Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-300-AC1, 2016

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Spatial and Temporal Variability in Baseflow in the Mattole River Headwaters, California, USA" *by* N. Queener and A. P. Stubblefield

N. Queener and A. P. Stubblefield

aps14@humboldt.edu

Received and published: 4 October 2016

We thank the reviewer for their detailed comments. Here is our reply.

Anonymous Referee #1 comments

"Nevertheless, the statistical design of the exercise is notably weak, because the authors analyze the role of over 60 catchment descriptors on just 3 baseflow variables without sufficiently taking into account the redundancy among most of the descriptors... Before interpreting the results, the authors should show a correlation table between the catchment descriptors and use the Principal Component Analysis made for mapping these descriptors. The interpretation of the causal relationships

must be done taking into account more the factorial axes than the separate variables. This means that most of the results and discussion sections must be rewritten accordingly."

Response: We agree that the statistical design of the analysis could be strengthened. We intend to examine the correlation matrix and remove highly correlated catchment descriptors, such that no two remaining catchment variables have a correlation coefficient >0.8. Then, conduct Principal Components Analysis using all of the remaining variables. We will rewrite the results and discussion based on the resulting composition of the principal components with eigenvalues greater than one, and the loadings on the variables within those components.

"Furthermore, most of the baseflow variables were obtained using linear regressions without estimating the uncertainty associated to these interpolation methods" – and - page 6, lines 11-18: "the uncertainty associated to these interpolation methods should be analyzed."

Response: The majority of baseflow variables (36 out of 52) were obtained from direct measurements of streamflow (see Table 2 in the manuscript). In the case of the 16 values that were estimated, using this method to obtain values for the baseflow variables is similar to the use of a stage/discharge rating curve to obtain streamflow values from periods when no flow measurement was made. No uncertainty is reported in those cases, another method of estimating "missing" streamflow values. In this case we simply use discharge at the downstream index gaging station, instead of stage.

As we state in the article, the interpolation was only made within the range of measured tributary values. – we did not interpolate up or down beyond the range of measured values, which would potentially introduce substantial error into estimations since streamflow recession is not always a linear function.

At sites where there appeared to be an inflection point in the recession of tributary flows plotted against the index gage, we used only the measurements taken nearest

the desired value on the Ettersburg hydrograph to generate the predictive equation, to avoid fitting a straight line across that inflection point in the recession curve.

Nevertheless, we would be happy to report the error associated with each estimated value. R2 values ranged from 0.89 to 0.99.

"- Page 5 line 1: some more information on the age of the rocks as well on their degree of tectonic and metamorphic modifications would be of value taking into account the subject of the paper."

Response: We will rewrite the 1st sentence on page 5 to read: The underlying geology is highly folded and variably sheared sandstone and argillite, classified as Late Cretaceous to Pliocene-aged rocks of the Coastal Belt of the Franciscan Complex (Davenport et al. 2002).

"- page 7, lines 3-7: If climatic data for the catchments are derived from their topographic characteristics, both the original and derived variables should not be equally analyzed for their role on baseflows. Subsequently, cause-effect relationships should be used instead of statistical ones."

Response: When removing highly correlated catchment descriptors as described previously, we will also remove the physiographic variables used to derive precipitation and temperature records.

"-page 7, line 32: explain how these cooler and humid episodes affected the recession flows."

Response: In general, cooler and humid episodes seemed to decrease the rate of recession or caused flows to increase slightly in streams with surface flows throughout most of the drainage network, but appeared to have little impact in streams with long stretches of subsurface or intermittent flow. However, our synoptic measurements didn't have the necessary temporal resolution to describe this phenomenon with a high degree of certainty.

Table 1: "the extent of dry reach surveys" is not shown in the table Response: We will delete this from the Table description.

"Figure 2: This graph is not necessary given the written explanations. Instead, a map of the catchment variables would be necessary. The fraction of the correlation explained by the axes should be stated in the caption."

Response: This figure will be revised accordingly after re-doing the statistical analysis as suggested by reviewers.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-300, 2016.