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Analysis of convective storms in Estonia based on the data from polarimetric weather radars and lightning detectors

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Convective storms represent considerable hazard as they may cause large damage to the areas they cross. Therefore it is important to investigate the local characteristics of these storms. Data from two dual polarization C-band weather radars located in Estonia, lightning detector data from NORDLIS network and rain gauge data of Estonian Weather Service was used to study the properties of the convective storms in Estonia. The investigated period ranges from 2011 – 2014 and includes the months with most convective activity in the area, from May to September. Statistical analysis of radar and lightning data of Estonian convective storms is chosen as a starting point of severity classification. The statistical approach is based on gridded datasets of ground flash density and radar rainfall intensity distributions. To construct them, the area of Estonia was divided into grids of 10 km x 10 km. Clustering-based tracking algorithm is used to detect individual storm areas. It is followed by the analysis of radar data and lightning activities in the pre-classified storm areas. The storm severity attributes used in the analysis are storm maximum radar reflectivity value, maximum echo top height 20 dBZ, maximum echo top height 45 dBZ and storm maximum lightning activity. Heavy precipitation that often accompanies thunderstorms is studied as a comparison of radar rainfall accumulation and rain gauge measurements. Radar rainfall estimation algorithm used in the study is based on horizontal reflectivity (Zh) and also specific differential phase (KDP) data for strong reflectivity areas (dBZ > 40). This demonstrates that KDP could be used operationally in the calculations of rainfall intensity in the cores of convective storms, as Zh overestimates the intensity in these cases.