



## **Extreme precipitation events in northern Switzerland**

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Extreme precipitation events occurring in populated areas surrounded by steep terrain, lakes and rivers like northern Switzerland have great potential to cause damages. Breaking synoptic Rossby waves located over western Europe, play a central role in triggering such extreme events in southern Switzerland. In contrast, synoptic scale structures triggering extreme precipitation events on the north side of the Swiss Alps have so far not been studied comprehensively.

An observation based high resolution precipitation data set for Switzerland (MeteoSwiss 2011) is used to identify extreme precipitation events affecting the north side of the Swiss Alps for the time period 1961-2010. For these events a detailed dynamical analysis of the upper level flow is conducted using ECMWFs ERA-40 and ERA-Interim reanalysis data sets. For the analysis northern Switzerland is divided in two investigation areas north-eastern and western Switzerland. Using k-means clustering, a distinct classification of upper level structures associated with extreme precipitation events in the areas of interest is presented. For each class is calculated a composite of daily mean: isentropic potential vorticity at the tropopause levels, wind at 850 hPa and precipitation in which the relevance of these variables is highlighting. The extremeness of moisture in the atmosphere before and during the events is also studied. The significance of the PV anomalies indicated by the classification and the potential for upper-level Rossby wave upstream precursors is examined using a Monte Carlo significance test.