Explaining recent trends in extreme precipitation in the Southwestern Alps by changes in atmospheric influences

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We analyze recent trends in extreme precipitation in the Southwestern Alps and link these trends to changes in the atmospheric influences triggering extremes. We consider a high-resolution precipitation dataset of 1x1 km² for the period 1958-2017. A robust method of trend estimation is considered, based on nonstationary extreme value distribution and a homogeneous neighborhood approach. The results show contrasting extreme precipitation trends depending on the season. Excluding autumn, the significant trends are mostly negative in the Mediterranean area, while the French Alps show more contrasted trends, in particular in winter with significant increasing extremes in the Western and Southern French Alps and decreasing extremes in the Northern French Alps and Swiss Valais. In autumn, most of Southern France shows significant increasing trends, with up to 100% increase in the 20-year return level between 1958 and 2017, while the Northern French Alps show decreasing extremes.

By comparing these trends to changes in the occurrence of the dominant weather patterns triggering the extremes, we show that part of the significant changes in extremes can be explained by changes in the dominant influences, particularly in the Mediterranean influenced region. We also show that part of the trends in extremes are explained by a shift in the seasonality of maxima.