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# Impact of Atmospheric Circulation on Flooding Occurrence and Type in Luxembourg (Central Western Europe)

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In the second half of the 20<sup>th</sup> century, hydrological regimes in central Western Europe were largely characterised by large-scale winter floods. This type of event was predominantly triggered by westerly atmospheric fluxes, bringing moist and mild air masses from the Atlantic Ocean to the European continent. Since the late 1990's, major flooding events seem to have shifted in time and magnitude. Flash flood events, while being a well-known phenomenon in Mediterranean catchments, are increasingly also reported at higher latitudes. Unlike the large-scale winter flood events, flash floods are of very narrow spatial extension and triggered by rather short, but highly intense rainfall events.

Here, we focus on the specific case of rivers in Luxembourg that have experienced several flash flood events in recent years, while only small to moderate winter flood events have been reported since the late 1990's. National hydro-meteorological monitoring and flood forecasting systems have been designed for large-scale floods and are not suited for simulating local flash flood events. Therefore, there is a need to increase our understanding of the hydro-meteorological processes underlying flash flood occurrences in our area of interest.

While increasing air temperature is known to allow a higher air moisture content that can lead to more intense rainfall events and possible flooding, we moreover hypothesize that the recent increase in flash flood occurrences in Luxembourg is reinforced by a change in atmospheric circulation patterns. To test this hypothesis, we analyse the prevailing atmospheric patterns on rainy days during summer and winter months over the period 1954 - 2019, with a particular focus on rainfall events that lead to moderate and extreme floods. In a next step, we intend to extend our findings for Luxembourg in a larger European context. This analysis should allow to better assess the current situation of hydrological extreme events in central Western Europe in order to take precaution measures and prepare for a diversifying hazard.

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