

Comment on “Variations in airborne bacterial communities at high altitudes over the Noto Peninsula (Japan) in response to Asian dust events” by T. Maki et al.

Previous studies have shown that biological aerosols probably have a significant impact on environment and climate. Recently bioaerosol-radiation-cloud interaction that is known as important research topic for climate community needs more investigation of bioaerosol spatio-temporal distribution in the atmosphere. The manuscript presents an investigation of atmospheric bioaerosol (bacteria) in Japan, mainly by use of aerosol sampling analysis from aircraft measurements. Then concentration and types of airborne bacteria during dust events and non-dust events could be obtained from fluorescent microscopy and 16S rDNA sequencing analysis. The topic is of sufficient interest to the communities of study of atmospheric aerosol (especially bioaerosols), climate as well as human health. In general, I find this manuscript to be of interest for publication and appropriate for *ACP*. There are several suggestions for improvement listed below that should be considered by the authors and the editors before publication.

1. Introduction: bioaerosols could act as active ice nucleus, consequently affect the microphysical properties of cloud in the atmosphere. Please review some papers about climate effects of bioaerosol, so that the readers are easy to understand the importance of your study.
2. Line 28 in page 3: the authors claimed that aerosols in the two cities directly originate from continental areas. I think it is not rigorous and suitable. There are several sources of aerosols in the Noto Peninsula, such as continental and Ocean area, even from local area, depending on condition of airflows. The word should be changed.
3. Line 23 in page 4: depolarization ratio is more popular for lidar community than depolarization rates. Please replace it throughout the manuscript.
4. Line 8 in page 5: add ‘number concentration’ to the behind of ‘aerosol’.
5. Line 17 in page 6: change ‘dust mineral’ to ‘mineral dust’.
6. Line 7-10 in page 7: the word ‘troposphere’ is not appropriate in the manuscript, please consider ‘tropopause’.
7. Line 25-29 in page 7: please rewrite and cut the paragraph short, it is not necessary to list so many names of the samples. Perhaps the authors can mark dust samples and non-dust samples in Table 1.
8. Section 3.3: four types of fluorescence particles, such as white, blue, yellow, or black particles, could be seen from fluorescent microscopy. To make the reader easier understand, the author should explain the methods and basis of classification. For example, why the white particles are indicative of mineral dust and yellow particles are organic matter.
9. Section 4.1: I suggest move this sentences to Introduction and Section 3.1. Also, I suggest that rewrite the Section 4, and move some sentences to Introduction.
10. Line 21 in page 12: combine “Maki et al., 2010” and “Maki et al., 2013” to “Maki et al., 2010 and 2013”.

11. Line 32 in page 12: add ‘long-range’ in the front of ‘transported’.
12. Figure 1: it is not easy for the readers to understand meaning. Please enlarge four panels of helicopter flight routes and reduce size of the East Asia map. Furthermore, panel (a) can be removed and the location of three cities could be marked in panel (b). N and E should be put at the front of latitude and longitude, such as 50°N and 120°E.
13. Figure 2: according to the meaning described in the paper, the authors would like to use depolarization ratio of aerosols from lidar measurements, for classifying dust events and non-dust events. But the lidar data as shown in fig. 2 is attenuated backscattering, not depolarization ratio. Same as for the panel (a) in fig. 4 and fig. 5. Please replace the data.
14. In my opinion, more bacteria should be observed during dust events comparing the condition during non-dust events. Because mineral dust usually can be long-range transported with bioaerosols. However, concentration of fluorescent particles (especially blue particles) at near surface (ground level) was lower during dust events (as shown in fig. (a) and (b)) than those during non-dust events. Please explain the reason.
15. Figure 3: there are several backward trajectories in each panel, but the authors claimed that these three-day backward trajectories only be obtained at two altitudes (2500m and 1200m). Same as for the panel (c) in fig. 4 and fig. 5. Please explain it.
16. Figure 5: the title of x-axis in panel (a) should be “March 2015”, please change it.
17. The results in the paper give us more information about bioaerosols in the atmosphere, especially during dust events. The authors are encouraged to compare their results with others from previous studies. Please summarize similar results from other papers in response to dust events, and then add a table in Section discussion.