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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 #1

Received and published: 13 February 2015

This study reports on the size resolved measurement of free amino acids in Antarctic aerosol at two different sites, a coastal and an inland station, as well as during a cruise. Higher concentrations of amino acids were found at the coastal station originating from the sea with an enrichment of amino acids in the fine fraction compared to the inland station. Further inland, amino acids were predominantly present in the coarse fraction. The authors attribute these differences to physical and chemical processing of amino acids during atmospheric transport from the sea further inland. During the cruise the highest concentrations were found which the authors attribute to the presence of intact biological material. The manuscript presents a valuable data set and provides

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important insights into the chemical and microphysical characteristics of amino acids in aerosol in a sparsely studied environment. I recommend publication after a careful revision of the interpretation of results as outlined below in the “general comments” section.

General Comments:

In addition to the collected data the authors use back trajectory analysis to interpret their results. Beyond this, they rely heavily on literature for interpretation especially regarding the implications for and of ice nucleation related to the presence of amino acids in the aerosol. The authors present no measurement based evidence nor direct links to previous studies for their speculative interpretation that amino acid containing aerosol transported towards inland Antarctica has undergone ice nucleation and exhibits therefore amino acid enrichment in the coarse fraction. The single reference that is given to support this does not contain information that would directly discuss this process. Since neither evidence by the data nor from literature is provided that the observed amino acids can actually serve as ice nuclei, and since it is not at all clear from the description in the manuscript whether ice-nucleated particles were present in the coarse mode aerosol collected on the filter, I suggest removing the related passages. These are: p. 1284, l. 22-24: “. . .this is unlikely. . .”, and p. 1285 l. 5-8: “The most likely process. . .”. Instead it can be said that the specific reason for this enrichment is not clear based on the available data.

Specific Comments:

Make sure that all references named in the text are present in the bibliography, there are some inconsistencies.

p. 1271, l. 21: Not all amino acids enhance the ice nucleating ability of aerosol, I suggest relativizing as follows: “. . . because some of them have been shown to . . .”.

p. 1274, last paragraph of the introduction: Include the years when the measurements

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were conducted.

p. 1274, l. 16-18: Include quantitative evidence that air masses were really not influenced by emissions from the research station.

p. 1277, l. 5-8: The message of this sentence is very difficult to understand. Please make several sentences out of this. In addition, in line 7 the single “s” probably means “used”.

p. 1278, l. 17: What do you mean by repeatability? Do you mean standard deviation?

p. 1282, l. 4: Specify which temperatures you refer to: air, sea surface etc.?

p. 1284, l. 21: insert “or” in “due to condensation of molecules from the gas phase or by collision of small and large particles. . .”. And continue as follows: “However, this is unlikely in Antarctica due to the very clean conditions.” Remove the following sentence “This is unlikely. . .”.

p. 1286, l. 3-5: Again, not all amino acids enhance ice nucleating abilities. In addition, hydrophilicity is not a necessity for a particle to ice-nucleate. A wettable particle can do so as well (e.g. mineral dust). I suggest deleting the sentence “This is a very important indication. . .” since it does not support your conclusion regarding the water content of the aerosol.

Technical Comments:

p. 1270, l. 4: introduce an “and” between “. . . organic nitrogen in aerosols, and particles containing amino acids. . .”

p. 1274, l. 14: delete “the” before “the 29 November”

p. 1275, l. 5: no capitals in “Slotted Quartz Fiber filter”

p. 1277, l. 16: continue the sentence “To ensure that. . . this evaluation was carried out. . .”.

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- p. 1277, l. 24: insert a “,” between “filters, respectively.”
- p. 1278, l. 5: delete “%”
- p. 1280, l. 20: include “,” before and after “respectively”
- p. 1280, l. 21: replace “an” by “a”
- p. 1280, l. 25: move “respectively” to the end of the sentence.
- p. 1281, l. 2: replace “find” by “found”
- p. 1281, l. 8: replace “while” by “and”
- p. 1281, l. 9: replace “is” by “it”
- p. 1281, l. 10: remove “concentrations a high”
- p. 1281, l. 12: remove “proportional”
- p. 1281, l. 16: remove “the” in “that the 1 %”
- p. 1283, l. 7: replace “shows” by “presents” to avoid repetition
- p. 1286, l. 27: replace “internal” by “inland”
- p. 1287, l. 2: replace “composition” by “contribution”
- p. 1287, l. 8: remove “a” in “promoting a numerous series”
- p. 1287, l. 15: remove “the” in “the 13 January”
- p. 1288, l. 3: replace “where” by “that”
- p. 1289, l. 25: replace “come” by “came”
- p. 1290, l. 2: remove the parenthesis
- p. 1290, l. 10, remove “were”

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