

In general, the authors have done a very good job of responding to the referees comments, and with some minor revisions this paper is well worth publishing in ACP. My only remaining problems are with the units and some small points.

Response) We thank the reviewer for the additional comments, which we have addressed as described below.

To begin with, in Fig. 6, the authors say that these are "vertical profiles ( $\mu\text{g m}^{-3}$  (STP) at 288.15K and 1013.25 hPa)". This cannot be! The profiles are either at STP (273.15 K, 1013.25 hPa) or at 288.15 K and 1013.25. Given that the authors have been so confused on these points I would urge them to re-check which temperature and pressure they have actually used.

Response) Thanks for catching this typo. We have updated the caption of the figure to read: "Figure 6: Comparison of mean OA vertical profiles ( $\mu\text{g m}^{-3}$ (STP) at 273.15K and 1013.25 hPa) measured during recent aircraft field campaigns (see Table S5).."

Elsewhere in the manuscript STP was correctly referenced as: "For ARCTAS, the observed OA concentrations above the 99<sup>th</sup> percentile i.e. larger than  $16 \mu\text{g m}^{-3}$ (STP) (where 'STP' stands for standard conditions of 273 K and 1 atm) were filtered out to limit the influence of biomass burning plumes that the GEOS-Chem model cannot resolve at the considered horizontal resolution."

Also, in line 1345 the 2nd "STP" is within a non-closed parenthesis.

Response) It is corrected now.

RI.8.6 The authors have added text about IMPROVE samples, but doesn't the same problem apply to EMEP data?

Response) We have mentioned the evaporation issue with the IMPROVE data as that issue has been reported and quantified in previous studies (e.g. Kim et al. 2015). This evaporation might be occurring at the EMEP sites as well, but we do not have a reference that quantifies it.

Fig. 2. Explain the different colors in the caption. I wonder also why this figure uses ambient temperature whereas Fig. 6 uses STP (or 288K)?

Response) The caption has been added. Figure 2 shows differences in model profiles relative to each other at ambient conditions, whereas model results in Fig 6 are in STP to make it consistent with way measurements are reported.

Fig. 9(i) Why aren't the Spracklen et al. 2011 results shown for SOA?

Response) Spracklen et al. 2011 results are already shown for both total SOA and biomass burning SOA.

Fig. 9(ii) The Hallquist estimate was a top-down approach and not a model estimate. Also, Hallquist had a best-estimate value too, of 115 TgC/yr or 230 Tg/yr using the

not-mentioned factor of two that the authors have proposed. Hallquist also address biomass-burning. Be consistent across the references.

Response) We have included values from Hallquist et al. for both best estimates for total and biomass burning SOA.

Table 3. Specify mass or volume percent.

Response) It is the mass percentage. This is now explained in Table 3.