Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Improved identification of primary biological aerosol particles using single particle mass spectrometry" *by* Maria A. Zawadowicz et al.

Anonymous Referee #3

Received and published: 19 January 2017

In the mauscript "Improved identification of primary biological aerosol particles using single particle mass spectrometry" Zawadowicz et al. present a new particle classification method for a less vulnerable identification of "biological material". In detail the phosphate and organic nitrogen peaks respectively their ratios were used as markers for the assignment of either biological phosphorus or inorganic phosphorus. This is a scientific important step and fits the scope of ACP.

The paper is well written and the data basis seems to be excellent, but the general structure of the manuscript has to be revised. I would recommend the publication of this manuscript in ACP after major revisions. I have two major concerns concerning the manuscript.

1. The main message/orientation of the manuscript is not really clear. It can be seen as a methodical manuscript, but in this way there would be a lack of methodical information and critical discussion. Therefore, the reader cannot reproduce the uncertanties and in this way the quality of the new classification procedure. Some parts of the manuscript are dealing with atmospheric applications of the new classification procedure or biological particles in general. For example the introduction is dealing with very specific atmospheric questions, where biological particles have a crucial impact as their function as nutrient source or ice nuclei. But there are nor results/ discussion to these fields in the manuscript. In my opinion focusing on a critical discussion of the new procedure and all linked uncertanties would be essential to strengthen the significance and impact of this paper.

2. Based on the missing detailed methodical discussion, I am not sure if I can follow all parts of the procedural method completely. Within the manuscript a good register of the main particular sources for phosphorus is given. As the peak intensity in SPMS is not following the mass abundance only I am not convinced that only the three discussed groups (soil dust, fly ash, biological) will show phosphorus signatures in SPMS. What is with mixed particles e.g. biological layers on soil dust or sea-salt particles? Do they show phosphorus signals? There is one of the best atmospheric SPMS data sets in the world in Cambridge and Boulder, which could be used to get some additional information about the frequency of phosphorus signals in SPMA spectra at different locations. This information would help to estimate the applicability of the new classification procedure in the field.

Single points:

One question to the tested reference materials. A variety of pollen samples are tested. These pollen will have a size of $> 10~\mu$m, while the upper limit for the SPMS is given with 2-3μm. Is debris of the original pollen measured? In this way a discussion about the kind of biological particles, which should be captured with the new classification method (size, mixing-state = only external mixed biological particles or also external

mixed biological layers) would also be a great advantage.

C3