Dear Professor Graham Feingold,

Thank you for your constructive comments. Briefly, we have addressed all your comments. The corresponding responses are listed below. Furthermore, the Wiley Editing Services (https://editingservices.wiley.cn/) provide thorough English language editing.

With regards,

Naifu Shao, Chunsong Lu*, and co-authors.

Comments:

I note that nowhere in your manuscript do you discuss the role of shortwave radiation and its affect on fog lifetime. This is an important part of the discussion. With increasing liquid water path (LWP) and increasing drop concentration, SW heating increases. There are also longwave aerosol-related effects: at low LWP (< ~ 25 g/m2); an increase in drop concentration will increase radiative cooling. I also note that there is no quantitative information on LWP, only its response (e.g., Table 4). This is really important information if one is to understand the radiation interactions.

Response: Thank you for your suggestion. We agree that it is important to discuss the role of shortwave radiation during fog dissipation and its effects on fog properties. We have revised and reorganized the related sentences.

Page 12, Lines 282-285: Compared with clean conditions, the larger τ_t (mainly due to larger τ_c) and delayed fog dissipation in polluted conditions reduce short-wave radiation reaching the ground (from −46 W m^{-2} to −121 W m^{-2}) during the Fog1 dissipation time, leading to a decrease in T_{2m} (from −0.2 °C to −1 °C) and PBLH (from −42 m to −118 m) (Fig. 7).

Page 14, Lines 325-330: "As shown in Fig. S5, LWP is larger under polluted conditions than that under clean conditions, particularly for Fog2. The average LWP in Fog1 and

Fog2 under polluted conditions are 11.6 g m^{-2} and 24.3 g m^{-2}, respectively. Therefore, τ_c in Fog2 (4.9) is larger than that in Fog1 (2.1). Similar to previous studies (Jiang et al., 2001; Williams and Igel, 2021), higher LWP or τ_c leads to stronger long-wave radiative cooling at the fog-top."

A linguistic revision

1) What are "conducive PBL conditions"? I think you mean "conducive to fog formation". Please make changes throughout.

Reply: Yes, we mean "conducive to fog formation". We have modified the phrase to be: "PBL conditions conducive to Fog2 formation". We have revised the entire article.

2) change 'scenario' to 'event'

Reply: All 'scenario' in our article have been revised to 'event'.

3) remove all "the" before "EXPn"

Reply: All "the" before "EXPn" has been removed.

4) dissipation time (not dissipate time)

Reply: All "dissipate time" has been revised to "dissipation time".

5) Fog 1 occurs under clean conditions (not Fog1 161 is under the clean condition)

Reply: We have revised "is under the clean conditions" to "occurs under clean conditions".

6) "under clean and polluted conditions" (remove 'the')

Reply: It has been removed in our article.

7) What is 'more remarkable AFI'? Do you mean stronger AFI? Please be clear.

Reply: Yes, 'more remarkable AFI' means stronger AFI. We have revised it in our article.

8) “can enhance cooling” do you mean “enhances cooling”? Please use clear causal language if that’s what you mean. There are many instances "can affect", "can indicate".

Reply: Yes, we mean that “enhances cooling”. We have revised all the related phrases.

9) You have a tendency to create new acronyms like AFI, FOD, TOD, which makes the manuscript less readable to the broader audience. The use of symbols significantly alleviates this problem (e.g., \tau_f, \tau_t). Even AFI might be unnecessary given the familiar ACI. (You could simply point out that ACI in fog has its own particular questions). Also, why N_f when N_d (drop concentration) or N_c (cloud droplet concetration) are widely used. And \tau_c would be better than \tau_f. As it is you use other standard cloud-related acronyms such as LWP, LWC.

Reply: Thank you for your suggestions to make the manuscript more readable to the broader audience. We have revised the acronyms and symbols accordingly. AFI, FOD, TOD and N_f have been revised to ACI, τ_c, τ_t and N_d, respectively.

References

Jiang, H., Feingold, G., Cotton, W. R., and Duynkerke, P. G.: Large-eddy simulations of entrainment of cloud condensation nuclei into the Arctic boundary layer: May 18, 1998, FIRE/SHEBA case study, J. Geophys. Res.: Atmos., 106, 15113-15122, 10.1029/2000jd900303, 2001.

Williams, A. S. and Igel, A. L.: Cloud Top Radiative Cooling Rate Drives Non-Precipitating Stratiform Cloud Responses to Aerosol Concentration, Geophys. Res. Lett., 48, 10.1029/2021gl094740, 2021.