



Climate modeling: do regional models improve the results from global models?

Silje Lund Sørland, Daniel Lüthi, and Christoph Schär

Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland (silje.soerland@env.ethz.ch)

The assessment of regional climate change and the associated planning of adaptation and response strategies are usually based on complex model chains. Typically these model chains employ global and regional climate models (GCMs and RCMs), as well as one or several impact models, for instance to project the hydrological implications of climate change in a particular river catchment. It is a commonly held belief that the errors in such model chains behave approximately additive, and thus that the uncertainty should increase with each modeling step. For instance, in a one-way nested GCM-RCM modeling approach, the overall uncertainty would then increase with the consideration of the RCMs, and not necessarily lead to an intrinsic improvement (beyond higher-resolution detail) of the GCM results. Here we investigate the bias patterns (offset during the control period against observations) and climate change signals of two regional models that have downscaled a comprehensive set of GCMs following the EURO-CORDEX framework. It is shown that the two RCMs considered systematically reduce the biases of their driving GCMs, reduce the spread of the projections, and also significantly modify the amplitude of the projected climate change. Based on our findings, we suggest that state-of-the-art RCMs are correcting the GCM bias and tend to reduce the uncertainty in the model chains.