Biogeosciences
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Discussions

Interactive comment on "Effects of different N sources on riverine DIN export and retention in subtropical high-standing island, Taiwan" *by J.-C. Huang et al.*

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This paper has two merits: The first one is to provide information about one of the highly populated watersheds in the world, with a tremendous level of N contamination. The fact that about 30%-50% of human-induced N would be ended in rivers. That is extremely interesting, given that different findings have been achieved when we compared with similar research in other watersheds. The second one is that the authors can enhance our understanding of factors controlling riverine N exports through the comparison among different watershed groups. Overall, I enjoyed reading this paper and believe that it will make a nice contribution to Biogeosciences. However, the

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methodology used in the study is a little bit different from previous studies, although the discussion is sufficient and the conclusion is noteworthy. In this study, atmospheric N deposition, fertilizer N and human emission was summed as total N input. But this method could be subjected to high error. The commonly used method is NANI methodology, which was proposed by Howarth et al., (1996). NANI has been widely accepted as almost complete inventory for calculating human-induced N. NANI sums N contributions from atmospheric deposition, fertilizer application, agricultural biological fixation, and net import/export of N in food and feed to a watershed. To me, I think your N inventory is incomplete, and hence calculated N input could be underestimated. If N accounting method of this paper is quite different from other studies, how much confidence do we have with the the extremely high value of 30%-50%? I would not prefer to argue whether your methodology is suitable or not, but more discusses on the method should be guaranteed. Below, I provide some suggestions for your further consideration: (1) I cannot quite understand why you exclude N inputs of biological N fixation, food and feed imports and/or livestock excretion (usually, livestock N excretion was incorporated with the estimate of food & feed imports). Can you explain more on this? I can give you more evidence for your further consideration: (a) As you have mentioned in the paper, many of these watersheds are dominated by forestland and/or cropland. The land cover type is a little bit similar to northeastern U.S.A.. Boyer et al. (2002) had addressed that biological N fixation could be as high as 30% of total N inputs. However, one should be cautious because of the high uncertainties in the estimate of biological N fixation (Sobota et al., 2013). But this really implies that biological N fixation cannot be just omitted. (b) As a curious idea, I have checked the imported food from other countries in Taiwan. High amount of food (e.g., more that 1 million tons of wheat) was imported annually. In part, this number addresses that N inputs through this source should be significant. You can refer: http://faostat3.fao.org/browse/T/TP/E. More evidence could be seen in other similar watersheds. For example, in Huai River Basin of P.R. China (Zhang et al., 2015), which is also highly populated watershed, about 70% of land cover in this watershed is cropland. Even so, this watershed was

still relied on food and feed import. Hence, I believe food and feed imported N may be also significant in Taiwan. (c) You should mention more on why you exclude feed N (i.e., livestock excretion N). The number is expected to be very small? Can you provide more evidence? (2) About the analysis on the impacts of N inputs on DIN, some individual research on nitrate or ammonia could be helpful. I listed some of them for your consideration (please see below).

Boyer, E. W., et al. (2002). "Anthropogenic nitrogen sources and relationships to riverine nitrogen export in the northeastern U.S.A." Biogeochemistry 57-58(1): 137-169.

McIsaac, G. F., et al. (2002). "Relating Net Nitrogen Input in the Mississippi River Basin to Nitrate Flux in the Lower Mississippi River." J. Environ. Qual. 31(5): 1610-1622.

Zhang, W. S., et al. (2015). "Anthropogenic point-source and non-point-source nitrogen inputs into Huai River basin and their impacts on riverine ammonia–nitrogen flux." Biogeosciences 12(14): 4275-4289.

Sobota, D. J., et al. (2013). "Reactive nitrogen inputs to US lands and waterways: how certain are we about sources and fluxes?" Frontiers in Ecology and the Environment 11(2): 82-90.

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