Authors Response to Referees

A multi-scenario Lagrangian trajectory analysis to identify source regions of the Asian Tropopause Aerosol Layer on the Indian subcontinent in August 2016

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Comment: Abstract: Your abstract has current $\tilde{4}20$ words. According to ACP's new author guidelines, we recommend abstracts of 250 words. https://www.atmospheric-chemistry-and-physics.net/policies/guidelines_for_authors.html While I understand that you submitted your paper way before the implementation of these guidelines, I encourage you to shorten the abstract to focus on the main points and concisely describe topic/status of knowledge/gap/objectives/approach/results/importance.

Answer: Many thanks for handling the editing process and giving comments as Editor. To shorten the abstract we have removed some information of minor importance and used shorter formulations.

Comment: l. 36: 'originally' should be replaced by 'initially'

Answer: Done.

Comment: l. 52: 'was shown' should be 'were shown'

Answer: Done.

Comment: l. 129: Please use consistently either 'zeta' or the Greek symbol.

Answer: We have replaced zeta coordinates by the Greek symbol where ever possible.

Comment: l. 133: 'mitigate limitation in the resolution on convection' sounds awkward. Do you mean 'since they cannot resolve the small-scale convection processes'?

Answer: We rephrased the sentence to clarify its meaning: *Atmospheric models that are used to create reanalysis data need to apply convective parameterisation, because they are not able to resolve the small-scale convection processes.*

Comment: l. 134/5: replace 'does only contain' by 'only contains'

Answer: Done.

Comment: l. 152: Text seems redundant here. Can 'It will be explained in more detailed later' be removed? If it is explained in another section, in addition to appendix F1, please add the section number here.

Answer: We added the reference to the section 3.2., which is relevant to understand the selection of CIN.

Comment: l. 180 'each' can be omitted

Answer: Yes and done.

Comment: l. 245/6: Is it 'plain' or 'plains'?

Answer: We changed it to plain.

Comment: l. 259: Arabian Sea

Answer: Done

Comment: l. 329: delete 'the' (..the most..)

Answer: Done

Comment: l. 337: What do you mean by 'maritime processes'?

Answer: Maritime processes should refer to convection over the oceans and seas that transport the air upward into the UTLS. To clarify this we added: *Most of the relevant maritime convection (e.g. typhoons) that transport air masses out of the MBL into the upper atmosphere take place more than two weeks before the measurements.*

Comment: l. 382: (1) please write the equation in a separate line and give it a number, according to the mathematical notation and terminology guidelines https://www.atmospheric-chemistry-and-physics.net/submission.html (2) Make sure that the bar above the denominator can be clearly distinguished from the fraction stroke. Depending on screen resolution, currently it looks like C(t)/C(t) separated by a thick line. You may want to consider using / instead of the horizontal separation.

Answer: We have followed your suggestions and added a number for the equation.

Comment: l. 398: What do you mean by 'a couple 10%'? 'a couple' is synonymous with two, i.e. 20%? Or could you replace it by 'approximately 10%' or 'several tens of percent'?

Answer: We refer to changes between 10% and 100%. To clarify this we rephrased: *From day to day, the relative normalized deviation changes in absolute terms with the order of magnitude of 10% (i.e. 10-100%), while the total change of the relative normalized deviation during the period is roughly 90%.*

1 Reply to Reviewers Comment

Comment: My previous remarks were properly addressed by the authors. I have only a few minor comments, listed below.

Answer: Thank you for the review of our changes and your further comments.

Comment: l 122: I think that the world respectively can be omitted.

Answer: Yes, we removed it.

Comment: ll 310-311: "As a consequence of the frequent occurrence of CAPE" Do you mean frequent occurrence of high CAPE values?

Answer: We rephrased to *"As a consequence of the persistent occurrence of CAPE above South Asia in summer, the scenario with ECP simulates more and deeper convective updrafts in this region, than the scenarios without ECP."* However it is indeed the occurence of CAPE that triggers the parameterisation. The height of CAPE does not affect the parameterisation in the chosen set-up, because the CAPE threshold is 0. See also Hoffmann et al. [2023] Fig. 10 for further details on the occurrence of CAPE.

Comment: please correct the following typos: l 267: Arabian see → Arabian Sea l 153 and l 330: Persian Golf → Persian Gulf

Answer: Done.

2 Further changes

Comment: We found an error in the plotting routine for Figure 5a.

Answer: We corrected the plot and removed: *"except for the scenario with ECP."* (line 339), while no other part of the manuscript and analysis has been affected.

References

L. Hoffmann, P. Konopka, J. Clemens, and B. Vogel. Lagrangian transport simulations using the extreme convection parametrization: an assessment for the ecmwf reanalyses. *EGUsphere*, 2023:1–29, 2023. doi: 10.5194/egusphere-2023-72. URL https://egusphere.copernicus.org/preprints/2023/egusphere-2023-72/.