We thank the reviewer for taking the time to review this paper. We have addressed their comments, and believe that they have led to a substantial improvement of the manuscript. Below, the reviewers comments are reproduced in green, our answers are in black.

My main concern is that the authors describe their approach as a "model". To my understanding a model is something that uses a theoretical approach with known physical relationships that is used to predict experimental results. These predictions are then compared to the experimental results and, based on this, model parameters can be adjusted. What has been done here is a parameterization. Different variables that are known (or assumed) to have an influence on CDNC are correlated to the observed CDNC, and an empirical parameterization is built from this. For example, in panel a) of Figure 5, the "N_act predicted" is simply the number of CCN (particles larger than 90 nm) that are linearly correlated to the observed CDNC (here called N_act). In section 5.1 the authors seem to realize it and use the wording "statistical relationships". No physical explanations (e.g. from Kohler theory) for the factors in equation (2) can be given. Thus, I would strongly suggest replacing "model" by "parameterization" in the whole manuscript.
As similar potential for confusion exists with the word “parameterisation”, we have instead added “statistical” in many places throughout the abstract and text, so that it is always clear that this is not a physics based model. “statistical model” is a common and correct term for equations such as those used here. To maintain the readability of the paper, we have not preceded “model” with “statistical” in cases where there no potential for misunderstandings exists.

Specific comments

Page 15477, lines 22-25:
Removal of anthropogenically influenced data: How were these data identified? Particle number concentrations? CO levels? Please specify.
We have now added the following text to this part of the manuscript:
“In recent years, outdoor tourism activities around the JFJ have increased, resulting in more frequent local pollution events. Data that is likely affected by construction activities, snow groomer operation and other local anthropogenic influences (mainly cigarette smoke) have been removed from the data sets. As the JFJ is characterised as a background site, sudden, short-lived fluctuations in the size distribution can be interpreted as local pollution (Herrmann et al., 2015). Therefore the affected data were identified by visual inspection of the aerosol size distribution spectra.”

Page 15479, lines 3 – 12:
Why are different definitions for cloud conditions used? The difference is justified with different SMPS operation conditions (simultaneously scanning total and interstitial vs sequentially scanning both inlets), but the cloud conditions do not depend on the SMPS scanning time.
Essentially, we had to apply a stricter definition of “cloudy” to the campaigns where the SMPS scanning time was longer (sequentially scanning), to ensure that the JFJ was not within patchy cloud, which may have led to cloud-free periods during the SMPS scanning time. We now state this explicitly in the text:
“This more stringent criterion was used to avoid the inclusion of cloud-free periods in the longer (12 minute) SMPS scanning time. On the other hand, using the criterion of Hammer et al. (2014), which was found to be adequate for excluding cloud-free periods during the 6 minute scan time, allowed the inclusion of more data from the 2010 and 2011 campaigns.”

Page 15480, Line 15:
"The height of the JFJ above the cloud base (calculated from the total water content

and temperature measured at the JFJ):" This reads as if it was clear to everyone how the height above cloud base is calculated, but I must admit that I don’t understand how this is done. Also the calculation of the air temperature at cloud base seems to be a very simple approach. Please be more specific and mention the uncertainties in these calculations.
This part now reads:
“The height of the JFJ above the cloud base is calculated by using the total water content and temperature measured at the JFJ, calculating, under the assumption of a moist adiabatic temperature lapse rate (6 K/km), the temperature (and therefore the distance below the JFJ) at which the partial pressure of water in the air mass decreases below the saturation vapour pressure. This approach is described in detail in Hammer et al. (2014), and implicitly assumes that a minimal amount of water is lost from the air mass via precipitation between the cloud base and the JFJ.”

Page 15484, line 25:
One of the most interesting aspects here is the CCN size threshold of 90 nm that seems to work best. The authors mention that they tried 70 and 80 nm (but why not 100, see line 19 on page 15478?). I would suggest including a graph showing the results for 70, 80, 90 and 100 nm (predicted N_act only from CCN without the other variables)
We have included this analysis and plot as suggested by the referee, in section 5.1, showing that the skill of the model to predict the observed number of droplets is not highly dependent on the size used as cut off criteria for the number of potential CCN in the range 70-100nm. However, as the model performs slightly better with a potential CCN cut off of 80nm, we adopt this value, and have re-calculated the model fit and adjusted the plots accordingly, throughout the manuscript.

References
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