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Interactive comment on "Hydrological modelling for meso-scale catchments using globally available data" *by* A. Gafurov et al.

A. Gafurov et al.

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The objective of the study was to test the use of globally available data for data limited catchments. The Neckar basin is well monitored for modeling water balances in the catchment whereas the Chirchik basin is one of the catchments where modeling water balances can use only globally available data since the catchment lacks in ground observation stations. Proper water allocation for agriculture, municipalities and hydropower plants throughout the seasons is a big issue which is not possible without any information on the water balances of the catchment. This brings a challenge for modeling water balances in this catchment using globally available data.

1. Since the data for Chirchik basin was not available for the evaluation of the performance of water balance modeling in the region, the Neckar basin was chosen as a

support basin to check the validity of the model with the global data. The paper also does not state that the model performance in Chirchik basin was as good as it was achieved for Neckar basin. Because of different climatic and geographic conditions, the model had to be modified with the involvement of a glacier module which is important for Chirchik basin where the majority of the summer discharge is formed due to snow and glacier melt. Comparison of disaggregated global data against locally observed data highly supports the conclusion that the global data are underestimating precipitation for the Chirchik basin. For this reason, the correction of precipitation using lapse rate that was derived from the limited available meteo-station data was necessary. Monthly duration curves gave a reasonable result when compared with the observed ones. However, daily discharges were not available for comparison and it is a valid assumption that water balance modeling could be carried out using globally available data for daily scale also. The measured monthly data that was used in this study is the mean monthly values of daily discharges. Unfortunately, the daily data itself was not available for use.

2. The comparison of model performances using globally available data versus locally observed data would be another option to justify the obtained results. However, since the observed discharge was available for the validation of the results, the model was not rerun with the locally available data. But, this may be checked and included in the revised version of the paper. Table 1 gives some statistical comparisons of the results. Vaihingen-Enz has a worse performance then the others and this is mainly due to the Black Forest in that region. Heterogeneous subscale variability is high in this region because of dense forest and this makes it difficult to model water balances especially when the coarse global data is used as an input. The Graph 9, which shows low performance of the model in low flow periods, is mainly due to human impact on the Neckar River where up to 40 % of the discharge is coming from waste water treatment plants in low flow periods (Landesanstalt für Umweltschutz Baden-Württemberg (LFU)). Also, the Neckar River is controlled in low flow periods for navigation purposes. Better suited graphs are available for justification of the conclusions using daily flow duration curves

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and they will be included in the revised version of the paper. Anthropogenic effects on river dynamics in the Neckar basin are not included in the model. This is why the model produces lower discharge than observed where this observed discharge is not part of natural behavior of the river. Global data were as a first step compared and validated for the use in hydrological modeling. Some figures that support the validity of the global data when compared against available observed ones will be included in the revised paper.

3. Analysis of glacier melt and the possible impact of it to the discharge have shown that the existing glacier and snow are dominating the summer runoff. This can be visible from the annual hydrograph that will be included in the revised paper. This is why the glacier module was necessary to be included in HBV-IWS which then covers this important hydrological process of the catchment in water balance modeling. The rough assumption that the land use of upper Chirchik basin is mainly agricultural land was taken according to personal experience where several field visits had taken place previously in different parts of the catchment. Completely different land use classes such as urban area or dense covered forest are negligible. However, such an assumption can serve as good information where completely no records are available. In addition, glacier melt has a different physical process then the snow melt which was the only module for melting process included in the original HBV-IWS. Glacier melt follows the same type of formula as for snow melt, but with another degree-day factor. (Lindström et al., 1997). For this reason the glacier melt was computed separately from the snow melt which also was needed to model glacier melt, which dominates discharges for summer periods.

4. There is no specific lapse rate for precipitation but rather different ones for different regions according to the local geographic behavior of the region. The stations that are located in the valleys may give a different picture of precipitation when plotting against elevation due to orography effects. For example, the station with the minimum precipitation amount in figure 14 (Ustep-Ters) is located in a valley where the effect of

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orography may play a great role on the representation of this meteo-station. This is why it can be visible from the figure 14 that the given relationship does not really support the increase of rainfall with elevation. Other comparisons do actually support the change of precipitation according to elevation which will also be plotted in an additional graph in the revised version of the publication.

5. The global data for the Neckar basin was better visualized when compared to observed ones whereas there were underestimations for the higher elevation regions of the Chirchik basin. This can also be proven by the graphs that will be included in the revised version of the publication. High elevation regions are underestimated by global databases and this was assumed to be because of no existent meteo-stations in such high glacial regions of the Chirchik basin.

In general, the authors accept that there is lack of comprehensive information for some parts of the publication which has lead to disagreements and misunderstandings of the paper and this will be corrected in the revised version of the publication.

References:

1. Siedlungswasserwirtschaft 18, Landesanstalt für Umweltschutz Baden-Württemberg (LFU), 2001

2. Lindström et al., “Development and test of the distributed HBV-96 hydrological model” Journal of Hydrology 201, 1997

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 2209, 2006.