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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.

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We thank both referees for their comments regarding our manuscript “On the Use of Satellites to obtain Information on the Occurrence of Natural and Anthropogenic Aerosols over the Boreal Eurasian Forest” published in Biogeosciences Discussions. Below we give our answers to the referee comments and indicate what has been changed in the manuscript. Our reply is shown in italics.

A general response to both reviewers is that we agree that the manuscript “did not merit publication in its present form”. We realize that the reviewers have come to this conclusion because we have failed to clearly present what we want to contribute with

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this MS and included too much material which we don't use. In the revised version we will correct this and present our case more clearly. The goal is not to present a quantitative comparison between satellite and ground-based data and results from a chemical transport model, but rather to show how these can be used as different and complementary sources of information on the occurrence of aerosols over Eurasia, taking Finland as an example. Air which is 'clean' at one site (Hyytiälä) may be 'dirty' some distance away, but only a dense network would reveal this spatial variation, unlike satellites which give a snapshot of a larger area.

We also realized that the title was too broad and propose to change it too "Preliminary studies on the use of satellite data to discriminate between anthropogenic and natural aerosols over the Eurasian Boreal forest." Short title: "Aerosol over Eurasian Boreal forest"

Anonymous Referee #1

This work is one among many studies attempting to retrieve information on aerosols using the complementarity of ground-based observations, remote sensing data and model predictions. The paper presents a feasibility study on the separation of anthropogenic from natural aerosols above the boreal forested regions, based on information from satellites. Firstly, an overview of different satellite products (CO, HCHO, CHO-CHO, SO₂, LAI, NO₂, AOD, etc.) that could be used to achieve this separation is presented in Table 1, Section 2, and their potential in separating the natural from the anthropogenic aerosol source is discussed in Section 3. A description of ground-based data and the GLOMAP model follows in Section 4-5. The results include comparisons between aerosol properties obtained from the AATSR sensor, in situ data measured in Hyytiälä, Finland, and the GLOMAP model. The subject of the paper is well within the scope of Biogeosciences Journal. The article is written in a clear and concise way. However, the conclusions are neither convincing nor adequate. The manuscript does not have sufficient originality to merit publication in its present form. My points of criticism follow.

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1. Although the overview on satellite products and the discussion on their potential in Section 3 is useful, the rest of the paper does not make any use of this data. From the beginning of the paper to Section 3, the reader is brought to expect that these datasets will be somewhat used in this study, but is disappointed to see that all these new proxies are not used at all. For this reason, I do not see the interest of including this discussion.

We thank the reviewer for this important comment. The manuscript (MS) was indeed not proofread carefully. We have now clearly indicated what to expect so we do not raise expectations which are not fulfilled and indicate the limitations. The MS was intended as a project overview which has an important component on precursors and proxies. However, as indicated by the reviewer, there was a lot of material which was not further used in this paper. We have substantially reduced the text referring to precursors and potential proxies, especially as regards the VOCs.

2. The authors oversell the usefulness of HCHO and CHOCHO to bring constraints on aerosols (Section 3). In Section 3.1, the statement "Formaldehyde and glyoxal are two possible intermediates which can be produced during the atmospheric oxidation of VOCs. They can undergo further oxidation and thus contribute to the secondary organic aerosol formation" is erroneous since formaldehyde is not identified as an aerosol precursor. Furthermore, glyoxal-derived SOA represents only a fraction of total SOA, and is still subject to important uncertainties (e.g. Ervens and Volkamer, Atmos. Chem. Phys., 10, 8219–8244, 2010 and references therein). Furthermore, glyoxal is much shorter-lived than glyoxal-derived SOA and thus its use as a proxy is not envisageable. Finally, the glyoxal retrievals over high latitudes e.g. above boreal forests bear quite large uncertainties.

We have substantially shortened this section and removed the use of glyoxal as a proxy for aerosol particles.

3. A strong weakness of this study is the lack of any quantitative statistical comparison

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in the results section dealing with the comparison between AATSR AOD over Finland, Hyttiala in situ data and a global model. The entire discussion is only qualitative and does not allow to build confidence on the conclusions. In addition: (i) Figure 1 illustrates many boreal stations which are not used in this study; (ii) the scale in Fig. 5 does not allow evaluation against the result of Fig. 3, again in this case a quantitative evaluation is necessary but lacking. Finally, the scale in Fig. 3a going up to 0.25 does not allow to put in evidence an AOD equal to 0.45, as stated in the text (page 8466, line 9).

We have removed Figure 1 and re-written substantial parts of the paper in response to these comments.

Technical comments 1. The short title should reflect the content of the paper

We propose to change the short title to “Aerosol over Eurasian Boreal forest”.

2. p. 8455, ln. 16 :read “extent”

This paragraph has been removed in response to general comments

3. p. 8455, ln. 23 : remove one “an”

Done

4. p. 8457, ln. 20 : Eurasian should not be capitalised

Changed to Eurasian

5. p. 8459, ln. 13 : correct “extention”

This sentence has been removed

6. p. 8461, ln. 13 : correct “form”

Done

7. p. 8464, ln. 13 : correct “later”

Done

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8. p. 8466, ln. 7 : read “illustrated”

Done

9. p. 8466, ln. 16 : read “extinction”

Done

10. p. 8468, ln. 7 : read “passed”

Done

11. p. 8469, ln. 11 : read “formed”

Changed to “from”

12. p. 8481, caption : read “Helsinki”

Done

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