Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-138

Anonymous Referee #2

Referee comment on "Impacts of different types of El Niño events on water quality over the Corn Belt, United States" by Pan Chen et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-138-RC2, 2022

The authors investigated different impacts of two El Niño events on water quality over the Corn Belt region of US. The authors find that different El Niño events have different impact on TN and TP levels in the water on both annual and seasonal scales and these impacts are mainly driven by the changes of precipitation, as well as evaporation to a lesser extent. The manuscript is well written. The method of this study is solid and the results are well presented, providing new insights to the community. However, this paper needs some revisions before the acceptance for publication.

- The Corn Belt region is agricultural important. However, this is not clearly seen in the *introduction* section (Line 33-39). The authors need to added some sentences to describe why Corn Belt region needs your attention or why the water quality in this region is important, e.g., agriculture production/corn production, the fraction compared with the whole US. Besides, will a higher level of TN and TP in streamflow benefit agriculture or damage agriculture? These background information are missing, but imperative to the readers to highlight the importance of your study.
- Section 3.1.1 (1), a significance test is missing. Besides, why the results are shown in a table while for the results on seasonal scale (3.1.2 (1)) are displayed in bar plot? Maybe the authors should keep them consistent, all showing in bar plot. For the bar plot, an error bar should be added to show the spread.
- How the Monte Carlo test is performed in your study? This is also missing in the *methods* section.
- More description of the model is needed. For example, what is the forcing data of the model? Does the forcing data include the two El Niño events? The resolution of the model?
- On seasonal scales, the authors find that the changes of nutrients level are stronger in spring and summer. However, El Niño is usually strongest during winter. Is there any explanation for this delay?
- Line 327-328, in CP-ENYs, temperature decreased insignificantly, but evaporation

increased significantly. Is there any explanation for this phenomenon, as by intuition, evaporation should decrease as temperature decreases.

- The authors identify that precipitation is the most crucial factor that influencing TP and TN concentration by controlling runoff. Does irrigation have an impact on runoff or nutrient level?