

Paper acp-2014-190 by Formenti et al.

Answers to Anonymous Referee #1

We would start by thanking the referees for useful comments and suggestions which surely improve the readability and the significance of the paper. We have tried and addressed their comments at the best of our possibilities.

However, we would like to state my surprise regarding the form of some of the comments on the English. We are clearly not English native speakers and we acknowledge the fact that our writing might need improvement. However, we do not understand why this point has not been raised in the first technical phase of the review, where it was most appropriate. In this phase, confidential, the manuscript has been evaluated as “excellent” in all the criteria, including the presentation. It is difficult to understand how the status of the paper presentation has changed to such an extent between the confidential and the public phases. It might be that some of the referees were not the same in confidential and the public phases. In any case, harsh comments should be avoided as they are unnecessary.

Line 404: Should be Equation (2)

Done

Line 799: “In this purpose..”=>”For this purpose...”

Done

Line 885: “.than over transport zones” => and at some distance”

Done

Line 906-907: “Laurent et al., 2008)...Klaver et al., 2011).”=> “Laurent et al., 2008; Ginoux et al., 2012), and in attributing an origin to transported dust (e.g. Klaver et al., 2011).”

Ginoux, P., J. M. Prospero, T. E. Gill, N. C. Hsu, and M. Zhao (2012), Global-scale attribution of anthropogenic and natural dust sources and their emission rates based on MODIS Deep Blue aerosol products, *Rev. Geophys.*, 50, RG3005, doi:10.1029/2012RG000388.

Done

Lines 908 to 915: Sentence too long. Unclear.

This sentence has been rewritten as “Beside the uncertainties inherent to the detection of sources, there are two additional factors of ambiguity in source attribution: first, air masses, especially during winter-time, mostly travel in the boundary layer and might uplift dust aerosols at various times before reaching the sampling site; secondly, aircraft samples might integrate transport from various sources active at the same time due to the fact that aircraft moves during sampling and that sample collection lasts at least 20 minutes, which corresponds to about 120 km at typical aircraft cruise speed (see Figure 1 in Chou et al., 2008 and Figure 1 in Klaver et al., 2011).”

Line 917: “from the natural mixing that occur in the atmosphere during transport.”=>”from atmospheric mixing occurring during transport.”

Done

Line 941: “...with the estimate of parameters which are relevant ...”=>”estimate of parameters relevant...”

Done

Line 942: “...on the ocean productivity”=>”on ocean productivity”

Done

Line 946: "...this overcomes..." => "...higher than..."

Done

Line 947: "...has little correspondence with the model proposed by the OPAC database." => "... is quite different from the OPAC database."

Done

Line 976: "impacting the refinement of the" => "impacting our"

Done

Lines 1009-1020: Need editing for proper English.

This sentence has been rewritten as "Regarding the iron fractional solubility, our data are not conclusive in identifying a clear regional difference with respect to the variability observed for dust collected over the Atlantic Ocean after short- and long-range transport. This limited regional variability suggests that a single reference value (0.1%) of the fractional solubility SFe of Saharan and Sahelian dust before atmospheric transport could be used in biogeochemical models. Direct field measurements of SFe close to emission sources, unavailable at the moment, are needed to confirm this finding. Finally, the SFe value estimated for dust near source regions is in the lowest range than values obtained for dust collected over the Atlantic Ocean, pointing to the need of taking atmospheric processing into account when iron solubility is ought to be described at the global scale. "

Tables: I would recommend adding a table containing typical values for each source regions of the real and imaginary parts of the refractive index at 370, 440, 500, 700, 9600 nm, as well as soluble Fe. This is the main objective of the paper.

The main objective of the paper is to relate on the regional variability of the mineralogical composition of mineral dust. The complex refractive index and the Fe fractional solubility have been calculated to give an idea of the relevance of this regional variability (or its absence). So we do not feel it is necessary to

Figure 9: The caption should be rewrite as "Normalized volume size distribution $dV/d\log(\text{EOD})$ at Banizoumbou during 3 days in summer (J1 red line, J2 green line, J3 blue line) and winter (black line),..." Change the colors accordingly, as they cannot be distinguished in the actual Figure.

Done

Figure 11. "Figure 11.a represent the real part.." In my version Figure 11.a represents the imaginary part of the refractive index.

This is now corrected.

Figure 11. I don't understand why the imaginary part of the refractive index for Sahelian dust is smallest. This does not correspond to your analysis. You showed that Sahelian dust contains the highest iron content. You have either an error in your Figure or you will need to explain this inconsistency.

It is not surprising when thinking to the differences in the matrix. Sahelian dust has the highest content of no or little-absorbing minerals (kaolinite, quartz), which constitute 80% or more of the particle volume, the lowest content of illite (slightly absorbing), and no calcite.