Response to Referee #1 Comments on ESSD-2026-338

Dear Referee,

We sincerely thank referee for the positive evaluation of our manuscript and for the constructive comments. We have carefully considered all suggestions and revised the manuscript accordingly. Detailed responses are provided below.

Comment 1:

Introduction: The authors extensively introduced the definition, health impacts, climate effects, and global standard sampling methods of biogenic aerosols. However, it failed to clearly explain why a unified dataset urgently is needed in the East Asia region? I think this is the unique feature of this study.

Response:

Thank you for this valuable suggestion. We agree that the original Introduction did not sufficiently explain the scientific necessity of establishing a unified bioaerosol dataset for East Asia.

To address this comment, the Introduction has been substantially revised. The revised text now (1) discusses the limitations of existing bioaerosol observations, including methodological heterogeneity, limited spatial and temporal coverage; (2) highlights the specific characteristics of East Asia, such as frequent dust transport events, diverse climatic and ecological conditions, intensive human activities, and the large downstream population; and (3) clarifies that the increasing number of observations in East Asia remains fragmented in terms of sampling strategies, analytical methods, temporal coverage, and spatial distribution, which limits regional-scale comparisons and integrated assessments.

Based on these considerations, the revised Introduction explicitly emphasizes that a standardized dataset with unified sampling and analytical methods is required to support investigations of the spatial and temporal variability of bioaerosols across East Asia, as well as future studies related to climate, ecology, and public health.

Revision made:

Page 3, Line 67.

Revised:

In addition to methodological differences, the spatial and temporal coverage of bioaerosol sampling remains sparse (Zawadowicz et al., 2019). Many observations are restricted to isolated field campaigns or single-site stations, with particularly limited coverage in arid regions and developing countries (Shammi et al., 2021). In addition, long-term continuous records are scarce, and standardized time series spanning multiple years and sites are largely lacking. This limitation not only constrains the detection of long-term trends and interannual variability but also hampers the use of observations for model calibration and the assessment of climate-scale impacts (Huang et al., 2024a; Safatov et al., 2022). Furthermore, methodological heterogeneity across studies complicates data integration and limits large-scale analyses (Alfaro-Perez et al., 2025). Given the highly dynamic nature of the atmosphere, bioaerosol concentrations exhibit substantial spatial and temporal variability (Šantl-Temkiv et al., 2019), and conclusions derived from studies with limited spatial or temporal coverage may therefore be inconsistent (Jiang et al., 2022). Together, these factors further reduce the robustness of integrated assessments of bioaerosol impacts on climate, the environment, ecosystems, and human health (Gashi et al., 2025).

East Asia is one of the most densely populated and environmentally diverse regions worldwide (Su et al., 2015), characterized by frequent dust events driven by vast arid source regions in Central Asia and desert (Chen et al., 2026; Yu et al., 2023), rapid urbanization and industrialization (Tseng et al., 2024), intensive agricultural activities, and strong land – ocean interactions (Zhou et al., 2025; Lang et al., 2025). The abundance, dispersal, and community composition of atmospheric bioaerosols are influenced by meteorological conditions, including wind speed and direction, atmospheric stability, temperature, humidity, and precipitation (Uetake et al., 2019; Tignat-Perrier et al., 2019; Petersson Sjögren et al., 2023; Drautz-Moses et al., 2022). Under ongoing climate change, drought conditions are projected to intensify (Araujo et al., 2025; Xu et al., 2023), with East Asia expected to be particularly affected (Qi et al., 2024). Within this broad meteorological framework, dust events are of particular relevance in East Asia because the mobilization of mineral particles can simultaneously release soil-associated microorganisms and other biological materials into the atmosphere, while strong regional winds can transport these particles over long distances (Maki et al., 2019; Zhou et al., 2024; Tang et al., 2018). Thus, dust is an important mechanism linking terrestrial source areas with downwind environments. On this basis, the Dust – Bioaerosol (DuBi) field observation program adopted a source – transport – receptor perspective, incorporating observations in source regions, along transport pathways, and at downwind receptor sites. Given the extensive arid and semi-arid regions of East Asia and the large populations residing in downwind areas (Jin et al., 2022), the regional transport of dust-associated bioaerosols warrants particular attention because of its potential environmental and public health implications.

