Hail statistic in Germany based on a hybrid cell-tracking algorithm combining remote-sensing data and hailstone observations

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With hail damages estimated over Billions of euros for a single event (cf. Hailstorm Andreas over Reutlingen/Germany on 28 July 2013), hail constitute one of the major atmospheric risks in various parts of Europe.

The project HAMLET (Hail Model for Europe) in cooperation with the insurance company Tokio Millennium aims at estimating the hail hazard and vulnerability for European countries (Germany, Switzerland, France, Netherlands, Austria, Belgium and Luxembourg) with a high temporal and spatial resolution using several hail proxies, especially radar data. The focus will be at first on Germany for the period 2005 to 2013 and in the next step, the methods will be transferred and extended to other regions.
A cell-tracking algorithm TRACE2D was adjusted and applied to two dimensional radar reflectivity data from the German weather service (DWD) to detect strong convective cells by considering 3 near pixels over 45 dBZ (Reflectivity Cores RCs) in a radar scan. In the next step, the algorithm tries to find the same RCs in the next 5 minute radar scan and thus track the RCs centers over time and space. Additional information about hailstone diameters provided by ESWD (European Severe Weather Database) is used to determine the hail intensity of the detected hail swaths. Maximum hailstone diameters are interpolated along and close to the individual hail tracks giving an estimation of mean diameters on the detected hail swaths. In the next step, a stochastic event set will be created by randomizing the parameters obtained from the tracking approach of the historical events (Length, width, orientation, and diameter). This stochastic event set will be used to quantify hail risk and to estimate probable maximum loss (e.g., PML200) for a given industry motor or property (building) portfolio.