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Biascorrected projections of snow cover fraction from EURO-CORDEX regional climate models with MODIS remote sensing observations for the European Alps

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Snow is a key environmental parameter in mountains, and in this changing climate reductions in snow are expected. Traditionally, future estimates of snow are based on dedicated snow/hydrological models forced by climate projections, which, however, are computationally intensive and which decouple hydrology from climate forcing. Recently, regional climate models (RCM) have been used as an alternative, although snow is only an auxiliary parameter in RCMs and not as accurately represented as compared to dedicated snow models. Nonetheless, RCMs encompass the climate-hydrology feedbacks, cover large areas, and have recently become available in moderate horizontal resolutions.

Here, we skip the need to biascorrect the input variables to the snow/hydrological models (i.e. temperature, precipitation, ...) and use observations to directly biascorrect the target variable, i.e. snow cover. Quantile delta mapping (QDM), a trend preserving bias correction method, is used to correct biases in EURO-CORDEX RCMs that provide snow cover fraction as output (CCLM4-8-17, ALADIN63, WRF331F, WRF381P, RACMO22E, RCA4) using remote sensing observations of snow cover from MODIS for the European Alps. As such, snow cover biases were accounted for, which originated mostly from orographic mismatches as well as temperature and precipitation biases. Model ensemble means were calculated for two emission scenarios (rcp26 and rcp85; with 6 and 21 GCM-RCM combinations available). The biascorrected projections can be used to put the climate model projections into context of current observations thus facilitating interpretations.

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