Despite increasing bioaerosol observations in East Asia, existing studies are often fragmented in terms of sampling protocols, temporal coverage, and analytical methodologies (Safatov et al., 2022). This methodological and observational heterogeneity limits regional comparisons and large-scale assessments and makes it difficult to distinguish genuine environmental variability from differences introduced by sampling and analytical procedures (Pogner et al., 2024a). Accurate assessment of bioaerosol-related effects therefore requires broader observational networks, longer and more continuous monitoring records, and greater methodological standardization to facilitate regional and transregional data integration and sharing (Huang et al., 2024a). Accordingly, the establishment of a bioaerosol dataset with broad geographical coverage and consistent sampling and analytical methodologies is essential for advancing regional-scale research and applications (Sajjad et al., 2023; Gashi et al., 2025; Boifot et al., 2024; Jiang et al., 2022). Such a dataset would enable a more comprehensive characterization of the geographic distribution, spatiotemporal variability, and environmental and health impacts of bioaerosols, while supporting the assessment of public health risks under climate change and providing a scientific basis for mitigation strategies and policy development.

Comment 2:

Line 106-110: A custom-designed bioaerosol sampler was employed here. I'm wondering whether the collection efficiency of this sampler has been verified before? What are the comparison results with commonly used international standard samplers (such as the Andersen sampler)?

Response:

Thank you for this valuable comment. We appreciate the referee's concern regarding the sampling performance of the custom-designed bioaerosol sampler. We would like to address it from three aspects:

1. The polycarbonate membrane filter-based sampling approach employed in this study has been widely adopted by the bioaerosol research community over the past two decades and is well established as a mainstream methodology. Notably, it has been used extensively by research groups conducting long-term atmospheric bioaerosol monitoring in East Asia, including the work of Teruya Maki (Kindai University, Japan) and Daizhou Zhang (Prefectural University of Kumamoto, Japan), among others. The broad application of this sampler type across independent research teams provides substantial evidence of its reliability and scientific acceptance.
2. The collection efficiency of polycarbonate membrane filters has been rigorously evaluated in the literature. Guo et al. comprehensively evaluated the performance of six bioaerosol samplers in an aerosol wind tunnel. Polycarbonate membrane filters were assessed and compared with several commonly used bioaerosol samplers, including gelatin filters, the AGI-30 impinger, and the BioSampler. Their study demonstrated that polycarbonate membrane filters exhibited excellent performance during long-term sampling, although they were less effective at maintaining microbial viability. Since our study did not involve the assessment of microbial viability, this limitation did not affect our analyses. As shown in Fig. 1,

during the 60 min long-term sampling performance test, the total biological sampling efficiency of the polycarbonate membrane filter was consistently and significantly higher than that of the AGI-30 and other samplers.

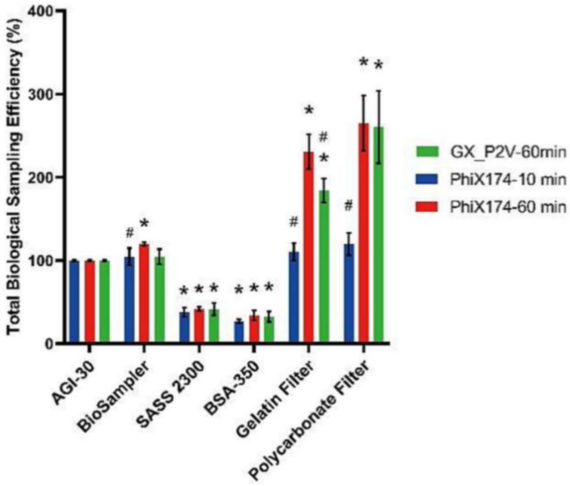

Figure 1: Total biological sampling efficiency of the tested bioaerosol samplers compared to that of AGI-30(Guo et al., 2024).

3. In addition, some of our sampling campaigns required continuous operation for 12h or even longer. Under such conditions, filter-based sampling offers several practical advantages over impingers or impactors, including the absence of liquid evaporation and sampler overloading during extended sampling periods. Moreover, it provides a stable sampling mechanism, convenient transportation and sample preservation, portable power-bank operation, and easy disassembly and component replacement. Considering both the methodological evaluations and the practical requirements of the DuBi observation network, we concluded that this sampler represented the appropriate choice for our study.

