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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Free amino acids in Antarctic aerosol: potential markers for the evolution and fate of marine aerosol" *by* E. Barbaro et al.

Anonymous Referee #3

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General comments:

I recommend the paper to be published subject to minor revisions.

This is the second time I referee your paper. I still see it as a valuable contribution to the field, since amino acid particles have not been properly characterized in remote regions. The introduction is very nice, with a broad description of the sources of amino acids in aerosol particles, which is needed to understand the sources of the amino acids in your paper. The Chirality description is very informative now. I am also very satisfied with detailed account of methods, and the result section.

The English language is excellent now, and also the sentences give meaning to the research performed (before you had several sentences, which didn't mean anything specific).

Specific comments:

Abstract

* Some amino acids are relatively good CCN also, like l-glycine. Please, if you mention IN ability, you also have to mention CCN ability. This goes for the Introduction chapter as well. There are several papers available on the CCN activity.

* "During the sampling cruise on the R/V Italica on the Southern Ocean, high concentrations of amino acids were found in the total suspended particles, this we attribute to the presence of intact biological material in the sample." Try to be more specific. I don't know what you mean here.

Introduction

* P 1271, L 12. "is due to", should be "depends on".

* P 1273, L 28. How can antarctic aerosols give information about formation and growth. Think you have to explain this. Which formation, and which growth are you referring to?

* Experimental section.

* P 1279, L 15. "S1-S3, it". Should be "S1-S3. It".

Result section.

* "The most likely explanation for this enrichment of amino acids in the coarse fraction, is that the fine fraction has 5 been subjected to processes that increased the particle size of the aerosol. The most likely process is ice nucleation during long-range transport promoted by the intense cold over the plateau and presence of amino acids

in the aerosol particles (Szyrmerand Zawadzki, 1997)." I don't think this should be a likely explanation. i think it is more probable that these amino acids are present in primary emitted coarse mode aerosol particles, which can come from phytoplanktonic sea spray coarse mode particles (Matsumoto and Ueamatsu, 2005), or from soil dust coarse mode particles (Mace et al., 2003). Particles and their chemical constituents can travel for many weeks in the upper troposphere without being lost provided they are not subject to wet deposition, or that the compounds are reacting in the aerosol phase. You are yourselves suggesting that hydrophobic amino acids can survive long range transport. in summary: You can add that these coarse mode amino acids can have both a continental and marine origin, but that you are not sure were they come from. And with continental origin, I mean both Australia, South America,Africa, Antarctica despite that the trajectory is not showing a continental origin within the last week. The coarse mode particles can come from the continents several weeks ago).

* P 1288, L 3. This is probably the main source of amino acids in our on-ship samples, this is also supported by the backtrajectory analysis (Fig. S8a–g), where demonstrate only a marine influence for that period. Should read: "This is probably the main source of amino acids in our on-ship samples. This is also supported by the backtrajectory analysis (Fig. S8a-g), which demonstrates only a marine influence for that period."

* P 1288, L 15. What is "Oceania"?

* P 1289, L 5-13. "The back-trajectory analysis (Fig. S8c–e) demonstrated that the air masses came from inland Antarctica, where no vegetation is present. The biological material present in the atmosphere with a size > 10 μm includes pollens which typically vary between 17–58 μm, fungal spores between 1–30 μm, and algal spores between 15–120 μm. Instead bacteria have a diameter between 0.25–8 μm, and viruses have diameters that 10 are typically less than 0.3 μm (Jones and Harrison, 2004). For this reason, we propose that the biological materials that influenced the concentration of the total free amino acids in the shipboard aerosols can probably be attributed to algal spores." Why only algal spores? You should not exclude pollen in this paragraph

already, since it is not until the next paragraph where you use Pro to isolate algal spores as the only explanation.

Conclusion

* "The study of aerosols with diameters > 10 μm indicated that bubble bursting pro cesses can also emit microorganisms that are composed of a higher number of neutral amino acids." I didn't get this from the result section?

References Mace, K. A.; Kubilay, N.; Duce, R. A. J. Geophys. Res. 2003, 108 (D10), 4320. DOI: 10.1029/2002JD002997. Published Online: May 31, 2003. Matsumoto, K.; Uematsu, M. Atmos. EnViron. 2005, 39, 2163

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