Hydrol. Earth Syst. Sci. Discuss., 6, S368–S369, 2009
www.hydrol-earth-syst-sci-discuss.net/6/S368/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Modeling nutrient in-stream processes at the watershed scale using Nutrient Spiralling metrics" *by* R. Marcé and J. Armengol

Anonymous Referee #1

Received and published: 18 March 2009

I thank the authors for their responses to my original comment and subsequent communications with the editor about the spurious correlation in the S_w versus Q relationship presented in their manuscript (Figure 7). Their responses are thoughtful and inclusion of their clarified description around Figure 7 in a revised manuscript will strengthen it tremendously. However, I must clarify and reiterate some points in my original comment. I think consideration of these points would increase the novelty of this study. I raise these points only to show an opportunity for the authors to expand the analysis in Figure 7 in a way that would be a nice contribution to stream biogeochemistry.

1. The argument that S_w and Q are measured variables, and thus the argument of

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spurious correlation is not applicable, is not satisfactory. S_w cannot be measured directly and from the studies included in Figure 7 and Q could have been measured in a number of different ways. S_w is derived from measured uptake (dC/dt from measures of nutrient concentration upstream and downstream) and hydrologic measurements (velocity, flow depth and width), which can also be used to calculate discharge. Thus, velocity is likely used to calculate S_w and Q, even if an individual study's author may call the metric 'measured'.

2. The Doyle et al. (2003) article is nuanced in its comparison of hydrologic and biological controls (e.g., see text towards the end of paragraph [44]). And, looking at Figure 11 in that article shows that the variation of hydrologic and biological metrics are quite similar.

3. The $S_w - Q$ relationship is spuriously correlated to some degree. Our debate is about the degree of spurious correlation. There remains a possibility that the relationship between S_w and Q exists only because u is correlated with u. The authors can dispel this with real data from the previous studies they use in Figure 7.

4. My suggestion for the easiest way to dispel the spurious correlation issue is to find the average C of TP in each study and calculate the V_f. This may be an opportunity to provide clarity for future authors as they compare hydrologic versus biological control. If V_f ($= U/C$) is related to Q, that is a stronger finding than S_w being related to Q. If V_f is not related to Q, that provides much more information than finding S_w is related to Q. Either way, the analysis would be more rigorous and novel.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 501, 2009.