Comment 3:

In Table 1, the Land Surface labels for several sites are marked as "-" (such as Dunhuang, Kanazawa). Is it a case of missing data or unclassified data? Please fill in the land use types for all sites (such as desert, farmland, forest, etc.).

Response:

We thank the referee concern for this helpful suggestion. The symbol "-" in the original version of Table 1 does not indicate missing sampling data. Following the referee's suggestion, we carefully re-examined the original field records and photographs for each sampling site and supplemented the corresponding land surface information. As a result, land surface categories have now been provided for all sampling sites in Table 1. This revision improves the completeness of the site metadata and provides a clearer description of the environmental characteristics of each sampling location.

Revision made:

Page 4, Line 103.

Revised:

Sampling Site	**Land Surface**	**number of samples**	**Latitude & Longitude**	**Sampling Period**	**Sampling Duration**
Dunhuang	Desert	13	（94.5° E, 40.1° N）	2011/9/9-2011/9/10 2021/7/11-2021/7/19	1-12h
Kanazawa	Urban	47	（136.7° E, 36.5° N）	2011/3/22-2011/5/1 2017/4/21-2017/5/15 2017/9/5-2017/9/28	6-15h
Hakui	Urban	2	（136.8° E, 36.9° N）	2013/4/28 2014/3/28	1h
Tsogt-Ovoo	Desert	14	（105.2° E, 44.2° N）	2014/3/16-2014/3/18 2017/4/29-2017/5/4	2-18h
Namie	Forest & Ground	59	（140.8° E, 37.6° N）	2015/8/19-2018/3/22	2-7h
Erlianhot	Sandy land	111	（111.9° E, 43.7° N）	2016/3/30-2016/5/25 2017/8/17-2017/8/19	2-24h
Zhangbei	Sparse grassland	140	（114.7° E, 41.2° N）	2016/3/29-2016/5/31	2-15h
Jinan	Urban	121	（117.1° E, 36.7° N）	2016/3/23-2016/6/4	7-34h
Dalanzadgad	Road	5	（104.4° E, 43.6° N）	2017/5/1-2017/5/3	7-11h
Bayannur	Urban	2	（107.4° E, 40.8° N）	2017/8/4	3-6h
Ulanqab	Sparse grassland	2	（113.1° E,41.1° N）	2017/8/4-2017/8/5	3-8h
Xilinhot	Urban	1	（116.1° E,44.0° N）	2017/8/5-2017/8/6	8h
Arxan	Urban	4	（119.9° E,47.2° N）	2017/8/6-2017/8/7 2017/8/14	3-9h

Ewenki Autonomous Banner	Urban	7	（119.8° E,49.1° N）	2017/8/7-2017/8/8	4-11h
Ergun	Urban	3	（119.9° E,51.3° N）	2017/8/9-2017/8/10	3-9h
Labudalin	Wetland	2	（120.1° E,50.2° N）	2017/8/10-2017/8/11	4-10h
New Barag Left Banner	Sparse grassland	3	（118.3° E,48.2° N）	2017/8/13-2017/8/14	4-9h
East Ujimqin Banner	Sparse grassland	2	（117.0° E,45.5° N）	2017/8/15-2017/8/16	4-9h
Abag Banner	Sparse grassland	2	（115.0° E,44.0° N）	2017/8/16-2017/8/17	4-9h
Baotou	Sparse grassland	2	（110.1° E,42.5° N）	2017/8/19-20174/8/20	4-11h
Urad Middle Banner	Sparse grassland	2	（108.5° E,41.6° N）	2017/8/20-2017/8/21	4-9h
Urad Rear Banner	River dam	2	（107.0° E,41.1° N）	2017/8/21-2017/8/22	4-11h
Alxa Left Banner	Grassland	2	（105.5° E,38.9° N）	2017/8/22-2017/8/23	4-10h
Yonago	Urban	96	（133.3° E,35.4° N）	2015/3/4-2015/6/19	19-30h
Yongin	Urban	68	（127.16° E,37.2° N）	2015/3/9-2015/7/4	17-120h
Lhasa	Urban	11	（91.0° E,29.6° N）	2018/5/7-2018/5/8 2018/5/27-2018/5/31	9-13h
Everest Base Camp, Xigaze	Alpine gravel bare ground	28	（86.9° E,28.1° N）	2018/5/11-2018/5/24	7-14h
Tazhong	Desert	40	（83.7° E,39.0° N）	2019/7/7-2019/7/30	9-22h
Minfeng	Grassland	31	（82.7° E,37.1° N）	2019/7/11-2019/7/31	11-12h

