

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

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We appreciate the time and effort of the reviewer. Our responses are below. Anonymous Referee #2 comments NQ 10/3/2016

“However, the PCA statistical analysis are not well described and should be modified. First a coloration matrix should be constructed for all the variables to test the collinearity (New table should be added). After removing the highly correlated variables, a PCA analysis could be performed. The Author also should test the rotation of the PCA components in order to maximize the variance among the variables under each component.

Response: We agree that the statistical design of the analysis could be strengthened.

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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, including varimax rotation, 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.

“Page 7, Line 17: PCA was based on standardized variables or original variables?”

Response: Variables were standardized within the function PcaHubert in R, using “Scale=True”.

“Page 11, Line 6: “Principal components analysis was run on two subsets of the variables. A table should be added for the two runs with the eigenvalue and the variance of each principal component, also the loading of each variable.”

Response: After re-doing the PCA with fewer highly correlated variables, as described above, there should no longer be any need to break the variables into two subsets. We will add a table reporting the eigenvalues and variable loadings.

Page 11, Line 11: Which criteria has been chosen to detect the high loading factor? Why didn't you try to rotate the PCA components to maximize the variance?

Response: No specific criteria was set for a “high” loading factor for variables. The variable loadings were examined, and those with the greatest absolute values were described as having strong or heavy loadings. Varimax rotation should have been performed.

Line 16: “none of the vegetation metrics showed particularly strong correlations with the flow metrics” A recent study was conducted to estimate the controlling factors of base flow using PCA analysis, and vegetation was found to be the first dominating factor for spatial variation of base flow. (Zomlot, Z., Verbeiren, B., Huysmans, M., Batealan, O. (2015). Spatial distribution of groundwater recharge and base flow: assess-

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ment of controlling factors. *Journal of Hydrology: Regional Studies*, 4(B), 349-368.)

Response: The relative homogeneity in the vegetation within our study area, in contrast to the study cited above, may have been partially responsible for the lack of correlation between flow and vegetation.

“Figure2: The figure looks a bit crowded, clusters should be marked with colours or dashed lines to be clearly seen. The Yew catchment in Figure 2: seems to be an outlier?”

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

The Yew catchment does seem to be an outlier. It differs in both aspect and vegetation from most of the other catchments, and is notable for having the most old-growth forest of any of the catchments in this study. PCA conducted with fewer highly correlated variables may help elucidate how this catchment differs, or doesn't, from the others with relatively higher flows.

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