

Interactive comment on “Lidar signal simulation for the evaluation of aerosols in chemistry-transport models” by S. Stromatas et al.

Anonymous Referee #1

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This paper presents a new software to generate lidar signals (attenuated backscatter, color ratio) based on aerosol concentrations calculated within a chemical transport model. This is a very useful tool to evaluate model output against satellite and ground-based lidar observations. The method is very interesting and helps reduce assumptions that are typically made in terms of interpreting the lidar signal (such as assuming/retrieving species composition in order to obtain a lidar ratio). This tool seems to be CTM independent and is made available to the community by the authors. I believe this is a valuable contribution to the community.

My main concern has to do with the discussion and presentation of the dust event in the Mediterranean. About half the paper is devoted to this case study. The related sections are too long and the discussion of the study is not particularly convinc-

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ing. The authors spend a great deal of time presenting each individual measurement (AERONET, MODIS, CALIOP) at length, while they could really only discuss CALIOP the lidar instrument as it is the most relevant to their paper, and only devote a couple of sentences and relevant references for the others. The same applies to the description of CHIMERE and WRF. These models are not the central part of the paper and their description could be shorter.

Furthermore, I am not convinced that including MODIS and AERONET is that relevant to the case study. The main purpose of the paper is to present the lidar signal simulation tool, so the emphasis should be on the comparison between CALIOP and CHIMERE. Moreover, the authors calculate the optical properties only at 532 nm (and 1064 nm), which are directly comparable for CALIOP. However, MODIS and AERONET are at other wavelengths (550 and 500 nm).

I suggest that the authors apply their tool to other case studies, for example some case studies already published in the literature. Depending on the model simulations that they have access to, they could focus on pollution case studies over Europe, or dust transport from Africa to the Atlantic, or dust/pollution transport from Asia to the Pacific. The advantage of doing this would be to demonstrate the value of their tool instead of comparing directly the model output (aerosol extinction) to Level 2 CALIOP products. More generally I suggest that the authors include both Level 1 and Level 2 products in their comparisons. This will allow them to demonstrate the value of their tool, and maybe emphasize the shortcomings of the lidar retrieval of level 2 products.

Minor comments:

- + page 1707, Line 11. Should it be $R'=1.2$ instead of R ?
- + page 1705, line 22. What does “MD” refer to? Molecular Density? Please specify.
- + page 1710, line 15. The authors vastly overstate the agreement with observations: “the agreement is good”. Figure 7 shows are rather poor agreement, with the model

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often being factors of 2-10 too low!

+ Figure 10. What do points 1, 2, 3 refer to?

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