

Interactive comment on “Hydrologic similarity among catchments under variable flow conditions” by S. Patil and M. Stieglitz

Anonymous Referee #1

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General comments

The paper presents an evaluation of similarity among a small number (5-8) of catchments within each of four river basins in the eastern United States. The primary question in the study is whether hydrologic similarity among catchments within an individual basin varies as a function of flow percentile. The authors conclude that, in general, catchments within a basin are more similar at higher flows than at low flows. This result is explained in terms of local controls on hydrologic behavior (e.g., terrain) being expressed more strongly at low flows compared to broad-scale controls (e.g., climate) dominating hydrologic response at higher flows.

The subject of catchment hydrologic similarity is within the scope of HESS and of C4075

interest to the broader hydrologic scientific community. To my knowledge, the specific focus of this paper (hydrologic similarity among catchments for various magnitudes of flow) has not been addressed previously and is a worthwhile objective.

In my specific comments, I describe some concerns I have regarding the methods for site selection and interpretation of the results.

Specific comments

1. Nested sites in individual basins: Among your sites, only the catchments in the Upper Delaware are completely non-nested. There are a few nested sites in the Lower Susquehanna and the Allegheny but extensive nesting in the Lower Chesapeake. (See attached figure.) Non-nested streamgages might be more useful because nested sites have only partially independent basins and, therefore, would be similar. In addition, streamflow from an upstream nested site is flowing into the downstream nested site.
2. I expect that the geology of a catchment has an important effect on groundwater discharge to streams and that baseflow is the primary source of low flows. It would be useful to have more discussion of how differences in catchment geology and soils would be affecting low flows.
3. What do you think is the effect of basin size on the coefficient of variation (CV) of different percentiles of streamflow? In general, does the CV decrease as catchment size increases?
4. Do catchments with higher BFI values have lower CV values?
5. Figure 4 shows that, typically, the CV decreases as the Q percentile increases. You should comment on whether this pattern is due to changes in the standard deviation or the average value.
6. Figure 7 might be more informative if you showed the percentage of streamflow estimated to be from baseflow, as opposed to the “raw” baseflow value. In general, baseflow from groundwater discharge is the primary source of streamflow during low

flow periods. "Common wisdom" would suggest that the percentage of streamflow derived from baseflow is high in the warm months when flow is low.

Technical corrections

"Susquehana" should be "Susquehanna". p. 8609: I would avoid using abbreviation "etc.". p. 8610, line 1: Change "it is also not clear yet" to "it is not clear". p. 8615, line 5: Change "reverse" to "inverse". p. 8613, line 27: Change "reduces" to "decreases". p. 8614, line 8: Change "exist" to "are". p. 8614, line 20: Explain more about what you mean by "decoupled". p. 8615, line 5: Change "reduces" to "is lower". p. 8615, line 21: Change "of catchment" to "of the catchment". p. 8616, line 1: It's not clear what you mean by "isolated nature".

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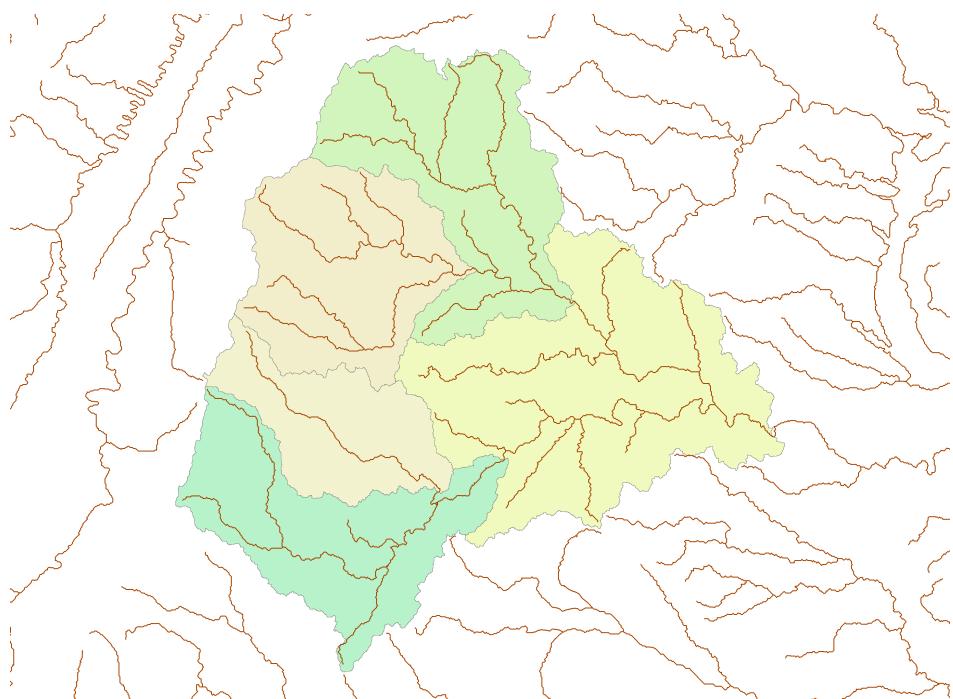


Fig. 1. Nested catchments in the Lower Chesapeake

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