

Interactive comment on “High-resolution monitoring of catchment nutrient response to the end of the 2011–2012 drought in England, captured by the demonstration test catchments” by F. N. Outram et al.

Anonymous Referee #4

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This manuscript reports the detailed information on N and P concentrations collected from three DTC catchments in England using on-site monitoring equipment, during the high flows in late April 2012 that followed an extended period of drought conditions. The data collected are of high quality and demonstrate a number of interesting features of the catchment responses.

However, having read the ms I was left uncertain as to the main purpose of the manuscript and whether the data presented merited publication in a high level inter-

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national journal in its current form. My primary concerns are listed below:

(1) The introduction contains a lot of superfluous information on the background to the DTC catchments. I would see this as being of limited relevance to the main thrust of the study. The key point would seem to be the existence of three catchments instrumented with similar equipment and representative of rather different landscape types.

(2) The modelling of nationwide rainfall patterns for the study period would seem to be of limited value/relevance. Representative rainfall records from each of the catchments would seem to be all that is required. By focussing on a short period as distinct from a longer time series, the rainfall data presented obscure the important difference in antecedent conditions between the Wensum and the other 2 catchments (see below). I would like to see rainfall records covering a longer antecedent period.

(3) The reason why attention focussed on the nutrient response of the catchments at the end of a drought period and the importance of the findings is not made clear. Is there a suggestion that such events are critical in terms of ecological impact or that changing weather patterns in the UK could make such conditions more common and that an improved understanding is therefore required?

(4) The basis for the comparison presented is not entirely convincing. The absence of N data for the Eden would seem to be a major problem, if the intention is to compare the response of different landscape types. It is important to know how the N concentrations in the Eden catchment responded to complete the story. This gap represents a large hole in the study. I was also not convinced that the antecedent conditions in the three catchments were very similar. Fig. 4 indicates that the antecedent flows for the Wensum were flows equalled or exceeded <10% of the time, whereas the equivalent values for the Eden and Avon were 60% and 80% respectively. This latter discrepancy makes the comparison dubious.

(5) If the purpose of the study was to provide an improved understanding of post drought catchment response, there would seem to be a need to compare this response with the

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more standard storm period response at different times of the year. Looking at the post drought period essentially in isolation would seem to be of limited value. I would also like to see detailed records of flow and nutrient concentration for the entire 2012 year presented in order to demonstrate precisely how the post drought response fitted into the longer term response. The 'duration curve' data are of limited value in this context. How does the hysteretic behaviour of the post-drought periods compare with that at other times of the year? The three catchments would seem to offer far more scope for comparison than that attempted in the study reported.

(6)The relevance of the analysis of hysteretic behaviour to the overall purpose of the study is not entirely clear and needs to be explicitly stated. If it is going to be included, there would appear to be a need to relate the post-drought behaviour to the hysteretic behaviour at other times.

(7)Towards the end of the ms attention shifts to emphasising the value of the detailed data provided by the onsite monitoring equipment. This introduces a different topic which needs to be treated more fully if it is important. Is the equipment used really so novel? Details of its calibration and the accuracy and precision of the measurements and the data recovery success need to be reported. The lack of N data for the Eden during the events under consideration could suggest that there were large gaps elsewhere in the record.

(8)There is a great deal of rather vague inference regarding flow paths etc and comparisons between the different catchments. This is based primarily on analysis of the hysteretic behaviour and it is well known that such analysis is far from definitive. More rigorous analysis is required to confirm the interpretations presented. To be meaningful such inferences ideally need to be confirmed by analysis of the behaviour of other geochemical parameters and particularly isotopic tracers capable of distinguishing old and new water etc. This raises issues of the purpose of the DTCs. If they aim to quantify the effectiveness of mitigation measures in terms of % change etc the instrumentation installed should provide useful results, but if the aim is to understand the response of the

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different catchments a more comprehensive monitoring strategy is arguably required.

(9)As indicated above, there is much subjective inference regarding contrasts in the response of the different catchments to the post-drought wetting. It was far from clear how the suggestion that the TP response of the Eden catchment was transport controlled was justified. If much of the P was PP derived from surface sources it would seem almost certain that this would be supply limited rather than transport limited. Lack of exhaustion is not in itself evidence of lack of a supply limitation.

(10)I was expecting some discussion of the extent to which the results presented conformed to other studies or existing understanding and thus their wider importance/significance.

(11)I am not familiar with the geology of the study catchments, but I found the reference to a clay layer underlying the Chalk and Greensand unclear. Are you referring to these rocks being underlain by clay strata or simply the existence of a clay layer at their base? More generally, I would see a need for a fuller description of the three catchments so that readers can link the results to the catchment characteristics more fully.

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