

Recommendation: Major Revision

The manuscript addresses an important and relevant topic and provides a useful continental-scale assessment of black carbon over Africa using AerChemMIP models, MERRA-2, fire data, meteorological variables, and trajectory analysis. The study has potential value; however, several methodological and interpretational issues should be addressed before publication.

Major Comments

1. MERRA-2 is used both as the reference dataset for model evaluation and as the basis for bias adjustment. This creates a degree of dependence between the correction and subsequent validation. The authors should clearly acknowledge this limitation and avoid presenting the agreement with MERRA-2 as independent validation.
2. The historical analysis is stated as 1981–2014, while Figure 4 reports a long-term mean for 1980–2023. Similarly, the burned-area period differs between the main manuscript and supplementary material. These inconsistencies should be carefully checked and corrected.
3. Some equations, particularly the Pearson correlation and Index of Agreement, should be carefully checked against their standard definitions and against the actual calculations used. The statistical treatment should also consider temporal autocorrelation and, where appropriate, the issue of multiple spatial significance testing.
4. Four models are selected based on an Index of Agreement threshold of 0.7, while GISS-E2-1G is excluded. The authors should provide a stronger justification for this threshold and discuss how excluding one model affects the resulting multi-model mean and uncertainty.
5. The lack of a statistically significant difference between the bias-adjusted MMM and MERRA-2 should not by itself be interpreted as proof that the bias correction is “effective” or that the two datasets are equivalent. This interpretation should be revised and supported with appropriate performance metrics.
6. The relationships between BC and burned area, as well as the PSCF and trajectory results, provide useful evidence about possible source regions. However, these methods do not provide quantitative source apportionment. Statements concerning specific emission sectors should therefore be presented more cautiously unless supported by additional emissions data.
7. The manuscript sometimes moves directly from spatially elevated BC concentration to a specific emission source (e.g., industry, traffic, mining, or biomass burning). However, atmospheric concentration reflects the combined effects of emissions, transport, dispersion, chemical & physical removal, and meteorological conditions. The authors should distinguish more clearly between where BC is concentrated and where it originates.
8. Bias adjustment may affect the interpretation of hotspots. The authors should clarify how much of the identified hotspot structure is derived from the original models versus the bias-adjustment procedure.
9. The manuscript associates dry-season BC maxima primarily with biomass burning and wet-season reductions with reduced burning and wet deposition. This is plausible, but the observed seasonal covariance does not establish that biomass burning is the dominant cause everywhere. Meteorological transport, boundary-layer height, precipitation, and regional circulation may also strongly control the seasonal cycle.
10. Some increasing BC trends are attributed to industrialization, fossil-fuel use and traffic, but sector-specific emission data are not directly analysed. These explanations should either be supported by additional evidence or expressed as possible contributing factors.

11. The manuscript uses terms such as “driving factors” and makes causal interpretations based mainly on correlations between BC, burned area and meteorological variables. Correlation alone does not establish causation. I suggest replacing strong causal wording with “associated factors” or “possible contributing factors” where direct attribution has not been performed.
12. The future results should include clearer information on inter-model spread or agreement. Since the analysis is based on a selected subset of models, the projections should be described as scenario-based projections rather than predictions.
13. The conclusions recommend region-specific emission-control strategies based on the identified BC hotspots and trends. While this is a reasonable implication, the study does not quantify individual emission sectors or/ & their contributions. The policy recommendations should therefore be presented as indicative rather than directly derived from quantitative source attribution.

Minor Comments

1. Use MERRA-2 reanalysis dataset rather than “observed BC” where appropriate.
2. Clearly define “near-surface” BC and the atmospheric density used to convert BC mass mixing ratio to concentration.
3. State whether regional averages are area-weighted.
4. Define precisely what is meant by "near-surface BC."
5. Provide the exact fire-product name and version consistently throughout the manuscript.
6. Resolve the discrepancy between the stated burned-area period and the period shown in Supplementary Figure S3.
7. Define how the Sen's slope is converted into percentage per year.
8. Clarify the statistical significance criterion shown in Supplementary Figure S8.
9. Correct apparent typographical errors such as "Miterrandian Sea" to "Mediterranean Sea."
10. Please specify the trajectory starting heights and duration in the Supplementary Figure S6 caption & Methods.
11. The captions of the supplementary figures should state the relevant data period and dataset wherever possible.
12. The climate discussion should distinguish BC concentration from radiative forcing, since radiative forcing is not calculated in this study.
13. The reference list should be carefully checked for typographical and bibliographic inconsistencies.
14. Cross check figure numbering, captions, units, and all reported time periods.
15. The conclusions should be slightly moderated where causal attribution is not directly demonstrated.