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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of ozone profiles from DIAL, MLS, and chemical transport model simulations over Río Gallegos, Argentina during the spring Antarctic vortex breakup, 2009" *by* Takafumi Sugita et al.

Anonymous Referee #2

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This article describes stratospheric ozone comparisons between the differential absorption lidar (DIAL) measurements of Rio Gallegos, Argentina, the Aura Microwave Limb Sounder (MLS) satellite observations, and the MIROC Chemistry-Transport Model (MIROC-CTM) outputs. The manuscript is well-written, and contains results from rare observations from a southern hemisphere ground-based station, making this contribution worth-publishing, after the few minor comments listed below can be addressed adequately.

Page 5, lines 8-15: What altitude variable is being used for conversion to pressure? (is

it the MLS-provided geopotential height?) Is geopotential height converted to geometric altitude? Please provide more details here

Figure 1, right panel: Can the combined (MLS and DIAL) uncertainty be added to the plot. This woudl show the differences int he context of their uncertainty estimates

Figures 2 and figures 3: Please add approximate geometric altitude for convenience Also, I would recommend showing differences in percent as well.

Page 7, lines 26-29: The explanation of model high bias is not convincing. Could the bias be related to inaccurate/incomplete chemistry causing in-vortex ozone loss to be underestimated? Please provide additional details supporting this statement.

On the use of meteorological fields: MIROC-CTM apparently uses ERA-based meteorological fields. However meteorological fields from GEOS-5/MERRA-2 are used for the other work described here (PV calculation, pressure/altitude conversion etc.). Would it be possible to use the same dynamical fields for improved consistency? If not, some discussion on the implications of using different met fields should be added, for example in section 3.

Figure 6b, (X-DIAL)/(X+DIAL)*200: I think plotting differences between instruments should not be done with respect to the mean of the 2 instruments. Biases between instruments are better identified when one instrument is used as the reference (typically, the instrument believed to have a best accuracy). I would recommend to modify figure 6b by taking DIAL as the reference, i.e., plot (X-DIAL)/DIAL*100 instead.

Page 9, lines 26-34: Below 70 hPa, large percent differences between observations are typically expected due to the lower ozone mixing ratio values at the bottom of the stratosphere, and occasionally also due to the proximity of the tropopause. The lidar signal saturation is a possible reason for the low bias, but the large percent differences are likely associated with the loss of sensitivity in this region of low ozone concentration

Conclusion: There is little discussion on the CTM outputs, especially the low ozone

bias inside the vortex at 18 hPa. This finding deserves some digging to my opinion, including references to published works on the subject. Finally the conclusion should emphasize the crucial importance of the DIAL station location and the dearly-needed continuation for long-term measurements there for NDACC.

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