K. Naccarato (Referee)

It is an interesting analysis of lightning solutions provided by the EUCLID network that sometimes do not accurately match the precipitation patterns given by weather radar images. The manuscript is well written, figures are clear and well explained and discussions are comprehensible. Anyway, I have some comments on 3 specific points:

1) In line 84, I really do not understand the sentence: "Note that the latter values are impacted by the strict location quality criteria and correct required stroke classification, i.e. CG versus CG, used in the analysis, as well as temporary sensor outages during the measurements campaign". Please clarify.

We would add following info to the text to clarify what we mean: "To retrieve the latter values, only those strokes are used in the analysis that match certain quality criteria such as $\chi 2$, a measure for the correspondence between the different sensor measurements, and semi-major axis of the confidence ellipse, and received a correct stroke classification as CG by the central processor. Those strict criteria, as well as temporary sensor outages during the measurements campaign, can impact the DE estimates given in Schulz et al. (2016). "

2) From line 193 to 213, the authors discuss the results of Figure 5 which mainly shows the seasonal variation of the percentage of outliers. According to the data, clearly during the winter time there is an increase in the number of outliers due to mainly 2 factors: (1) sensor upgrades that provides only TOA solutions during the calibration period; (2) low reflectivity of the precipitating systems due to their smaller size and depth. However, the discussion is confused and I cannot clear understand the apparently 2 opposite effects and their importance (or not): (1) the higher percentage of outliers during winter and (2) the higher absolute number of outliers during summer. This discussion must be rewritten to improve clarity.

- Maybe the confusion was caused by the fact that in L193 (and in the caption of Fig. 5) was written that the "number of outliers" is plotted as well. This is in fact not the true: the absolute number of total detections was plotted. Related to a similar comment of referee 1, we will add following figure to the text, showing the total (CG + IC) amount of detections as a function of a) year and b) month in Belgium and Austria.

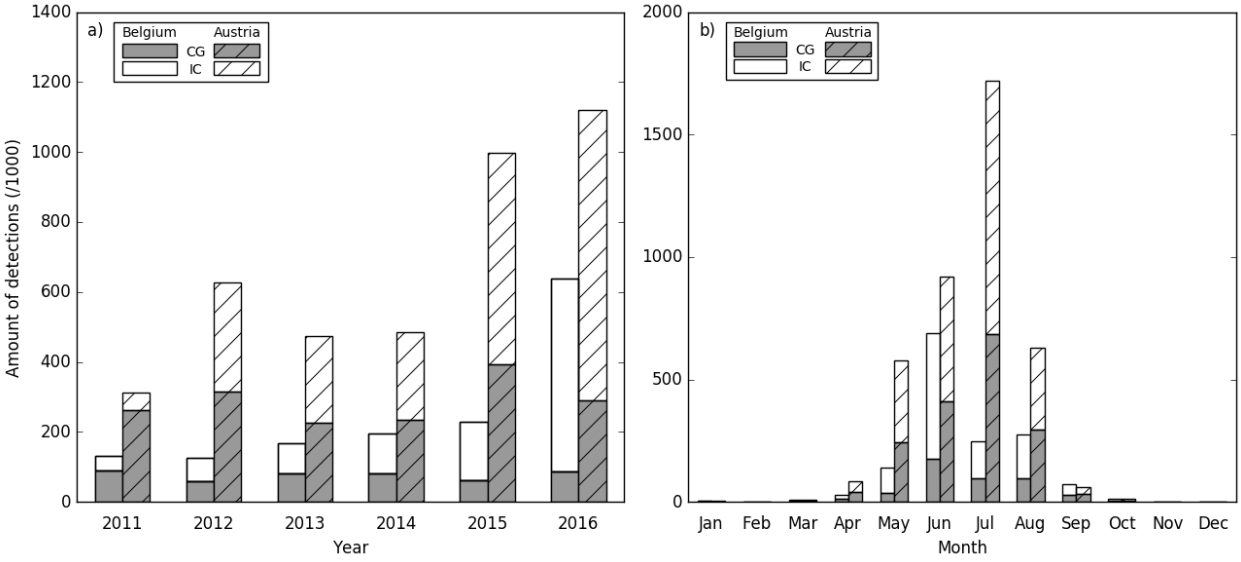

Figure 3: Distribution of the a) annual and b) monthly CG and IC counts as observed within the areas indicated over Belgium and Austria in Fig. 1.

