

Reply to the editor's comments

Black text: editor's comments

Red text: our replies and modified parts

Public justification (visible to the public if the article is accepted and published):

Dear authors,

thank you for your revisions and responses to the reports by the reviewers. These have now also undergone another assessment by a reviewer. Based on this and my own assessment I accept your manuscript subject to minor revisions. Please address the issues below in a revised version of your manuscript.

Reply:

Thank you for your valuable feedback and decisions. We have modified our manuscript accordingly and made our observation data publicly available online. Consequently, we have modified the data availability statement of our data to "The BC and CO observation results at the PFRR site are available online (<https://ads.nipr.ac.jp/dataset/A20241101-003>)." in L431-432. Please review these modifications.

Kind regards,

Philip Stier

1) Much of your analysis is correlation based. However, correlations on their own do not imply causation. Statements such as in your abstract " we found a positive correlation ($r = 0.44$) between the observed BC/ Δ CO ratio and fire radiative power (FRP) observed in Alaska and Canada. This finding indicates that the BC and CO emission ratio is controlled by" are therefore too strong and should be reworded so that they do not automatically imply causation from correlation.

Reply:

Thank you for your indication. We have modified our sentence as below. Please check.

L24-25: "This finding implies that the variability of the BC and CO emission ratio is associated with the intensity and time progress of forest wildfires..."

L352: reworded to "implies"

2) Given that the analysis is correlation based, “significant” should only be used for well defined statistical significance. You have partially addressed this issue in response to a reviewer comment but there remain ambiguous occurrences that should be carefully reworded.

Reply:

We checked again the parts which used “significant” and removed or reworded. Please check.

L33: removed

L158: removed

L238: reworded to “dominant”

L246: reworded to “contributed to the BC mass concentration in PFRR”

L261: removed

L344: removed

3) Your methodological description of how you select trajectories affected by wildfires is not detailed enough to be reproducible (lines 319-321). This needs to be fully reproducible from your description and should be moved from the results to the methods section.

Reply:

Thank you for your comment and suggestion. The data selection for the trajectory analysis was based on data used in section 3.4, specifically focusing on measurements conducted between June and September. Trajectories were calculated for all these selected periods, resulting in 184 cases where trajectories detected forest fires in Alaska and Canada ($\sum FRP > 0$). We have moved this description to the method section as below. Please check.

L148-149: “we compared the BC/ Δ CO ratio in high BC mass concentration cases (see section 3.4) observed between June and September (406 hours in total)...”

L164: “archived datasets (countries were “United States” and “Canada”) from...”

L167: “we used FRP values greater than 0.3 MW for each hot spot”

L169-171: “Through this procedure (hereafter, we simply use ‘back trajectory’), forest wildfires in Alaska and western Canada ($\sum FRP > 0$) were detected in 184 cases of hourly BC observation results. Note that we also confirmed that no back trajectories could suggest forest wildfires in other seasons.”