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Predictors for local daily precipitation extremes in Germany representing the general atmospheric circulation

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Extremes of weather and climate can leave devastating effects on human society and the environment and hence the study of extreme precipitation events and their related atmospheric circulation is of great importance.
To assess the reliability of future projections of extreme precipitation, one has to understand large scale mechanisms leading to extreme precipitation events and the variability of extreme precipitation on different time scales, and their representation in climate models.
Here we investigate the large scale mechanisms related to the general atmospheric circulation leading to extreme precipitation across Germany. Monthly maxima of daily precipitation observed at more than three thousand rain gauges are modeled by the generalised extreme value distribution. Their dependence on the large-scale predictors is formulated as a vector generalised linear model.
We identify the following relevant predictors: geopotential height, moisture flux, vorticity and divergence for different pressure levels. Their relative importance as a function of space and season is studied, as well as their variability on time scales from months to decades.
The identified relationships can also be used for statistical downscaling.