Y.L. Pan (Referee)

To make the review process efficient we have copied the review text below in black text and have responded to each section directly, offset and in red text.

This manuscript presents long-time measurements of atmospheric "fluorescent biological aerosol particles (FBAP)" from two locations in two different countries. It tries to find the seasonal cycles from the variations of concentration and size distribution from total aerosol particles and fluorescence particles, to seek the possible correlation between fluorescent particles and RH or rains, and to give some reasonable explanation of the results. This work will supply broader view in long time scale for atmospheric aerosol research and I strongly recommend this manuscript should be published in ACP, even the writing quality of this manuscript need further improved.

First I would like the authors to point out the following in their paper more clearly. As some researchers claimed that the UVAPS is able to distinguish bioaerosol from non-bioaerosol particles, and did not pay attention to the limitation of fluorescence-based bioaerosol sensors, I do see the authors have pointed out in this manuscript that these sensors are not "selective for all types of PBAP", "have certain instrument-specific biases", and have "lower limit for PBAP", even the 355 nm excited fluorescence particles also contain non-bioaerosol particles, for example as those containing certain polycyclic aromatic hydrocarbons (not of biological origin). For the shorter-wavelength excited fluorescence particles (ex. 263, 266, 280nm), it could give a higher concentration of bioaerosol particles result with some non-bioaerosol particles. Different bioaerosol particles fluoresce under the excitation of different wavelength, the same for non-bioaerosols [1-3]. Therefore, I suggest that if the paper can further clearly state that the "fluorescence biological aerosol particles" detected by UV-APS in this study is all the particles that have fluorescence above a certain threshold when excited by 355 nm laser and they are mainly from bioaerosol particles but not included all bioaerosol particles, and it is just called fluorescence biological aerosol particles, then can educate other readers better.

The statement on P17126, L29 was modified as suggested by the reviewer and now reads as follows:

Like all bioparticle detection techniques, real-time LIF instruments are not selective for all types of PBAP and each combination of excitation of emission bands can selectively detect different fluorophores and organisms with varying efficiency (Pöhlker et al., 2012). Further, some non-biological particle types have been shown to fluoresce in some cases (e.g. Bones et al., 2010; Huffman et al., 2010; Gabey et al., 2013; Lee et al., 2013), and LIF instrument-specific biases can complicate classification of particles as biological and cross-comparison between detection strategies. Despite the uncertainty, fluorescent biological particles (FBAP) detected by the UV-APS or WIBS, though not rigorously the same quantity due to differing fluorescence bands, have been considered to be a lower-limit proxy for PBAP (Huffman et al., 2010).

I may miss the description of the calibration and maintain of UVAPS for such a long time measurement, particularly the size calibration and filter replacement. I would like the authors to add that in. As I know, once the filters are used for long time and there are too many particles deposited, then the flow rate 1 Lpm is going to greatly decreased gradually with time, and the measured size distribution is going to shift with time from the real distributions. So I would like the authors to double check this, especially for the very strange particle size distribution in Fig 4, 5 with a sharp peak around 2.5 um with the number distribution is shifted toward bigger particles. The particle number size distribution I read from literatures are mostly somehow close to Fig 4 (b) with some certain degree of variations, but far from Fig 4(c), 5 (a, b).

The aerosol nozzles were inspected for clogs every week and the flow rate at the instrument was measured by Gilibrator every few months, on average. All measurements of flow were within a few percent of the desired flow rates (1.0 L min^{-1} for aerosol flow, 5.0 L min^{-1} for total flow). The outlet filters were changed every ~12 months, but we did not see associated changes in flow rate or any other observable changes.

We did not observe a systematic shift in size distribution over the course of measurements at either site, further suggesting that filter clogging and flow rate changes were not problems. The size distributions mentioned in Figures 4 and 5 were both relatively early in the Finland campaign and thus were operated with relatively freshly installed outlet filters. Also, the distributions shown in Figures 4 and 5 do not represent systematic changes that were present for the rest of the campaign, but are shown as representative exemplary periods. We cannot think of an instrument-change mechanism that would artificially produce a narrow distribution of fluorescent particles at 3 µm.

Hill et al 2009 is not on the Reference list.

The following reference was added as requested, and all references were double-checked:

Hill, S. C., Mayo, M. W., and Chang, R. K.: Fluorescence of bacteria, pollens, and naturally occurring airborne particles: excitation/emission spectra, Army Research Laboratory report ARL-TR-4722, 2009.

Most of the figures need improve their quality and carefully check the units, labels. Using thicker solid, dot, dash curves with different colors may help readers to distinguish them, especially when they are printed in black-white color, e.g. the curves in Fig. 1, 3, 7 No Y-axis label on the right for Fig 1. No X-axis label on Fig 7.

We have systematically improved all of the figures based on the reviewer suggestions, including Figures 1, 3, and 7 as suggested.

1. C. Pohlker, J. A. Huffman, and U. Poschl, "Autofluorescence of atmospheric bioaerosols – fluorescent biomolecules and potential interferences," Atmos. Meas. Tech. 5, 37-71 (2012)

2. Y.L. Pan, S.C. Hill, R.G. Pinnick, H. Huang, J.R. Bottiger, and R.K. Chang, "Fluorescence spectra of atmospheric aerosol particles measured using one or two excitation wavelengths: comparison of classification schemes employing different emission and scattering results," Optics Express 18, 12436-12457 (2010).

3. Y. L. Pan, J.D.T. Houck, P. A. Clark, and R. G. Pinnick, "Single particle size and fluorescence spectrum from emission of burning materials in a tube furnace to simulate burn pit", Applied Physics B: Lasers and Optics, 112 (1), 89-98 (2013)