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Qualitative and quantitative assessment of uncertainties in a regional climate change impact study in an Austrian alpine river catchment

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To assess the regional hydrological impacts of possible future climate changes typically a cascade of deterministic and/or stochastic models is used, including socio-economic models, global and regional meteorological models as well as hydrological models. Each model being part of the cascade introduces additional uncertainty which adds up to a considerable amount of cumulative uncertainty in the conclusions that can be drawn for regional water resources.The full range of this uncertainty however, is very often not clearly outlined, when discussing the results of such impact studies.

In the presented study an attempt has been made for a comprehensive description of the uncertainties inherent in regional climate change impact studies. Different strategies and methods to deal with the partial uncertainties are described and demonstrated in an Austrian case study, the Gail River in Carinthia. The cascades of models applied in this case study include the Global Circulation Models (GCMs) ECHAM4 and HadCM3, stochastic downscaling models and conceptual hydrological models.

The results of the model application in the case study show that, under the altered climate conditions simulated by the GCMs for the Emission Scenario IS95a, significant changes in the snow cover of the alpine region and a more balanced annual cycle of runoff will occur. Higher evaporation will lead to a decrease in the total runoff volume and to a slight reduction of flood frequency. The high degree of uncertainty inherent in these results is described qualitatively and partly also quantitatively.