

## ***Interactive comment on “Impacts of tropical cyclones on hydrochemistry of a subtropical forest” by C. T. Chang et al.***

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My coauthors and I appreciate the comments of the Anonymous Referee #1. The following is a point-by-point response to the comments.

1. Page 4544, Line 8: “quaintly” should be “quantity”

We thank the reviewer and corrected it.

2. Page 4547, Line 17: “Proportionally more H<sup>+</sup> (26%)” should be “Proportionally more NO<sub>3</sub><sup>-</sup> (42%)” 26% is within the range of 26%-37%.

We thank the reviewer for picking up this mistake. We double checked the statistics and found that it should be changed to “Not surprisingly proportionally more NO<sub>3</sub><sup>-</sup> (42%),

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and less H<sup>+</sup> (26%) and Ca<sup>2+</sup> (20%)...”.(lines 256-258) Because of this change we also modified the preceding sentence to “. . .except for NO<sub>3</sub><sup>-</sup>, H<sup>+</sup>, and Ca<sup>2+</sup>”.(line 256) Note that although the proportion for SO<sub>4</sub><sup>2-</sup> is also 26% it varies widely among the 6 years and the difference is not statistically significant.

3. Page 4547, Line 22: “except for NO<sub>3</sub><sup>-</sup>” The ratio is also large for NH<sub>4</sub><sup>+</sup>. We checked the statistics. Although the ratio is also larger for NH<sub>4</sub><sup>+</sup> it is not statistically significant.

4. Page 4548, Line 16 (also Conclusion 2): “storm rating system that includes rainfall would be far more useful” National Weather Service (CWB of Taiwan) issues a quantitative precipitation forecast (QPF) along with any typhoon forecast, which is a more detailed rainfall forecast for the specific region affected by typhoon. I do not think the storm rating with rainfall is better than QPF, although the skill of QPF should be improved further in the future. Authors should write what can be done to reduce the impact of typhoon on the eco-system if a better rainfall forecast is available.

We agree that the quantitative precipitation forecast (QPF) issued by the Central Weather Bureau of Taiwan is a detailed rainfall forecast for the specific region affected by a typhoon and could more accurately predict typhoon-induced precipitation. However, both in Taiwan and other tropical cyclone affected regions the cyclone rating systems are almost always based on wind velocity. Here we try to make the point that these rating systems are not very useful in predicting the effects of tropical cyclones on ecosystem hydrochemistry. Although the QPF could more accurately predict the tropical cyclone impacts associated with rain it would be most effective if it were complimentary to existing systems (or included) and not used as a substitute for the current wind-based rating system. We propose that these wind-based classification systems must include rainfall to make them more useful in predicting impacts on natural and perhaps also human systems. We are not arguing that rainfall-based rating systems would be better. We also agree that it would be useful to suggest measures that could be taken to reduce typhoon impact on ecosystems, but that is beyond the scope of this project as it would involve engineering. The current study focuses on improving our

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understanding on the impacts, not how to minimize the impacts.

5. Page 4549, L26 (also in conclusion and abstract): “10kg $\text{ha}^{-1}\text{yr}^{-1}$  (25% of total output)” Where does this number come from? It is not consistent with Table2, in which the number is 15 kg $\text{ha}^{-1}\text{yr}^{-1}$  (40% of total output).

First, as pointed out by the second reviewer, the numbers should be for  $\text{NO}_3^-$  not  $\text{NO}_3\text{-N}$  and we corrected them. Second, the watershed exported 15 kg  $\text{ha}^{-1}\text{yr}^{-1}$  during typhoon period as shown in Table 2. However, on an input-output budget the watershed lost approximately 10 kg  $\text{NO}_3^- \text{ha/yr}$  (15-4.9) during the typhoon period. To make it clear we modified the sentence to “. . .the net loss (output – input) of, on average, 10 kg  $\text{NO}_3^- \text{ha}^{-1}\text{yr}^{-1}$  during the typhoon period (9.5 d  $\text{yr}^{-1}$ ) could be important as it accounts for more than 1/4 of the annual output (36 kg  $\text{ha}^{-1}$ ) occurring at an average rate of 1 kg  $\text{NO}_3^- \text{ha}^{-1}\text{d}^{-1}$ ” (lines 311-313) With this modification we hope the meaning of the sentence is now clear.

6. Page 4553, Conclusion 5: Authors have shown a considerable impact of typhoons on the variation of nutrient, but have also shown a large resilience of the streamwater chemistry. I wonder if the authors conclude that the final impact of the typhoons on the forest eco-system is not so large because of the resilience, or even though the impact is still large and need to do something to reduce the typhoon impacts.

We thought that the first and third conclusions, which describe that the typhoons contributed 30% of the input and output of water and many nutrients, highlight the very substantial impact that typhoons have on ecosystem hydrochemistry. In Conclusion 5 we are trying to summarize the response of the studied ecosystem to typhoons, both in terms of resistance and resilience. As for doing something to reduce the typhoon impacts, again, that would be interesting but is beyond the scope of our study.

We also provide a PDF version of this response and the format of the fonts that appears awkward should appear correctly in the PDF file.

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Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/10/C2867/2013/hessd-10-C2867-2013-supplement.pdf>

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