

Interactive  
Comment

## ***Interactive comment on “Automated thunderstorm tracking: utilization of three-dimensional lightning- and radar data” by V. K. Meyer et al.***

**V. K. Meyer et al.**

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Many thanks for the careful considerations and comments.

- p. 2183, line 9: The main focus of this study was to find a fast method which still promises the capacity to contribute to the nowcasting of thunderstorm related hazards which pose a threat for human life and human resources. Threats are posed by lightning as well as heavy precipitation and hail (and wind gusts) at ground level. A further request has been the usage operational data with a high update rate to allow for an automated and close observation and the generation of sufficient cell-tracking data for statistical investigations. As a compromise and to stay within the project resources the usage of 2D low-level radar scans, resolved on a 1 km x 1km grid and provided every 5 minutes has been chosen as data base for the automated tracking of precipitation

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cells. MaxCAPPI radar data promise to detect earlier first cell developments and they would give better insight into regions, where the radar beam is (partially) blocked. But they do not provide information about the precipitating situation at ground. Since in the research domain radar beam shading has been no issue, too, there has been no need to use MaxCAPPI. (Note: Because the information content of the low-level scan into storm dynamics is restricted, it has been further decided to complement data from the automated cell tracking with 3D scans provided by the (non-operational) polarimetric research radar in case studies. )

- p. 2184, line 12: The apparent difference in discharge characteristics results from the diversity of thunderstorm characteristics. The evolution of a thunderstorm and therefore with the appearance of lightning activity depends on many internal and external factors. The fraction 60% : 30% gives the IC : CG mean for the whole data set. But storms are observed which evolve only incloud activity, others start with a cloud-to-ground strike. Whereas for the evolution of incloud discharges the discharge channels evolve within a throughout charged media, the channeling processes have to overcome the distance between storm base and ground in the case of a CG. The generation of CGs is supported by a high electric field, exposed features at ground and/or by a low cloud base respectively by a descending participation core. The exemplary storm, being a strong, long-living storm, which temporarily shows supercell characteristics, evolved stronger incloud activity compared with the mean which indicates strong updrafts and a comparably high located cell core. Further investigations on lightning characteristics related to storm types would give more profound insights. It has to be noted, that the IC/CG discrimination depends on the localization method applied by detection system and can therefore not easily be compared with studies from other lightning localization networks.

- p. 2189, line 15-16: I agree. Also a consideration of other data sources and “background” information, which further help to assess the current storm evolution, the weather situation, the potential storm type and the surrounding situation, would be

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interesting. But it has to be noted that object-oriented nowcasting based on pure extrapolation of initial conditions has its limitations due to the lack of knowledge about further internal and external physical processes.

- p. 2222, line 8-9: I agree. A sophisticated extrapolation method based on the previous track might be able to benefit from the high resolution of the lightning data, which allow for a very close cell tracking, and therefore might nowcast the further cell path well. The nowcast quality will depend on how accurately a "cell core" is identified (depending on the local accuracy of the lightning detection system and the cell identification method).

- p. 2194 , line 25-26 and p. 2199, line 21-24: Studies exist which say so. But within this study no analyses could be done to investigate this interesting question. Since I do not want to start personal speculations, I cannot give a sound answer to this question.

- Fig. 1 caption If it is referred to the blue parts within the contour please note that detected areas above the identification threshold are enlarged by 3 pixels (see p. 2184, line 24)

- Fig. 4: The comment will be considered in the final document

- Fig 8: The blue dots mark the sensor locations of the lightning detection network LINET. The comment will be considered in the final document.

- Fig 9a: The overshooting top is measured relative to the common cloud top level and uses the left scale (km). The comment will be considered in the final document.

- Fig 10: The comment will be considered in the final document.

Technical corrections:

p.2186, line 6-7: The comment will be considered in the final document.

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