

## ***Interactive comment on “Biomass-burning and urban emission impacts in the Andes Cordillera region based on in-situ measurements from the Chacaltaya observatory, Bolivia (5240 m a.s.l.)” by Chauvigné Aurélien et al.***

### **Anonymous Referee #4**

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This paper provides an interesting overview of the aerosol particle properties observed at the high mountain station Chacaltaya in the South America (Cordillera Real). The topic is of interest for ACP and the paper is generally well written. The scientific approach is sufficiently robust and the presentation of data and results is fair. Nevertheless, some points should be better addressed before publications. In particular, the authors should better discuss the caveats related with the back-trajectories analysis as well as provide more details and information about the experimental methodologies (e.g., no information about data generation, uncertainty characterization are provided).

C1

In the following you can find my specific comments. \_\_\_\_\_

Abstract. In the last sentence, the authors claimed that "CHC provides first evidences of impact of emission from Amazonian basin far away from their source". Be more specific. Which "far away" means? Please, in the site description provide distance of CHC from Amazonian basin

Line 71: please provide wavelengths

Line 92 - 105: this section is hard to follow. I would recommend to add a table with the different threshold values for each type of particles (dust, pollution, biomass burning) for the different Angstrom exponents (AAE, SAE, SSAE)

Line 103: please correct "bellow"

Line 135: please clearly state which kind of compensation must be applied to aethalometer data

Line 140. was the mass coefficient provided by the manufacturer independently assessed and validated by others? If yes, provide references, if not, provide adequate comments

The method for deriving the absorption coefficient it is not clear. Equation 2, what is  $C.R(\lambda)$ ? Equation 3 it is also not clear: please describe the contribution of each member/factor. What  $\ln(10\%)$  and  $\ln(50\%)$  represent? Why the factor R should be adjusted? What do you mean for "spot" change? Why the absorption coefficient should be the same before and after the spot change?

Equation 4: what "mEBC" is? Does QEBC is equal to QBC reported by line 148?

Line 155: the authors stated that the aethalometer measurement at 635 nm is unstable. Quantitatively, what does this mean? Do you are able to provide threshold value that other users can apply to evaluate if their own measurements are unsta-

C2

ble? In general, which QA/QC framework/procedures did you apply to all the suite of measurement discussed in this work? Please describe air inlet system and calibration strategies for the considered instrumentations (i.e. nephelometer, aethalometr, MAAP). Please quantify uncertainties related to each of these measurements.

Also equation 10 is not clear: what  $\sigma^2(x)$  with X=12,30,45,60 represent? I think that the vocabulary used by the authors can be misleading. More than layers this methodology can be able to discriminate turbulent versus stable (or more stable) conditions at the measurement site. Please change nomenclature.

Line 189: why was the residual layer excluded by the analysis? Does this mean that the residual layer conditions are embedded in what the author defined as "stable" layers? Please, better specify this point since this can have implications for the interpretation of results.

Line 193: I think that "morning" must be changed by "night"

Line 204: what BT set is used for the cluster analysis (12 hours or 96 hours)? Why different TRJ lengths were considered/calculated? Is the trajectory calculation set-up changing for the 12 and the 96 hours BTs? The authors did not provide any indication about the meteorological files (which are? Which horizontal and vertical resolution?) used for BT calculation nor about calculation set-up (which starting heights? single or multiple starting points around the station locations). The resolution of the input metro files is particularly important in this mountain region, I guess. Please comment on that and provide caveats about the effective reliability of trajectories in this region. This point is critical for interpretation of results.

Figure 4a is hard to understand and the comparison among the different cluster is challenging. Maybe, it can help to use a stack bar plot with 1 bar for each single month composed by the contribution from each different single cluster.

Also Figure 4b is difficult. The geographical boundaries are not clear at all. The same

C3

is true for the topographic features. Most of the locations listed in the legend are meaningful for readers not used with the region (are these villages, cities, regions?). For these reasons, it should be strongly improved.

Line 212: sentence starting with "Thus, for each cluster,..." isn't clear: what do you mean for "events"? "When the cluster have the most influence": what does it mean?

Line 263: Since the extinction is the sum of absorption and scattering, and scattering » absorption, the similarity between extinction and scattering is trivial.

Line 377 - 376: please better explain. in which way the AAE values are impacted by the aethalometer variability. Do you mean that the uncertainty of aethalometer is enhanced during wet season? For which reason? How this impact results robustness (please discuss in the conclusions)?

Line 401: the decrease of urban particle influence within air-masses from La Paz during "turbulent" conditions (in which I expect more efficient transport from the lower layers to CHC) is rather surprising. Does this indicate some inaccuracies in the local TRJ calculation or in the turbulent conditions identification?

Line 421: I agree that the transport to higher troposphere layers was supported but the spread over long-range (please, quantitatively specify what do you mean for long-range) is more a (reliable) hypothesis.

Line 435: the authors concluded that an effect of dust is visible during the entire dry season. However, looking at figure 9, SSAE is mostly >0 during the dry season which contradict this (see also line 103). Please comment and/or rephrase.

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C4