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Hail climatology and impacts for the Netherlands

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Convective storms that produce large hail are among the most damaging natural hazards and globally losses due to these events are increasing. To evaluate and quantify the potential risk associated with these storms, hail climatologies are created from historical records. Unfortunately, a comprehensive analysis of the Netherlands does not exist.

The aim of this study is to create a hail climatology of the Netherlands and report on spatial and temporal hail risk by combining two approaches. The first approach relies on written documents containing information on historic events collected from *Weerspiegel*-magazine and the *European Severe Weather Database* (ESWD), from the time period 1974-2019. The second approach utilizes radar-data from the time period 2008-2019 and implements a radar-based Hail Detection Algorithm (HDA) to estimate hailstone sizes.

Using these sources of hail observations, return periods are estimated for hail storms with various hail sizes in the Netherlands. Moreover, spatial differences within the Netherlands are explored based on both the written documents as well as the radar-based observations. Using this climatology, probabilities of being hit by hail with a certain size are calculated, differentiated by province. Such probabilities are of direct use for developing and evaluating risk management strategies for both the public (municipalities) and private sector (such as insurance). This becomes evident when looking, for instance, at solar panels, which serve an important role in the transition towards climate-neutral urban areas, but are also vulnerable to an (increasing) hail risk.