egusphere-2023-290

Reply to editors:

Based on review reports from three referees, I'm happy to accept your paper published in ACP if the following two minor points could be addressed.

Thank you for your kind comments. We have made effort to clarify every comment and implemented all the suggestions in the revised manuscript. The following texts are our point-to-point response.

1) About the last sentence in the abstract "Our finding suggests the aerosol species and number concentration variance in different storms should be considered in model simulation of the ice freezing process", this statement is somewhat excessive. It looks impossible to include the number concentration variance in the model. Please delete it or rephrase it as "Our findings highlight the need for atmospheric chemistry to be considered in the simulation of ice freezing process".

We have rephrased the sentence as your advice.

2) Fig. 1 and Fig. 8: Please show the full map in Fig. 1 and remote the background map in Fig. 8. The origin Fig.1 and Fig. 8:

In Fig. 1, we present the full map, while in Fig. 8, we have excluded the background. The caption for Fig. 1 remains unchanged. Below, you can view the two updated figures:

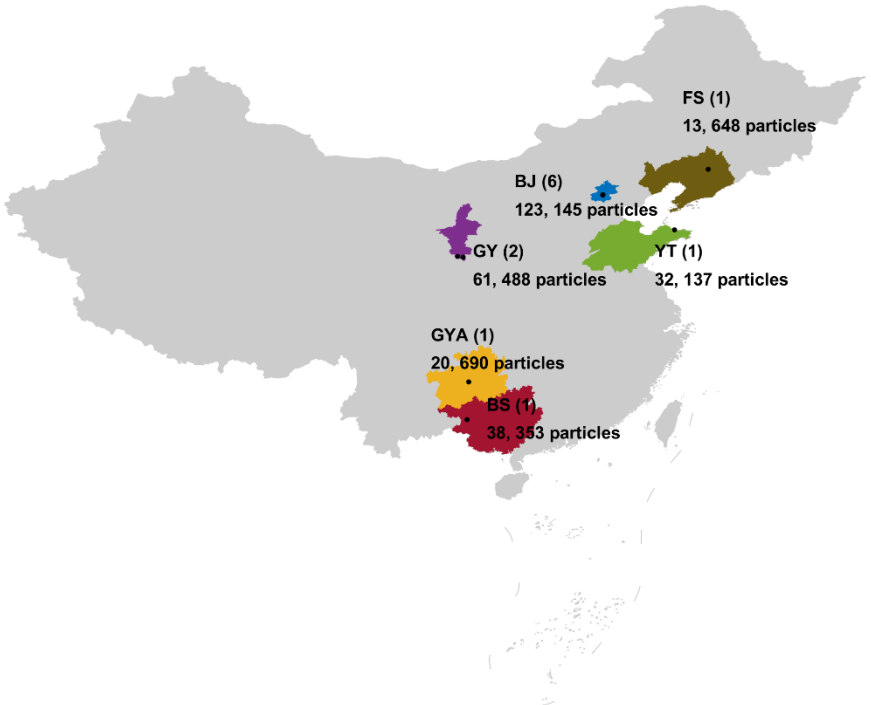

Fig. 1: Geographical distribution of collected hailstones. The collecting locations of hailstones are indicated by black dots. Provinces of China from which the hailstones were collected are represented by six different

colors. The number of hailstones we analyzed was indicated in parentheses. Abbreviations (corresponding to Table 1): BJ - BeiJing; BS - BaiSe; FS - FuShun; GY - GuYuan; GYA - GuiYAng; YT - YanTai.

