

Interactive comment on “Ambient measurements of biological aerosol particles near Killarney, Ireland: a comparison between real-time fluorescence and microscopy techniques” by D. A. Healy et al.

Anonymous Referee #2

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Title: Ambient measurement of biological aerosol particles near Killarney, Ireland: a comparison between real-time fluorescence and microscopy techniques

Corresponding Author: D. A. Healy

Contributing Authors: J. A. Huffmann, D. J. O'Connor, C. Pöhlker, U. Pöschl, and J. R. Sodeau

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The authors describe results from measurements of biological aerosol particles at a field station in Ireland. Mainly, the manuscript focusses on comparing different real-time fluorescence and microscopy techniques described and investigated in great detail.

Overall remarks: The data and results presented in the paper of Healy et al. are of importance for the atmospheric physics and chemistry community as detailed information on relatively new instrumentation is presented that might play an important role in the growing field of detection and analysis of biological particles. Primary biological particles (PBAP) are – in certain environments – a major contributor to the aerosol present in the atmosphere, and their role and significance in aerosol-cloud interactions are still under debate when it comes to their potential to act as cloud condensation and/or ice nuclei. Therefore, a detailed characterization/understanding of the technique used to measure PBAP, and a comparison of those is of major importance for the experimentalists in the field and makes the manuscript worth publishing. The manuscript is well written and I recommend publication with consideration to only two major and a few minor adjustments.

Major remark:

1. The manuscript was submitted to ACP whereas the focus of the paper is clearly the technical aspect, i.e. a publication of it in AMT could have been considered as well. However, as atmospheric data is included as well the decision towards ACP is justifiable. Still, the atmospheric aspect of the presented findings could be emphasized more throughout the manuscript. This mainly concerns the atmospheric observations embedded into section 3.3 “Real-time fluorescence sensors vs. Sporewatch” which should be presented in a section of their own (comparable to section 3.4 “Marine particle influence”). As an example: The authors report on “observed trends that many bioparticle classes correlate strongly with RH and peak at night” (p3891, l18ff). The atmospherically interested reader would expect an explanation (or assumption) here, not only a reference. Also, a lot of technical terms seem to be more familiar to microbiologists or scientists which actively work with bioparticles – but not to the ACP community

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("flavine", "hyaline") – and should be explained briefly. The atmospheric relevance and origin of the spore species assumed to be detected should be discussed briefly (or noted at the relevant position in the text).

2. In section 3.1 the total particle comparison between WIBS-4 and UV-APS is presented, and the authors report on a discrepancy starting at approx. 50 cm⁻³. Is this number expected to be universal, i.e. is there a technical explanation for that? Could it be a coincidence error in the WIBS optic? Particle coincidence is not discussed at all, and as a reader I would expect not only a lower threshold for particle detection, also an upper threshold (in number). Is there any information on that number except from the one obtained from Fig. 1? What means a number of 50 per cc from an atmospheric perspective/typical atmospheric number concentration?

Minor remarks:

1.P3879, l9/10: "Emission related excited by ..." would better read as "Emission related to excitation by ..."

2.P3881/l28: Relates the 0.5 μm to the D50 = 0.49 mentioned beforehand, or does this value comes from an independent measure of the optical capabilities of the instrument?

3.P3884/l1: the acronym "PMT" is used earlier in the text already (e.g. p3881/l18).

4.P3887/l15 to l25: Is there a way to simplify this statement?

5.P3890/l7ff: A short note on how the cited studies "estimated" the concentration of bacteria over vegetated surfaces would be helpful to put the much higher number of measured PBAP into perspective.

6.P3890/l9ff: Here, assumptions are listed why the fluorescence sensors and Sporewatch disagree in number. Lots of "likely ... but", "unlikely", "less likely" makes the text confusing so that the outcome/possible reasons for the disagreement are blurred. Also, shouldn't be the SOA and soot particles much smaller, i.e. below or close to the lower size limit of the WIBS/UV-APS?

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7.P3891/l6: "This is unlikely ...". This sentence does not show any continuity and should be rephrased.

8.P3894/l26: Number of 2nd mode is missing.

9.P3894/l10: "better" or "higher" resolved distribution instead of "more resolved"?

10.P3908/Fig. 1 and P3910/Fig. 3: "grey" vs "gray" – be consistent with BE vs. AE.

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