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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 #1

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The manuscript presents a comparative study of several model configurations to simulate run-off in the Upper Danube in the recent decades. The model configurations comprise the use of two global models, two regional models and one hydrological model with the options of correcting or not biases in the output of the regional climate models. The general conclusion is that it is very difficult to establish which model configuration performs best considering different skill criteria, such as mean, variability, etc. and that the correction of biases of the regional climate models is very important

In general terms the manuscript is well written and offers a wealth of information about

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Interactive Discussion

Discussion Paper

the pros and cons of the different model set-ups. The comparisons are quite detailed, and very likely the users of the both regional climate models, REMO and MM5, will find very interesting bits of information about the capabilities of these regional models in this domain.

I have basically one general concern about the skill of the models is assessed. This assessment is mostly accomplished by comparing the simulated and observed climatological annual cycles of hydrological variables, like the mean discharge and quantiles of the discharges. One can see that this measure of skill discriminates between the different model set-ups, and thus this assessment is pertinent, in the sense that it is a logically a necessary condition. But I think that this type of comparisons are not sufficient, since the annual cycle contains relatively few degrees of freedom, even more so if the possible biases are statistically corrected. A more stricter test, and one that might be more meaningful to assess the model skill to simulate future changes, is to compare the time evolution of the simulated and observed discharges through the period 1972-2000, separately for winter and summer (or alternatively for the discharge season). This comparison could take simply the form of the correlations between observations and simulations (n=29) or more sophisticated measures, such as the ratio of variances, etc. For the case in which the simulations are driven by the global model ECHAM5, this is indeed not possible, but for the simulations driven by ERA40 this would be possible and would also give more information about the model skill. Figure 7 (a) displays this type of calculation, but not exactly. For instance, any reasonable model would produce an annual cycle more or less similar to the observations, and thus days belonging to the observed discharge season will roughly agree with days in the simulated discharge season. Much more informative would be a similar Figure in which the days have been disaggregated by season, in which the reader could see that summer days with observed high (or low) discharge have been correctly simulated. Perhaps the authors could include this type of information for some cases that they deem important

A minor point:

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'An increase in atmospheric greenhouse gases has been observed over the last decades that is changing the earth's radiation balance and, as a direct consequence, alters weather patterns around the globe (Houghton et al., 1990). In order to develop'

I think that the reference to Houghton et al. is out of date.

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