Review

General

The paper presents aerosol chemical composition measured with two instruments, an ACSM and an Aethalometer, and particle number size distribution measured with an SMPS from January 2017 to March 2018 during the Delhi Aerosol Supersite (DAS) campaign. The data were used for estimating the number concentrations of cloud condensation nuclei (N_{CCN}). The data were also classified according to geographical source areas and thereby the variabilities of aerosols in different air masses. The analysis shows also diurnal cycles of both chemical compounds and the estimated hygroscopicity parameter κ and the estimated N_{CCN}. Considering the extremely high pollution levels in Delhi this type of measurements are important both for air quality and climate studies. It would be important to have measurements of N_{CCN} but since no CCN counter was available it is valuable to make estimations such as in the present paper.

The paper is basically fairly easy to read and I can recommend publishing it in ACP after some additions, corrections and more detailed explanations.

At the moment there is no evaluation of the quality of the data since there was no independent PM_1 measurement or CCN counter. But something can be done. A straightforward way would be to make a closure study of mass calculated from the number size distributions measured with the SMPS and as the sum of the chemical constituents of the ACSM + BC. Doing that remember the SMPS shows size distributions using mobility diameters whereas the ACSM size range is with aerodynamic diameters. I would like to see scatter plots for the major air masses and some discussion on them.

Another thing that I noticed is that the hygroscopicity parameter was calculated using only ACSM data. There was a lot of BC in air and that definitely as also an effect on κ. Find $\kappa(BC)$ from the literature and repeat the calculations taking also BC into account.

Detailed comments

P1,L12-13 The first sentence of the abstract "This work presents for the first time long term and time-resolved estimates of hygroscopicity parameter (κ) and CCN for Delhi" emphasizes that the measurements were long term. That is not really true since in generally long-term measurements are such that also trends of various properties can be estimated. A bit more than one year of data cannot be considered long term. Another thing is that the paper mainly presents variations of chemical composition, only a small part is about CCN. So it is somewhat misleading to start the abstract with the κ and CCN.

P3,L31-32 "... relatively lesser traffic compared to the city in general ..."
"lesser" is wrong here. The comparative of little is "less", not "lesser".
      -> ... relatively less traffic than the city in general

P3, Section 2.1 This is the section showing the ACSM instrument. Write the particle size range it measures.

P4,L13 in the title 2.2, is the acronym OOA right or should it be POA?

P4,L31 What are the residuals here? Explain.

P5,L6-17 This text looks like it is taken from a computer program. Explain in a short text the contents of it and move this text to the supplement.

P5,L24-26. Present the hygroscopicity parameters of the different compounds clearly in a table and add there the references of the papers where you got them from. A compilation like that helps the readers.

P5,L32 Bhattu et al. (2015) calculated Dc using ammonium sulfate, ammonium nitrate, insoluble organics and soluble organics and gives the respective constants. You have different constituents so you should show all constants you have used either in a table or in the text like Bhattu et al. (2015) did.

P6,L1, "...CCN.." -> N_{CCN}

P6, Eq (4) correct toulene -> toluene

P7,L1 [OH] is definitely not constant, it varies a lot. Discuss this a bit.

P8,L19 Define aerosol neutralization ratio. Explain and give formulas.

P8,L28, 1 < R > 2 is never possible. Correct.

P9,L12 "...AS was associated with BBOA...". What does this mean?

P10,L15, "... ammonium nitrate is relatively more stable than ammonium chloride..." Give a reference.

P10,L20 "chloride depletion". Give formula or expain clearly what you mean here. I have calculated chloride depletion when comparing Cl-to-Na ratios in filter samples with the same ratios in pure sea salt. Now it is not possible, ACSM gives no Na concentrations.

P11,L4 "Hike in sulphate concentration...". What does hike mean here? Explain or rewrite clearly.

 P12,L14 "The correlation of NO3 with ns-NH4 was found to be very poor..." Show some scatter plots, eithier in the main text or the supplement.

P12,L21 " The BC concentration in BB air masses was considerably lower than SA." Here is a grammatical error. The sentence means that BC concentration is smaller than South Asia!
It should be " The BC concentration in BB air masses was considerably lower than in the SA air masses."
There are similar errors in several sentences in the paper. Check and correct.

P13,L5 "lesser" is a wrong word. Rewrite the sentence

P13,L13 " Both BC and POA are quite less compared to SA." I don't understand, rewrite.

P13,L17-24 This text is clearly conclusions so why don't you have it there in the "Conclusions" section?

P13, L26 A bit more than a year is not "long term".

How do the κ values look like when you take BC into account?

P15,L19- Note that NCCN was measured with a CCN counter in the other studies and the activated fraction was actually measured. So I would be careful in making very strong conclusions.

P31,Fig 1. In the uppermost subfigures the bars should be the mean values of NRPM.
In the middle subfigs the sum of the constituents should be the same as in the upper subfigures.
But they are not. What is wrong?