

This paper discussed the chemical properties of the South Asian Upper Troposphere Lower Stratosphere during the Asian Summer Monsoon. They used Meso-NH cloud-chemistry model to simulate the monsoon deep convection on the composition of Asian Monsoon Anticyclone at the 15 km spatial resolution during the StratoClim campaign in 2017. The simulated CO, O₃, POA, and BC were compared with StratoClim and IAGOS observations. Overall, this paper is good, except for some defects in the analysis and model description.

General comments:

1. The simulation was conducted at 15 km resolution. The Kain-Fritsch-Bechtold scheme was used to simulate the parameterized (subgrid) convection. Do you use any scheme to simulate the subgrid convective transport and wet scavenging of the chemical properties? Or maybe the Kain-Fritsch-Bechtold scheme included the subgrid convective transport and wet scavenging of the chemical properties? Could you show more details about the subgrid convective transport and wet scavenging of the chemical properties in the model description part?

The subgrid convective transport and wet scavenging of the chemical properties are very important at 15 km spatial resolution especially in the developing stage of the convection. You can refer to the following two papers for more details:

Grell, G. A., & Freitas, S. R. (2014). A scale and aerosol aware stochastic convective parameterization for weather and air quality modeling. *Atmospheric Chemistry and Physics*, 14(10), 5233–5250. <https://doi.org/10.5194/acp-14-5233-2014>

Li, Y., Pickering, K. E., Barth, M. C., Bela, M. M., Cummings, K. A., & Allen, D. J. (2018). Evaluation of parameterized convective transport of trace gases in simulation of storms observed during the DC3 field campaign. *Journal of Geophysical Research: Atmospheres*, 123, 11,238–11,261. <https://doi.org/10.1029/2018JD028779>

2. The concentrations of the chemical properties in the upper troposphere are very sensitive to the relative location of the storm. Could you plot the flight tracks over the BT plots (or over radar reflectivity, or anything that can show the storm location) for each flight?

Specific comments:

1. Line 25: What's IAGOS? Could you show the full name of IAGOS?
2. Line 60: If you decided to use CO to represent carbon monoxide, please keep consistent throughout the paper (e.g in line 102, and in the captions of Figures 2, 4, 6, 7, 9).
3. Line 62: Please show the full name of CALIPSO.
4. Line 83: Please show the full name of MACCity.
5. Line 100: Could you show the aircraft tracks over radar reflectivity or BT to show their relative location to the convections?

6. Line 105: Please show the full name of HITRAN.
7. Line 124: Please show the full name of CTL.
8. Section 2.3: What's the time resolution of the simulation? It would be better if you can use a table to show the model setups.
9. Line 181: Are these meteorology schemes are the best combination? Did you try other schemes?
10. Line 181: How did the model transport the chemical properties in the subgrid scale? See general comments 1 for more details.
11. Section 3.2: Could you compare the simulation with the observation before convection started to prove the accuracy of the initial chemistry condition?
12. Section 3.2: When you compared the simulated and observed chemical properties, did you use a criterion to separate the inside-cloud and outside-cloud region? The CO concentration might be very different inside and outside the cloud.
13. Line 265: The height of the tropopause layer might increase in the area of deep convections. Therefore, it is not good to the climatological TTL height to determine whether the pollution affected the lower stratosphere or not. It's better to use the temperature gradient (like the WMO tropopause definition) to determine the height of the TTL.
14. Line 290: How do you define the cloud boundary? I see the definition in the caption of Figure 8, could you also mention it in the main content of the paper?
15. Line 321: Could you use an equation to describe the contribution of Sichuan?
16. Line 324: Change "The evolution of the difference ..." to "The evolution of the contribution of Sichuan ..."
17. Figure 1. What's STCLM?
18. Figure 2: This is the first time "CNTL", "SIC06", "SIC01", "CHN01", and "IND01" were mentioned in the paper. You may need to explain the meaning of these abbreviations.
19. Figure 7: Change "Horizontal map of BT ..." to "Horizontal map of simulated BT ..."
20. Figure 9: Please add the label of the x-axis (i.e. Date).
21. Figure 9: Please show the description of the blue box in the legend and caption.