Atmospheric
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Discussions

Interactive comment on "Polarimetric radar characteristics of lightning initiation and propagating channels" *by* Jordi Figueras i Ventura et al.

Anonymous Referee #3

The present study aims at combining LMA and polarimetric radar observations to infer relationships between lightning activity and cloud microphysics. It is based on a significant dataset collected in the northeastern part of Switzerland over a period of two and a half months during summer 2017. Overall this study provides interesting findings regarding potential interactions between the microphysical cloud structure and lightning initiation/propagation. It is, however, extremely descriptive and definitely lacks some physical interpretation to support the results. Section 3, for instance, mostly consists in a discussion of endless series of numbers and percentages / histograms with no interpretation and no comparison against previous findings. Authors also lack perspective on the performance of their classification algorithm, especially as we all know that

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dual-polarimetric HCA are subject to large uncertainties (low percentage values such as discussed in the paper don't really make sense and should definitely be avoided). Actually I believe that Section 3 should be simplified and rewritten to highlight the most significant results as it is very difficult to comment on the results as they stand.

Specific comments:

More details are needed regarding the Hydrometeor Classification Algorithm used in this study. Authors should also discuss the uncertainty associated with their method, especially regarding hail/graupel identification. Actually I am quite surprised by the high proportion of lightning initiation and propagation that takes place in hail. Most past studies have found that graupel is by far (70-90%) the preferred environment for lighting initiation. Also, author are using a C-band radar. However we know that at such frequency hail identification might be a problem due to resonance scattering effects. Please comment.

Radar scientists claim to be able to identify as many hydrometeor types as possible. However, due to the high level of uncertainty in HID, it would be more realistic to use less categories. This would also ease the interpretation of the results.

As mentionned previously, this paper lacks physical interpretation of the results. Results should be compared with the literature (especially regarding hail) and more details should be given about the role of the microphysical environment in the initiation/propagation of lightning. Also what is the influence of orography on lightning? As mentionned by the authors, the particularity of this study is that it takes place over very complex terrain. Hence the effect of mountains should be considered when analyzing the results.

The spatial extension of the domain of analysis seems rather small to me. LMA data can potentially be used up to 100/150 km without any problem. Please comment.

I do not see the need for 20 figures. Most of the results shown in Figs. 4 to 20

could be summarized in a few tables. Instead, authors should include the analysis of two contrasting events in their study and discuss the storm structures, associated horizontal/vertical cross-sections of reflectivity / polarimetric moments, and location of LMA sources within the storms.

A detailed comparison between EUCLID and LMA detection capability would be interesting.

A discrimination between convective and statiform regions of the storms would also help interpreting the results.