Response to referee comment on acp-2016-743 by Gosselin et al.

Anonymous Referee #2
Received and published: 13 October 2016

Note regarding document formatting: black text shows original referee comment, blue text shows author response, and red text shows quoted manuscript text. Changes to manuscript text are shown as *italicized and underlined*. All line numbers refer to discussion/review manuscript.

General Comments: The manuscript entitled "Fluorescent Bioaerosol Particle, Molecular Tracer, and Fungal Spore Concentrations during Dry and Rainy Periods in a SemiArid Forest" by Gosselin et al. reports correlations of fluorescent aerosol particles of UV-APS and WIBS-3 with molecular tracers of fungal spores and bacteria. This study provides further investigations of the detection ability of UV-LIF instruments of fungal spores. In general, the manuscript was well written and the analysis of the data was well performed. I recommend this manuscript to be accepted for publication after minor revisions.

Author response: We thank the referee for his/her positive assessment and summary.

Specific Comments:
Comment 1: In the last paragraph of Introduction and the Discussion sections, the authors declared that this is the first comparison of online UV-LIF with organic molecular tracers measurements. In fact, a recent study has also made such comparisons between WIBS and fungal spore tracers (see Yue et al., 2016, Sci. Rep.).

We thank the referee for pointing out this reference that we have now included at L127. The Yue et al. paper indeed briefly presents arabitol and mannitol concentrations and also shows WIBS data during one rain event, but does so by showing only qualitative relationships between WIBS and tracer measurements without presenting any quantitative correlations. We have edited the text at L132 to the following to be more accurate with respect to the inclusion of the Yue et al. reference:
"This study *of ambient aerosol* represents the *first quantitative comparison of* real-time aerosol UV-LIF instruments with molecular tracers or culturing."

The Yue paper is also discussed and references in the text at L480:
"More recently, Yue et al. (2016) studied a rain event in Beijing and observed increased polyol concentrations at the onset of the rain. The observed mannitol concentration (45 ng m^{-3}) was approximately consistent with observations reported here and with previous reports, while the arabitol concentration values observed were approximately an order of magnitude lower (0.3 ng m^{-3})."

Comment 2: In part 2.2 Online fluorescent instruments (Line 174 – 176), the fluorescent detection bands for WIBS-3 should be λem 310 – 400 nm and λem 400 – 600 nm (see Gabey et al., 2010, ACP). Please clarify it.

The WIBS-3 was not a commercialized instrument and so different models had slightly different detector properties. Crawford et al. (2014) reports the following parameter for the PMT detectors: "excitation wavelengths centred at 280±10 nm and 370±20 nm" and emission in "one of two bands that do not overlap the excitation emission, 320–400 nm and 410–650 nm." We have

adjusted the lower bound of the FL1 emission channel from 310 nm to 320 nm to match the Crawford et al. values (L175-176).

Comment 3: Line 205: Provide references for "One important difference between the models is that the WIBS-3 exhibits comparatively weak FL1 and FL2 signals with respect to the more updated models, and is thus more influenced by FL3".

We have clarified the text after L205:
"One important difference between the models is that the ~~WIBS-3 exhibits comparatively weak FL1 and FL2 signals with respect to the more updated models, and is thus more influenced by FL3. This results in a different break-down of~~ *optical chamber design and filters of the WIBS-4 models were updated to enhance the overall sensitivity of the instrument (Crawford et al., 2014). Additionally, slight differences in detector gain between models and individual units can impact the relative sensitivity of the fluorescence channels. . This may result* in differences in fluorescent channel intensity between instrument models, as will be discussed later."

Comment 4: In Figure 5 (e, f), the unit for WIBS Cl1 FAP was given as mass concentration. How do the authors convert the number concentrations to mass concentrations for WIBS-3? Such information should be provided in the Methods section.

For all mass concentration data reported in the manuscript we took UV-APS or WIBS-3 number size distributions, assuming spherical particles with unit density, and converted to mass distributions (mass = number x 4/3 pi x r^2), where r is the particle diameter. Integrated mass concentrations were calculated by integrating the total mass between 0.5 and 15 µm. This process is detailed in the discussion version of the paper at L159-167, but has been revised slightly as detailed below:
"Total particle number size distributions (irrespective of fluorescence properties) obtained from the UV-APS *and WIBS* were converted to mass distributions ~~using~~ *assuming spherical particles of* unit particle mass density as a first approximation ~~for all direct comparisons with tracer mass and~~, unless otherwise stated."

References

Crawford, I., Robinson, N. H., Flynn, M. J., Foot, V. E., Gallagher, M. W., Huffman, J. A., Stanley, W. R., and Kaye, P. H.: Characterisation of bioaerosol emissions from a Colorado pine forest: results from the BEACHON-RoMBAS experiment, Atmos Chem Phys, 14, 8559-8578, 10.5194/acp-14-8559-2014, 2014.