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# Understanding climate change projections for precipitation over Western Europe with a weather typing approach

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Precipitation over Western Europe (WE) is projected to increase (decrease) roughly northward (equatorward) of 50°N during the twenty first century. These changes are generally attributed to alterations in the regional large-scale circulation, e.g. jet stream, cyclone activity and blocking frequencies. A novel weather typing within the sector (30°W–10°E, 25–70°N) is used for a more comprehensive dynamical interpretation of precipitation changes. A k-means clustering on daily mean sea level pressure was undertaken for ERA-Interim reanalysis (1979–2014). Eight weather types are identified: S1, S2, S3 (summertime types), W1, W2, W3 (wintertime types), B1 and B2 (blocking-like types). Their distinctive dynamical characteristics allow identifying the main large-scale precipitation-driving mechanisms. Simulations with 22 CMIP5 models for recent climate conditions show biases in reproducing the observed seasonality of weather types. In particular, an overestimation of weather type frequencies associated with zonal airflow is identified. Considering projections following the RCP8.5 scenario over 2071–2100, the frequencies of the three driest types (S1, B2 and W3) are projected to increase (mainly S1, +4%) in detriment of the rainiest types, particularly W1 (-3%). These changes explain most of the precipitation projections over WE. However, a weather type-independent background signal is identified (increase/decrease in precipitation over northern/southern WE), suggesting modifications in precipitation-generating processes and/or model inability to accurately simulate these processes. Despite these caveats in the precipitation scenarios for WE, which must be taken into account, our approach permits a better understanding of the projected trends for precipitation over Western Europe.