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Interactive comment on "Shifts in stream hydrochemistry in responses to typhoon and non-typhoon precipitation" *by* Chung-Te Chang et al.

Anonymous Referee #1

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Chang et al. present work from four small watersheds in northern Taiwan and report stream and precipitation hydrochemistry data over a 3-year period that encompasses 11 typhoons. It is an interesting dataset and I largely think that the methodology is adequate to answer questions related to differences between typhoon and non-typhoon hydrochemistry. There could be issues associated with using the drainage-area ratio method in watersheds with different land-uses, especially during higher flows and for watershed comparisons, but it might not matter too much for the internal hydrochemistry dynamics. The differences between the typhoon and non-typhoon hydrochemistry are striking, but also not unexpected, as storm hydrochemistry often differs from baseflow hydrochemistry. What I am missing, though, is a general discussion

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WHY these pronounced differences exist (or at least an attempt at an explanation). Because of this the manuscript feels incomplete and I would not recommend publication in its current form. I would suggest the authors alter (or add to) the discussion to include possible explanations for the stark differences in typhoon and non-typhoon hydrochemistry response. Origin and fate of the water constituents should be discussed in more detail (or, for that matter, at all). Pre-typhoon conditions might matter for nutrient mobilization and typhoon runoff ratios (rather than total streamflow) could also help in interpreting the data. Are there precipitation or streamflow thresholds that change the delivery dynamics of nutrients? How might the activation of different flowpathways or water sources contribute to the differences? Please find below some more comments/suggestions.

P3 L5: Based on size, it would make sense that F1 is a 1st or 2nd order stream. However, the drainage network in Figure 1 suggests it might be a 3rd order stream.

P3 L9-10: Were the samples also analyzed within 24 hours of sample collection?

P3 L15: What is the topographic relief in the F1 watershed? Is it large enough that orographic precipitation differences should be considered?

P3 L17: The drainage-area ration method assumes similar watershed characteristics and runoff generation mechanisms. Considering that A1 and A2 have a considerable amount of agricultural area, runoff generation mechanisms are likely different, which would call into the question the comparability of streamflow volumes.

Table 1: I am not sure I understand the difference between the accumulated and total precipitation (and streamflow) values. The accumulated values are the values for just the typhoon days, while the total values are the values for the entire typhoon week? That means precipitation was measured at sub-weekly intervals and later aggregated to weekly values? This is not immediately clear from paragraph 2.3.

P4 L4-18: It would be important to have more basic hydrologic data in this paragraph.

For starters, I am missing streamflow hydrographs for the study periods. For a better overview of the general hydrologic conditions. This paragraph and Table 1 contain data to calculate typhoon runoff ratios (the amount of precipitation that becomes runoff over a period of time: streamflow/precipitation), but it would also be interesting to see annual runoff ratios for the watersheds with and without the typhoon periods. Assessing pre-typhoon conditions might also be helpful for interpreting the different response between typhoon and non-typhoon periods but also the variability within the typhoon responses.

P4 L17 and Figure 2: Record over what time? What are the "5, 8, 9, and 9 typhoon weeks" and how are they shown in Figure 2? What do the dashed lines in Figure 2 represent?

P4 L14-18: This whole paragraph is about hourly intensities, not precipitation totals.

Table 2: It's good to list the regression models but this could be supplemental information in my opinion.

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