



Hail statistic in Western Europe based on a hybrid cell-tracking algorithm combining radar signals with hailstone observations

Elody Fluck (1)

(1) Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany, (2) Tokio Millennium Re AG, Zürich, Switzerland

Hail statistic in Western Europe based on a hybrid cell-tracking algorithm combining radar signals with hailstone observations

Elody Fluck¹, Michael Kunz¹, Peter Geissbühler², Stefan P. Ritz²

With hail damage estimated over Billions of Euros for a single event (e.g., hailstorm Andreas on 27/28 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 Re aims at estimating hail probability, hail hazard and, combined with vulnerability, hail risk for several European countries (Germany, Switzerland, France, Netherlands, Austria, Belgium and Luxembourg). Hail signals are obtained from radar reflectivity since this proxy is available with a high temporal and spatial resolution using several hail proxies, especially radar data. The focus in the first step is on Germany and France for the periods 2005- 2013 and 1999 - 2013, respectively. 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 different radars operated by European weather services such as German weather service (DWD) and French weather service (Météo-France). Strong convective cells are detected by considering 3 connected pixels over 45 dBZ (Reflectivity Cores RCs) in a radar scan. Afterwards, 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 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 for the detected hail swaths. Furthermore, a stochastic event set is created by randomizing the parameters obtained from the tracking approach of the historical event catalogue (length, width, orientation, 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.