

Independent scientific review of "Multi-year statistical and modelling analysis of submicrometer aerosol number size distributions at a rain forest site in Amazonia" by L. V. Rizzo et al.

Major comments

This paper discusses observations and features of ambient atmospheric aerosols in the Amazonia. Special focus is directed towards how the physicochemical properties is vastly changed from the wet season, with high occurrence of intensive rains, to the dry season. It is well known that the wet season are characterized by low particle number concentration and smaller size particles. While the dry season may show high abundance and concentration of biomass burning aerosols and an urban plume from the city of Manaus. In this paper, cluster analysis has been elegantly applied in order to explain many of the observed temporal features in aerosol size and aerosol mass concentration. Modelling trough the ADCHEM model has also been used in a comprehensive way in order to parameterize physical properties of importance for observed aerosol features. The main conclusion of the paper is the necessity of three stated aerosol sources in order to explain the observed physical properties of the aerosol.

The language is on a very high level and easy to follow. The methodology is technically sound and the inferred results and conclusions are well-supported by data from modelling, observations and references. The tables and figures are easy to read and understand. This paper deserves to be published after consideration of the minor comments stated below.

Minor and specific comments

Page 3, line 18-19. Please explain somewhere in the introduction why NPF is rare below BL in Amazonia but more common above the BL. This is unclear to me.

Page 6, line 27. State developer and version of the MATLAB software.

Page 6, line 29. Can these data-fences be illustrated somehow for increased understanding of the methodology?

Page 6, line 30. Explain the 1.5 factor please.

Page 7, line 13. It would be nice to get a very brief explanation of the "K-theory" here.

Page 11, line 3. "Surface emission of biological could...". Biological what? Particles?

Page 11, line 31. Should be "Figure 5".

Page 11, line 32 (Fig. 5). I do not understand the difference between "occurrence in each season" and "occurrence along the entire dataset". In the figure both of these are seasonally divided.

Page 14, line 1. Are these biological particles primary or secondary?

Page 15, line 14. Please explain why high emissions of isoprene would inhibit NPF. Presence of BVOCs would enhance NPF?

Figure 1. Please explain the "ten-day window" in the figure caption.

Figure 5b. I can't recall that I ever heard anything about an 8th cluster as shown in fig. 5b?

Figure 5c-d. As mentioned earlier, I have some problem understanding the difference between 5c and 5d. Both are seasonally divided, still you claim that only fig. 5d show cluster occurrence for the entire dataset.

Figure 6b. Evidently, some absorption occur during the wet season. Can you elaborate in the text why we see this and what particle types that can be suspected for causing this absorption?