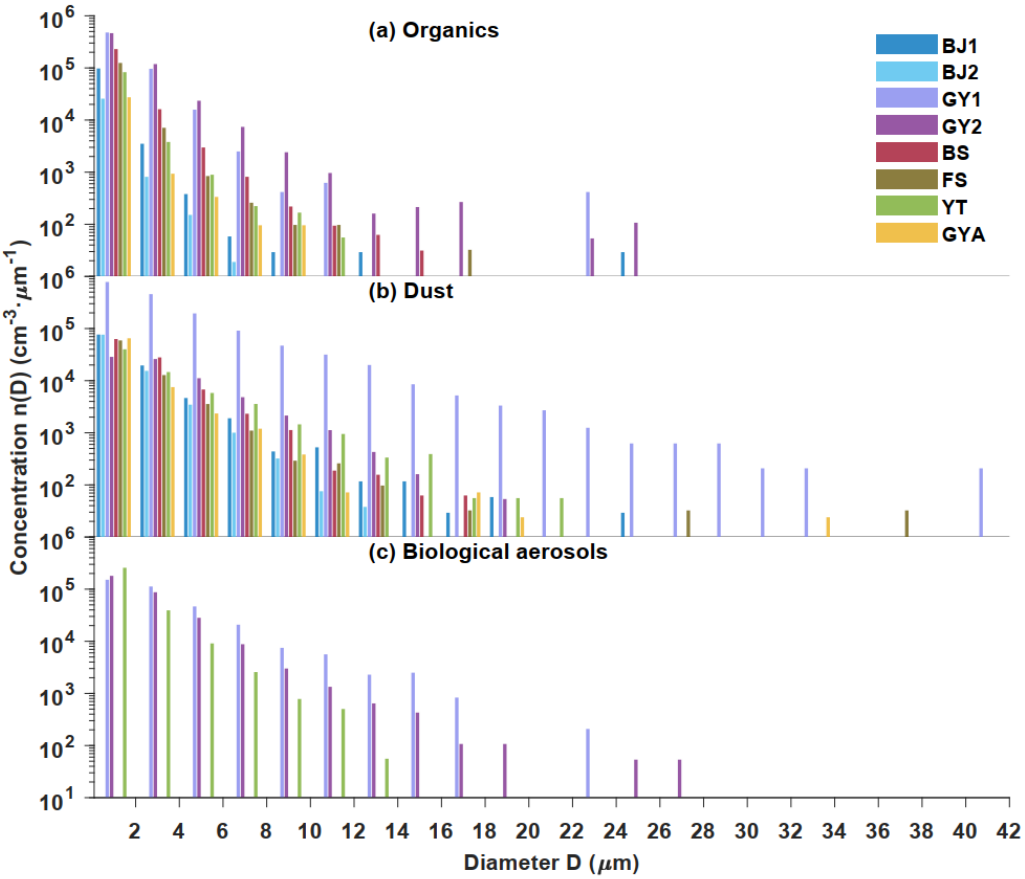

Fig. 8: Size distribution of (a) organics, (b) dust, and (c) bioprotein aerosols in hailstone embryos. Colors represent different hailstones. Abbreviations (corresponding to Table 1): BJ - BeiJing; BS - BaiSe; FS - FuShun; GY - GuYuan; GYA - GuiYAng; YT - YanTai.

3) Fig. 10: Some texts are overlapped by the figure plots. Please improve these plots, or maybe consider adding a table (as SI) to show all the equations and parameters.

Following your recommendation, we have excluded the parameters pertaining to image coverage and encapsulated them in Table 2.

