The authors appreciate the effort from the reviewer and acknowledge his/her contribution to improving this manuscript. The replies are provided in red.

Rewiever 1

The manuscript show the results obtained with a new methodology: to apportion source contributions (shipping, vehicular, residential heating, industrial) and study optical properties variation of BrC species due to atmospheric aging. This methodology, named INTERPLAY, integrates multi-year aerosol observations with air mass back-trajectories and emission inventories.

The paper is very good, showing interesting and sounding results that can be useful at different scientific and technical levels. The manuscript very well written and clear in every part.

Thank you.

General comment: the results obtained following the INTERPLAY approach are well discussed, with a focus on BrC lifetime, as well as the comparison with the output of the Aethalometer model. However, the manuscript lacks sufficient information on the model itself, effectively making it impossible for another researcher to attempt to replicate it in another context. While this is understandable (given that this is a research article), my personal position is that this powerful tool should (anyway) be better described in 2.5, with the basic technical details in the supplement.

Following the remark from the reviewer, we decided to place the INTERPLAY code on the SI. This will allow reproducibility while keeping the methodology section with enough details for the aerosol community.

Specific comments:

Line 14: I would explain also in the abstract what “ATOLL” stands for.

Done.

Line 31: Why is “Light Absorbing Carbonaceous particles” acronym written in capital letters (LAC) while “Aerosol-Radiation Interaction” acronym (ari) in lowercase? Same for aci.

We agree with the reviewer, to be consistent, “aerosol-radiation interaction” and “aerosol-cloud interaction” are now all capitalized.

Line 308: do the Authors intend “AAEff” and “AAEwb” instead of “BCff” and “BCwb”? I suspect there is some confusion here. BC, optically speaking, is something with the AAE close to 1 by definition, and the deviation from this value depends mainly on the mixing/coating state/size distribution. Other things are BC from fossil fuel combustion (BCff) and by wood burning (BCwb). Together they form BC (BCff + BCwb = BC). But BCwb has an AAEwb close to 1 since it is still BC. In the literature are reported values of AAEwb up to 11, but (as done in the present paper) a value of 2 is generally accepted. But this value (AAEwb) is not characteristic of BCwb alone nor of the BrC present in the PM produced by wood combustion: it is an “effective average value” between AAE_{BCwb} and AAE_{BrC}, as well as the most critical parameter to be set in the Aethalometer model. Please take care of the differences between absorption coefficients apportioned by the Aethalometer model ($babs_{ff}$, $babs_{wb}$), related masses BC_{ff}, BC_{wb}, and spectral dependencies of the light absorbing species AAE_{ff},

AAE_{wb}, AAE_{BC} and AAE_{BrC} and consider revising this part. I actually suggest having a look at the following paper: Multi-wavelength optical determination of black and brown carbon in atmospheric aerosols, https://doi.org/10.1016/j.atmosenv.2015.02.058.

As correctly identified by the reviewer, there is a typo in the manuscript, and we were of course referring to the associated absorption angstrom exponents (AAE_{ff} and AAE_{wb}) instead of different components of BC according to the aethalometer model (BC_{ff} and BC_{wb}). This has been corrected.