We highly appreciate the insightful comments and suggestions provided by the reviewer, which have helped us enhance the quality of our manuscript. We have carefully considered each comment and implemented the suggested revisions or provided detailed clarifications where appropriate. Note that our responses are represented in blue.

Wildfires have been a hot topic recently due to more frequent and stronger influences due to global warming. This study investigated the influences of atmospheric pollutions from wildfire biomass burning in the HTP. Multi-source data (including MODIS fire produce, CALIPSO, ground-based AERONET and so on) and SBDART simulations were used to test the influences of wildfires on temperature structures over the region. It is found that the wildfire activity in 2021 is possible to contribute mid-tropospheric warming and alterations in the vertical temperature structures. The manuscript is well organized and presented, and both the observations and simulations are well discussed. The paper could be considered for publication after addressing following specific comments.

Thank you for your thoughtful and helpful comments on our manuscript. We have revised our manuscript taking all these comments into account.

General comments:

1. On the conclusion of the manuscript: This study compared the observations during wildfire active (2021) and less-active (2022) years, and indicated the influences due to wildfire from the differences. This is the main conclusion of the paper, while it should be presented more carefully due to the annual and seasonal differences on the atmospheric temperatures between the two years.

Thank you for the insight comment. We acknowledge the importance of considering annual and seasonal differences in atmospheric temperatures between 2021 and 2022. This is exactly why we chose to compare temperature lapse rates rather than temperatures. The temperature lapse rates reflect the vertical temperature structure and present similar regulatory patterns in the typical atmosphere. In our study, we observed a consistent reduction in the vertical temperature lapse rate in regions affected by wildfires, while no such change was detected at the NADOR site, which is situated far

from the influence of wildfires. We recognize that further robust evidence, including model results and additional measurements, are necessary in future work to strengthen our findings.

2. A large number of observations and retrievals of different kinds was used in this study to tackle the problems, and they have quite different accuracy. A brief discussion on the accuracy of different observations is suggested to be given (maybe in the supporting materials), because it will help the authors as well as the readers to better understood the reliability of the conclusions.

Thank you for pointing that out and we highly agree. We now have added a description of "data quality" for different types of data included in Part 2: Data and Method.

Specific comments:

3. For some of the figures, the colors of similar kinds were used, which may make the comparing confusion. For example, the red lines in Figure 8 can be hardly differed. Similar conditions were noticed in Figure 2 as well.

We highly appreciate the reviewer's detailed comments and suggestions. We have adjusted the colors in both Figure 8 and Figure 2 to enhance clarity and avoid confusion during comparisons.

4. I suppose the word "fire counts" indicates the number of pixels detected as fires by MODIS product, and this could be different for general understanding of fire count. Please correct me if I am wrong, while the concept may be confusing for readers if I am right.

You are correct regarding the term "fire counts" and we appreciate your insight on this matter. Actually, many studies use "fire counts" based on this definition. To avoid confusion, we have replaced "fire counts" with "fire pixel counts" in the main text and used "number of fires" in all figures.

5. The vertical profiles of absorbing aerosol play an important role for the heating of aerosol radiative effects, Lu et al. (https://doi.org/10.1016/j.atmosres.2020.104891) gave an estimation of heating due to aerosol based on their numerical regression. Their estimations may be briefly compared with this study.

Thank you for the suggestion and we appreciate it. We have incorporated a discussion

on this comparison in Line 437-438: "*The observed atmospheric warming and heating rates of the smoke aerosols are consistent with the radiative effects (5.85–21.56 W m^{-2}) and heating rates (0.37–1.71 K day^{-1}) of BC from in situ aircraft observations (Lu et al., 2020)*".

6. Figure 6 is difficult to be read, and suggested to be reorganized.

Thank you for pointing this out. We have removed the section titled "(a) CALIPSO observations of aerosol and cloud layers over the HTP region on April 12, 15, and 28, 2021" to the supplementary materials, allowing us to focus more effectively on the VFM data presented in Figure 6.