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Interactive comment on "Speciation and dynamics of dissolved inorganic nitrogen export in the Danshui River, Taiwan" *by* T.-Y. Lee et al.

Anonymous Referee #2

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This paper presents a nice example of the propagation of dissolved inorganic nitrogen (DIN) concentration and the interaction between the different forms. There are 20 stations with measurements of nitrate, ammonium, nitrite and dissolved oxygen in the Danshui river (Taiwan). The authors are trying to explain the pathway of nitrogen from upstream to downstream. They also couple these observations with anthropogenic factors like population density, percentage building area, land-use (agricultural and natural) and water flows.

The presentation quality is fair. There are 6 tables and 7 figures, which give a nice presentation of the results and data used. In general i can follow the way the conclusions are obtained, but some conclusions are in my opinion 'a step too far'. The text needs major improvement to clarify or be more precise and less speculative.

General remarks This study is performed on a river basin of 2726 km2. This area is comparable with one grid cell of 0.5 * 0.5 degree. I believe that global models, like for example Global NEWS, can only be used at a regional scale like continents and a number of rivers which have an area of at least 10000 km2. Using results of a global model on rivers with a basin area like the Danshui River is not within the scope of global models. The idea that this river could be an estimator for Oceania is doubtful. This needs to have more explanation and underlying facts. Method RV is influencing the results. It needs a second thought whether this approach is needed here. The measurements are more than 10 years old. Are there no additional measurements (for example from the EPA) to show some trends? I miss the supporting information with all the measurement data and background parameters used. I think this is essential.

Technical remarks pp 2498-2499: "have emitted doubled". I don't understand this. Pp 2499, 11: Give a more precise definition of Oceania. Pp 2499, 16: change yet into they Pp 2499, 25-26: Why the reason "and has relatively well resources for river studies". Remove. Pp 2500, 4: city into City Pp 2500, 5-6: The findings .... rivers (references). I don't have seen any information to confirm this sentence. Remove. Pp 2500, 9-11: "most of global models may have very likely underestimated DIN export in the Oceania" This is too general formulated. Specify this or remove this highlight. Pp 2500, 9 – 13. It seems to me, that this is a result. So move to results or discussion section. Paragraph 2.2. It is not clear to me, when the measurements are taken. In table 2 there are 8 or 9 measurements. But here (line 21) is mentioned "monthly" and "the same as EPA" and in 2003. So 8 or 9 can not cover the year 2003. In combination with lines 16-19 about the typhoons, i have concerns about the coverage over the year 2003. Could you please clarify this? Pp 2500-2501, 26-1: Community development ...coal mining. Nice to know but irrelevant. Remove. PP 2502, 1-12: Is temperature or land-use a factor in converting precipitation into discharge? This paragraph is very general description. It is an important step. Please make it more specific. In flux calculation you realise that there uncertainties involved. But for discharge, there are also uncertainties. Give also some information about this. PP2502, 1-12: Table 1 is missing the upstream

area for each station. Add it. Pp 2502, 26 Change nitrate into DIN. Pp 2502-2504, paragraph flux calculations. Make this paragraph shorter. Move equations and further explanation to supporting information. Pp 2502, 15: Change “water” in “DIN”? Pp 2502, 17 : Change weighted into weighed pp 2504, 5-13: Text does not match with formula C=aQB. Make consistent with formula 4. I do not understand the RC method. First it appears that it is used to make discharge on a daily bases, but in eq. 4 it gives an DIN flux. It is used on small mountainous rivers. Is that the case here? What is the value of a and b? This method does not make any sense. This formula is generally used to estimate discharge, but here it looks that DIN is generated. Pp 2504, 24: 1593 – 2569 mm is not consistent with 2500-4000 mm (pp 2500, 18)? pp 2504-2505, 18 – 3. To me, this is not a result. Move to section 2. pp2505, 4: The discharge in terms of runoff is very confusing. Pp2505, 6: What is rho? Pp 2505 and further. Change runoff depth into runoff. Pp2505, 4-7. I don’t understand why S05, S07 and S12 are removed. Is this due the downscaling of discharge to a daily bases? How is it possible to have more discharge than precipitation? Could you explain this more? Pp2505, 20: except D03. I think it would help when the load (kg N) is also presented in table 2. This could clarify this. Or not? Pp 2505, 17: I miss in section 2 the description of the population numbers and population density. Add it. Pp2505, 17: unit of population is different than in abstract. Make consistent. Pp 2507. The dillution part and higher concentration in wet season, could be proven with a load. I hope that adding the load would clarify these issues. Pp2508, 20: Landuse. What is the source of this? What is meant by bare land? Agricultural land? Explain this. But not here, but in section 2 (data and methods). Pp2508, 21: remove and in “highly and positively”. Pp2508, 26: It is not population density that regulates DIN but the activities related to population.... pp2511, 13: “A modeling work” Which? Pp2511, 27 change do into to From paragraph 4.3 including 4.4 and 4.5 i am very surprised that these paragraphs are placed here. It looks there is a description of a model development. But there are no sign in this paper, that this is the case. Besides that, these steps is “a step too far”. I have not seen any connection between this river and the whole of Oceania. This river is too

small to compare this work with some global models. It does not make any sense at all. Going from river measurements to budgets is very speculative. There are no other sources used to provide more basis for this story. So i think skipping these paragraphs and rewriting the conclusion is an important improvement for this paper. I have stopped here to give detailed comments.

Interactive comment on Biogeosciences Discuss., 11, 2497, 2014.