Title: Possibilities of Using of Remote Detection Data for Convective Storms Intensity Nowcasting

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Abstract: Evolution of 60 isolated convective storms from 2016 and 2017, which formed in the region of Central Europe, is studied by means of multi-sensor observations. According to the reports from the European Severe Weather Database, two categories of storms are classified: severe and non-severe. Based on radar, lightning and satellite measurements, trends of storm characteristics are analyzed to ascertain their typical behavior. Lightning stroke rates and their change could well warn about the ability of the storm to become severe, therefore a Lightning jump algorithm was proposed within this work. From individual case studies follows that methods of remote sensing offer comprehensive information about convective storm life-cycles.

In order to objectively determine crucial variables for estimating the storm severity, logistic regression models and regularized regressions (elastic net) are employed. In total 53 variables from the first 30, 60 and 90 minutes of the monitored storm lifetime are used to show their predictive skill. Results of the models indicate that the essential predictors of particular remote sensing are: 1) maximum number of strokes per 5 minutes and its sudden increase, 2) radar echo-tops and area of identified reflectivity cores and 3) minimum brightness temperatures in the 10.8 µm spectral band. Similar variables were also selected by the elastic net, which can handle sparse data and correlated variables. Further training of the models and their operational adaptations have a potential to bring direct use of these results for nowcasting and improve a real-time warning process.

Keywords: lightning stroke, radar, satellite, severe weather, regression model