

Dear Editor,

Thanks for your comments towards improving our manuscript. We have addressed all your comments. Our [author responses \(AR\)](#) are marked in blue and the [revisions in the manuscript](#) are marked in red.

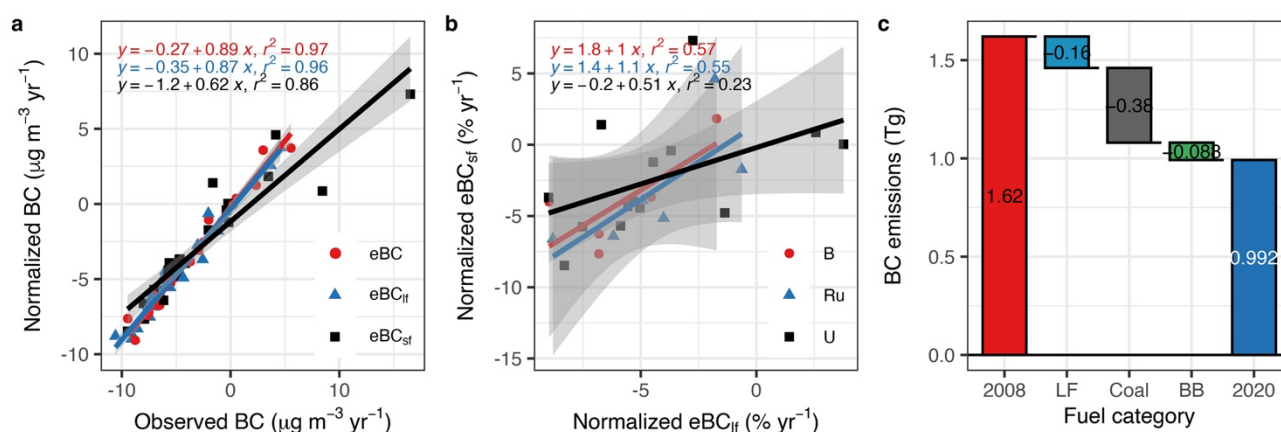
A few technical corrections are needed:

Thanks, and we have revised the technical corrections as follows.

Notification to the authors from review file validation

1. Please ensure that the colour schemes used in your maps and charts allow readers with colour vision deficiencies to correctly interpret your findings. Please check your figures using the Coblis – Color Blindness Simulator (<https://www.color-blindness.com/coblis-color-blindness-simulator/>) and revise the colour schemes accordingly with the next file upload request. -> Fig. 10

AR: Thanks, and we have checked the color schemes of our figures using the Coblis. We have also revised the color schemes of Fig. 10 and using different shapes in panel a and b to help interpreting it.



Revised Fig. 10.

2. Please note, if you used scientific abbreviations without giving the written-out explanation, these must be written out with the next file upload request.

AR: Thanks, and we have carefully checked the manuscript, and the full names of missing scientific abbreviations have been given as listed below.

Line 38-41 in the revised manuscript: Based on BC observations from 2010 to 2016 at three representative background sites in East Asia, Choi et al. (2020a) estimated the average 40 transport efficiency of BC to be 0.73, which was lower than the mean rate of 0.91 from the FLEXible PARTICle Lagrangian transport model (FLEXPART, version 10.4).

Line: 221-222 in the revised manuscript: The transport indicator was the cluster category of air masses reaching the observational site, calculated by the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) (Stein et al., 2015)

Line 244-247 in the revised manuscript: Model simulations from the Community Earth System Model 2 (CESM2), Centre National de Recherches Météorologiques (CNRM), Geophysical Fluid Dynamics Laboratory (GFDL), NASA Goddard Institute for Space Studies (GISS), Japan Meteorological Research Institute (MRI), UK Earth System Model (UKESM1) were used here (see **Table S5** for details).

Figure 7 caption: The NMB and IOA represent normalized mean bias and index of agreement, respectively.

3. However, do not forget that there is a limit to characters (not words!) for “Short summary”: it must be < 500 characters.

AR: Thanks, and we have checked the “Short summary”, and the total characters is 471 (including blank).

Please change the title of the summary section to 'Conclusion'

AR: We have revised it.