Hydrol. Earth Syst. Sci. Discuss., 8, C5096–C5098, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C5096/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Controls on hydrologic similarity: role of nearby gauged catchments for prediction at an ungauged catchment" *by* S. Patil and M. Stieglitz

Anonymous Referee #2

Received and published: 25 November 2011

Thank you for the opportunity to review the manuscript titled "Controls on hydrologic similarity: role of nearby gauged catchments on prediction at an ungauged catchment." I believe the authors address an interesting and important research question. I have some technical questions related to the approach the authors have taken but I feel that the overall conclusions in the manuscript are valid and important.

In particular, the authors frame the use of proximity to select a donor catchment in the context of transferring hydrologic model parameters from gauged to ungauged catchments (pp. 9325-9326); however, the experiment design does not test the use

of proximity for this purpose. Therefore, I do no think the authors can make any statements about the use of proximity in transferring calibrated model parameters from an ungauged to a gauged location (p. 9337, lines 18-20). I think the authors should clarify that the paper provides only evaluates the use of proximity for one specific transfer method (namely, the IDW interpolation scheme), which merely transfers weighted streamflow time series to the ungauged catchment. This is quite different from the transfer of calibrated model parameters to estimate streamflow at ungauged catchments.

My second technical question relates to the method used to estimate streamflow at ungauged catchments. Could the authors provide some justification as to why this method was used? If the streamflows were all standardized by drainage area before weighting the flows, are you not actually testing the drainage-area ratio method (the assumption that flow per unit area between the ungauged and donor catchments are equivalent)? Otherwise, to my knowledge, this is not a common method to estimate streamflow at ungauged catchments. A few citations to this method would help strengthen the justification for the use of this method in the experiment design.

I also wonder if the use of multiple catchments is confounding the interpretation of the results. The decision as to how many streamgauges to use in the weighting seems to add an additional layer to the analysis. How can you separate the effects of multiple donor catchments from the effects of distance given that the average distance between 5 donor catchments in the southwestern US will be quite different than in the northeastern US? I think this complicates your conclusions in section 4.3, which might be more easily explored if each site only had one donor.

With respect to the goodness of fit methods, were the logarithms of the streamflows taken before computing the NSE values? If not, your NSE values may be swamped by the fit of the high streamflow values. This effect could be mitigated by the authors' use of scaled streamflows but I would check to be sure that the NSE values reflect the fit across all streamflow values. Additionally, you note in the methods section and in the

graphics that the WBE was also used as a metric to test goodness of fit but only NSE is discussed in the text (except section 4.2). I would add some sentences about the WBE metric throughout the results or remove it from the manuscript.

I think your analysis using the Budyko to understand controls on model fit is a strong technical contribution of this work.

Specific comments are listed below:

1) p. 9324, line 4: Change “reliable” to “common.” If the method were reliable, you would not be testing its value here.

2) p. 9325, line 14-15: I do not believe that the most common method of transfer is parameter transfer. Maybe change sentence to “One such method is the transfer of hydrologic parameters.” Although I am not even sure this discussion should be part of this manuscript (see comments above).

3) p. 9336, line 28: Add “in” after “low predictability.”

4) p. 9337, lines 18-20: Remove the sentence starting with “Our. . .” You did not evaluate this statement in any way in the manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 9323, 2011.