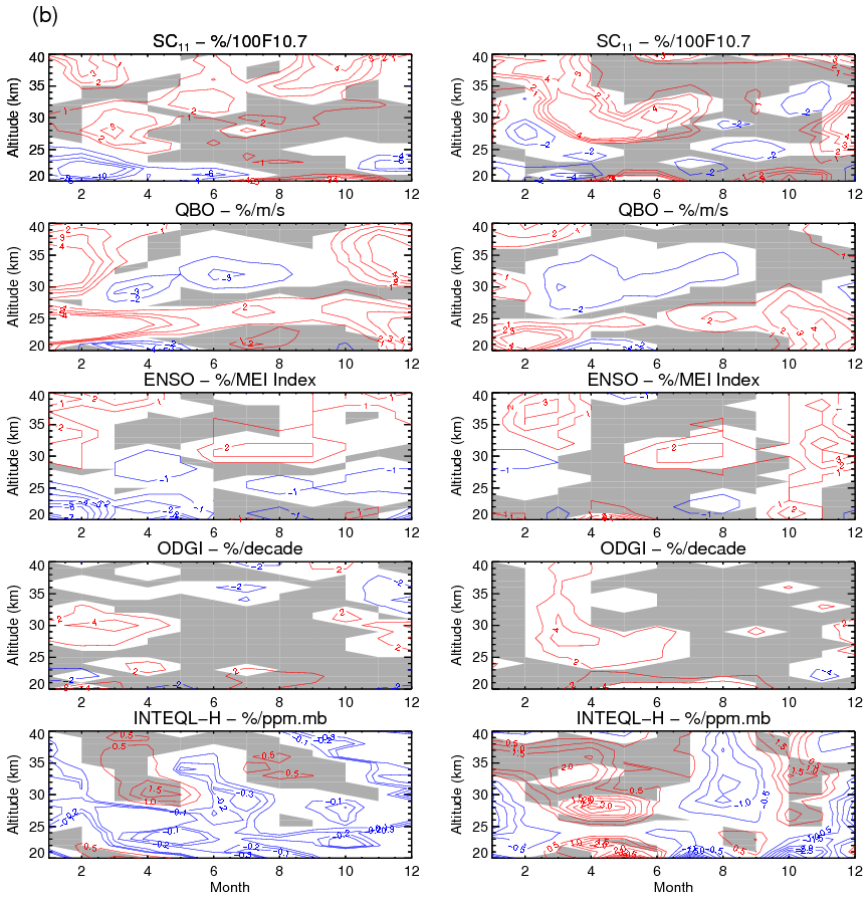

Fig. 2.

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