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# Bias-correction conditioned on circulation patterns for ENSEMBLES precipitation simulations in mountainous regions

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Although climate projections are widely used to investigate future climate change impacts, regional climate model (RCM) simulations often show significant biases under present conditions. Such biases in precipitation and temperature are of particular concern for hydrological impact studies, because they can largely affect simulations of present and future catchment discharge.

In this study we assess precipitation biases of RCM simulations from the ENSEMBLES project by comparing them with gauge observations in Switzerland for the period 1980-2009. We especially investigate whether these RCM simulations indicate different biases depending on the circulation patterns (CPs). Our focus is on systematic biases in orographic precipitation, as they are strongly related to CPs and to the coarse representation of local topographic features in the RCMs.

We then apply a bias-correction based on quantile mapping conditioned on CPs. The complex topography and the dense network of precipitation gauges in Switzerland make the area well suited to evaluate the benefits of accounting for airflow patterns. Correction of biases in the mean precipitation and in other statistical properties relevant for hydrological modelling is assessed quantitatively. We furthermore investigate the robustness of the bias-correction method using a differential split-sample method. We finally evaluate its capacity to account for possible physical causes of the biases, such as the lack of topographic details in the RCMs or their inaccurate representation of CPs relative frequency.

Our overall aim is to use these bias-corrected RCM simulations for future scenario conditions to produce discharge projections for mesoscale catchments representative of typical Swiss discharge regimes. This will enable us to assess the sensitivity of discharge simulations to this bias-correction approach.