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Atmospheric Measurement Techniques Discussions

Interactive comment on "Impact of aerosol size distribution on extinction and spectral dependence of radiances measured by the OMPS Limb profiler instrument" *by* Zhong Chen et al.

Anonymous Referee #1

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1 General Comments

This article discusses the retrieval of stratospheric aerosol extinction profiles using the OMPS-LP measurements. The authors use a gamma particle size distribution derived from the CARMA model instead of the standard lognormal assumption, and it is found that this helps to improve the spectral response of the modelled signal at 20.5 km. The approach is a novel one and valuable to the limb scattering aerosol retrieval community. The writing is concise, and the material is generally well explained; after the following minor edits I recommend publication.

2 Specific Comments

Some additional information on how and why the CARMA ASD was chosen would be beneficial. It is not clear what sampling is used to derive the parameters in Table 2. What years are the June-July-August data from, what altitudes are used, etc. Is a single GD chosen due to retrieval requirements, or other reasons? Why is sampling near Laramie important if the balloon data is not compared against?

Figure 1: Usually the majority of the increase in extinction is attributed to Ruang/Reventador in late 2002 (from the figure it appears the increase starts before 2003) and Manam in 2005 (eg. Vernier et al, 2011). Is there a reason the increase is attributed to Anatahan here?

Figure 2: Why is only the 20 km altitude shown in panel B? Also, why are only select CARMA radii used as comparison points (red dots) in panel B and not all of them?

Page 5, Line 15-16: It is not clear that a Gamma distribution is better from this plot, particularly for the 25 km distribution, which appears bimodal. Maybe a fitted lognormal distribution in panel B as a reference would make this clearer?

Figure 7: More information on this plot is needed. Is this a simulation at each scattering angle shown, or an average over many orbits? Is this using real data or simulated? You mention the scene reflectivity (and presumably zenith angle) is an important factor in the sensitivity, but that value is not mentioned here.

Figures 6-7: These figures nicely relate the gamma parameters to more physical quantities and the impact of a particular change ($\alpha, \beta \pm 10\%$) on the retrieval. However, I think the piece of information that is needed to interpret the results is how much the fitted gamma parameters vary in the CARMA model, and how much the phase function varies over this range.

Page 11, Line 5-8: If the difference in phase function ratio and retrieved extinction ratios is due to multiple scattering, wouldn't the smearing effect be more pronounced at 20.5 km, rather than 25.5 km? Lower altitudes generally have a larger multi-scatter component to the signal.

Figure 11: I think it is important to show the wavelength relationship for other altitudes. Particularly if only the CARMA data at 20.5 km was used to generate the ASD used in the retrieval.

Page 14, Line 7: It should maybe be mentioned that the retrieval is performed at 675 nm, so the residual must (presumably) be zero at this wavelength for both methods?

Page 15, Line 13-14: From Figures 11/12, the spectral dependence seems to be affected for the entire Northern hemisphere. From Figure 5, this could range from about 60-120°, please define "small Θ".

3 Technical Comments

Page 3, Line 20: Seems odd to start a paragraph with an equation, should it come after line 12?

Page 4, Line 21: At 20 and 25 km altitudes?

Page 6, Line 20: CARAM to CARMA

Page 6, Line 21: GD distribution = Gamma Distribution distribution?

Page 11, Line 5: duo to due

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