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Discussions

Interactive comment on "Historical and future trends in wetting and drying in 291 catchments across China" *by* Zhongwang Chen et al.

Anonymous Referee #2

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The authors interpret long term trends in runoff within a Budyko framework and test if the "the dry get drier, wet get wetter" (DDWW) paradigm of climate science holds with observational runoff and meteorological data. The authors highlight the need for a useful definition of wet and dry and use the aridity index for this purpose. Then they define wet vs dry by a aridity index of 1, i.e P = E0 and find that a majority of runoff trends indeed follows the DDWW pattern in China. When the authors use GCM model output and compare the simulated trends for the 21th century they find that their DDWW pattern is not reproduced, almost opposite of the historical trends. Thus the historical trends in runoff are at odds with GCM predictions for climate change. However, the problem I see is that the historical runoff trends may be caused not only by changes in precipitation, but also by human alterations of catchment conditions and water abstractions etc. These impacts are not resolved by GCMs. Therefore a precipitation trend

analysis for both historical records and GCMs should be complemented to this study to interpret the DDWW pattern.

I recommend minor revisions before the manuscript can be published in HESS.

Comments and remarks:

- runoff trends may have been caused by human alterations, water abstractions and land cover changes. Many papers have already shown the relevance of this for runoff trends in China. How were catchments selected to the keep this influence low? What would be the effect on the interpretation of the results?

- Discuss patterns of historical precipitation changes in China, do these trends in P follow the DDWW pattern?

- I believe that the existence of a DDWW pattern has many implications also for water resources. A brief discussion of the implications would emphasize the relevance of the findings!

- add which significance test was used in methods

- add details for computation of Penman potential evaporation (observations and GCM) in methods or appendix.

- please explain better Fig 11 such that the reader can understand the conclusions in section 4.2

- Fig. 11 maybe add the Budyko curve with n = 1.8 to the plots.

- discuss the role of bias correction / spatial resolution of GCM output - when looking at Fig 12 it seems that P was corrected but not all variables needed to calculate E0

- do GCMs reproduce the runoff trends / patterns?

- I checked some GCM projections for precipitation changes in China (Roderick et al., 2014, Hagemann 2013 ESD, IPCC AR5) and the projected precipitation changes are indeed different from the runoff trends shown in Fig. 8. Thus it seems that the GCM simulated precip changes in China are different from the historical ones observed in China.

Minor Comments: - abstract: P1L12: be more precise than "simulated data"

P1L25ff rephrase

P3L14: what is meant with restored streamflow data?

P5L15: for which period was n determined?

P8L3: it is somewhat unclear for which variable and period the coefficient of variation Cv was actually determined? Please specify.

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