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Interactive comment on “Understanding atmospheric peroxyformic acid chemistry: observation, modeling and implication” by H. Liang et al.

Anonymous Referee #2

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This paper by Liang et al. entitled ‘Understanding atmospheric peroxyformic acid chemistry: observation, modeling and implication’ discusses formation mechanism of peroxyformic acid (PFA) based on field observation data and a box model. I have several comments on the manuscript.

P2059 L 24 ‘The relative position of PFA peak coincides with that reported in Kok et al. (1995).’ It seems that this is the only one reason why the authors have identified the peak as that originated from PFA. However, I am not sure if the systems used by Kok et al. and this study are exactly the same or not. In addition, no information is provided about the calibration. How the authors did quantify the concentration of PFA? These

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points need to be clarified.

P2060L19 'The rates of these reactions were assumed to be the same with the corresponding reactions of PAA and peroxyacetyl 20 radical.'

It would be valuable to discuss (1) how much these reaction rates of organic peroxyacids could vary, and (2) how the uncertainty could affect the interpretation of the results. PFA is the smallest peroxyacid molecule; the reactivity of this compound might be quite different from other peroxyacids. This point needs to be investigated more carefully.

P2062L13 'Here, we provide an estimation of the Henry's law constant of PFA on the basis of the PFA observation data in both gas phase and rainwater.'

It would be important to discuss if this method is sufficiently accurate, and what kinds of artifacts could exist. I am not sure how fast the chemical composition of rain droplets equilibrate with the surrounding air. Rain droplets fall down from the upper atmosphere, where both temperature and concentration of PFA could be different from the surface level.

P2063L18 'The most important factor seems to be the solar radiation. As is shown in Fig. 1, observed PFA/PAA in June (BJ-2012S) was about 0.10 on average whereas the ratio in August and September (BJ-2012F) was about 0.33 on average. '

A detailed comparison with solar radiation data is needed to derive this conclusion. Other meteorological parameters such as temperature and relative humidity could also be different for these two different time periods.

P2067L14 'In a foggy day, the production rate of PFA in this pathway could be 2 or 3 orders of magnitude higher than the clear day value, owing to the greatly enhanced liquid water content compared to clear days.'

Was the observation conducted only during clear days? If the observation periods include both clear and foggy days, this difference should also be discussed.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 2055, 2015.

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