Hydrol. Earth Syst. Sci. Discuss., 6, S363–S364, 2009
www.hydrol-earth-syst-sci-discuss.net/6/S363/2009/

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

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Received and published: 17 March 2009

We thank the Editor for focusing the question. Although we are confident with Sw-Q correlations (i.e., they cannot be considered as spurious in a statistical sense), we did not answer the most fundamental question: which is the relative influence of biological uptake processes versus hydrology on phosphorus retention in streams?

Fortunately, this was already answered by Doyle et al (2003) in a seminal paper in Water Resources Research. Although we strongly recommend reading this manuscript for a complete understanding of our point (particularly Figure 10, 11, and 13), we will summarize here main conclusions. First, consider:

Sw=u*h/Vf (Equation 5 in our paper)

where u is velocity and h is channel depth (very related to Q), and Vf is the mass transfer coefficient (a measure of the biological uptake).

Then, Doyle et al. used field data and considerations about hydrogeomorphic features of river networks to conclude that both biological uptake processes (Vf) and hydrology (u*h) are driving phosphorus retention in streams. However, for inter-sites comparisons Vf variability is stronger than hydrologic variability. Quoting Doyle's abstract:

"Review of published phosphorus retention values revealed greater variability in biochemical uptake rates than in hydrogeomorphology. Thus uptake rates should exert a stronger control on reach-scale MRP retention than changing channel morphology or hydrology."

Although we acknowledge that water velocity is responsible for some of the explained variability in the Sw-Q relationship, probably biological uptake processes plays a prominent role. Considering that Doyle's database and our data is greatly overlapped, and considering also that Doyle's conclusions are strongly supported by theoretical considerations, we do not find necessary to repeat here his analysis.

Thus, we are confident that Sw-Q regressions are statistically acceptable, and ecologically sound.

We hope that both the referee and the Editor will find this reasoning convincing.

Rafa Marcé and co-authors

Doyle, M. W., Stanley, E. H., and Harbor, J. M.: Hydrogeomorphic controls on phosphorus retention in streams, Water Resour. Res., 39, 1147, doi:10.1029/2003WR002038, 2003.

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