This study compared the radiative effects of anthropogenic aerosols between western hemisphere and eastern hemisphere in the recent decades and their impacts on the atmospheric circulation. It is an interesting topic, as the interhemispheric contrast of anthropogenic aerosols were often focused in previous studies but the eastern-western hemispheric contrast of anthropogenic aerosols gains much less attention despite this may be the dominant change of anthropogenic aerosols in the NH during the last four decades. The analysis is solid, but some descriptions are not very accurate and some mechanisms are still unclear. Moderate revisions are needed to address these concerns.

Detailed comments:
1. Page 2 L23-26: I don't think you can say the SAT gradient can be used as a ***predictive*** metric of NH jet changes, as they are just the same thing based on the thermal wind relationship. Both of them are forced by other factors.

2. Page 2 L28-29: First, this sentence seems problematic; Second, when you say "dominating role of WH forcing", which aspects do you point to? Based on your results, at least for the jet shift, it is more caused by EH forcing.

3. L38-40, IPCC AR6 shows it is 1.1C

4. L40-42: Dong and Mcphaden (2017) also shows a good example of how the GHGs and internal variability, such as IPO, shapes the global warming at the decadal time scale.
Lu Dong and Michael J McPhaden 2017 Environ. Res. Lett. 12 034011.

5. L53-55: Similar conclusions have been obtained in earlier studies, such as Salzmann (2016).
Salzmann, M. Global warming without global mean precipitation increase? Sci. Adv. 2, e1501572 (2016).

6. L44-61: Although there are many differences between GHGs and aerosols as you mentioned here, some other studies found some climate impacts caused by GHG and aerosols can be very similar. For example, Xie et al. (2013) showed the SST and ocean precipitation response patterns are very similar in both GHGs and aerosols. Recently, Song et al. (2021) also shows both GHG and aerosols modulate the seasonal delay of tropical rainfall in a similar way, i.e., by modulating the atmospheric column humidity. This similarity between the two forcings should also be mentioned.

Xie, SP., Lu, B. & Xiang, B. Similar spatial patterns of climate responses to aerosol and greenhouse gas changes. Nature Geosci 6, 828–832 (2013).
Song, F., Leung, L.R., Lu, J. et al. Emergence of seasonal delay of tropical rainfall during 1979–2019. Nat. Clim. Chang. 11, 605–612 (2021).

7. L59-61: As mentioned above, Song et al. (2021) found the recent decreases of aerosols, combined with the increased GHGs, contribute significantly to the seasonal delay of tropical rainfall. As the decreased aerosol and increased GHG will continue in the future, the seasonal delay of tropical rainfall is expected to amplify in the future.

8. L69: for the first reference: Who?

9. L78: tropics->tropical

10. L166-167: Fix_FF1920 have 20 members, but here Fix_EastFF1920 and Fix_WestFF1920 only contain 10 members, is there any sensitivity of the results to the member numbers? For example, if you also only use 10 members of Fix_FF1920, could you obtain the similar results? Another relevant question is that you should also show whether the trend of many variables you focused here in the Fix_FF1920 is roughly the sum of Fix_EastFF1920 and Fix_WestFF1920.

11. L201-202: We know the decreased trend of FF-related aerosols in the North America and Europe is due to the clean air acts and increased trend of FF-related aerosol in the India and China is due to the economic development, but what's the reason of the stronger increasing trend of BB-related POM over the northeastern Asia?

12. L217: removing "1"

13. L241: and FF-> FF and.

14. L238-240: Could you explain a little bit more about how the indirect effects of aerosols (i.e., cloud droplets number and cloud lifetimes are enhanced) could expand the affected regions? Do you mean the cloud formed in the emission region can be transported to other places?

15. L244: should be decrease of CLDTOT rather than increase in response to WestFF based on Fig. 3?

16. Figure 3. You mentioned that regions passing the 95% significance is dotted, but I didn't see any dots there. You may also need to do the significance test in Fig. 2 and many other figures.

17. Fig. 5: What did you do when you say "smoothed in 30 degrees of latitudinal range"

18. would you like to mention how the increased FSNTOA gradient drives the equatorward shift of the NH jet stream?

19. L371: below 35N? seems problematic. Suggest changing to southward of 35N

20. Fig. 6: Here, why do you only focus on the EH, rather than Global in previous figures? Could you explain it a little bit?

21. L394: sometimes using FSDS, but in other cases, you use FSNTOA. Please justify your choices.

22. L418: references are needed here.

23. L430: induce es->induces a

24. L468: other ver?