

***Interactive comment on* “Characterisation of biofluorescent aerosol emissions over winter and summer periods in the United Kingdom” by Elizabeth Forde et al.**

Anonymous Referee #2

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General comments.

The manuscript concerns the observations of bioaerosols using WIBS-3 and WIBS-4 and their main classification into types of bioaerosols using clustering, their typical patterns and potential sources, where the source analysis has been done with ArcGIS. The observational period cover 4 sites in the UK and the observations are Jan-March 2009, June-August 2013 (WIBS-4), Feb-June 2013 (WIBS-4) and August 2009 (WIBS-3). Please find below a numbered set of comments to the manuscript as well as one specific comment.

1. The manuscript cover an area there is of relevance to ACP and an area where there

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is very few studies.

2. The study itself contains a large data set, about 9 months of data of bioaerosols obtained with WIBS instruments. However the data itself are not part of the manuscript, but only coarse numerical summaries.

3. The conclusions in the manuscript are mainly related to clustering of data into 4 or 5 main clusters and there are some indication to potential source areas. These conclusions seem however to be indicative and qualitative instead of quantitative.

4. The scientific methods are valid and clearly described

5. The results and the methods are not described in depth to reach the current conclusion. This relates to both clustering and the mapping using ArcGIS. See issues below

5a. Issues on mapping : There is no exact geographical location of the sites. Please add this to the manuscript

5b. Issues on mapping: I could identify the Weybourne observatory and compared Figure 1 with both google maps and land cover 2015 (Digimap). The land cover in Fig 1 shows large amounts of Coniferous woodland near Weyborne. However Googlemaps and Digimap shows that this area is improved grassland. Is this a simple mapping mistake when drawing figure 1 or is there a more systematic mistake in the manuscript, where the land cover has not been used correctly for all the sites?

5c. Issues on mapping. Several times in the manuscript including the conclusion there is a connection between the observations and specific farming activities. However the manuscript does not contain any information about farm location. This connection can therefore not be made unless such data are present. Furthermore, why have those specific farms been attributed as source and not other farms in the area?

5d. Issues on mapping. The chosen land cover map is probably among the best maps in the UK. However it has some limitations. Smaller features such as smaller

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woodlands are not part of this map. The authors have not taken these limitations into account.

5e. Issues on clustering. The clustering use an approach by Crawford et al. (2015). This requires use of dry materials that are aerosolised and added to the instrument in a laboratory. This calibration data is not present in this paper.

5f. Issues on clustering. The paper by Crawford et al. (2015) only describe pollen but not if other bioaerosols have been used. Crawford et al. writes that the four pollen types are common in the UK. This is not correct. Two of the four allergens (paper mulberry and ragweed) are rare in the UK. The third in Crawford (birch) is common in the UK, typically with a season in April. This suggest that in this manuscript only Capel Dewi would have had a chance to detect this. The fourth pollen in Crawford et al (2015) is ryegrass. However, the pollen size is typically 30-40, which is above the typical detection limit of the WIBS. Have the authors also calibrated with pollen and have they also used pollen that are less likely to be in the UK atmosphere and less likely to be detected by the WIBS?

5g. Issues on clustering. In the paper by Crawford et al (2015), the team has used dry pollen. Dry pollen from commercial samples will have a very different shape to fresh airborne pollen as pollen can take up and loose water. Using dry pollen will generally cause poor calibration of real-time instruments as the shape of dry pollen is very different compared to fresh pollen. Secondly has there been any investigations if dry pollen will cause different excitation compared to fresh pollen

6. The methods section are generally good if the issues in section 5 can be solved

7. The citations and reference list seems to be up-to-date with a good selections of citations to new and relevant literature. However the manuscript is not clear where the studies confirms existing knowledge and more importantly where it contributes with new knowledge by positioning the results against published literature

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8. The title of the paper reflects parts of the study, but not the part that try to associate the observed bioaerosols with potential sources (the ArcGIS part)

9. The abstract cover well the contents of the paper.

10. The presentation is generally clear and well structured but the conclusion might need some work (see point 13)

11. The language is generally clear and fluent and does not need further improvements

12. 12. The manuscript does not include mathematical formula. However the manuscript describes the use of a third order polynomial with R values between the observations and the polynomial (Table 5). The polynomial is not found anywhere in the manuscript (or in supplementary information) and the results (including low R values) will probably need a discussion.

13. The conclusion is almost two pages and part of the conclusion seems to be a discussion (e.g. the section concerning difficulties in the clustering). Maybe the conclusion should be shortened to make it more sharp and part of the material should be moved to the discussion section. If the authors have used calibration of the instrument against known material, then this calibration needs to be described in more detail and in particular how well the instrument is able to identify test samples similar to the calibration material.

14. There seem to be 60-65 references in the manuscript. This seems appropriate for this type of manuscript

15. There is no supplementary information. The authors might consider if adding supplementary information can improve transparency of the methods and the documentation.

Specific comments

On page 25, line 4 onwards, the authors write that this is the first time ArcGIS has been

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used in relation to land cover mapping and bioaerosols to derive emission patterns etc. As far as I know there are many such studies (some of them are in fact in the reference list), but it is the first time it has been done in connection with the WIBS instrument.

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