

Referee report on ACP-2022-483 - Concurrent photochemical whitening and darkening of ambient brown carbon

Appreciate the effort of the authors to address the comments in detail and incorporate them in the necessary content throughout the manuscript. I believe the manuscript is suitable for publication after the following minor comments are addressed. Overall, as there are several instances of long sentences and grammatical errors that cloud the important messaging, a thorough language revision may be considered.

Minor comments;

Lines 22-25-MAC and contribution to total absorbance of POA and SOA could be discussed for POA and SOA separately to make the message clearer. For example. "Photochemical processes were found to reduce the mass absorption cross section (MAC) of primary OA, reducing its contribution to total absorption by 20%, at the same time increasing MAC for secondary OA, which showed a 30% enhancement in contribution to total absorbance....."

Line 25-26-"The study provides.....*nitrogen-containing secondary* OA can compensate for some effects of bleaching of primary BrC."

In some text, the authors have implied that photooxidation was responsible for the observed changes while in other instances photochemical processes are mentioned. As the study cannot isolate what type of reactions may have caused the increase or decrease in absorptivity, maybe it is safer to use the term photochemical processes. Please read through and keep the message consistent.

Line 318-321 -The sentences are not well combined. Re-writing these sentences combining the messages maybe clearer.

Line 321- Needs revision for grammatical errors and plain language.

Line 324- Can be considered to be revised as "Though other processes such as aqueous-phase reactions may cause changes to MAC of BrC at nighttime, the apparent change in aerosol absorption observed in this study during daytime can play an important role on the radiative impacts due to intensive solar radiation during daytime"?

Lines 314-339 – If possible, it may be better to revise this paragraph and re-organise the important information mentioned. The current layout appears to be jumping back and forth between MAC, relative contribution of POA and SOA and SOA formation pathways.

Line 340-342 – Sentence too long and unclear. Please re-write as two or more sentences.

Line 340-348 – Can be considered to be included in Conclusions section instead, as it is repeating some of the main messages that was described in the paragraph right above.

Lines 360-361- "These OA could primarily emit as aerosol phase, or in gas phase which requires further oxidation to be in aerosol phase to serve as BrC." - I am unclear of the relevance of this sentence.