Elevation dependence of biases and trends of climatic indices in the EURO-CORDEX ensemble over the European Alps

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Mountain regions are especially sensitive to climatic changes. At the same time, the complex local topography modulates meteorological and climatic patterns. Here, especially the elevational dependence of meteorological variables is of high relevance, which is found in both observations and models at varying resolutions. However, previous evaluations of regional climate models focused on large scale horizontal spatial patterns and less on elevation dependencies.

In this study we evaluate the historical EURO-CORDEX ensemble at 0.11° resolution over the European Alps as a function of elevation. In addition to evaluating the standard EURO-CORDEX model output we assess the impact of bias-adjustment as represented in the CORDEX-Adjust ensemble. The model data are compared to high-resolution observational datasets over the entire Alpine region, such as APGD and EOBS, and to national observational datasets. Besides climatic averages, also climatic indices that sample extreme conditions are evaluated. We identify how potential biases depend on elevation, region, and climatic index. In addition, we highlight potential advantages and weaknesses of bias-adjustment methods within CORDEX-Adjust with respect to elevation and climatic index.