



Patterns of 21st Century Climate Change in the European Alps: The CORDEX RCM ensembles

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The European Alps are a hot spot of climate change and of related impacts on a large variety of natural and socioeconomic systems. Due to their physiographic complexity and their location between distinct climatic zones, climate change and climate impact assessments in this region are challenging and often associated with substantial uncertainties. In particular, previous studies have highlighted the added value of high-resolution climate models to capture fine scale spatio-temporal Alpine climate variability and to assess climate change impacts for high elevation regions.

Against this background, we here exploit the currently available CORDEX multi-GHG-multi-model ensembles to assess 21st century climate change over the European Alps. We focus on the spatial change pattern, explicitly including elevation dependencies, and on the uncertainties of the projections. For this purpose we analyze the available EURO-CORDEX and Med-CORDEX ensembles carried out at resolutions of 12 km and 50 km. The results largely confirm the findings of previous studies based on the ENSEMBLES experiments, but also yield a number of new insights. The projected increase of winter precipitation, for instance, appears to be stronger and more robust while the model agreement on summer drying is less pronounced. Elevation dependencies of the near-surface temperature change can be substantial. In springtime, strongest warming occurs at medium elevations where snow cover changes are largest, indicating a contribution of the snow albedo feedback to the vertical profile of near-surface warming confirming previous works. These elevation dependencies, however, can differ between the high and the low resolution RCM ensemble. Obvious model deficiencies in the Alpine area were identified. For instance, several high-resolution RCM versions (12 km runs) tend to constantly accumulate snow cover at some isolated grid cells resulting in a distortion of the temperature change signal.