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Hydrology and Earth System Sciences Discussions

Interactive comment on "The effect of downscaling on river runoff modeling: a hydrological case study in the Upper Danube Watershed" *by* T. Marke et al.

Anonymous Referee #2

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This paper treats a very important topic, the impact of the choice of different downscaling methods on hydrological modeling. The great number of papers dealing with the impact of a possible climate change on the water cycle are of very different quality and their conclusions are unfortunately often more the consequence of some subjective methodological choices than that of a climatic signal. From this perspective the paper intends to fill a gap.

The paper is unfortunately less attractive than its title. Surprisingly the authors dealing with down*scaling* use spatial and temporal scales in a very arbitrary manner. For

example they use a model with a 1 hour 1 km x 1 km spatial resolution for which the correction of the precipitation input is derived from monthly distributions. Further model results are compared mainly on monthly means (or even long term monthly means) aggregated over the a large catchment of 76000 square km. There are many reasons which can lead to the same integral performance but with poor spatial details. The only higher frequency related evaluations are done in time using 1 day resolution flow duration curves and scatter plots of observations. These are all of different quality. Several comparisons are made on a monthly mean scale. The annual cycle of different discharge statistics shows reasonable agreement with observations, but unfortunately this is mainly caused by the natural annual cycle. All these statistics show that the modeled peak is in May which is earlier than observed. As one would expect such a change with increasing temperature this error decreases the credibility of the prediction of the model chain if applied for changed climate. In fact the time period would have allowed an investigation of results from a time series perspective. This would have lead to more information on whether the model chain can capture climatic signals.

It is not clear from the paper if it was worth to make the large effort of detailed modelling with the available observation and climate model output uncertainty or whether a simpler approach could do as well. Especially the claim that this approach can capture climate change signals correctly is not sufficiently supported.

Minor remarks:

The paper discusses the problem of observation data uncertainty. Blaming observations is a possibility to reduce the modeling errors of the RCMs, but if observations are wrong then the hydrological model which produces good output of bad input is also wrong.

Patterns of hourly precipitation are very different from patterns of monthly precipitation. Hourly precipitation has practically no correlation with elevation. How can the authors justify their correction approach?

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The frequency diagrams of hourly rainfall are unusual. Normally one produces either a histogram of a smoothed density. The figure is showing a mixture. Further the difference of dry/rain probability is of great importance and not given in the paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 6331, 2011.