

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 #1

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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, CHOCHO, 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

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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.

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.
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.
3. A strong weakness of this study is the lack of any quantitative statistical comparison in the results section dealing with the comparison between AATSR AOD over Finland, Hyytiälä 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)

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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).

Technical comments

1. The short title should reflect the content of the paper
2. p. 8455, ln. 16 :read "extent"
3. p. 8455, ln. 23 : remove one "an"
4. p. 8457, ln. 20 : Eurasian should not be capitalised
5. p. 8459, ln. 13 : correct "extention"
6. p. 8461, ln. 13 : correct "form"
7. p. 8464, ln. 13 : correct "later"
8. p. 8466, ln. 7 : read "illustrated"
9. p. 8466, ln. 16 : read "extinction"
10. p. 8468, ln. 7 : read "passed"
11. p. 8469, ln. 11 : read "formed"
12. p. 8481, caption : read "Helsinki"

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