Tazhong–Minfeng route	Desert	8	（82.9° E,37.5° N）	2019/7/23-2019/8/1	2-3h
	Cropland		（80.1° E,37.1° N）		
	Desert		（80.1° E,37.4° N）		
	Desert		（81° E,38.6° N）		
	Grassland		（75.2° E,37.8° N）		
	Grassland		（76° E,39.5° N）		
	Grassland		（82.8° E,37.1° N）		
Ngari	Urban	50	（79.7° E,33.4° N）	2019/7/7-2019/7/31	11-12h
Namtso	Alpine meadow	80	（91.0° E,30.8° N）	2020/8/3-2020/8/24	9-13h
Qinghai	Urban	8	（101.8° E,36.6° N）	2020/7/16-2020/7/20	2-12h
	Alpine meadow		（99.8° E,36.7° N）		
	Sparse grassland		（99.1° E,36.8° N）		
	Urban		（100.1° E,37.3° N）		
	Cropland and urban		（100.3° E,38.2° N）		
	Cropland		（101.5° E,37.5° N）		
Yuzhong	Grassland	62	（104.1° E,36.0° N）	2020/10/31-2020/11/19	2-6h
Yadong	Forest	141	（88.9° E,27.4° N）	2021/6/22-2021/8/30	11-13h

Comment 4:

Also, in the Sampling Duration column of Table 1, the stations of Namie and Yongin are marked as "-". What is the exact duration of the sampling?

Response:

We thank the referee for this helpful comment. The sampling duration information for the Namie, Yongin and other sites has been carefully re-checked against the original field records in consultation with the co-author responsible for these sampling campaigns. Following this verification, the exact sampling durations for these sites were confirmed and have now been included in Table 1. This revision improves the completeness and accuracy of the sampling metadata and ensures that consistent information is provided for all sampling locations included in the dataset.

Revision made:

Page 4, Line 103.

Revised:

Sampling Site	**Land Surface**	**number of samples**	**Latitude & Longitude**	**Sampling Period**	**Sampling Duration**
Dunhuang	Desert	13	（94.5° E, 40.1° N）	2011/9/9-2011/9/10 2021/7/11-2021/7/19	1-12h
Kanazawa	Urban	47	（136.7° E, 36.5° N）	2011/3/22-2011/5/1 2017/4/21-2017/5/15 2017/9/5-2017/9/28	6-15h
Hakui	Urban	2	（136.8° E, 36.9° N）	2013/4/28 2014/3/28	1h
Tsogt-Ovoo	Desert	14	（105.2° E, 44.2° N）	2014/3/16-2014/3/18 2017/4/29-2017/5/4	2-18h
Namie	Forest & Ground	59	（140.8° E, 37.6° N）	2015/8/19-2018/3/22	2-7h
Erlianhot	Sandy land	111	（111.9° E, 43.7° N）	2016/3/30-2016/5/25 2017/8/17-2017/8/19	2-24h
Zhangbei	Sparse grassland	140	（114.7° E, 41.2° N）	2016/3/29-2016/5/31	2-15h
Jinan	Urban	121	（117.1° E, 36.7° N）	2016/3/23-2016/6/4	7-34h
Dalanzadgad	Road	5	（104.4° E, 43.6° N）	2017/5/1-2017/5/3	7-11h
Bayannur	Urban	2	（107.4° E, 40.8° N）	2017/8/4	3-6h
Ulanqab	Sparse grassland	2	（113.1° E,41.1° N）	2017/8/4-2017/8/5	3-8h
Xilinhot	Urban	1	（116.1° E,44.0° N）	2017/8/5-2017/8/6	8h
Arxan	Urban	4	（119.9° E,47.2° N）	2017/8/6-2017/8/7	3-9h

