The paper "High sensitivity of simulated fog properties to parametrized aerosol activation in case studies from Paris Fog" by Ghosh et al. addresses an important scientific question about "aerosol-cloud" interactions, which remains a major uncertainty in estimates of the indirect forcing exerted by aerosols. The paper is well written and the study objective and simulation design are clear and well suited to investigate the influence of aerosols in the case of fog.

More specifically, the authors investigate the ability of the UK Met Office Unified Model to simulate aerosols and fog properties during case studies from the ParisFog field campaign at the SIRTA site in November 2011. In particular, they explore the sensitivity of different fog properties to changes in simulated aerosol activation. This work is interesting, well presented, complete and uses several in-situ observations to evaluate the performance of different model configurations.

At this stage, I think that this study could be improved or completed in several aspects. The effects of certain biases on aerosol properties (number concentrations, chemical composition) or certain meteorological variables (as humidity) could be discussed more and are not detailed enough.

Major points :

First and for the Mod-Kappa test, a value of 0.1 is used for OC. Does it take into account SOA (which is not represented in the model) ? Does this value therefore represent a « low » value of Kappa that does not consider hydrophilic secondary organics aerosols ?

The time series of the number of foggy grid boxes (Figure 4) shows a large difference between the Def-ARG and Mod-Kappa simulations. Could this point be more detailed and discussed ? Is it possible to show the low cloud fraction for the two different simulations ?

With regard to the different evaluations discussed in sections 5.2 and 5.3, and even if the overall performance of the model is satisfactory, it would be interesting to discuss a little more the impact of certain biases on the simulated droplet concentration. For example, what is the possible effect of the (generally) negative bias on surface humidity for 15, 16, 17 or 24-26 November? What is the effect of the underestimation (sometimes with a significant bias, e.g. 21-22 and 23 November) of the aerosol concentration on the microphysical properties of clouds? For example, could the underestimation observed on 19, 21, 22 or 23 possibly explain part of the bias in simulated Nd (Figure 12e,f,h) ?

As mentioned previously and even if the hygrosocipity tests seem to be a second order effect, what is the possible effect of underestimating the contribution of SOA and sulphate hygroscopic aerosols (Figure 9 and Table 4), which could possibly affect the number of activated aerosols and fog droplets concentration ?

The comparisons of aerosol chemical composition are made with Crippa et al. (2013), but it could be interesting to use observed concentrations of inorganic aerosols at Sirta station to evaluate more chemical properties (if such in-situ observations exist) ?

Regarding the aerosol and droplet size distributions, it would be interesting to have a few more days to support the analysis shown in Figure 10 by indicating comparisons for days used to analyse the fog droplet concentration (Figure 12) or LWC (Figure 13). Here and as indicated in the text and Figure 10, the simulation of Nd by Def-ARG performs better than Mod-Kappa for the 15th day, whereas this is not the case for the 16th day. Is there any reason for this? it is not really discussed in the text. This could explain the overestimation of Nd by Mod-Kappa as shown in Figure 12a ?

Similarly, does the underestimation of the accumulation mode concentration on the 20th (Figure S3b) explain part of the negative bias in the simulated fog droplet concentration (Figure 12e) ? Could this point be discussed more in the context of the overall size distribution ?

In terms of droplet concentration and on the 24th (after 16:00) the Mod-Kappa simulation strongly overestimates the Nd observations while the aerosol concentration is very well reproduced by the model. Could this be due to some of the temperature biases indicated in Figure 6 or in the aerosol size distribution ?

In parallel with droplet concentration, it may be interesting to use the MODIS liquid cloud droplet effective radius product to constrain this microphysical property using the same method as proposed for Nd concentration.