

Interactive comment on “Analysis of the formation of fog and haze in North China Plain (NCP)” by J. Quan et al.

J. Quan et al.

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We thank the reviewer for the careful reading of the manuscript and the helpful comments. The reviewer's comments are accordingly addressed in the revised manuscript. We think that the paper is significantly improved following the reviewer's suggestions.

Comments and suggestions: 1, In p. 11921, line 2, it is better to show the original author of the formula 1.

Yes, we changed to Seinfeld and Pandis (1998)

2, In fig.1, there were 17 stations, 1 more than described in p.11914, line 11. In fact, the Wuqing station was also marked in fig.1 as a rural station, and it should be a field experiment station and was not a historic data station.

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Yes, we changed it

3, In fig.1, authors used squares and circles to mark rural or urban stations, not black and white symbols listed in fig.1.

Yes, we changed it

4, in p.11914, two criterions were used to identify haze or fog. Did authors meet the condition that visibility \leq 2km. and RH \leq 95 percent? Are those criterions consistent with definitions of haze and fog accepted by WMO?

The criterions of fog and haze in this work are generally consistent with that of WMO. However, we also make an adjustment for the criterions based on the particular situation in China. For example, fog and mist are not easily distinguished in China due to the heavily polluted aerosol condition. We add a table in revised manuscript (Table 1), which lists the criterions of WMO et al. For the condition pointed by reviewer, it can be judged, for the condition that visibility \leq 2km. and RH=95, it is counted as fog event, and for condition that visibility \leq 2km. and RH<95, it is counted as haze event.

5, in p.11916, line 7-12, the non-linear relationship between OHAZ and OFOG were shown in fig.4 and there were two conditions. From condition 1, authors were suggesting a strong impact of aerosol particles on the fog formation, but it was not a clear description. In fact, liking the condition 2, it seems that meteorological conditions are critical factors to form fog. In fig. 3, after 1980's fog days per year were almost constant 15 days for both rural and urban stations, perhaps, the climate could be a factor either.

We thank the valuable comments. In the revised manuscript, we rewrite the text to address the reviewer concerns as follow: "The detailed relationship between OHAZ and OFOG shows in Figure 4. The result indicates that there was a nonlinearity relationship between the OHAZ and OFOG days. When the OHAZ days were lower than 75 days/year (a crucial value), the OFOG days were strongly dependent upon the OHAZ days (Condition-1). When the OHAZ days exceeded the crucial value, the

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OFOG days were not sensitive to the OHAZ days (Condition-2). The occurrence of haze and fog was influenced by weather conditions, such as static stable weather condition and abundant vapors (for fog). In addition, the aerosol concentration might also be a factor that influences the OFOG days. Under a constant liquid water content during fog events, the higher of fog droplets concentration were formed, with smaller of fog droplets size, leading to a longer of resident time of fog event due to slower gravitational settling velocity. Therefore, the increase of aerosol concentration tends to increase the OFOG days (Condition-1 in Fig.4). However, when the aerosol particles exceeded a certain values, there were no enough water content to form more fog droplets (Zhang et al., 2011), and the increase of aerosol concentration would have no further contribution on OFOG days (Condition-2 in Fig.4). As shown in Fig.3, the OFOG days at urban stations were almost constant (12 days) after 1980's, which were not similar as the trend of OHAZ days.”

6, in p.11920, comparing the fog measurement results with Canadian results, authors suggested the resident time of fog should be longer. It could be true, but there was not the direct evidence.

We agree with the reviewer for this comment. Though the comparison the fog measurement results at NCP with Canadian results and analysis in p.11920 cannot provide direct evidence to the role of aerosol concentration on the resident time of fog, but the analysis of this paragraph is helpful to understand their relation. The duration of fog event is affected by many reasons, including weather condition, temperature change, and gravitational settling of fog droplets etc. High concentration of small fog droplets is observed over NCP, where owns high concentration of aerosol particles. The resident time of fog droplets will be raised with the decreasing of their size if the dissipation of fog event is only affected by gravitational settling.

7, in p.11924, line 17-18, the conclusion was not clear, in fact, in NCP there were enough CCN to formation of fog.

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Yes, the comment of the reviewer is reasonable. We deleted it in revised version.

8, in p.11925, line4, it seems unnecessary to descript NCAR, since for this paper no author and no fund are from NCAR.

Yes, we delete it.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/11/C6907/2011/acpd-11-C6907-2011-supplement.pdf>

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