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Large hail impacts and hail-related financial losses across Europe

Tomas Pucik (1), Pieter Groenemeijer (1), Christopher Castellano (1), Anja Rädler (2), Thilo Kühne (1), and Eberhard Faust (2)

(1) European Severe Storms Laboratory, Wessling, Germany (tomas.pucik@essl.org), (2) Munich Re, Munich, Germany

By December 31st, 2018, more than 41 000 quality-controlled reports of large hail had been submitted to the European Severe Weather Database (ESWD) by volunteers and ESSL. This data set and the NatCatSERVICE Database of Munich RE jointly allowed us to study the hail hazard and its impacts across Europe over a period spanning multiple decades.

We present a spatio-temporal climatology of the ESWD reports, diurnal and annual cycles of large hail, and indicate where and how they may be affected by reporting biases across Europe. We also discuss which hailstorms caused the most injuries and present the only case with hail fatalities in recent times. Additionally, we address our findings on the relation between hail size to the type of impacts that were reported. For instance, the probability of reported hail damage to infrastructure strongly increases as hail size exceeds 5 cm, while damage to crops, trees, and greenhouses is typically reported with hailstone diameters of 2 to 3 cm. Injuries to both animals and humans are reported with hail 4 cm in diameter and larger, and greater number of injuries are reported for even greater diameters.

Using the NatCatSERVICE data, we studied economic losses associated with hailstorms occurring in Central Europe, where the data set coverage is best, and looked for long-term changes. The trend in hail losses and the annual number of hail loss days since 1990 till 2018 are compared to that of meteorological conditions favorable for large hail based as identified by ESSL's Additive Regression Convective Hazards model. Both hail loss days and favorable environments show an upward trend since 1990, in particular since 2000.