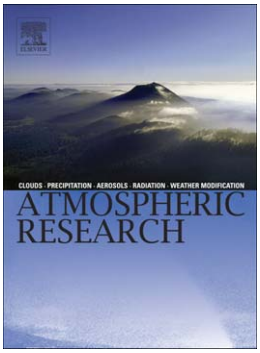

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A Poisson regression approach to model monthly hail occurrence in Northern Switzerland using large-scale environmental variables

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Abstract

In Switzerland hail regularly causes substantial damage to agriculture, cars and infrastructure, however, little is known about its long-term variability. To study the variability, the monthly number of days with hail in northern Switzerland is modeled in a regression framework using large-scale predictors derived from ERA-Interim reanalysis. The model is developed and verified using radar-based hail observations for the extended summer season (April-September) in the period 2002-2014. The seasonality of hail is explicitly modeled with a categorical predictor (*month*) and monthly anomalies of several large-scale predictors are used to capture the year-to-year variability. Several regression models are applied and their performance tested with respect to standard scores and cross-validation.

The chosen model includes four predictors: the monthly anomaly of the two meter temperature, the monthly anomaly of the logarithm of the convective available potential energy (CAPE), the monthly anomaly of the wind shear and the month. This model well captures the intra-annual variability and slightly underestimates its inter-annual variability. The regression model is applied to the reanalysis data back in time to 1980. The resulting hail day time-series shows an increase of the number of hail days per month, which is

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