



Analysis and nowcasting of the thunderstorm life-cycle based on multiple high resolution data sources

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This study presents the analysis of the life-cycle of thunderstorms and first results of a new life-cycle model with the aim to improve the thunderstorm nowcasting. In contrast to previous studies, the whole life-cycle from initiation until dissipation will be considered by using a multi-sourced data set consisting of high resolution satellite, radar, lightning, and model data.

Basis for the study are thunderstorm cells identified and nowcast up to one hour by the DLR tool Cb-TRAM over Germany in June 2016, May, June, and July 2017, and June 2018. The lifetimes of all cells are normalized, averaged and separated into the life-cycle stages to investigate the behavior of the parameters from the different data sources during an ordinary thunderstorm life-cycle. Furthermore, the thunderstorm cells are sorted by their lifetime to determine differences between the life-cycle of long- and short-living thunderstorms. The 90, 75, 25, and 10 percentiles for each parameter are calculated in order to show the variability of the parameters, and correlation analyzes are performed to identify parameters with redundant information. The findings of this analyzes are used as basis for the life-cycle model. The relevant parameters are combined by the Fuzzy Logic method to determine the actual stage of a thunderstorm, and to nowcast its remaining lifetime and its maximal intensity. It is expected that the new life-cycle model contributes to an improvement of the thunderstorm nowcasting.