In addition, the original Fig. 5 becomes now:

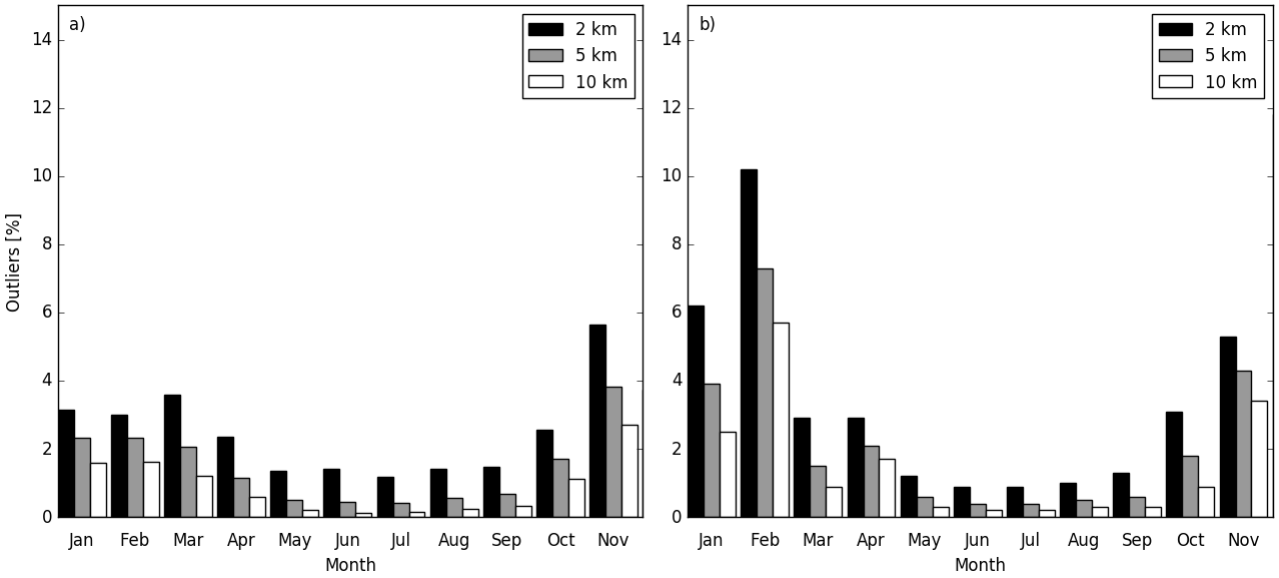

Figure 6: Monthly distribution of the total (CG + IC) percentage of outliers in a) Belgium and b) Austria, for search radii of 2, 5, and 10 km, respectively.

- In order to remove the confusion, we plan to make some changes to the paragraph related to the monthly distribution of outliers as follows: "Fig. 6 illustrates the monthly variation of the percentage of outliers. An obvious decrease is observed in the percentage of outliers during May-Sept, compared to the other months of the year. This feature could be related to the fact that more sensor upgrades occur during winter or because precipitation of winter thunderstorms is more difficult to detect with the weather radars. In addition, the 3D structure of lightning flashes in winter compared to summer is somewhat different (Lopez et al., 2017), which could increase the difficulty to locate those in winter accurately. Regarding the sensor upgrades, those often result in disabled angle information because systematic angle errors, i.e. site errors, are at first unknown and the correction takes a while because lightning data is necessary. Consequently, upgraded sensors start operation with disabled angle information during winter months. With respect to the observation of precipitation, during summer most of the storms are associated with large amounts of precipitation in vertically extended clouds, meaning that those storms are always very well detected by the radars. In contrast, winter storms are generally associated with less intense precipitation cells and with smaller vertical extensions. In some cases winter storms are not detected by the radars at long range. In that case, lightning produced by such undetected winter storms are wrongly classified as outliers. Vice versa, an incorrect classification may also occur when a wrong detection appears by chance in a precipitation area detected by the radar. In this case, a wrong lightning detection is classified as a correct detection. Since radars generally detect less precipitation in winter than in summer (e.g. Hazenberg et al., 2011) such misclassification occurs less in winter than in summer, which means that the classification method will produce more outliers in winter. Thus, the reduced efficiency of precipitation detected by the weather radars in winter is an additional possible source of the observed increase of outlier classifications in winter. Note that Poelman et al. (2016) showed that on average peak current estimates of winter lightning are higher than in summer. One would therefore expect that on average in winter more sensors participate in a lightning event compared to summer, resulting in a good location accuracy. Nevertheless, the absolute number of outliers during winter is much smaller compared to summer, as can be deduced from Fig. 3b. Thus, the increase in percentage of outliers may not be too important for the majority of applications."

3) From Figures 7, 8 and 9, I ask to the authors: all those outliers cannot be considered simply IC discharges misclassified by the network? Note that they mostly present the typical behavior of IC

flashes:(1) low peak current values (because they are in majority weaker than the CGs); (2) usually are detected with larger SMA (because are detected by less sensors and has long horizontal extensions inside the clouds leading to major errors in their location (i.e., projection over ground); and (3) present (in a such way) "random" polarity since the ICs can move upward and downward inside the clouds. I'd like to hear more from the authors about this point based on the presented results.

We add a small paragraph at the end of Sect. 3 related to the above question raised: "Looking at Fig. 7 to 9 one could wonder whether those CG outliers could be simply considered as IC discharges misclassified by the network, since IC discharges have on average lower peak currents, hence lower number of contributing sensors and therefore smaller SMA. Although this can be partly true, still a considerable fraction of the CG outliers are found to have large peak currents. It is therefore unlikely that all the CG outliers found with this method are in fact misclassified IC discharges."