



## **Stratospheric intrusions and heavy precipitation along the Alpine south-side - a climatological analysis**

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Extreme precipitation at the Alpine south-side can lead to floods, land slides and cause severe damage. It has been shown in case studies that such heavy precipitation events are often associated with meridionally elongated stratospheric intrusions (so-called “streamers”) upstream of the Alpine ridge. In combination with the highly-structured orography they lead to the localised severe rain events.

This study discusses the role of potential-vorticity (PV) streamers as upper-level precursors to heavy precipitation along the Swiss Alpine south-side on a climatological time-scale. A climatology of streamers is used, compiled on the basis of the ERA40 data set. Days of extreme precipitation (1% AS-EX1P, 5% AS-EX5P quantiles) along the Swiss Alpine south-side are determined from an observational Alpine precipitation climatology (1966-1999). For these days, the presence and location of the streamers as well as their orientation is recorded.

A quantitative evaluation is derived of the concomitant occurrence of intrusions and heavy precipitation. The results show that on 73% of the AS-EX1P days, a streamer is situated over western Europe. The seasonal and regional variability is also discussed. Dynamically the occurrence and the evolution of intrusions is a result of wave propagation and breaking along the tropopause, more specifically along the narrow band of strongest PV gradient. Therefore, the role of the PV background and the wave propagation as precursors to heavy precipitation events is also investigated.