

Interactive comment on “On the use of satellites to obtain information on the occurrence of natural and anthropogenic aerosols over the boreal eurasian forest” by G. de Leeuw et al.

Anonymous Referee #2

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General comment

This article presents a brief literature study on how to potentially use a combination of satellite products, ground based observations and modeled data to distinguish between natural and anthropogenic aerosols. The motivation for such studies is evident, and this is also clearly highlighted by the authors. The abstract seem to promise interesting reading and results, with new insights on the applicability of satellites to provide information on the topic indicated by the title. After spending some time reading the manuscript, although piecewise informative, it is clear that the authors fail to fulfill these expectations. The actual data analysis presented is limited and does not reflect the dis-

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cussion presented previously in the article.

Overall, the manuscript seems rushed and to some degree randomly composed. It is thus my opinion that the manuscript cannot be published in its current form. My recommendation is to reject publication.

The more specific issues that caught my attention are outlined below:

The authors suggest the use of several different methods to discriminate between natural and anthropogenic aerosols, and the expectations are built up. However, the presented analysis seems superficial and clearly does not explore the potential approaches that are discussed. The quality of the article would be significantly improved by deepening the analysis including e.g. patterns of HCHO and glyoxal. In its current form, the study more resembles a project proposal than scientific study.

Several different methods for remote and in situ observations are performed, and but the discussion on how they should be integrated is fairly limited.

Regarding the results: With the risk of appearing ignorant, I have to ask what is new here and what are the conclusions drawn from this analysis that merit publication? The authors show that the high satellite retrieved AOD coincide with observations of high in situ observations of aerosol number and mass. These findings are further corroborated by modeling results (or rather vice versa). It is certainly not novel to compare AOD retrievals with in situ observations and the additional comparison with GLOMAP model results is extremely limited. The analysis seem to be done in a hurry, and it is furthermore not at all clear how the presented analysis would help/aid in the discrimination between natural and anthropogenic aerosols. What is shown in the analysis is that high retrieved AOD (usually) coincide with observations of large aerosol number and mass and that low retrieved AOD usually coincide with in situ observations of low particle number and mass. In other words dirty air is dirty and clean air is clean. Even if it would be the first time these satellite products were presented in the literature, the analysis performed would be far too limited to merit publication.

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Specific comments:

Page 8453, line 15-18: This sentence seems a little out of track. The aerosol-cloud effect must certainly be included in "human induced aerosol impact".

Page 8454, line 19: As written now it seems that boreal forests are main source of SOA from BVOC oxidation. A few lines below it is stated that boreal forests only contribute with 5-10% of global BVOC. There seem to be a disagreement here. Or is the boreal region so much more efficient in producing SOA compared to e.g. tropics?

Page 8454, line 28: Maybe should replace "are crucial" to "could be crucial" or "are likely crucial" or similar which are more adequately supported by the conclusions given in the paper. Same goes for previous statement that monoterpenes "dominate" which would be better changed to "could dominate".

Page 8455, lines 12-14: Sentence does not read well.

Page 8455, line 20-21: Add reference.

Page 8455, line 26-29: It sounds as the availability of quality assured data from these networks is limited to Finland. Clarify.

Page 8456, lines 20-21: How? It is not clear to me how the abovementioned methods should be applied to discriminate between natural and anthropogenic aerosols. Please specify and or expand the discussion. The paragraph seems a bit contradicting.

Page 8460, lines 1-2: Do the authors suggest HCHO to be an aerosol precursor? I guess it should say HCHO could be used as an indication of VOC oxidation and thus potentially also SOA formation.

Page 8460, lines 1-2: Is HCHO and glyoxal preferentially formed by BVOC or from VOC in general? The suggested connection is not evident. Suggest to add the Vrekoussis reference here to avoid confusion.

Page 8460, lines 7-9: Repetition

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Page 8460, lines 14-15: This sentence seems to be a little out of place as the general discussion in this paragraph seem to relate to HCHO and glyoxal.

Page 8461, figure 1: The presentation of these stations as "boreal zone stations" is not adequate. According to my knowledge, the only stations that should be considered boreal would be Hyytiälä, Kuopio, Värriö, Sodankylä and Pallas. Helsinki would potentially qualify as a boreal zone station although it is located in a coastal city. The Arctic stations are definitely not located in the boreal zone. Tiksi is borderline, and Aspvreten is pretty much located in the southern rim of the boreal zone. Vavihill and Danish stations are also not to be considered boreal. Figure caption and text should be revised accordingly.

Page 8464, line 6: I do not follow. Please re-write.

Page 8465, line 15-17: I do not understand the motivation of just using Hyytiälä data here. Certainly the gradient between stations must be of high interest to investigate the accuracy of the satellite prediction on larger scales.

Page 8466, line 7: "ullustrated"→"illustrated"

Page 8466, line 19: "has"→"showed" or similar.

Page 8468, line 12-14: Is it really proper to say that the model support the observations. It is usually the other way around I would say.

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