Geophysical Research Abstracts
Vol. 15, EGU2013-11072-2, 2013
EGU General Assembly 2013

An uncertainty assessment of discharge projections for eight Swiss catchments

Nans Addor (1), Ole Rössler (2,3), Nina Köplin (2,3), Luzi Bernhard (4), Thomas Bosshard (5,*), Rolf Weingartner (2,3), and Jan Seibert (1)

(1) Department of Geography, University of Zurich, Zurich, Switzerland, (2) Oeschger Centre for Climate Change Research, University of Bern, Switzerland, (3) Institute of Geography, University of Bern, Switzerland, (4) WSL Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf, Switzerland, (5) Institute for Atmospheric and Climate Science, ETH Zurich, Zurich, Switzerland, (*) now at: Swedish Meteorological and Hydrological Institute, Norrköping, Sweden

Projections of discharge under future climate are impaired by uncertainties arising from different sources: the emission scenarios, the climate models, the post-processing of the climate projections, the hydrological models structure and parameterisation. In this project we investigated the contribution of each of these sources to the final simulation uncertainty for discharge using analyses of variance (ANOVA) in eight catchments representative of the typical Swiss discharge regimes. The catchments are distributed among the Jura, the Swiss Plateau and the Alps, and are known to react differently to climate change. We used climate projections of the CH2011 dataset obtained from the Center for Climate Systems Modeling (C2SM). This dataset consists of two types of projections, both based on the climate model runs of the ENSEMBLES project: one relies on the delta change technique applied to 10 runs and the other is based on a Bayesian multi-model approach combining 20 runs until 2050, and then 14 runs until 2099. In addition to the climate projections for emission scenario A1B chosen for the ENSEMBLES project, the CH2011 team generated simulations for the scenarios A2 and RCP3PD using pattern scaling. This enabled us to address the influence of the uncertainty in green house gases emissions on discharge projections. We ran hydrological simulations using three conceptual models: HBV, PREVAH and WaSiM. HBV and PREVAH rely on a similar reservoir structure, while WaSiM uses the process-oriented Richards-equation approach. PREVAH and WaSiM use a higher level of spatial discretization than the lumped HBV model. The use of the three different models allowed evaluation of the sensitivity of discharge projections to the hydrological model complexity and structure. Simulations were run for the periods 2020-2049, 2045-2074 and 2070-2099 to assess the variation of the different sources of uncertainty over time. The pattern scaling enabled the assessment of uncertainty arising from the emission scenarios in ENSEMBLES simulations and preliminary results suggest that this uncertainty is dominant by the end of the century for the majority of the catchments. Furthermore, in contrast to similar studies on uncertainty quantification that focus on a single catchment or geographic region, our setting demonstrates that the respective contribution of the different sources of uncertainty varies with catchment properties.