

Interactive comment on “Observing relationships between lightning and cloud profiles by means of a satellite-borne cloud radar” by Martina Buiat et al.

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The reviewer comment highlights two main points in our paper: novel approach, and unsatisfactory database extent. We agree with the first statement, and would like to comment the second one.

We analyzed five cases observed by the CloudSat CPR, after a screening carried on over one and an half year of CloudSat data (from July 2009 to January 2010, two convective seasons). Convective events are spatially and temporally limited, and usually lightnings are found in a small area with respect to the cloud extension. It has to be remarked that the CPR acquires one, nadir-looking beam 1.3 km wide along its low earth orbit. The very narrow observed stripe makes it very difficult to collect a statistically

complete dataset of convective events over a relatively small area (Italian land, where LINET data are available to us).

Recognizing this limitation, the aim of the paper is to document, for the first time with space-borne cloud radar, some insights on the whole ice cloud structure of convective clouds and relate them with corresponding high-quality lightning activity measurements. The enlargement of the database to more years would certainly result in more cases, but very likely, it would be not enough to consolidate the answers to the interesting questions of the reviewer. We remark that we were lucky to observe such impressive event in near optimal way with CloudSat. To enlarge the study area would be a second option to increase statistics, but in this case, we should rely on lightning data less accurate than LINET, and include different cloud climatology.

The structure of the paper, appreciated by the reviewer, ensues from the considerations above. We first used histogram representation to highlight some general features shared by all the five events considered (1031 cloud profiles), highlighting the relevance of IWC peaks level and value, and the less relevant role of Reff. Moreover, we compared our results to other studies, with different statistical relevance, showing their consistency. Then, we went deeper in the analysis with the study of the most severe (and better observed by CPR) case: specific features are found and commented (referring strictly to this particular severe event) even if they are of unknown, and not demonstrable with CPR, general significance. We think that our study draws the attention of the scientific community to the relevance of small ice in the upper part of the cloud, seldom investigated by ground weather and satellite-borne precipitation radar.

In the revised version of the paper, we will specify with more details and clarity the aim of the paper, and of the two different analysis carried out

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Discussion paper

