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Interactive comment

# *Interactive comment on* "Convective uplift of pollution from the Sichuan basin into the Asian monsoon anticyclone during the StratoClim aircraft campaign" *by* Keun-Ok Lee et al.

**Anonymous Referee #1**

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This manuscript investigated the convective uplift of pollution from the Sichuan basin into the Asian summer monsoon anticyclone during the StratoClim aircraft campaign in 2017 by simulations with the Meso-NH cloud-chemistry model. After validation with the BT from satellite data and CO and ozone from airborne observations, the simulations are believed to study the impact of Sichuan convection on the AMA composition. Overall, the manuscript shows some interesting results, particularly the role of Sichuan basin as source region of pollution. Some major issues should be addressed before acceptance for publication in ACP. Major issues: 1. How to verify the simulations of aerosol in the tropopause layer? Because no measurements are used to validate the simulation. There are already some published studies, where the observations

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Discussion paper

of aerosol signal are used to validate the simulations. 2. Could you validate the CO simulations with MLS data? The simulations are not so good for F6 and F8 as shown in Fig. 4, so more validations are in need. MLS CO data will surely show the enhanced CO plume after the deep convection if the results given in this paper are correct. Minor issues: 1. L43-45: A recent paper by Bian et al. (2020) gives a comprehensive review of the deep convection on the UTLS composition during the ASM, which is recommended to be cited here. Bian, J., et al., 2020: Transport of Asian surface pollutants to the global stratosphere from the Tibetan Plateau region during the Asian summer monsoon, National Science Review, 7, 516-533, doi:10.1093/nsr/nwaa005. 2. L52: Higher tropopause over the ASM region is shown by Bian et al. (2012), which also shows the structure of AMA and therefore is recommended to be cited here. Bian, J., L. L. Pan, L. Paulik, H. Vömel, H. Chen, and D. Lu, 2012: In situ water vapor and ozone measurements in Lhasa and Kunming during the Asian summer monsoon. Geophys. Res. Lett., 39, L19808, doi:10.1029/2012GL052996. 3. L64-68: The different contribution from Indian and China sources to the UTLS is investigated by Yan et al. (2015), which conducts the simulation for one month with WRF-chem model and is recommended to be cited here. Yan, R. and J. Bian, 2015: Tracing the boundary layer sources of carbon monoxide in the Asian summer monsoon anticyclone using WRF-Chem. Adv. Atmos. Sci., 32(7), 943–951, doi: 10.1007/s00376-014-4130-3. 4. L180-190: How are the CCN activation and second activation by entrainment in the convective cloud considered, which is critical to the simulation of aerosol profile as shown by Yu et al. (2018)? Yu, P., K.D. Froyd, R.W. Portmann, O.B. Toon, S. R. Freitas, C. G. Bardeen, C. Brock, T. Fan, R. S. Gao, J. M. Katich, A. Kupc, S. Liu, C. Maloney, D. M. Murphy, K. H. Rosenlof, G. Schill, J. P. Schwarz and C. Williamson (2019), Efficient In-cloud Removal of Aerosols by Deep Convection,Geophys. Res. Lett., 45, 1061-1069, https://doi.org/10.1029/2018GL080544 5. Fig 6 and Fig 7: CO data from MLS is suggested to compare with the model simulation. 6. Fig. 10: CALIPSO data for aerosol is suggested to compare with the model simulation if the signal is so strong. 7. L340: Aerosols with radius of 0.385um are easily removed from the convection by activation.

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