Atmospheric Chemistry and Physics Discussions

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Comment on acp-2021-277

Anonymous Referee #2

Referee comment on "Origin of water-soluble organic aerosols at the Maïdo high-altitude observatory, Réunion Island, in the tropical Indian Ocean" by Sharmine Akter Simu et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-277-RC2, 2021

General comments:

This study presents chemical analyses of submicron aerosols sampled at Maïdo observatory on La Réunion Island in the Indian Ocean during March – May 2018. This period covers part of the wet and dry season. There is a clear need for improved knowledge on the physicochemical properties of aerosols in remote locations, especially the undersampled Southern Hemisphere. I therefore support eventual publication of this manuscript in ACP, however comments detailed below should be addressed first. Overall, the manuscript is well written, and the analytical procedures appear sound, with the exception of PMF, where more details on the choice of factors should be given.

Specific comments:

P. 1, L. 23 – 24; P. 2., L. 33 - 34: The separation into FT and MBL is usually not that simple (see e.g. Collaud Coen et al., 2018), and also the references given (Guilpart et al., 2017, seems to be missing in the reference list) state that no observational evidence is available to confirm the assumption of FT conditions at night. A short discussion and more information about the uncertainties related to the potential influence of MBL or residual layer on the night-time samples need to be given.

P. 1, L. 26; P. 2, L. 31 – 32; P. 4, L. 13 - 26: The separation between wet and dry season is described in “methods” as "[…] wet (typically from November to April) and dry seasons (from May to October).” How do you justify the separation of your data into “dry” and “wet” with the change taking place within one day? More information needs to be given, e.g. a time series of the water vapor mixing ratios should be shown. Also, in section 3.1 you mention “significant” differences in water vapor mixing rations at several instances, however, are the differences really statistically significant? If not please use another word than “significant”. Also, without more context and analyses the values do not prove or

confirm the the separation into FT and MBL. Please revise.

P. 1, L. 26, P. 5, L. 5: The outbreak of the volcano coincides with the start of the dry season. The sulfate is therefore not due to a change in season, but due to the volcano. This needs to be stated very clearly, otherwise the interpretation is very misleading.

P. 1, L. 33: "[…] which may be responsible for cloud formation […]" - This is too strong of a statement, I suggest toning it down, similar for P. 7, L. 38 - 39

P. 2, L. 8: The bubble bursting process also produces particles larger than 1 micrometer

P. 3, L. 5 – 8: How were the filters stored after sampling and before analysis? Please add this information.

P. 4, L. 3 – 10, section 3.4: These sections need more information for the reader to be able to understand the PMF results; e g. how were the analytical measurement uncertainties calculated? Based on what criteria did you choose a six-factor-solution, especially given the uncertainties related to F5 and F6? You state that PMF reproduced 86% of the measured WSOC mass – what about the other aerosol components that you used as input in PMF? You state in L. 4 - 5 that you investigate the sources of WSOC using PMF, however your input also contains inorganic ions. Please clarify.

P. 5, L. 1 -2: Why? Can you give some reasoning here?

P. 5, L. 26, 29: Given the stated uncertainty range, these values are very close to the limit value. Please comment.

P. 5, L. 31 – 34: Give details here on the mass balance equation. Also, the d13C values you used in the equation – how well do they represent your dataset? Please discuss.

P. 6, L. 38 - 39: "[…] attributable to local terrestrial biogenic emissions of VOCs during the transport from the ocean to the observatory […]" – unclear, how can terrestrial emissions be transported from the ocean?

P. 7, L. 11 – 12: I don´t understand how you come to this conclusion.

Technical comments:

P. 1, L. 16 – 17: Revise sentence; CCN and IN are aerosol particles, and "important factors relevant to" therefore is unclear

P. 2, L. 2: The ocean is a source of aerosols, the ocean surface is simply the interface to the atmosphere. Suggest deleting.

P. 3, L. 19: Should read "were transferred"

P. 4, L. 1: ECMWF: Give full name

P. 5, L. 11 – 12: "Substantially larger" – compared to what?

P. 5, L. 19 – 22: Give a short explanation here how this is done, and the accuracy and uncertainty range of the limit values in L. 24

P. 4, L. 38: "typical" for what?

P. 6, L. 10: "Enrichment" compared to what?

P. 7, L. 15: "additional" to what?

Caption Figure 2: "Extreme data"?

Figure 5: Dotted lines are not visible

Figure 6: Specify 10-day period. Color scale is missing.

References:

Collaud Coen, M., Andrews, E., Aliaga, D., Andrade, M., Angelov, H., Bukowiecki, N., Ealo, M., Fialho, P., Flentje, H., Hallar, A. G., Hooda, R., Kalapov, I., Krejci, R., Lin, N.-H., Marinoni, A., Ming, J., Nguyen, N. A., Pandolfi, M., Pont, V., Ries, L., Rodríguez, S., Schauer, G., Sellegri, K., Sharma, S., Sun, J., Tunved, P., Velasquez, P., and Ruffieux, D.: Identification of topographic features influencing aerosol observations at high altitude stations, Atmos. Chem. Phys., 18, 12289–12313, https://doi.org/10.5194/acp-18-12289-2018, 2018.