				2017/8/14	
Ewenki Autonomous Banner	Urban	7	（119.8° E,49.1° N）	2017/8/7-2017/8/8	4-11h
Ergun	Urban	3	（119.9° E,51.3° N）	2017/8/9-2017/8/10	3-9h
Labudalin	Wetland	2	（120.1° E,50.2° N）	2017/8/10-2017/8/11	4-10h
New Barag Left Banner	Sparse grassland	3	（118.3° E,48.2° N）	2017/8/13-2017/8/14	4-9h
East Ujimqin Banner	Sparse grassland	2	（117.0° E,45.5° N）	2017/8/15-2017/8/16	4-9h
Abag Banner	Sparse grassland	2	（115.0° E,44.0° N）	2017/8/16-2017/8/17	4-9h
Baotou	Sparse grassland	2	（110.1° E,42.5° N）	2017/8/19-20174/8/20	4-11h
Urad Middle Banner	Sparse grassland	2	（108.5° E,41.6° N）	2017/8/20-2017/8/21	4-9h
Urad Rear Banner	River dam	2	（107.0° E,41.1° N）	2017/8/21-2017/8/22	4-11h
Alxa Left Banner	Grassland	2	（105.5° E,38.9° N）	2017/8/22-2017/8/23	4-10h
Yonago	Urban	96	（133.3° E,35.4° N）	2015/3/4-2015/6/19	19-30h
Yongin	Urban	68	（127.16° E,37.2° N）	2015/3/9-2015/7/4	17-120h
Lhasa	Urban	11	（91.0° E,29.6° N）	2018/5/7-2018/5/8 2018/5/27-2018/5/31	9-13h
Everest Base Camp, Xigaze	Alpine gravel bare ground	28	（86.9° E,28.1° N）	2018/5/11-2018/5/24	7-14h
Tazhong	Desert	40	（83.7° E,39.0° N）	2019/7/7-2019/7/30	9-22h

Minfeng	Grassland	31	（82.7° E,37.1° N）	2019/7/11-2019/7/31	11-12h
	Desert		（82.9° E,37.5° N）		
	Cropland		（80.1° E,37.1° N）		
	Desert		（80.1° E,37.4° N）		
Tazhong–Minfeng route	Desert	8	（81° E,38.6° N）	2019/7/23-2019/8/1	2-3h
	Grassland		（75.2° E,37.8° N）		
	Grassland		（76° E,39.5° N）		
	Grassland		（82.8° E,37.1° N）		
Ngari	Urban	50	（79.7° E,33.4° N）	2019/7/7-2019/7/31	11-12h
Namtso	Alpine meadow	80	（91.0° E,30.8° N）	2020/8/3-2020/8/24	9-13h
	Urban				
	Alpine meadow		（101.8° E,36.6° N）		
	Sparse grassland		（99.8° E,36.7° N）		
Qinghai		8	（99.1° E,36.8° N）	2020/7/16-2020/7/20	2-12h
	Urban		（100.1° E,37.3° N）		
	Cropland		（100.3° E,38.2° N）		
	and urban		（101.5° E,37.5° N）		
	Cropland				
Yuzhong	Grassland	62	（104.1° E,36.0° N）	2020/10/31-2020/11/19	2-6h
Yadong	Forest	141	（88.9° E,27.4° N）	2021/6/22-2021/8/30	11-13h

Comment 5:

On Line 235-239, I wonder if the "mid-April concentration peak" might correspond to a specific biological event (such as pollen outbreak, agricultural activities)? Has the author provided any other relevant data (such as pollen counts) for support or made an appropriate speculation about the possible causes?

Response:

We thank the referee for this insightful comment. Following the referee's suggestion, we further investigated whether the concentration peak observed in mid-April could be associated with a biological event. To this end, we obtained historical pollen observations for the Chugoku–Shikoku region from the Ministry of the Environment Government of Japan(https://www.env.go.jp/page_00209.html).

