

## ***Interactive comment on “Surface matters: limitations of CALIPSO V3 aerosol typing in coastal regions” by T. Kanitz et al.***

### **Anonymous Referee #2**

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Kanitz et al. have analysed CALIOP aerosol classification at coastal sites and concluded that due to the limitations in the CALIOP retrieval, the aerosol optical thicknesses are overestimated in these regions. The paper is well written and concise. The issue with the surface-dependent marine aerosol typing in the CALIOP algorithm is evident, however, a numerical estimate of its effect has been missing. Therefore, I feel that the paper by Kanitz et al. brings new information to lidar research and I recommend its publication in AMT.

The largest shortcoming of the paper is the lack of extinction measurements from the ground-based lidar. This data would have enabled direct comparison with the CALIOP extinction profiles. However, the authors were able to make a convincing analysis by using the same lidar ratios as in the CALIOP retrieval.

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The paper leaves some open questions, that should be addressed in the text before it can be accepted to AMT.

First of all, you should present the decision tree that CALIOP uses in the determination of the aerosol types. Please, explain in detail how the marine type is selected.

Why does the CALIOP retrieval choose mainly polluted continental, polluted dust and smoke aerosol types for the cases with marine aerosol over land? Why doesn't it select clean continental which would result in smaller overestimation in the AOD?

Figure 3d shows that CALIOP can classify some aerosol layers as marine over land? How can this be if the marine type is limited to sea surfaces only? Is it caused by the longer spatial averaging used for the thinner aerosol layers?

You suggest a new aerosol type for the CALIOP algorithm: mixed marine. How should it be defined in the retrieval and what kind of properties it should have (e.g. lidar ratio)? How far inland should this mixed marine be used and should it also be used over ocean near the coasts?

What is the spatial extent of this overestimation in AODs by the CALIOP retrieval? I mean, how much is the global AOD overestimated due to this issue? And how much would the use of mixed marine aerosol type reduce this overestimation?

Specific comments:

Fig 3a: Is the length of the thicker red line correct (50S to 55S)? Other plots indicate that it should be from 52S to 54S.

Fig. 4a: Mention in the text what kind of smoothing was used for the PollyXT and CALIOP backscatter profiles.

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