Atmos. Chem. Phys. Discuss., 15, C8652–C8655, 2015
www.atmos-chem-phys-discuss.net/15/C8652/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric salt deposition in a tropical mountain rain forest at the eastern Andean slopes of South Ecuador – Pacific or Atlantic origin?" *by* S. Makowski Giannoni et al.

Anonymous Referee #1

Received and published: 29 October 2015

General comments:

The manuscript discusses the possible source regions affecting sea salt deposition in a tropical mountain rain forest site in Southern Ecuador. The discussion was based on five years of rain and occult precipitation water ion composition data, sea salt aerosol concentration data from MACC (Monitoring Atmospheric Composition and Climate) re-analysis and NOAA/Hysplit backtrajectories. The authors discuss well the contribution of Pacific and Atlantic source areas of NaCl to the study area, combining MACC and

backtrajectories datasets. However, both are reanalysis datasets, which are based on satellite, surface observations (scarce in the Amazonian region) and modelling. The link to actual measurements (rain and occult precipitation data) is rather weak, and should be reinforced.

Specific comments:

1) The term "salt" is not precise (title and abstract). Better to use "sea salt" instead.

2) Lines 45-49: references are missing. I suggest Talbot et al., 1990.

3) Line 135: detection limits of cations and anions analysis should be mentioned.

4) The rain water data set presented in the manuscript spans from 2004 to 2009. Was part of this dataset published by Fabian et al., 2009? If so, that could be mentioned somewhere.

5) Section 3.1: the horizontal resolution of MACC reanalysis data should be mentioned: 80 km (Inness et al., 2013).

6) Section 3.2: the frequency of calculated trajectories should be mentioned. Based on the number of trajectories mentioned in the abstract, one could guess that daily trajectories were used. Nevertheless, this should be explicit in the methods section.

7) Section 3.2: Which criteria did you use to define the number of trajectory clusters?

8) Line 224: The authors shall raise hypothesis to explain why Cl- concentrations were usually higher than Na+ in rainwater. Pauliquevis et al., 2012 also reported higher Cl- in Amazonian rainwater. On the other hand, in the aerosol phase, the literature shows Cl/Na molar ratios smaller than 1 in Amazonia (Martin et al., 2010; Junior et al., 2015). Please comment on that.

9) Lines 240-260 (linked to the previous comment): Figure 3 shows that in some cases Cl- is associated with SO42-, NO3- and K+. In addition to sea spray, are there other sources that could contribute to Cl- in rainwater and OP?

10) Table 1 and lines 299-300: please clarify how the percentage of total concentration was calculated.

11) Table 2 was not discussed, and there is not even a reference to it in the manuscript.

12) Table A1 should not be in the appendix, because it is the only link between actual measurements and MACC reanalysis data. The table caption is not clear. Are the numbers reported the linear correlation coefficient in each case? How about the "mean" column, what is the meaning, and what are the units?

13) Lines 274-275: I am not convinced that MACC NaCl aerosol concentrations represent well the conditions observed at the ground measurement sites. MACC's horizontal resolution is 80 km, while the distance between the Reserva Biologica San Francisco and the Pacific Ocean is about 100 km. The topography and its significant influence on atmospheric circulation and on the transport of scalars cannot be correctly described within MACC's horizontal resolution. This limitation should be mentioned in the manuscript, as well as the possible bias resulting from that.

14) The results from trajectory cluster analysis, PSCF and CWT are interesting and consistent with each other. However, they are all based on MACC's sea salt particle concentrations, and not on actual measurements. With that, you can only demonstrate that the model within MACC predicts that $\sim$80% of sea salt particles, in a 80 km square area in Ecuador, comes from the Atlantic, and that $\sim$20% comes from the Pacific. To provide stronger evidences, you should include the five years of rain water and occult precipitation observations in the cluster, PSCF and CWT analysis.

15) In years of El Niño, the Eastern winds typically weaken. Did you notice any trends on sea salt transport in El Niño years between 2004 and 2009?

Technical corrections

1) Some phrases should be reformulated. Examples: lines 28-29; line 56 (the word "taxa" seems to be misplaced); lines 105-107.

2) Typos on lines 245-246: replace SO4- by SO42-.

References

Inness, A., Baier, F., Benedetti, A., Bouarar, I., Chabrillat, S., Clark, H., ... & Zerefos, C. (2013). The MACC reanalysis: an 8 yr data set of atmospheric composition. Atmospheric chemistry and physics, 13, 4073-4109.

Junior, R. C. D. O., Keller, M. M., Ramos, J. F. D. F., Beldini, T. P., Crill, P. M., Camargo, P. B. D., & Haren, J. V. (2015). Chemical analysis of rainfall and throughfall in the Tapajós National Forest, Belterra, Pará, Brazil. Revista Ambiente & Água, 10(2), 263-285.

Martin, S. T., Andreae, M. O., Artaxo, P., Baumgardner, D., Chen, Q., Goldstein, A. H., ... Trebs, I. (2010). SOURCES AND PROPERTIES OF AMAZONIAN AEROSOL PARTICLES. Reviews of Geophysics, 48(RG2002). http://doi.org/10.1029/2008RG000280

Pauliquevis, T., Lara, L. L., Antunes, M. L., & Artaxo, P. (2012). Aerosol and precipitation chemistry measurements in a remote site in Central Amazonia: The role of biogenic contribution. Atmospheric Chemistry and Physics, 12(11), 4987–5015. http://doi.org/10.5194/acp-12-4987-2012

Talbot, R. W., Andreae, M. O., Berresheim, H., Artaxo, P., & Garstang, M. (1990). Aerosol chemistry during the wet season in central Amazonia - The influence of long-range transport. Journal of Geophysical Research, 95(D10), 2156–2202. http://doi.org/10.1029/JD095iD10p16955

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 27177, 2015.