

Atmos. Chem. Phys. Discuss., referee comment RC3  
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## Comment on acp-2021-599

Anonymous Referee #3

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Referee comment on "Inferring iron-oxide species content in atmospheric mineral dust from DSCOVR EPIC observations" by Sujung Go et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-599-RC3>, 2021

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This work presents the application and discuss the results of a new algorithm that applies to MAIAC EPIC data to retrieve the mass concentration of hematite and goethite content in the global atmosphere over land. The aim of the study is of relevance for dust investigations, from the earth's radiative budget analyses to the biogeochemical studies. The retrieval scheme and the Maxwell Garnett approximation applied seem reasonable. Hypothesis and steps of the retrieval are clearly presented. Data from laboratory and field observations are used to compare and validate the results. Regional and seasonal variability of hematite and goethite mass concentration retrievals are analysed. The paper is well written and properly organised.

I am in favour of the publication of the paper after the authors have addressed some points below.

- The validation of  $k$  from MAIAC, which is the starting point of the analysis, is actually missing. Can you compare the  $k$  values against lab and field observations as you did for the retrieved hematite and goethite mass concentrations ?
- To my understanding the algorithm applies only on cases with AOD larger than 0.6, when MAIAC EPIC provides outputs of  $k$ , AOD and  $b$ . This is one point to discuss when analysing the regional/seasonal concentrations of hematite and goethite, perhaps. What is the impact of this assumption on the retrieval and its exploitation/application? is it a real "global" climatology that is obtained?
- This retrieval applies to the AOD for the coarse fraction, therefore hematite and goethite are referring to the coarse dust AOD only. Is this assumption biasing the retrieval in such a way ? considerations on the size-dependent composition of dust and distribution of Hematite and Goethite as a function of size should be added.
- Figure 3 can probably show goethite dataset for real and imaginary refractive indices as well, similar for Table 1, the corresponding information for goethite is missing

- Line 284 : what do you mean with « significant » events ? in AOD or other ?
- Line 291 : Di Biagio et al . (2019) analysed aerosols generated from natural soil samples and not soil properties, check elsewhere in the paper (in example sect 3.2 and following text) and clarify this aspect which is of relevance for the validation of the retrieved atmospheric aerosol hem and goet concentration from the present study
- What is the impact of fixing the real refractive index on the retrieval ?
- I would discuss possible perspective applications over ocean, an aspect which could be of great interest for biogeochemical studies
- Please, clearly state in the abstract the conditions to which this retrieval applies (land, AOD>0.6, ..)