

General comments:

The relative contribution by aerosol and urbanization to the fog formation is highly debated due to the competing but opposite effect. To tackle this challenge, this manuscript by Yan et al. attempted to quantitatively elucidate how urbanization and air pollution, both of which afflict the rapid economic countries like China and India, affect fog by means of sensitive model experiments. This topic is very interesting, and it is worth of further investigation. Overall, this manuscript is well written, and the methodologies are straightforward and easy to follow. However, the authors are recommended to adequately address the following concerns before consideration for acceptance for publication by ACP.

Specific comments:

1. Line 37-38: As indicated in IPCC AR5, “aerosol-cloud-radiation interactions” is suggested to be rephrased as “aerosol-radiation interaction” and “aerosol-cloud interaction” separately.
2. Line 41: “Many”->“Previous”
3. Line 45: “lower supersaturation” ??
4. Lines 64-65: Some important references are missing regarding the observational evidences of aerosol boomerang effect in China, e.g., Wang et al., AE 2015, doi: 10.1016/j.atmosenv.2015.04.063; Guo et al., GRL 2017, doi: 10.1002/2017GL073533; Liu et al., Sci. Rep. 2019, doi:10.1038/s41598-019-44284-2.
5. Lines 69-71: I notice that the work by Yan et al. JGR (2019) mentioned here is also from the same research group. Also, it occurs to me that the motivation seems a little confused: Since previous work has “quantitatively” proved..., why the authors attempt again to “quantitatively” confirm by model simulation of a fog event. Two “quantitatively ” is redundant. Therefore, this sentence is suggested to be rephrased as follows: e.g. Our recent observational work (Yan et al., 2019) indicated a decreasing trend in fog days, and ...”
6. Line 75: “facilitates”-> “is expected to facilitate”
7. Line 85: Something is suggested to be mentioned concerning Section 4 immediately after “Section 3.6 discusses the rationality and reliability of the results.”
8. Line 90: it is suggested to clarify which city you are referring to? Since the reader cannot easily get any info from either text or Figure 1b.

9. Line 97: “replace”-> “used to replace”
10. Lines 160-165: The logic seems a little problematic: since the fog holes are mainly caused by urbanization, as demonstrated in the references in this paragraph (aerosol effect is not mentioned and is supposed to not be the focus here), why you mentioned the effect of aerosol pollution. It is generally thought that urbanization effect tends to reduce LWP whereas aerosol tends to accumulate the formation of fog. The combined effect is highly dependent on the competing effect of the two factors. Here it is not accurate to argue that both of them “reducing the LWP or advancing the dissipation of fog”.
11. Section 3.2: What are the criteria for you to determine a fog event from model-simulated LWP, which is required to be clarified here.
12. Section 3.3: The authors attempted to discuss the complicated non-monotonic effect of aerosol on fog formation by differing the emission rate, which is not very common. Why not used the aerosol concentration or CCN or Na that can well represent the real atmospheric pollution level for the time period investigated here? I am curious of the actual CCN or Na concentration for the experiment of 10^3 ?
13. Lines 215-216: It will be misleading for the statement “the current pollution level in China is still located in the promoting regime rather than the suppressing regime of fog occurrence”. Both ideal simulation (e.g., Rosenfeld et al. Science, 2008) or observational studies (Wang et al., AE 2015; Guo et al., GRL 2017) indicated that the tipping point tends to occur at AOD of 0.3-0.4 or CCN concentration of $1200/\text{cm}^3$. Recent observational work by Ilan Koren et al. (Science, 2014) suggested the cloud and precipitation is most sensitive to aerosol over the South Ocean. By comparison, the average AOD from MODIS in East China is on average much larger than 0.6, irrespective of the meteorological conditions.
14. Lines 205-206: times is redundant and should be removed.
15. Line 448: it is better to indicate the year of 2017 following 03 January in the figure caption.
16. Figure 3: it is suggested to show the major cities in the regions of interest shown in panel a and b, given the convenience to better understand the fog hole induced by urban. Besides, two subregions in Figure 3 is better to be marked in Figure 1 or 2.