

Interactive comment on “Use of regional climate model simulations as input for hydrological models for the Hindukush–Karakorum–Himalaya region” by M. Akhtar et al.

M. Akhtar et al.

Received and published: 15 July 2008

Response to anonymous Referee 2 The authors of this paper would like to thank Referee 2 for the constructive and helpful comments and suggestions of improvement of the manuscript. We will provide a summary of the results in the final authors response. The sequence of our repose follows the points made in the review comments.

1. Benchmarks: It is a good idea to make benchmark HBV simulations using original ERA-40 and HadAM3P data to interpret the usefulness of PRECIS downscaled data. This will really improve the scientific value of the paper. In the revised manuscript we will compare the simulations of the HBV hydrological model using PRECIS data with the simulations of the HBV hydrological model using original forcing data.

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2. PRECIS simulations of current climate: we agree with the referee to some extent that our paper does not prove the capacity of PRECIS for present day simulations. However, our statement "Analysis of present day simulations shows that PRECIS possesses strong capacity to simulate spatial patterns of present climate characteristics" is based on the comparison of PRECIS simulations with CRU reference data (as given in figure 4 5) and not on hydrological modelling results. Since there is data scarcity in the study area and meteorological network is thin, we found it more viable to compare PRECIS simulations with CRU reference data. This comparison clearly shows that PRECIS is not deteriorating the global forcing data. However, as the referee suggested in his specific comment (comment 8) we will add the comparison of biases in PRECIS simulations with biases in global forcing data in the revised manuscript. This analysis will support some explicit statements regarding PRECIS8217; capacity to simulate present day climate. The issue whether PRECIS data have added value for the hydrological modelling is dealt with in comment 1.

3. Robustness: Although it seems illogical to correct observed meteorological data with CRU data, the referee raised a strong point regarding the unfair comparison. Therefore, in the revised manuscript we will test the robustness of CRU corrected meteorological data. We think this analysis will add to the scientific value of the paper.

Specific comments:

4. Resolution of GCMs: We have made the statement about the resolution of GCMs in the introduction. We agree that a 250 km resolution of GCMs is a crude estimation. To make the statement more general we will change 8220;(about 250 km)8221; in 8220;(generally about 250 km)8221;.

5. Length and temporal resolution of discharge data: We will add the following sentences in section 2 in the revised manuscript: 8220;Daily observed discharge data for three river basins are available at the outlets of the basins. These data cover the periods, 1975-1996 for the Hunza basin, 1962-1996 for the Gilgit basin and 1975-1996 for

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the Astore basin.

6. Sensitivity analysis and parameter sets: To clarify the sensitivity analysis the last paragraph of section 3.2 will be improved by adding/ improving the following sentences: 8220;For each river basin, a univariate sensitivity analysis was performed to assess the influence of individual parameters on the output of the model. This was done by varying the value of one parameter while keeping other parameters constant (default value). For the three river basins, the parameters gmelt, FC, DTTM, TT, PERC, and cfmax were found to be most sensitive. There appeared to be a strong interdependence among four of these parameters (gmelt, FC, DTTM and TT). In the second step, a multivariate sensitivity analysis was performed to optimize these interdependent and sensitive parameters of the HBV-Met, HBV-ERA and HBV-PRECIS models for each river basin. The values of the remaining key parameters (PERC and cfmax) were optimized by univariate sensitivity analysis.8221;

7. HBV performance with original ERA-40 and HadAM3P data: We agree with the referee that adding the performance of HBV with the original ERA-40 and HadAM3P would greatly improve the ability to assess the value of the PRECIS downscaling. However this figure does not give the results of the HBV model, but instead, it compares the PRECIS simulations with CRU reference data for the selected river basins.

8. Biases forcing data and PRECIS: We agree to add the biases in the original forcing data for these river basins in the revised manuscript for comparison.

Technical corrections:

9. Repetition: We will omit repetitions in the revised manuscript.

10. Correction: We will make this correction in the revised manuscript.

11. Topography: We think it is important to illustrate the potential benefits of using the PRECIS RCM compared to the HadAM3P GCM given the large differences in Fig. 2 between the topography of PRECIS and HadAM3P on the one hand and the similarities

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in Fig. 2 of the topography of PRECIS and GTOPO30 2MIN DEM on the other hand.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 865, 2008.

HESSD

5, S677–S680, 2008

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