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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Free troposphere ozone and carbon monoxide over the North Atlantic for 2001–2011" *by* A. Kumar et al.

Anonymous Referee #1

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This paper presents an analysis of the Geos Chem model with some observations from the Pico observatory in the Atlantic. What the observations are very important at this site, I am not convinced that they support a clear indication of a trend. The observations appear to be limited over this 10 year period, with some years having no data and most years having no seasonal information. So overall, it appears to me that the authors have largely based the trend analysis on the model results and set out to support or "prove" this trend using the observations. The limited comparison of the data with the model (Figure 2), only compares monthly means, which provides very little insight into the models capabilities. I would suggest that the authors do a much better job at explaining what the observations really show, then to see if the model can reproduce the observations before talking about trends.

Key points:

1. Don't understand how you can fit with sinusoidal given limited data on annual cycle. While this fit is statistically significant (given the large number of data points), from figure 2, it does not appear to have a very high R2 and thus must be viewed with caution.

2. Only the seasonal cycle in the model is compared with the observations. This tells us very little. What other model evaluation for Pico have you done? The source analysis (table 4) depends critically on the model capturing day to day variations.

3. Model and satellite data are not independent, given apriori. What model is used in apriori and can you demonstrate that the satellite data show some reasonable agreement with the observations beyond the seasonal cycle.

My impression overall, is that it seems like you want to "prove" the model trend, rather than presenting an unbiased analysis of the observations.

Detailed comments:

P 15380, Line 9: decreasing trend is the second derivative. I don't think this is what you mean. 15381, line 10: This is very puzzling. Every other mtntop station reports a diurnal cycle in upslope/downslope (eg MLO, MBO, Jungfraujoch). Comments? Line 23: There are biases in the day vs night AIRS data. See some of the recent AIRS analyses on this. 15389, line 19: Can you clarify the meaning of 1/3 in this context. 15391, line 20+: I find the model-observation comparison very limited (seasonsal cycle) and not helpful in this regard. The satellite comparison is suspect because of the apriori influence. It would be more convincing to do daily comparisons of the model, obs and satellite. Without this, the results are not convincing.

Table 2: Need R values. Figure 1: Not needed. Standard information. Figure 2: Appears to present the only model-obs comparison. Very limited in scope. Figure 3: Data are critical, but hard to see and certainly don't seem to fit the model very well.

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They appears to be very little data covering the full season and many years are missing. Need more convincing to demonstrate a trend in the observations.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 15377, 2013.