Atmos. Chem. Phys. Discuss., 7, S4839–S4843, 2007
www.atmos-chem-phys-discuss.net/7/S4839/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol and precipitation chemistry in a remote site in Central Amazonia: the role of biogenic contribution" *by* T. Pauliquevis et al.

Anonymous Referee #2

Received and published: 10 September 2007

This paper presents the monitoring of atmospheric aerosol and rain chemical composition in the remote site of Balbina in Central Amazonia. This study is part of the global thematic dealing with atmospheric chemistry, i.e, aerosols and rain chemistry as part of atmospheric deposition studies. This thematic is relevant with scientific questions within the scope of ACP. The main objectives are (1) to determine the mass and the chemical composition of the aerosols with a size discrimination focused on Black Carbon (BC) and trace elements, and (2) to determine the rain chemical composition. Aerosol and precipitation compositions are analyzed and discussed as a function of atmospheric sources strength and variations; and climatological conditions.

General Comments The paper presents an original dataset in a remote tropical forested site. In addition the period of measurements including 2 to 3 years allows to follow seasonal variations and to understand the sources contributions to rain and aerosol composition. In general, the paper is well written and data are clearly presented in tables and figures of good quality. This work aims to propose adapted sampling procedures and analytical methods for particulate matter and rain composition monitoring. Main results show that natural sources of gas and particles are predominant in the west Central Amazon rainforest and determine the atmospheric composition. Biogenic aerosols are dominant. In the introduction, the link between aerosols and rain is well presented according the description of atmospheric processes. This link is also presented as the main objective of the paper; however results doesn't show any conclusions of the potential aerosol contribution to rain chemistry and a lack of discussion is noted.

1- The authors present data for the site of Balbina identified as a remote site. Biomass burning is clearly emphasized as an important signature both in rain and aerosol. It will be necessary to define the potential sources that influence the site at a regional and a more global scale. In this way, I suggest that seasons will be clearly defined in the text in terms of month. In this way it will be possible to see in the results of concentrations intra and inter seasonal change and to identify the different step of the wet season.

2- According to the data presentation, I suggest to determine and to emphasize orders of magnitude for month, seasons in aerosols and rain. This could help to give the main characteristics of aerosol and rain chemical composition representative of the site. It will be also important to clarify the correspondence between species and potential source that the authors use.

3- Rain water chemistry is not sufficiently discussed. Conclusions on the weak contribution of biomass burning to the rain composition are not evident. To complete the discussion, authors can answer to questions written in the next section (questions and minors comment). The acidity of rain is also not well explained and seems to be mainly related to mineral acidity.

ACPD

7, S4839–S4843, 2007

4- The section entitled discussion needs to be revised. According to the paper objectives, it is necessary to try to relate aerosol and rain chemistry. The authors could perhaps try to identify the particulate and the gaseous contribution to the rain composition.

Questions and Minor comments:

It will be important to use page numbers to submit the reviewed version and other papersĚ because it is difficult to identify locations for corrections.

1- As for the title, I would like to suggest that long term measurements will be removed from the abstract and the text (see end of the introduction, with just the mention of the number of years of measurements. Long Term monitoring is more appropriate when it is related to decade's studies for example.

Section 4.1 More informations on BC analysis are needed. The author can add in the text the method of reference they used (the instrument, the method). A TOR method is too general as a description. Is it a thermal method? A thermo-optical method?? In the text, BC concentrations are discussed according the aerosol size and the mass distribution. It is difficult to follow BC composition in fine and coarse mode and to relate mass variation in the fine and coarse mode according to the figure 2 and 3. To clearly indicate the influence of BC in the fine mode, the figures have to be compiled.

Biomass burning, soil dust and biogenic aerosol No calculation of enrichment factor for example with Aluminum as a reference for soil dust contribution in both seasons. At the end of the section, sentences are repeated to explain that BC is predominant in the fine mode.

Section 4.1.1 There is no 4.1.2 , so 4.1 is sufficient

Table 3: CPM is coarse particulate mass not fine. It will be interesting to have for table 2 and 3 the same order of presentation for the different species.

In the discussion of BC seasonal cycle, it seems that the non influence of biomass

ACPD

7, S4839–S4843, 2007

burning in the coarse mode is not evident. Caution in this part of the discussion should be taken. Figure 3 has not the same scale for fine and coarse mode, a detailed analysis can be done for each mode and each season. Important -Highlighted: choose one word in the same sentence.

For the sea salt component, the discussion is too long according the known result for the marine contribution in rain.

In addition to biogenic absorbing particles in the coarse mode; the authors can think to discuss to the absorbing properties of soil dust particles.

Figure 6: in the coarse mode: chlorine should be associated to a potential source as all the other aerosol contributors. In this figure: the author group in the coarse mode 94% biogenic and soil: is it not possible to give the contribution of each source separately. Later in the text, soil is associated to 0.23%?? The aluminum ratio in soil dust can help to do it. The figure needs to be clarified. In the discussion, soil dust emission at the local scale is discussed but the terrigenous influence is often associated to long range transport of dust.

Figure 8 Y axis of the figure is FINE (not FFINE)

Section 4.2

Section 4.2.2 The author state that there are no differences between dry and wet season fluxes, it is true. This result is very important because of the large difference in the amount of rain considered in the both calculations. The discussion need to give more informations on the amount of rain and the seasonal variability on the site of the pluviometry regime.

Results are not clear according the influence of biomass burning in the dry season. VWM of chlorine, potassium and also oxalate are higher in the dry season. These results let to think to biomass burning source.

The acidity is higher in the dry season, is it related to stronger VWM of nitrate??.

ACPD

7, S4839–S4843, 2007

This section is not clear with a mixture in the discussion of wet deposition fluxes and VWM. The text needs to be clarified, with first comment on VWM seasonal variations followed by deposition rates.

What is the possible link between oxalate and nitrate? Have they a common source?

In this section, there is no discussion of the different contributions present in the biogenic source. Is the soil contribution present in biogenic source?

Discussion and conclusions

The author said that analytical methods are different for rain and aerosol composition. It is true but when PIXE and IC determine calcium concentration, this species can be largely attributed to soil dust or marine source. Calculation shows that 91% of calcium is non sea salt. In the discussion, the authors speak about soil dust contribution in rain but this contribution is not discussed and present in table 5.

The conclusion in the last three sentences is too rapid. For example, in Africa, all the papers cited for comparison with Balbina in terms of chemical composition of rain show remote sites with no anthropogenic activities but normal local perturbations.

In this section, I encourage the authors to summarize the main chemical characteristics of aerosols and rain in Balbina in relation with sources, season, climatology. Finally, this discussion needs to further investigate the sources signature influencing both rain and aerosol composition.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 11465, 2007.

ACPD

7, S4839–S4843, 2007

Interactive Comment