



Quantification of model projection uncertainty in EURO- and MED-CORDEX over Switzerland

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The provision of climate change projections for a small country such as Switzerland is typically based on the post-processing of a multi-model ensemble of regional climate models (RCM) that are used to dynamically downscale global climate model (GCM) simulations. The model projection uncertainty associated to such an ensemble of opportunity primarily arises from the use of different dynamical cores and physical parameterizations in both the RCMs and the driving GCMs. Further contributions come from different model resolutions and boundary conditions such as soil and vegetation parameters and orography. Model projection uncertainty is known to be one of the most important uncertainty components in climate change projections.

The quantification of model projection uncertainty, however, is far from trivial. First, an ensemble of opportunity (e.g. RCM-GCM chains from ENSEMBLES or CORDEX) is incomplete: very likely, only a fraction of the parameter space is covered by the relatively small amount of simulations available. Second, there are dependencies among the models that may to some extent reduce the effective sample size if they are accounted for. Dependencies arise simply from the use similar parameter values and parameterizations (and thus similar model deficiencies or biases). If the multi-model ensemble is dominated by certain GCMs and RCMs as is the case with MED- and EURO-CORDEX, simply computing empirical quantiles from unweighted models will result in estimates of model projection uncertainty that are inevitably biased towards these models.

Following this argument, a detailed analysis of the model projection uncertainty in EURO- and MED-CORDEX simulations is carried out over the Swiss Alps. We analyze how the different RCM and GCM simulations and different model selection methods modulate the resulting estimates of model projection uncertainty over five regions in Switzerland. This work precedes the release of a new generation of Swiss climate change projections and it may be helpful as a guideline for the setup of future regional climate multi-model projects such as CORDEX.