Pollen observations were unavailable at the Yonago sampling site or surrounding stations on 17–18 April, preventing a direct comparison between the observed bioaerosol concentration peak and local pollen concentrations. To further investigate the possible cause of this event, we combined pollen monitoring data with Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT) (Fig. 2). Backward trajectories were calculated at arrival heights of 10, 50, and 100 m above ground level for the sample collected from 23:00 LST on 17 April to 19:00 LST on 18 April. The results showed that the low-level air masses reaching Yonago during the sampling period predominantly originated from the southwest. Based on these transport pathways, we further examined pollen observations from four monitoring stations located southwest of Yonago. All four stations exhibited unusually high pollen concentrations around 17 April. Taken together, the pollen observations and backward trajectory analysis suggest that the observed bioaerosol concentration peak was likely associated with a regional pollen outbreak and its subsequent atmospheric transport. Nevertheless, because pollen observations were unavailable at Yonago and its surrounding stations during the sampling period, this interpretation should be regarded as a plausible explanation rather than direct evidence, and further observations are needed to confirm the underlying mechanism.

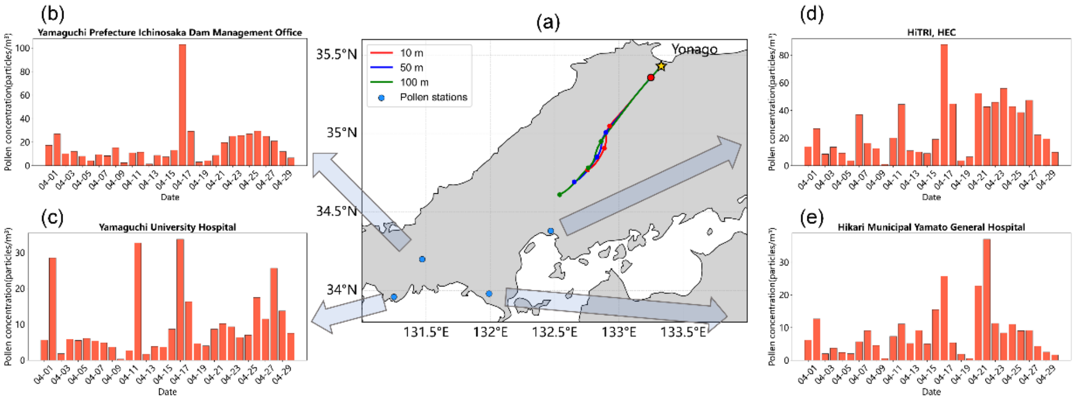

Figure 2: (a) Cases of 18 h backward air mass transport trajectories for the Yonago sampling site at starting heights of 10, 50, and 100 m above ground level, simulated by the HYSPLIT model at 0500 UTC 18 April 2015. Each trajectory node represents a 6 h interval. Temporal variations in pollen concentrations at four sampling sites during April 2015: (b) Yamaguchi Prefecture Ichinosaka Dam Management Office, (c) Yamaguchi University Hospital, (d) Hiroshima Prefectural Technology Research Institute, Health and Environment Center, and (e) Hikari Municipal Yamato General Hospital.

Comment 6:

This study mainly showed the diurnal variation characteristics. However, the sampling period is from 2011 to 2021, covering different seasons. So if you have those data, It's better that the authors analyze the variation patterns of concentration and community structure on a seasonal scale. This will be of great value for understanding the annual cycle characteristics of biogenic aerosols.

Response:

We sincerely thank the referee for this valuable suggestion. We fully agree that seasonal variations in bioaerosol concentration and community structure are of great importance for understanding the annual dynamics of atmospheric bioaerosols.

We carefully evaluated the possibility of conducting a seasonal analysis using the current dataset. However, such an analysis would not be sufficiently robust because none of the sampling sites was monitored continuously throughout an entire year (Fig. 2). Furthermore, bioaerosol characteristics exhibit substantial spatial heterogeneity across East Asia. Therefore, combining data from different sites to infer seasonal patterns could introduce considerable spatial bias and may lead to misleading conclusions.

Since the primary objective of this study is to present a high-quality, standardized dataset, we prefer not to include a seasonal analysis that is not adequately supported by the available observations. We agree that seasonal variability is an important topic and plan to address it in future studies based on more continuous and systematic observations.

