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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "Uncertainty in acquiring elemental fluxes from subtropical mountainous rivers" *by* T. Y. Lee et al.

**Anonymous Referee #2**

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General comments:

This paper does not provide much new contribution to scientific progress, as most of the results have been shown in prior papers discussing streamwater constituent load estimation techniques and small watershed studies with similar issues of hydrologic flashiness. Much of the discussion's findings reiterate results of these other studies, and there is a lack of references to these studies. The most interesting part of the paper is its discussion regarding the strategies for determining sampling requirements versus error for the various constituents. But the major shortcoming of this analysis is eluded to in the discussion and conclusion: Flow-stratified sampling would be a much better sampling approach for reducing errors in load estimates with much fewer sampling

requirements. I don't understand why the authors chose to focus on an analysis of a fixed-frequency sampling approach (plus event-based sampling of 4 typhoons at one site) with a random sub-sampling approach and then conclude that fixed or random sampling is not the appropriate approach to take with these load estimation methods (which is previously known). Instead, the authors could have advanced the science by testing some more reasonable flow-stratified sampling approaches that they have concluded are more ideal.

The paper is generally technically correct and contains good quality and choice of figures and tables. But the title, abstract, and introduction all suggest aspects of the study that are not ultimately addressed in the paper. That is: 1. what did one learn from the inclusion of the event-based sampling at one watershed, and; 2. what are the unique challenges regarding errors in load estimates for subtropical mountainous rivers? The paper is poorly written, as there are many occurrences (even in the all-important abstract) where the tenses of words are wrong, where the wrong singular/plural is sues, and where wrong word choices are used – the paper needs to be edited.

Specific comments:

1. From the title, abstract, and introduction, it appeared that one focus on this paper was that the hydrogeology and chemistry of the subtropical mountainous rivers are not well studied and their responses might differ from other smallish mountainous watershed around the world. But the authors don't really address whether the results from this study are similar to other steep watersheds, or unique. It appears to me that the results, in general, are not that much different – some constituents dilute, some constituents increase concentrations with increasing streamflow, and some constituents don't have a strong relation with streamflow. Also, other small watershed studies have shown the importance of event sampling. Whether the results of this study are similar or different to other watersheds, the comparison should be addressed.

2. It is not clear to me how the event-based sampling during 4 typhoon events for the



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one watershed were incorporated into the analysis. Table 1 does not indicate the presence of these samples in the analysis. There appears to be no affect of including these samples in the analysis in any of the figures (that is figures 5-7). I would have expected that if there was a significant number of event-based samples with-respect-to the number of fixed-interval samples, the random sampling approaches would change the bias for the DA method and adjust the results of the FW approach towards that of high flow samples since a random sampling of the mixed-frequency samples would have more high-flow samples than expected than for samples collected randomly through time. Furthermore, I see no discussion of what these event-based samples added to the analysis, whereas they were indicated to be an important aspect of the study in the abstract.

3. The use of the reference flux is less than satisfying. I understand your argument that the sampled days generally represent the observed hydrologic conditions – but this is not sufficient for station D – and this is not further addressed. A result of this, as you later state, is that obviously the load estimates will always converge on the reference flux when you use the FW method, as you are just using a subset of the population – and when the subset of the population is big enough, it represents the population.

4. Seems silly to do a random sub-sampling of the samples – this creates datasets that are very unlikely to occur. Researchers either do fixed-interval sampling or some sort of hydrologically based sampling. Should choose sampling scenarios that are realistic.

5. Might have been better off to see how well one could estimate loads during the typhoon events with various sampling schemes. Then estimate what contribution the typhoons contribute to the overall annual loads to assess the importance of the errors during the typhoons.

6. Need to clearly state that all these errors are for the 3-plus year periods, and that the errors for shorter periods are likely to be greater – due to the serial correlation of the streamwater solute concentration that are likely to be observed.



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Technical corrections:

1. In introduction, state that Oceania represents 12% of global water discharge to indicate the importance of studying subtropical mountainous rivers. This argument is flawed, as not all of Oceania is made up of subtropical mountainous rivers.

2. The term “Monte Carlo simulation” refers to the use of an artificial dataset created with known statistical error added to the dataset. You are doing a sub-sampling experiment sometimes referred to as a bootstrap experiment.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 7349, 2009.