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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range transported bioaerosols captured in snow cover on Mount Tateyama, Japan: Impacts of Asian-dust events on airborne bacterial dynamics relating to ice-nucleation activities" *by* Teruya Maki et al.

Anonymous Referee #2

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Comment on "Long-range transported bioaerosols captured in snow cover on Mount Tateyama, Japan: Impacts of Asian-dust events on airborne bacterial dynamics relating to ice-nucleation activities" by T. Maki et al.

It has been proven that bioaerosols have a significant impact on environment and climate over the past decades. In particular, bioaerosols could serve as active Ice Nuclei (IN), consequently affect the microphysical properties of cloud in the atmosphere. So, bioaerosol-cloud interaction in the atmosphere is known as important research topic for climate community. To investigate the ice-nucleation activities of bioaerosol and

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Asian dust, this study presents aerosol chemical analysis and bioaerosols characterization in snow at the altitudes of 2450m AGL over mount Tateyama in Japan. Then concentration and types of bioaerosols for 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) and climate change. 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 before publication.

1. Section 2: To make the readers more easily understand the method of your study, a flowchart that briefly summaries snow sampling and analysis processes is needed in the manuscript. Probably, 'Sampling and Methods' is better for the title of Section 2. Moreover, current title of section 2.2 is not appropriate because several analysis methods by use of ion chromatography, epifluorescence microscope as well as lidar are introduced.

2. Section 3 and 4: The authors are encouraged to combine these two sections together. The current version is quite hard to get intact information of each subsection. Therefore, please rewrite and combine to a section.

3. Figure 3: lidar measurements at Toyama AD-net are used to show the periods of Asian dust events and air pollutions during February to April 2013. However, this figure cannot show sufficient information so that should be improved. The authors should use attenuated backscatter coefficient and depolarization ratio that could clearly show dust events and non-dust events, rather than retrieved extinction coefficient of spherical and non-spherical particles (soil dust).

4. Moreover, what is the altitude of lidar site at Toyama? According to position of red boxes in figure 3, it seems that the altitude of lidar site is very close to sea level. Now all dust events should be clearly seen based on lidar measurements, but it is not clear to distinguish local air pollution days from others. Please enlarge size of panels and

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rescale the axis of figure 3.

5. Figures 4: there is a peak at 698-695cm of snow cover height for concentration of bacteria. Is it also a dust event? According to results from 16S rDNA sequencing analysis in figure 6, dust aerosols probably affected the sample. Please explain in the paper.

6. Line 3 in page 3: please change ‘Taklamakan’ to ‘Taklimakan’.

7. Line 6 in page 3: please change ‘Huang et al., 2015ab’ to ‘Huang J. et al., 2015; Huang Z. et al., 2015’.

8. Line 16 in page 5: change ‘36.57N, 137.60E’ to ‘36.57°N, 137.60°E’.

9. Line 1 in page 6: I think ‘coloured layers’ is not suitable, ‘polluted layers’ and ‘dirty layers’ is much better. Please replace it throughout the manuscript.

10. Line 4 and 5 in page 7: depolarization ratio is more popular for lidar community than depolarization rates. Please change ‘depolarization rates’ to ‘depolarization ratio’ throughout the manuscript. Actually spherical-particle rates is included within lidar data in the paper, please rewrite it.

11. Line 5 in page 9: please change ‘workers’ to ‘Researchers’.

12. To increase reader better understanding of impact of Asian dust and bioaerosols on climate over East Asia, please reference papers as follow.

Sugimoto, N., Z. Huang, T. Nishizawa, I. Matsui, and B. Tatarov, 2012: Fluorescence from atmospheric aerosols observed with a multi-channel lidar spectrometer, Optics Express, 20(19), 20800-20807.

Huang J., Y. Li, C. Fu, F. Chen, Q. Fu, A. Dai, M. Shinoda, Z. Ma, W. Guo, Z. Li, L. Zhang, Y. Liu, H. Yu, Y. He, Y. Xie, X. Guan , M. Ji, L. Lin, S. Wang, H. Yan and G. Wang, 2017: Dryland climate change recent progress and challenges. Reviews of Geophysics, 55, 719-778, doi:10.1002/2016RG000550.

Huang J., H. Yu , A. Dai, Y. Wei, and L. Kang, 2017: Drylands face potential threat under 2°C global warming target. Nature Climate Change, doi: 10.1038/NCLIMATE3275.

Tang, K., Huang, Z., Huang, J., Maki, T., Zhang, S., Ma, X., Shi, J., Bi, J., Zhou, T., Wang, G., and Zhang, L.: Characterization of atmospheric bioaerosols along the transport pathway of Asian dust during the Dust-Bioaerosol 2016 Campaign, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-1172, in review, 2017.

13. The results in the paper give us further information about bioaerosols in snow, especially affected by Asian dust events. The authors are encouraged to evaluate the impact of bioaerosols on surface albedo and melting rate of snow in future.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2017-1241/acp-2017-1241-RC2-supplement.pdf

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