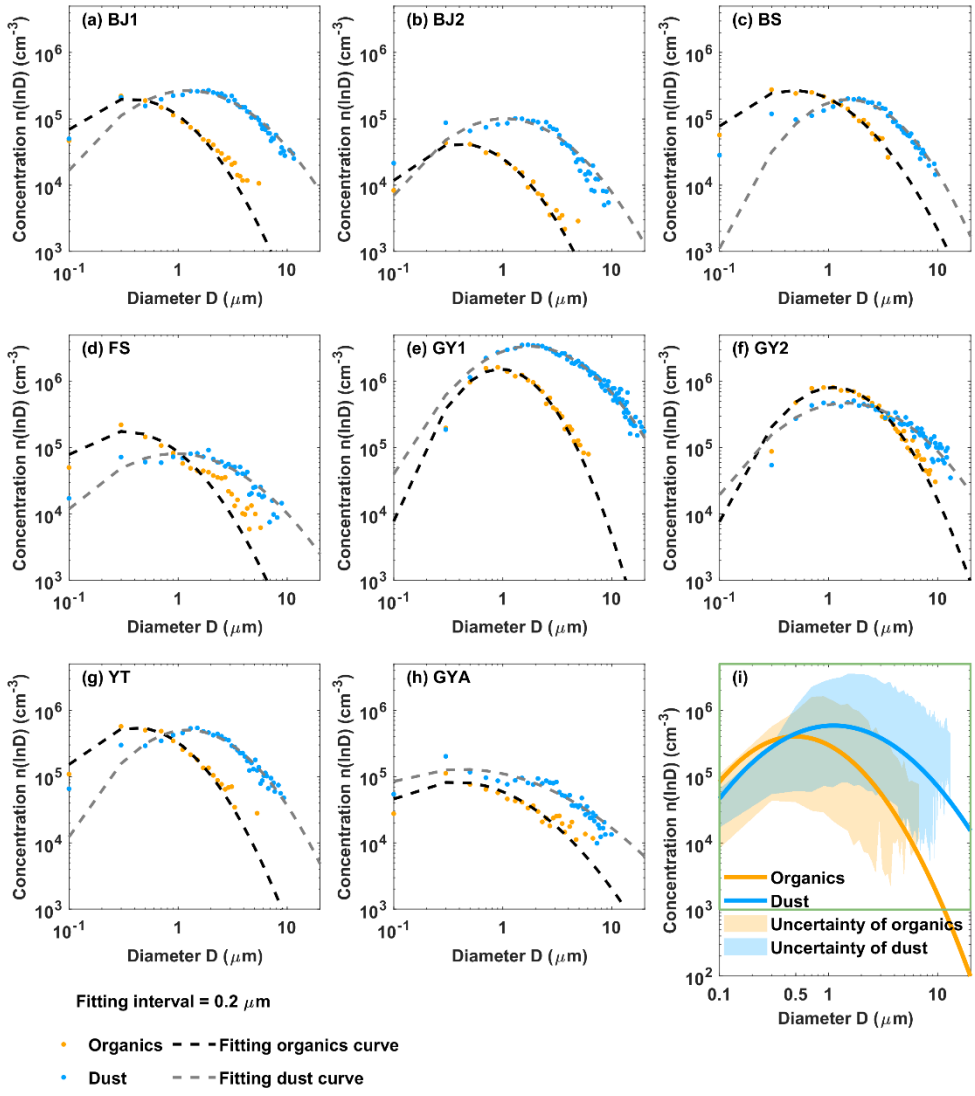

Fig. 10: Fitting size distribution functions of organics and dust contained in the whole hailstone. (a)-(h) Fitting parameters of logarithmic normal distributions of BJ1, BJ2, BS, FS, GY1, GY2, YT, GYA. (i) Classic modes of dust and organics (interval of data is 0.2 μm and fitting curves painted with interval of 0.02 μm). The fitting parameters for subfigures (a)-(h) are listed in Table 2. The fitting range of (a)-(h) is shown with a green rectangle in (i). The centroid of the organics fitting parameter (orange line) is $\ln \sigma_o = 0.91$, $ln\, D_o = -0.70$, and $N_o = 9.19 \times 10^5$ cm^{-3}. The centroid of the dust fitting parameter (blue line) is $\ln \sigma_d = 1.07$, $\ln D_d = 0.11$, and $N_d = 1.59 \times 10^6$ cm^{-3}. Shading showed uncertainty of organics and dust. Abbreviations (corresponding to Table 1): BJ - BeiJing; BS - BaiSe; FS - FuShun; GY - GuYuan; GYA - GuiYAng; YT - YanTai.

Table 2:The fitting parameters of dust and organics size distribution in Fig. 10 (a)-(h).

Sample	$N_o\ (cm^{-3})$	$ln\ D_o$	$\ln \sigma_o$	R_o^2	$N_d\ (cm^{-3})$	$ln\ D_d$	$\ln \sigma_d$	R_d^2
BJ1	4.57×10^5	-0.98	0.90	0.97	7.11×10^5	0.20	1.06	0.93
BJ2	9.32×10^4	-0.90	0.88	0.98	2.55×10^5	0.02	1.01	0.89
BS	6.65×10^5	-0.75	0.98	0.97	4.12×10^5	0.40	0.84	0.91
FS	4.13×10^5	-1.12	0.93	0.89	2.35×10^5	-0.05	1.15	0.87
GY1	2.66×10^6	-0.05	0.69	0.97	8.15×10^6	0.57	0.96	0.98
GY2	1.60×10^6	0.10	0.79	0.98	1.25×10^6	0.37	1.06	0.95
YT	1.21×10^6	-0.90	0.87	0.98	1.16×10^6	0.20	0.92	0.94
GYA	2.51×10^5	-0.99	1.21	0.84	5.06×10^5	-0.87	1.57	0.79

4) The font sizes of all figures/sub-figures could be somehow improved.

We have meticulously revised all figures and sub-figures, striving for full satisfaction.

5) Figure 9: Please note that single figure panels with their own caption are not allowed in the final version.

The caption has been improved.

Author's annotation in other one modification:

1) We found an error in Fig. 5 and corrected it.