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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Interrelated variations of O_3, CO and deep convection in the tropical/subtropical upper troposphere observed by the Aura Microwave Limb Sounder (MLS) during 2004–2011" *by* N. J. Livesey et al.

Anonymous Referee #2

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Review of "Interrelated variations of O3, CO and deep convection in the tropical/subtropical upper troposphere observed by the Aura Microwave Limb Sounder (MLS) during 2004–2011" by N. J. Livesey et al.

In this paper MLS observations of upper tropospheric O3, CO and IWC are presented in form of biweekly regional (15°latitude, 30° longitude) averages. The geographical and temporal variability of the data are described in detail with an emphasis on seasonal and interannual variations. The presented data set may provide a valuable tool for the evaluation of Chemical Transport Models (CTMs). In general the paper is well

written and of interest for the scientific community. Publication of the manuscript is recommended after addressing the following comments.

Page 18674, Line 7: What about limb scattering (e.g. OSIRIS)?

Page 18677, Line 7-8: Please explain what ''iterative fitting ... cloud ice product" means.

Page 18680, Line 3-4: '' and summer over the North Atlantic ..." not clear which panel this statement refers to. Please add information.

Page 18680, Line 23: There is no 8Nb in Figure 1.

Page 18680, Line 21: Does this mean that regions with a strong seasonal signal also show strong interannual variability? Or that interannual variability is pronounced during times of largest ozone abundance?

Page 18681, Line 18: Which long term average is used here? The same as for the MLS data? In this case wouldn't it make more sense to compare the individual years where sufficient sonde data is available?

Section 4.1 and 4.4: The relation between ozone and convection is not explored in a clear way and the reader is left somewhat confused about the fact if and how well they are anticorrelated. Section 4.1 states that there is an anticorrelation between ozone and IWC MLS data and refers to some regions displayed in individual panels. However, this argument is hard to follow (and check) since the species are shown in different panels. The correlations in Figure 6 and 7 (indicated by the symbol size versus ozone on y-axis) are not easy to interpret either (however, for most panels there seems to be no real anticorrelation). A clearer presentation of this issue is needed. This could either happen through improved Figures (maybe also show correlation between O3 and IWC directly) or through additional information on the correlation coefficients (enlarge Figures 6 and 7 and add correlation coefficients between O3 and IWC where statistically significant) or through presentation of O3 and IWC seasonal cycles in the

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same panels.

Summary (or elsewhere): Has a similar analysis been conducted for other levels above and below? Which ones of the presented features are valid for a deeper altitude range and which ones are only found in the 215 hPa level? Even though it will be impossible to give a complete answer to this question some information will help to connect results presented here to other studies.

Figures 1-4: While the presented Figures contain a large amount of detailed information they are hard to read. Red lines in Figures 3-4 are not really necessary since the interannual variability is shown by the standard deviation. The numbers (S and V) need to be larger and more easily readable. Maybe it is better to group different areas instead of different species in one Figure.

Figures 6-7: Varying symbol size indicating the IWC does not help to understand the relation between IWC and O3 or CO and complicates the plot unnecessarily.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 18671, 2012.