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Interactive comment on "Use of the CALIOP vertical feature mask for evaluating global aerosol models" *by* E. P. Nowottnick et al.

Anonymous Referee #2

Received and published: 4 March 2015

General comments This paper is really interesting and dealing with a relevant issue for aerosol global studies: the aerosol typing and how this is captured by the models (and by the satellite). As general comment, I suggest to the author to explicitly report that CALIPSO typing algorithm has of course some limits and some are already known. Report about this, some references. Moreover as I reported also in the quick comment, I suggest to modify the nomenclature of VFM as obtained by MERRAero. There are CALIPSO Level2 and Level3 data as well, and actually the VFM is a CALIPSO Level2 product. Using Level 2 and Level3 nomenclature for the MERRAero, even with a different meaning respect to CALIPSO one, could be misleading and could confuse the reader. Apart from this general comment, there are minor points to be addressed, which I report in the Specific comments below.

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Specific comments: Page 1402 lines 10-13: here is not clear the difference between lev2 and lev3. The authors describe it better in the text. I consider important the abstract reports in the clearest way this relevant difference.

Page 1404 lines 23-26: for ground based/airborne lidars, your references are just some examples, so use e.g. and probably it would be more correct to provide few references but for different regions of the globe.

Page 1407, line 19: decreases

Page 1413, lines 5-18: authors state that using their look up tables and computing particulate depolarization ratios, they found values different from measured ones, so they increased of 30% the depol values for dust particles. A fair explanation of this problem is reported about the inability of the model to represent the actual non-sphericity of dust particles. My point here is: does this inability affect not only particulate depolarization ratio but also other parameters as extinction and backscatter?

Page 1416, line 7: fig. 2a

Page 1416, line 19-20: though. . .MERRAero. Not clear, please rephrase.

Page 1416, lines 22-26: the absence of correlation is not simply related to a potential bias in the values: if they would be just biased the correlation would be however high. The low r could be related to the inability to well reconstruct the angstrom for same particles (eg dust) but not for others. In this way, you would loss correlation.

Page 1418, lines6-15: I support the hypothesis of marine particles identified by CALIPSO as dust ones. Dust particles flowing at very low altitudes for thousands of km seems to me unrealistic. On the other side, if those layers are marine particle layers instead of dust; this would mean that a lidar ratio around 20 sr instead of 40sr should be used reducing the extinction from CALIPSO (fig 3 top panel) and obtaining a better agreement with MERRAero extinction profiles.

Page 1421, lines 4-10: which is this feature with low aerosol load and high depolariza-

tion? Which is its source? Explain it, please.

Section 4.4: a general comment. If v2 and v3 agrees you could state that the VFM algorithm works well, great. But if you have a type in your model (lev3), the algorithm identifies another type (lev 2) and CALIPSO another one this could indicate that the optical properties used within the model could be not so reliable. Did you investigate this point? You should at least mention in the paper that the optical properties for some aerosol types could be affect by a certain (please quantify) uncertainty within the model.

Page 1426, lines 24-26: this should be an error in the VFM, yes, because marine layer can be detected only over Sea surface.

Figure 6-8 could this be merged? A big figure with 6 rows (0-1 km at bottom and 5-6km at the top) and 3 columns (calipso, MERAAero 2, MERAAero3) would be easier to read

Page 1429, lines 17-20: is not possible that the model simulates too much particles? This should be also considered and discussed here.

Page 1431, lines 14-17: not clear from figures. Maybe you mean dust-free in CALIPSO VFM?

Page 1432, line 21: through