An updated and extended radar-based hail climatology for Switzerland

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Hail is among the costliest natural hazards in Switzerland, close to the Alpine chain. It occurs on a yearly basis ruining harvests, and damaging cars and infrastructure. The localized and often short-lived nature of hail storms, along with the difficulty in measuring hail, pose challenges to weather forecasters, risk managers, and atmospheric researchers alike.

While difficult and expensive to measure on the ground, hail occurrence can be estimated with volumetric radar reflectivity algorithms such as e.g. Probability of Hail (POH) and Maximum Expected Severe Hail Size (MESHS). The radar network operated by MeteoSwiss offers an area-covering database with high spatio-temporal resolution of 1 km^2 and 5 min to assess the frequency and intensity of hail events in Switzerland. In 2011 and 2012 the network was renewed with dual-polarimetric capabilities. Two additional radars have later been added to the network at high elevation, guaranteeing both better coverage in their surrounding area and better backup observations in case of outages of any of the other three radars.

First radar-based hail statistics for Switzerland have previously been presented for the period 2002 to 2014. This study presents extended and updated statistics of the occurrence and characteristics of hail storms for the period 2002 to 2018, comprising data from all five radars. POH and MESHS are combined with a radar-based storm tracking algorithm (Thunderstorms Radar Tracking, TRT) to identify hotspots of hail activity and to estimate the risk of hail of different sizes. A special focus is put on the inter-annual variability of hail days and regional storm track patterns. An attempt is made at specifying the magnitude of the uncertainty in the 17-year hail climatology for Switzerland.

The presented work is part of the project “National Hail Climatology Switzerland”, within 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.

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