EMS Annual Meeting Abstracts
Vol. 12, EMS2015-249, 2015
15th EMS / 12th ECAM

ELAPSE – Enhanced regional and local climate scenarios for Switzerland

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21st century climate change in the European Alps is expected to strongly affect various natural and socio-economic systems. For Switzerland, the CH2011 climate change scenarios (www.ch2011.ch) provide a concise summary of these expected changes and a data repository readily available to end users. Being based on the delta change methodology and on a limited set of regional climate model (RCM) simulations, the CH2011 scenarios are subject to a number of limitations which can hamper a full consideration of climate change aspects and their inherent uncertainties in subsequent impact applications. Related to the EU COST Action VALUE, it was the aim of the collaborative research project ELAPSE (Enhancing local and regional climate change projections for Switzerland) to elaborate on some of these constraints by further developing downscaling and post-processing techniques. We here present a summary of the main findings and the related climate scenario products of ELAPSE.

First, the probability distributions of regionally averaged temperature and precipitation change signals obtained through Bayesian inference from coarse-resolution general circulation models (GCMs) were related to the respective change signals in the nested RCMs. The resulting scaling relations (difference in mean and ratio of standard deviation) between the normal distributions of GCM and RCM change signals help to assess the uncertainties inherent to sparse GCM-RCM matrices, model generation and potential model selection approaches. They furthermore shed light on the possibility to fill such matrices by statistical means.

Second, empirical statistical downscaling and bias adjustment methods - namely different variants of quantile mapping (QM) - were evaluated for a large number of stations in Switzerland in both a cross validation and a pseudo reality framework. Additionally, the conservation of inter-variable relations has been assessed. The evaluation reveals a satisfying and temporally stable QM performance. Based on these results, one specific QM implementation has been employed to construct bias-adjusted transient temperature and precipitation scenarios for stations in Switzerland. These scenarios will be provided to end users and complement the delta-change-based local scenarios of CH2011.