Responses to Editor

1.Lines 233-238: when explaining the column burden, please provide information on the top of the column (up to xx hPa, or km).

Response:
    Thanks for your suggestion. In the revised manuscript, we have added the relevant description as "Column burden refers to the concentration of aerosols contained in the air column above a unit area with a top at 60 km, which can better reflect the aerosol transport within the air column and is more related to the aerosol radiative effect."

2.Lines 210-218: when discussing the model evaluation for 1980-2010 and 2017-2010, you should also discuss what does not agree. For instance, I can see that over SW Canada, MERRA-2 shows increases for both periods while this is not captured by your model. Similarly for 2017-2010 over East Russia, MERRA-2 shows an increase that is not as marked in your model results.

Response:
    Thanks for your suggestion. In the revised manuscript, we have added the detailed comparison as following:
    "However, the model simulation does capture the increases in $PM_{2.5}$ in southwestern Canada and eastern Russia. It is because the wildfire emissions were kept unchanged during the simulation, while wildfires occurred more frequently in these regions during the analyzed time period (Jolly et al., 2015; Goss et al., 2020), leading to the increases in $PM_{2.5}$ in observations."

3.When discussing ERF in Fig 11, you could mention studies that show that aerosol reduction has contributed to faster warming in downwind regions like the paper for instance by Urdiales-Flores et al 2023, for the Mediterranean https://doi.org/10.1038/s41612-023-00423-1 in addition to the Wang et al., 2023 Nature communications paper that is already cited in the revised manuscript.

Response:
    Thanks for your suggestion. In the revised manuscript, we have added the details as following:
    "This is also revealed by previous studies that aerosol reduction has caused fast warming in downwind regions (Urdiales-Flores et al., 2023)."

4.In Figure S3, left panel, please correct units to $\mu g/m^3$

Response:
    Corrected.

5.In Figure S4 you need to correct the annotation at the color bar since there is a typo in the word 'concentration'

Response:
    Revised.

6.Caption of Figure S5 needs to be corrected to mention that changes in concentrations are shown and not absolute concentrations and the units have to be given on the color bar.

Response:
    Corrected.

References:

Jolly, W. M., Cochrane, M. A., Freeborn, P. H., Holden, Z. A., Brown, T. J., Williamson, G. J., and Bowman, D. M. J. S.: Climate-induced variations in global wildfire danger from 1979 to 2013, Nat. Commun., 6, 7537, https://doi.org/10.1038/ncomms8537, 2015.

Goss, M., Swain, D. L., Abatzoglou, J. T., Sarhadi, A., Kolden, C. A., Williams A. P., and Diffenbaugh, N. S.: Climate change is increasing the likelihood of extreme autumn wildfire conditions across California, Environ. Res. Lett., 15, 094016, https://doi.org/10.1088/1748-9326/ab83a7, 2020.

Urdiales-Flores, D., Zittis, G., Hadjinicolaou, P., Osipov, S., Klingmüller, K., Mihalopoulos, N., Kanakidou, M., Economou, T., and Lelieveld, J.: Drivers of accelerated warming in Mediterranean climate-type regions, npj. Clim. Atmos. Sci., 6, 97, https://doi.org/10.1038/s41612-023-00423-1, 2023.