

Responses to Referee # 1

Anonymous Referee #1

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A valuable study for the changes made to the extinction and optical depth retrieval algorithms that are used to create the version 4.10 CALIOP Level 2 data products. A very interesting comparison of CALIPSO V3 and V4 with MODIS collections was conducted.

Some technical corrections will perfect this paper:

page 5, Table 1, the categories for tropospheric aerosol subtypes refer only in V4. i.e. elevated smoke and not just smoke as in V3

We thank the referee for reminding us of the change in the nomenclature of some aerosol types and have modified section 2.1.1 as shown in red text. (For consistency, we have also replaced “biomass burning”, which was used in some earlier documents, with “smoke”.)

2.1.1 Initial lidar ratios for aerosols

The initial lidar ratios and their uncertainties for several of the aerosol subtypes have been revised for V4 (Kim et al., 2018). As can be seen in Table 1, V4 specifies larger 532 nm lidar ratios for dust (by 10 %), clean marine (by 15 %) and clean continental (by 51 %) aerosols. These higher lidar ratios, which are consistent with improved knowledge gained over the past decade (Kim et al., 2018), contribute to higher values in the retrieved backscatter, extinction and optical depths than were reported in V3. Our better understanding of lidar ratio variability led to significant reductions in the uncertainties ascribed to the lidar ratios for marine, desert dust and ~~biomass-burning smoke~~ aerosols, resulting in generally in lower uncertainties in the retrieved products for these aerosol types. As explained in Kim et al. (2018) and documented in the V4 CALIPSO Data Products Catalog (https://www-calipso.larc.nasa.gov/documents/dpc_index.php), the nomenclatures of the aerosol type 3 “polluted continental” and type 6 “smoke” were changed in version 4.1 to “polluted continental/smoke” and “elevated smoke” respectively. V4 also adds a new “dusty marine” tropospheric subtype and five new stratospheric subtypes. The lidar ratio for the dusty marine mixture is significantly higher than that for clean marine, but significantly lower than that for polluted dust. (Aerosols identified as dusty marine in V4 were generally classified as polluted dust in V3.) Some aerosol lidar ratios at 1064 nm have also been changed, as shown in Table 1. Note that there was no cloud-aerosol classification in the stratosphere in V3 and that all stratospheric layers were assigned an initial lidar ratio of 25 sr and a multiple scattering factor of 1.

page 7, Figure 1, the optical quality of this figure should be increased

In recreating this figure, in addition to increasing the optical quality as requested, we have swapped panels (b) and (c) to agree with modified text in Section 2.1.2.1 and changed the axis labels to agree with AMT style guide.

page 12, Figure 2, the axis labels and ticks should be increased in the first figure

The figure has been recreated to increase the size of the ticks and the text.

page 13, line 10, “...which of these error sources cause...”

Done

page 33, Figure 11a, (a) white symbol should be deleted

Done