

Review of the Manuscript [Manuscript # HESS-2015-362]:

**"Quantifying the Nutrient Flux within a Lowland Karstic Catchment"**

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**Summary**

The manuscript presents a detailed analysis of nutrient contamination and governing processes for several turloughs in a karstic catchment in Ireland. The authors applied a calibrated mixing model (published in a previous study) defining the hydraulic conditions within these turloughs. An extensive set of hydro-chemistry data sampled in the turloughs, rivers and groundwater wells was used to analyze mixing of different sources within the turloughs. The hydraulic model was used to test nutrient flux hypotheses.

**General Comments**

The subject of the manuscript is within the scope of "HESS" and could be potentially interesting/ have impact for hydrologists working in the fields of karst hydrology, groundwater hydrology or ecohydrology. The language within the manuscript is well-written (from my point of view as a non-native speaker), but there are several points that require more clarification:

- First, there is no clear research question or hypothesis, which introduces the analysis and guides the reader through the manuscript: "In this study, the nutrient flux... was investigated..."; "Hence, the aim of this research was to investigate the nutrient flux within a series of such protected turloughs ... whilst also examining the nutrient flux within the overall catchment surrounding them."

These aims are very open and not specific enough to understand the concept and ideas behind this paper. The presented concepts of the different turlough systems could be used to generate such a conceptual frame for this study (and the study should focus on these systems alone).

- This unclear statement of research can be found throughout the manuscript. It took me quite a while to read the paper completely, though there was no clear lead to follow through the text. This means the paper needs to be restructured regarding clear objectives such as "...the mixing behavior of different turlough systems". The chapters should not be structured according to the variables analyzed within a chapter, but rather regarding the processes presented in a chapter.

- Regarding the nutrient fluxes in the streams this paper did not shed enough light on governing processes. I suggest as treating them just as the upper boundary of the studied turlough-systems.

- I do not understand why the authors did not compare water level changes and concentration changes in the different turloughs quantitatively? There should be shown if +/-changes of water tables and concentrations are interlinked.

- There is no proper comparison of modelling results and observations. The authors state first (p 16, 124) that they compare the modelling results to the field data. Whilst on p17,122 they state that observations could not be compared directly to the modelling results. They even avoid plotting modelling results and observations together in one single Figure (this could be done by normalizing the concentrations). Nevertheless they draw conclusions from the modelling and the literature. This could have been done without any of the field data. In this context it is not clear to me, how the authors could identify denitrification processes within the data (the decrease of concentrations could be caused by mixing processes as well: slower inflow of GW with low nitrate concentrations into the turlough combined with faster outflow of "high" concentrated turlough water).The authors have to find a way to compare the information in the data with the information in the model.

Overall, I recommend publication after major revisions.