

A climatology of severe convection based on IRW overshooting cloud top detection and its application for a European risk model for hail

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The 'overshooting' of cloud tops above the equilibrium level into the lower stratosphere indicates the presence of very strong convection. These overshooting tops (OTs) are often associated to severe weather conditions at the ground, including strong wind, heavy precipitation and hail. We use this relation, together with synoptic information from reanalyses and hail reports to build a climatology of hail fall in Europe and to derive a stochastic risk model that is applied in the insurance industry.

Cloud tops are identified from an infra-red window (IRW) brightness temperature product of the Meteosat Second Generation (MSG) SEVIRI instrument. The analysed data set covers the European sector (30N-65N, 12W-40E) over the period 2004-2011. The seasonal cycle consists in a single quasi-normal mode in central and northern Europe but of two distinct modes in the Mediterranean and surrounding regions. The daily cycle has a pronounced maximum in the afternoon over the continent but exhibits a second, stronger maximum over the sea. In regions with a sufficient density of ESWD hail reports, we find a reasonable agreement between OT- and ESWD-derived climatologies.

For the development of a risk model, the quarter-hourly OT detections are grouped to 'events' representing the evolution of a thunderstorm during the day, forming areas where hail fall is likely. The OT events are characterized by their position, length, width, orientation and minimum OT temperature. These properties are then used to calculate a stochastic event catalogue. Minimum OT temperature is used as an indicator for hail size, the distribution of which is derived from ESWD. The resulting data set is the first hail event catalogue based on a single homogeneous observation source. Key hail occurrence areas in central and southern Europe are represented, and high frequencies occur in regions neighbouring the Alps and the Pyrenees. A further maximum occurs in central Eastern Europe. Major hail events can however occur everywhere in Europe.

nomischen und institutionellen Daten sowie auf Informationen aus einer Befragung vom Augusthochwasser 2002 betroffener Haushalte. Unsere Ergebnisse zeigen eine hohe Resilienz in den Landkreisen an der bayerischen Donau und am Lech, hohe bis mittlere Resilienz an Oberrhein und Unterelbe und mittlere bis geringe Resilienz an Niederrhein, Elbe und Mulde.

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