

Interactive
Comment

Interactive comment on “Long term in-situ observations of biomass burning aerosol at a high altitude station in Venezuela – sources, impacts and inter annual variability” by T. Hamburger et al.

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General overview

This manuscript presents a 2,5 year set of aerosol measurement data from a high-altitude site near the savanna region of northern South America. The measured aerosol parameters are particle number size distribution (12-500 nm), size-dependent non-volatile particle number concentration (300 C) and aerosol absorption coefficient. No other long term measurement campaigns have been published from this area, but part of this measurement data has been published in a paper by Schmeissner et al.,

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2011. This new manuscript looks at the data from a different point of view, and does not conflict or take credit from the earlier paper. The results presented in this manuscript are new and important for the scientific community.

The instrumentation and data analysis is generally well described and valid. The authors clearly state the reasons to use or exclude certain parts of the data. The two-altitude trajectory analysis used in the manuscript is a nice approach to cope with the problems trajectories have in complex terrain. The main results are stated clearly and discussed well. Also earlier work is cited and credited properly.

The overall structure of the paper is clear, but as one looks closer to the individual chapters, the focus of the text often jumps from one topic to another and then back. This, combined with complex sentence structures, makes the manuscript unnecessarily difficult to follow. Streamlining the text would make it a lot more reader friendly.

The number of tables and figures is appropriate for the text, and there is no need to add or remove any tables or figures. More precise comments are given in the end of this referee comment under section “Tables and figures”

In general this is a good manuscript presenting valuable data and results. I suggest this manuscript to be accepted with modifications stated below:

Major comments

Data and analysis:

The authors have measured size-dependent number concentration of particles, but report particle volume concentration throughout the text. The manuscript should state how the number concentration data was converted to volume concentration and what assumptions were made.

The reported measurable particle size range is (10-500nm) different from Schmeissner et al., 2011 (10-470nm), even though the instrument and data are the same. Also the seasons are defined differently. It would be good to discuss the differences and

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add some more information of the ambient particle number concentration and size distribution in the text, even though they are reported in the Schmeissner et al., 2011 paper.

Text streamlining throughout the manuscript, especially following chapters:

3.2 Seasonal cycle: Please re-structure the chapter so that you first describe the conditions for dry season and then for wet season, and the same for LFT and BL. In the current form the chapter is very difficult to follow.

5.2. 12 yr of satellite observations: This chapter first states the meteorological conditions as the main reason for inter annual variability in aerosol conditions. Then it describes the regulations and then back to meteorology. I suggest discussing the meteorology first and then the regulations. Also in the meteorology part it is unclear for some sentences whether they describe El Nino or La Nina conditions.

Minor and technical comments

It would be nice to point out in the manuscript that the number-size-distribution of the aerosols is already examined in Schmeissner et al., 2011 and is therefore not included in this manuscript.

P13082 L10: There is a lot of other recent research besides Myhre et al., 2009 aiming to reduce the uncertainty of the climate effects of aerosols. Since you can not list them all, I suggest using form (eg. Mygre et al., 2009), with possibly some other sources mentioned as well.

P13082 L11-12: “Within ... Troposphere” I suggest moving this sentence in the last chapter of the introduction, as that is where you describe other things about your own work.

P13082 L21-22: “Unlike ... sunlight.” This sentence is not needed, as the same thing is said in the previous paragraph.

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P13084 L12 “It ...” Please replace word “It” by “The station” to make it more clear that you are not talking about ZFK or KIT anymore.

P13084 L12: Is the eastern branch of the Andes is roughly like a single ridge or more complicated topography in this area.

P13084 L13-18: I suggest to include the altitudes of the cities in the text to make it clear that the station is at clearly higher altitude.

P13085 L21: “The residual ... aerosol.” Even though this sentence is probably true, there is nothing in your measurements that can prove it. You can only assume that they are primary particles.

P13085 L26-29: “Particles ... plumes (hours).” Is this also from Janhäll et al., 2010?

P13086-13087: I suggest streamlining the text such that you first report what data you remove from both DMPS and PSAP (cloud periods), then go through one instrument at the time for further exclusions and then tell how much data is left for each instrument. It could also be good to estimate how much error is caused by the exclusions. Finally in the end keep the description of the LFT / BL division.

P13089-13090 L29-2: “We were ... boundary layer” This sentence remains unclear. Please consider rephrasing.

P13090 L13-14: “The ITCZ ... Hadley Cell.” I suggest removing this sentence, since it is not needed for the analysis, but distracts the reader.

P13092 L12-13: “The average RH ... observation period.” Please rephrase.

P13093 L9-13: It would be good to point out that these numbers include both LFT and BL values.

P13094 L10-12: “In addition, ... possible sources.” In the introduction you state that Rissler et al., 2006 states that 30% of global biomass burning activities take place in entire South America. Here you give the same value and reference for the Amazon

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basin. Please correct the one that is wrong.

P13094 L18-21: In the figures figure 5a is without precipitation and figure 5b with precipitation taken into account, here the opposite way. Please correct.

P13095 L12: “. . .precipitation event.” Please add a reference to figure 6.

P13096 L15-16: “But, not only . . . important.” This sentence is unclear. What do you mean by individual properties of the plume? (Is that each property of the plume alone or properties of individual plumes?) P

P13096 L17-21: “Sakeada . . . radiative effect.” Please check the signs of the effects, and consider using warming and cooling effect to avoid misinterpretation.

P13097 L12: “The transport . . . in Fig. 7a and b.” What do you mean by dashed clouds?

P13097 L22: Please use 12 years instead of 12 yr in the section header.

P13098 L10-11: Please include a reference or more description about the tri-national policy shift.

P13098 L23-26: “Those brigades . . . across the country.” Explaining the work of the communal fire brigades is clearly outside the scope of this manuscript. Please exclude this sentence.

P13098 L27-30: “So far, . . . legal regulations” Here I can not follow your reasoning. How do the lack of trend indicate success in implementing legal regulations?

P13100 L24-25: “No evidence of long range transport . . .” Since the Amazonas plumes are described in previous sentences, I assume that this means transport from Africa. It would be more clear to rephrase the sentence into “No evidence of long range transport from Africa . . .”

Tables and figures

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Figure 1: Extending the map a bit more to the west would be nice. Now Pico Espejo is close to the edge of the map even though it is the downwind edge.

Figure 2: Adding time series of N would be nice. Also using smaller maxima for the Y-axis of V and b_{abs} would improve the readability.

Figure 3: Same suggestions as to Figure 2.

Figure 4: Similar suggestions than to Figures 2 and 3.

Figure 5: Concentration this figure to only South America would increase the readability.

Figure 8: Seasons in plural in the figure caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 13079, 2013.

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