



## A Hail Storm Climatology for Switzerland

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Worldwide, large hail regularly damages cars and infrastructure, and even small hail stones can ruin entire harvests in no time. With annual costs of several hundred millions of Euros, hail is among the costliest natural hazards in Switzerland. The localized and chaotic nature of hail storms challenge forecasters, risk managers, and researchers alike, and in addition, climate change might exacerbate the intensity of convective storms in the future. The Alpine region calls for special attention, as it is characterized by complex topography and sharp climatic gradients, which coarser-scale studies of severe convective storm environments often cannot sufficiently resolve.

A new generation of observations from the weather radar network operated by MeteoSwiss offers a high-resolution (1 km<sup>2</sup>, 5 min), area-covering database to assess the frequency and intensity of hail events in Switzerland. Building on Nisi et al. (2016) and Nisi et al. (2018), this study presents an extended and updated climatology of the characteristics and distribution of hail storms in Switzerland for the period 2002–2018. Empirical gridded radar-derived parameters of Probability of Hail (POH) and Maximum Expected Severe Hail Size (MESHS) are combined with vector data from a radar-based storm tracking algorithm (Thunderstorm Radar Tracking TRT) to identify hotspots of hail activity as well as to estimate the risk of large hail stone occurrence. Object-based hail storm properties are investigated, deliberately considering the observed high inter-annual variability of hail days and regional storm track patterns. We also reflect on the uncertainties that accompany radar-based climatological analyses. The presented findings will serve as a basis to advance probabilistic hail risk assessments that go beyond the time scales of observational radar records.

The presented work is part of the project “National Hail Climatology Switzerland”, in which scientists and stakeholders work together to generate a novel, consistent, spatially and temporally differentiated hail climatology for Switzerland. The aim is to advance our climatological understanding of highly heterogeneous hail storm occurrence as well as to create and provide ready-to-use maps and data for various applications in risk management and damage prevention.

### References:

- Nisi et al. (2016): Spatial and temporal distribution of hailstorms in the Alpine region: A long-term, high resolution, radar-based analysis. *Quarterly Journal of the Royal Meteorological Society* 142 (697) DOI: 10.1002/qj.2771
- Nisi et al. (2018): A 15-year hail streak climatology for the Alpine region. *Quarterly Journal of the Royal Meteorological Society* 144 (714) DOI: 10.1002/qj.3286