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# Evaluation of Temperature and Precipitation in Coupled Regional Climate Model Simulations

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Climate change is expected to have major impacts on society and ecosystems during the upcoming decades. The exact quantification of the climate change signal to be expected, however, is still associated with many uncertainties. For an atmosphere-ocean general circulation model (AOGCM) uncertainties in projecting future climate arise from a number of different sources: uncertainties in physical process understanding and model formulation, natural climate variability, and the amount of future anthropogenic greenhouse gas levels in the atmosphere. When analyzing AOGCM-driven regional climate model (RCM) simulations, which are often applied to provide local climate change information to the impacts community and policy makers, a further level of model uncertainty is introduced. An important step towards quantifying model uncertainty is the analysis of systematic model biases and of the the inter-model spread of the climate change signals obtained.

Here, we compare RCM simulations of temperature and precipitation from the FP6-ENSEMBLES project among each other and against observations over Europe, and in greater detail over Switzerland. The RCMs (at 25 km horizontal resolution) were driven by AOGCMs and run in transient mode over the period 1950 to 2050 based on the A1B emission scenario. Some of the RCMs were forced by the same AOGCM, hence allowing to study the spread of different RCMs under the same boundary conditions. Climate change over Switzerland is assessed for the period 2021-50 as seasonal means over distinct climatic regions.

The coupled RCM-GCM models exhibit remarkably large systematic biases in temperature and precipitation. Over selected European regions the absolute temperature bias can be as high as 5 K, although the annual cycle is relatively well reproduced. In general, the models simulate too wet conditions with biases of 50 - 100 % above observations during wintertime. Over Switzerland the interannual variability is generally overestimated, irrespective of season and region. Contrary to studies of the ERA40 driven RCM simulations, in the observational period no systematic bias increase or decrease could be revealed in the coupled model runs. An analysis of the climate change signals shows that the inter-model spread in temperature and precipitation change is largely dominated by the driving GCM. The found systematic biases, however, do not directly translate into different climate change signals.