**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "A reanalysis of MODIS fine mode fraction over ocean using OMI and daily GOCART simulations" *by* T. A. Jones and S. A. Christopher

Anonymous Referee #2

Received and published: 26 January 2011

In the manuscript, a chemistry-transport model is used to define regions where an aerosol type dominates. These regions are then used to analyse satellite retrievals of the aerosol fine-mode fraction and see how it can characterise the dominating aerosol types. I must disclose that I reviewed a previous version of the manuscript in May 2010, for *J. Geophys. Res.*. My opinion at the time was that the method relies too much on a single model (GOCART) and this source of uncertainty is not quantified. This is now discussed shortly by the authors, but it remains an issue. In addition, I am surprised that the more powerful method using the OMI AI for an additional screening is not presented as the standard method. Overall, results remain of interest and I would suggest publication after major revisions to address the comments below.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

1 Main comments.

- Page 29783, lines 7-20: This is the fragile point of the method proposed, and it is nice to see it discussed in this version of the manuscript. Since GOCART defines the regions where a given aerosol type is expected to dominate, results are likely to be GOCART-dependent. The question is how much so? The authors have yet to prove that using another model would yield similar regions (line 17). Since daily data from other models may not be readily available, I would suggest trying to vary the threshold used to define the regions, and assess the impact on results.

- Page 29789, line 21: Since the study is limited to oceans, it is expected than all regions have a sea-salt contribution to both the AOD and FMF, as acknowledged by the authors. It is thus unlikely that any region will ever correspond to a "pure" aerosol type (assuming such a thing exists outside of numerical models). So the authors try too hard in explaining differences between the different datasets: they are simply looking at different aerosols, where one type may dominate if GOCART-defined regions can be relied upon. In the end, the FMF values given by the study in Table 1 are unlikely to be "more correct" than those in previous studies shown in the same table - they are just different. And a future study using other models and satellite retrievals will end up with yet another set of different results, which will not be wrong either... In addition, GOCART-defined regions are small: at such small scales, the variability is expected to be large.

- Section 4.2 brings more information and using the AI seems to be improving the sampling of SU and CC aerosol types. I would therefore have organised the paper differently, presenting the most powerful method (using the AI) and its results first, then making a sensibility study where the AI is not used.

- Section 4.3 on vertical distribution is purely based on unvalidated GOCART ver-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

tical profiles, and there are no satellite data to discuss. It brings nothing to the manuscript and should be removed.

2   Other comments.

- Page 29764, line 17: "the use of daily GOCART simulations improves our confidence in the results compared to monthly analysis". It remains to demonstrate that GOCART is able to get correct daily aerosol distributions. Is the validation of GOCART AODs made on a daily basis, or a monthly basis?

- Page 29776, lines 6-8: Writing that "Their results clearly show anthropogenic aerosols are mostly fine mode" is incorrect. This is not a result of these studies, this is an *assumption*: by assuming that anthropogenic aerosols have low FMF, studies manage to identify aerosols as being anthropogenic. Not the other way around.

- Page 29780, line 22 and Page 29782, line 26: If OC has a natural component due to natural biomass burning events, then BC must also have a natural component from the same sources, since the two species are co-emitted.

- Page 29781, line 22: While it is true that DU and SS aerosols exhibit more diversity in the AeroCom intercomparison than for other species, it remains that the overall diversity is large. As shown in Figure 3b of Textor *et al.* (2006), diversity on total dry mass is of the order of 30species.

- Page 29789, line 5: "Carbonaceous aerosols" would be a better term than "carbonate", as carbonate is not necessarily dominant in the chemical composition.

- Page 29793, line 7: "increase in biomass burning in Central Africa". Increase compared to what reference?

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

- Page 29793, line 13: "Note that GOCART considers DU as surface source". The authors make it sound like a simplication. Obviously mineral dust aerosols originate from the surface.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 29773, 2010.