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Climate change scenarios over Switzerland: assessing the added value of dynamical downscaling

Elias M. Zubler, Andreas M. Fischer, Mark A. Liniger, and Christof Appenzeller MeteoSwiss, Federal Office of Meteorology and Climatology, Zurich, Switzerland (elias.zubler@meteoswiss.ch)

The provision of local climate change scenarios is a challenge due to a cascade of associated uncertainties. To sample part of these uncertainties, climate change scenarios are commonly constructed from ensembles of regional climate models (RCMs) driven by ensembles of general circulation models (GCMs). In Switzerland, the RCMs of the ENSEMBLES project were used for generating the climate change scenarios CH2011. Uncertainties in temperature and precipitation projections were assessed with a Bayesian multi-model combination algorithm. Projection uncertainties are explored at different horizontal scales. We compare the regional climate change responses separately in RCMs and their driving GCMs. The ultimate goal is to derive scaling relationships that are

sponses separately in RCMs and their driving GCMs. The ultimate goal is to derive scaling relationships that are applicable to GCM projections that lack an explicit dynamical downscaling step. If successful, this would allow expanding on the model sample size and emission scenarios.

With the help of ENSEMBLES projections (with and without RCM downscaling), a first inter-comparison is performed for seasonal mean temperature and precipitation changes over the Alps. The analysis is performed for a reference period in the 20st century and several periods across the 21st century. Largest differences are found for summer temperature and precipitation changes. Surprisingly, the ENSEMBLES RCMs project future temperatures that are markedly different from their driving GCMs suggesting an added value of dynamical downscaling.

Additionally, the ENSEMBLES signals are then contrasted to the recent GCM model suite of CMIP5. First results show largely consistent climate change signals over the whole Alpine region for the two model suites ENSEMBLES (A1B) and CMIP5 (RCP6.0). In case of summer precipitation and in contrast to ENSEMBLES, the CMIP5 models do not reveal a clear tendency of drying toward the end of the century.

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