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Short-duration extreme convective precipitation in the southeastern Alpine forelands of Austria under climate warming

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The expected intensification of short duration extreme convective precipitation events (SDECPEs) under climate change likely leads to an increase of flash floods and landslides in vulnerable catchments such as the Styrian Raab catchment in the southeastern Alpine forelands of Austria. These extreme events may have strongly adverse effects on different sectors such as public infrastructure, households, and agriculture. Therefore, a clear understanding of SDECPEs is crucial to avoid severe damage risks.

In this work we aim to assess in this context the fingerprint of climate warming in SDECPE's sub-hourly and hourly rainfall intensities in the southeastern alpine forelands in summertime from data over 1961-2019 within a southeast Austria focus region. We use high-resolution precipitation and temperature time series, and auxiliary data, from 20 gauges of the Austrian weather service (ZAMG) and the Austrian hydrographic service (AHYD) over 1961 to 2019 and additionally from the dense WegenerNet network of around 150 stations in southeast Austria, available over 2007 to 2019. Complementary synoptic data over the greater Alpine region, mainly from the European Reanalysis ERA5, help in convective-event weather typing and interpretation. Weather typing through principal component and cluster analysis as well as artificial intelligence methods and joint station analyses aid to assess the SDECPE changes.

It is found that extreme summertime precipitation in this region is frequently of short-term convective type and its intensity increased. According to previous work on temperature-precipitation scaling (Schroeer and Kirchengast, Clim.Dyn., doi:10.1007/s00382-017-3857-9, 2018), sub-hourly and hourly SDECPE intensities scale at super-CC rates in the region (about 9–14 % per °C) and we will report preliminary results on the rainfall intensification over the long-term time horizon from 1960 to present.