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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of Asian Summer Monsoon Anticyclone on the Trace gases and Aerosols over Indian region" *by* Ghouse Basha et al.

Anonymous Referee #1

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Review of the paper:

"Influence of Asian Summer Monsoon Anticyclone on the Trace gases and Aerosols over Indian region..."

written by Basha et al.

General comments

This paper presents the spatial and temporal distributions of water vapour, ozone, carbon monoxide, temperature, and aerosols over the Asian Summer Monsoon Anticyclone (ASMA) region based on MLS, COSMIC GPS, and CALIPSO satellite observations and investigates the influence of ASMA on the tracers and tropopause parameters. Additionally, QBO and ENSO indices are used to identify the connection between these two climate patterns and tracers over the ASMA region. At the end, the manuscript shows the difference of several parameters under various monsoon conditions. In general, it is valuable to understand the characteristic of tracers and aerosols over ASMA region and the effect of QBO and ENSO on them. However, this study only presents the preliminary results of the distributions of tracers and aerosols without insightful finds. The data (e.g. ENSO) and definition (e.g. tropopause) used in the study are not consistent. The descriptions of the results are often not precise. More importantly, some statements given in the manuscript are not supported by the figures (e.g. the influence of QBO and ENSO on the tracers). There are still a lot of detailed technical errors in the manuscript. Therefore, I suggest this paper should be majorly revised.

Specific comments

- P7. L.159-165
  The description of the method used in the study is unclear. The equation should be explained in details.
- P8. L.180-181
  Some references should be included here about the representation of ASMA with 16.75 km GPH.
- P8. L.185-186
  "The height of the tropopause reaches 18-18.5 km in the northwest of the ASMA

region". From Fig.2a, the region with tropopause height 18-18.5 km lies in the southwest of the ASMA region.

- P9. L.203-205
  The statement here is unclear. This sentence should be revised.

- P9. L.209-211
  Fig.2f shows large amount of aerosol in the southern part of the ASMA. The values of ASR inside the anticyclone are in the range of 1.1-1.15.

- P11. L.253-255
  The correlation coefficients between ASR and other parameters are quite small. I can not conclude they are highly correlated.

- P11. L.257-262
  The conclusions given here are too general. More explanation and the connection to the figures should be included.

- P11. L.276-277
  Fig.5 does not always show positive values of ASR during eastward phase of QBO and vice versa. This sentence should be revised.

- P12. L.278-280
  Section 2.3 describes MEI ENSO index is used in this study. Later, Section 3 shows Nino 3.4 ENSO index is applied. Here, SOI ENSO index is used to analyze. Later, ONI ENSO index is also used. Which index did you really use? Why do you use several kinds of ENSO index? To help understand the figure, the definition of ENSO from different indices should be also included.

- P12. L.282-283
  Can you specify the lag between QBO and the parameters used here?

- P12. L.286-287
  Can you specify how much are seasonal, annual, QBO and ENSO components for all parameters?

- P12-13. L.299-303
  I can not conclude that the tropopause altitude and CO increase and the tropopause temperature and O_3 decrease over the whole ASMA region during the active days of monsoon from Fig.7. The results from Fig.7 present more like increase (decrease) of tropopause altitude and water vapour (tropopause temperature and O_3) in the southern ASMA region which may be connected to the deep convection region (BoB and the indian subcontinent). It looks like CO in the southern ASMA region slightly decreases instead of increases, the result will be clearer if you change the colourbar range of CO (Fig.7e). Significantly different test results should be included and shown in Fig.7 to indicate where is strongly affected by different monsoon conditions.

- P13. L.316
  Fig.8d does not show that ozone decreases over ASMA region during strong monsoon years. Maybe it is also affected by other factors (e.g. ENSO, QBO, mixing). You should include some explanation here.

- P13-14. L.323-327
  The statements here are not clear. Do you mean the tropopause altitude, water vapour, CO and ASR (tropopause temperature and ozone) increase (decrease) during La Nina years? If it is true, the results shown here are contradict to the statements before (L278-280) based on Fig.6. Or, you mean the tropopause altitude, water vapour, CO and ASR decrease during La Nina years? Check the data and confirm the statements. If it is contradict to the result before, what is the explanation? If it is not, this paragraph should be revised.

- P15. L.360-362

Again, the results shown here are contradict to the statements before (L278-280).

- P15. L.371-373
  I can not see that the tracers and aerosols in the ASMA are significantly impacted by the transport processes of moisture and pollutants from the northern part of Tibetan Plateau based on your study. Can you specify the connection?

Technical corrections

There are many detailed errors regarding tense, punctuation, and grammar... The manuscript should be edited thoroughly.

- Since the concentration units of water vapor, ozone, and CO are all mixing ratio, it might be better to just use "WV" instead of "WVMR" in several places of the manuscript.
- P12. L.296
  The reference Rajeevan et al. (2010) is missing.
- P26. Figure 2
  The results would look clearer if you make the range of colorbar smaller (e.g. WV, CO, and ASR).
- P28-30. Figure 4-6
  It will be easier to connect the text about the years with special conditions to the figures if you change the x-coordinate to yyyymm (year-month) or yyyy instead of using pure months (1,...,121).