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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical Note: Testing an improved index for analysing storm nutrient hysteresis" *by* C. E. M. Lloyd et al.

Anonymous Referee #1

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This technical note compares different methods to quantify hysteresis patterns and introduces a new, more robust way to do so. The manuscript is well-organized, clearly written and potentially of interest to quite some of the readers. From my point of view, it can could be considered for publication after addressing a few minor comments:

(1) although being widely used in hydrology, the term "hysteresis" used here is formally incorrect. Hysteresis is defined as the dependence of a system output on its history of inputs (and thus on its internal state). Although discharge is a manifestation of the system state, the discharge-concentration relationships are technically no hysteresis loops but rather closed loops of a functional relationship. In addition, actual hysteresis is characterized by unique input-output relationships below and above given threshold values (e.g. Schmitt-triggers from electronic circuits as examples for sharp hysteresis).

I would therefore suggest to qualify the terminology here, for example by stating:"[...] closed loops, thereafter referred to as hysteresis loops".

(2) p.7883, l.9ff: I could not quite follow this explanation. In other words, I am not sure if the new method is capable of a more robust representation of figure-of-eight shapes. Even if using the normalized ranges, wouldn't a regular 8-shape (for the sake of the argument say for example horizontally aligned at an angle of 0 degrees) result in a HI of 0 in spite of exhibiting "hysteresis"? It would be great if the authors elaborated a bit on that and clarified this question.

(3) is there a particular reason not to show the box plots in figure two with equal y-axis scales (at least for panel ii and iv of each storm). this could more clearly illustrate that HInew is somewhat more robust.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 7875, 2015.