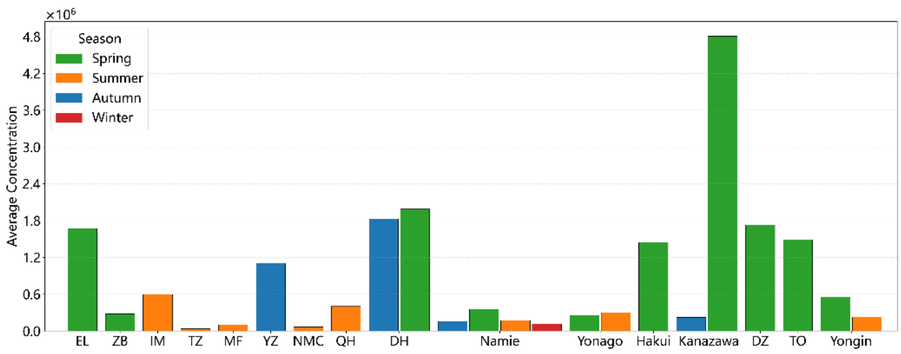

Figure 3: The average distribution of biological aerosol number concentrations at each site during different seasons in the DuBi field sampling experiment.

Comment 7:

One interesting finding of this study is that the concentration of biogenic aerosols and the α diversity index are significantly negatively correlated with NDVI. However, the present result comes mainly from descriptive correlation analysis, lacking quantitative interpretation of the underlying mechanisms. It is suggested that further mechanisms research should be carried out in future work. At least, this deficiency should be mentioned in the conclusion.

Response:

We greatly appreciate the referee's insightful observation regarding the negative correlation between biogenic aerosol concentrations and α diversity index with NDVI. This is indeed an interesting and counterintuitive finding from our dataset. We acknowledge the referee's point and have addressed it as follows:

The referee correctly identifies that our current analysis is primarily descriptive in nature, establishing the statistical correlation without providing detailed mechanistic interpretation. We agree that the underlying mechanisms driving this relationship remain open questions. Potential mechanisms could include differences in regional vegetation composition, land-use heterogeneity, atmospheric circulation patterns factors that cannot be fully disentangled from the present correlation analysis alone.

Following the referee's suggestion, we have added a paragraph to the Conclusions section explicitly acknowledging this limitation and highlighting it as an important avenue for future research. Thank you again for this constructive feedback, which has helped strengthen the scientific rigor and transparency of our manuscript.

Revision made:

Page 16, Line 324.

Revised:

Although significant correlations were identified between bioaerosol characteristics and environmental variables such as NDVI and temperature, the underlying mechanisms remain unresolved. The lack of year-round continuous observations at individual sites limits robust seasonal analysis, while the uneven spatial distribution of the network, particularly the underrepresentation of forested and other densely vegetated regions, constrains its ecosystem representativeness. Future studies should therefore combine longer-term monitoring, expanded coverage of vegetation-dominated environments, and more detailed process-based analyses to better resolve seasonal variability, vegetation-related emissions, and the mechanisms linking bioaerosols to environmental conditions.

Comment 8:

In conclusions, the author believes that this database can serve as a data foundation for climate models. Could you provide some examples to illustrate its potential application scenarios?

Response:

We thank the referee for this constructive suggestion. We agree that the original manuscript did not sufficiently illustrate how this dataset can be used in future research. As suggested, we have expanded the Conclusions by providing several representative application scenarios to better demonstrate the scientific and practical value of the database.

Specifically, because the dataset provides standardized observations of bioaerosol concentration, bacterial community structure, meteorological conditions, air quality, and NDVI across a wide range of environments in East Asia, it can serve as a valuable observational basis for atmospheric and climate studies. We have therefore clarified that its broad spatial coverage and standardized observations can provide valuable constraints for atmospheric and climate models, particularly by improving the representation of bioaerosol emissions, transport processes, and their potential interactions with cloud formation. In addition, we emphasize that the integration of biological and environmental variables enables the dataset to support evaluations of environmental exposure and associated public health risks across East Asia.

We believe that these additions provide clearer examples of the potential applications of the dataset and better highlight its value for future atmospheric, climate, and public health research.

Revision made:

Page 16, Line 324.

Revised:

Its broad spatial coverage and standardized observations provide valuable constraints for atmospheric and climate models, particularly in improving the representation of bioaerosol emissions, transport processes, and potential interactions with cloud formation. In addition, the dataset offers a basis for evaluating environmental exposure and associated public health risks across East Asia.

Once again, we sincerely appreciate your careful review and valuable comments, which have helped us improve the quality and completeness of our manuscript.

Sincerely,

The Authors