We thank reviewer 3 for their comments and suggestions which have been very useful in improving the paper. We specifically address their points below.

This study proposes a new parameterization method to calculate the lightning flash density based on upward cloud ice flux, which in turn can improve chemistry-climate simulations. The authors calculate the lightning flash distributions using their proposed method and compare them with the ones obtained using the observations by the Lightning Imaging Sensor (LIS) satellite and results obtained from several existing parameterization methods; they conclude that the proposed method yields better estimates of flash frequency distributions than the other methods. The manuscript is very well written. I have only identified few minor issues with the manuscript, as other referees have already identified the major ones. I recommend that this manuscript be accepted for publication after minor revisions.

Major comments:

As investigated by referee 2, it is important to consider the meteorological fields, such as precipitation and cloud top height that are used as input for the parameterization methods because errors in these inputs can influence the performance of these methods during their evaluation; the results could be biased because of differences in error magnitudes/characteristics of the input variables. At very least, more discussions on error characteristics of ERA-Interim, for instance, the ones based on ERA-Interim evaluation reports, are required to clarify whether the proposed approach overcomes the limitations of other existing approaches.

RESPONSE. We agree with all three reviewers that more discussion of input variables and associated assumptions and errors is needed. We have included additional paragraphs in section 2.1 discussing these.

Minor comments:

p.17825 L5: Please clarify if the annual global total flash rate is adjusted to 44 flashes/s, and the seasonal variation and the global distribution are simulated using each parameterization.

RESPONSE. The text has been adjusted to clarify the point.

p.17827 L9: Please describe whether you applied any length limitation for "nearest".

RESPONSE. We have included in the text in sections 3.2 and 3.3 that "all" points outside this range were set to the nearest value. No length limitation was used.

p. 17831 L7-8: It is not clear from this study whether reduced errors in input data change the correlation between the upward ice flux and the lightning density. Consider adding more discussions or removing the sentence "Given the errors in input data the correlation over land is better than might be expected."

RESPONSE. Since we cannot quantify the input errors we accept that the statement is too strong and have removed it.

p. 17832 L11-13: No evidence is presented to support this statement. To support the validity of this statement some evidence is required, for instance, comparisons of OLR between the ERA-Interim and any satellite observation.

RESPONSE. We have removed the statement since our study of ERA-Interim evaluation literature has not suggested that the ECMWF model in particular has difficulties associated with topophraphy or monsoons. However, reviewer 2 has noted the difficulties that LIS has within the SAA and so we feel it justified to reiterate that source error in the text instead.

p. 17833 L16-18: It is not clear whether there exists no significant trend (with which significance level?) for the global total flash rate or the flash rate at every grid point. Please clarify this point.

RESPONSE. We have made this statement clearer. There was found to be no significant trend at the 95% level in the annual flash total over the LIS region. We are aware that using annual flash totals provides too small a sample to seriously study the trend which is why we have not aimed to include a detailed trend analysis in this study. However, we have taken the analysis further by considering the monthly flash totals with the climatological monthly values removed. This analysis found that there was a trend with p-value 0.02. However, the trend was small, 1.03×10^{-5} fl. km^{-2} day^{-1}. The lightning statistics being considered in the study are at least an order of magnitude greater than the trend so we consider it to have no impact. We have changed the trend statement in text to represent this more robust argument.

p. 17833 L25-27: There is a possibility that all parameterization methods cannot be applied to simulate the realistic flash density for this region, even if the meteorological data is not affected by any source of error. Please provide a clarification.

RESPONSE. We have added this possibility to the text in section 5.

Section 6: It would be useful to add discussions about the use of output from cloud-resolving models (CRMs) with regard to more explicit representations of cloud parameters.

RESPONSE. We fully agree that CRMs, using more explicit microphysics, would help to better understand the details of how cloud processes link with lightning generation. Furthermore, having shown the parametrisation to be promising on large scales it is important that it is tested on smaller scales with field data and CRMs. We have now explicitly mentioned the possible use of CRMs in the discussion so as to acknowledge their important role in furthering this research.