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Interactive comment on "CALIPSO lidar level 3 aerosol profile product: version 3 algorithm design" *by* Jason L. Tackett et al.

Anonymous Referee #1

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This paper outlines the methodology behind the CALIPSO Level 3 data product. A simple average is used to aggregate Level 2 profiles, with clear skies assigned zero extinction (rather than being omitted from the average). The quality control system is described at some length, identifying unreliable data by geometrical, statistical, and algorithmic means (e.g. aerosols found in unexpected locations, a maximal uncertainty on extinction, and QC flags, respectively). The spatial and temporal impacts of each filter are presented, demonstrating that these choices alter the final result but in a manner that is expected to be more representative of reality.

The paper is suitable for publishing with only typographical corrections. The many years that went into its development are evident from the depth and extent of the discussions. Every detail is rationalised (and I eagerly await their justification in the

upcoming validation paper). Some familiarity with lidar is required to completely understand some of their choices (e.g. the fact that negative extinctions should be retained is less well known that it should be but neither cited nor discussed here), but that seems fair given the paper's length and audience. The language and presentation are exemplary throughout.

I include only a few very minor comments and corrections. P1L2 means line 2 of page 1.

§4.3 Considering aerosol properties tend to be log-normally distributed, have you explored averaging $\ln \sigma$?

P11L8 This recommendation seems sufficiently novel and important to be worth mentioning in the paper's abstract.

Figs. 6,7 Larger tick lengths in these colourbars could be beneficial.

P15L5 Add 'the' after 'During'.

P18L2 The peak of Fig. 13 looks nearer to 7 km than 6 to my eye.

P19L3 Delete the first 'the' and 'is'.

P19L3 What motivated the choice of 4 km as a floor for this filter rather than, say, 5 km?

P21L15 There should be commas before and after 'on the other hand'.

P21L30 Add 'the' before 'Antartic'.

Fig. 15 Any idea why (b) is stripy when all the other fields shown have been fairly smooth?

P23L4 I'd word this, '. . . higher altitudes because there are more likely to be overlying layers.'

P24L12 Delete the second 'or'.

Fig. 19 If this image only showed the region in the red box, it'd be quite convincing. As it stands, my attention is drawn to the difference between the spatial patterns of the two panes outside of your box, especially near the equator, and how the filter slightly reduces AOD in regions where the NSA is uncommon.

Fig. 22 Add 'the' before 'extinction'.

§A.1 The aggressivness metric is new to me. Have you adapted it from somewhere or invented it? Also, does it ever happen that the filter both rejects many samples and sharply decreases the extinction, which could result in small Agr?

P36L16 The page number for Koffi et al. 2012 is D10201.

P36L23 The page number for Koren et al. 2007 is L08805.

P38L20 The page number for Vernier et al. 2011 is L07804.

- On three on my devices with different operating systems, equations at P15L19 and P33L1 are poorly rendered with overlapping symbols.

- I believe the following should be hyphenated: P17L3 no-confidence; P18L11 and L13 high-confidence.

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