

Interactive comment on “Carbon and nutrient export regimes from headwater catchments to downstream reaches” by Rémi Dupas et al.

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Received and published: 22 August 2017

1. Some structural issues have to be resolved: parts of the site description already appear in introduction and some interpretations are already made in the results section. Response 44: We have partly followed this recommendation. The small paragraph presenting the sites in the introduction was deleted, and the paragraph about stoichiometric ratios was moved to the Methods (see also response 17, referee 4). However, the sentence describing hydrological regimes was maintained in the results because there is no section in the discussion to describe climate and hydrology. In this manuscript, we focused the discussion on how climate and hydrology influence solute export regimes, so description of hydrology belongs to the context rather than to the discussion. The sentence saying that export regimes are rather chemostatic was also

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kept in the results because this is not purely a discussion point in this manuscript (the discussion on this topic is an interpretation of the export regimes in terms of sources, flow pathways, etc.).

2. At some point a table with an overview of attributes of the 5 catchments might help to improve the site description and a flow chart elaborating the methodological flow might improve the elaboration of the general scope of the methodology Response 45: We have added such a table and flow chart in the supplementary information.

3. The first two subsection of the discussion are a bit long and could use some more reference to the work of others. In contrary to that subsection 4.3 and 4.4 are very valuable as they describe possible implications and limitations of this work. Response 46: In the revised manuscript, these two subsections include nearly 25 references and among them 16 are from different research groups and different countries; 5 are from the TERENO observatory but not necessarily the same authors and 4 are from the same authors but different sites. The somewhat high percentage of TERENO references in the discussion is because we wanted to discuss the interpretations that we made from the present top-down analysis with process studies from the same or similar research sites. Additionally, in the revised manuscript, we have added references from various countries (Sweden, Zambia, Austria, UK, Belgium, Peru, USA, France, Ireland). The manuscript now exceeds 60 references. Baronas, J. J., Torres, M. A., Clark, K. E., and West, A. J.: Mixing as a driver of temporal variations in river hydrochemistry: 2. Major and trace element concentration dynamics in the Andes-Amazon transition, *Water Resour. Res.*, 53, 10.1002/2016WR019729, 2017. Bishop, K., Buffam, I., Erlandsson, M., Folster, J., Laudon, H., Seibert, J., and Temnerud, J.: Aqua Incognita: the unknown headwaters, *Hydrol. Process.*, 22, 1239-1242, 10.1002/hyp.7049, 2008. Dupas, R., Mellander, P. E., Gascuel-Odoux, C., Fovet, O., McAleer, E. B., McDonald, N., Shore, M., and Jordan, P.: The role of mobilisation and delivery processes on contrasting dissolved nitrogen and phosphorus exports in groundwater fed catchments., *Science of the Total Environment*, 1275–1287, 2017. Hartmann, A., Kobler, J., Kralik,

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M., Dirnböck, T., Humer, F., and Weiler, M.: Model-aided quantification of dissolved carbon and nitrogen release after windthrow disturbance in an Austrian karst system, *Biogeosciences*, 13, 159-174, 10.5194/bg-13-159-2016, 2016. Herndon, E. M., Dere, A. L., Sullivan, P. L., Norris, D., Reynolds, B., and Brantley, S. L.: Landscape heterogeneity drives contrasting concentration-discharge relationships in shale headwater catchments, *Hydrology and Earth System Sciences*, 19, 3333-3347, 10.5194/hess-19-3333-2015, 2015. Lambert, T., Teodoru, C. R., Nyoni, F. C., Bouillon, S., Darchambeau, F., Massicotte, P., and Borges, A. V.: Along-stream transport and transformation of dissolved organic matter in a large tropical river, *Biogeosciences*, 13, 2727-2741, 10.5194/bg-13-2727-2016, 2016. Minaudo, C., Meybeck, M., Moatar, F., Gassama, N., and Curie, F.: Eutrophication mitigation in rivers: 30 years of trends in spatial and seasonal patterns of biogeochemistry of the Loire River (1980-2012), *Biogeosciences*, 12, 2549-2563, 10.5194/bg-12-2549-2015, 2015. Temnerud, J., von Bromssen, C., Folster, J., Buffam, I., Andersson, J. O., Nyberg, L., and Bishop, K.: Map-based prediction of organic carbon in headwater streams improved by downstream observations from the river outlet, *Biogeosciences*, 13, 399-413, 10.5194/bg-13-399-2016, 2016. We acknowledge that these two subsections are a bit long to read but we did not manage to reduce the size without losing a key step in the demonstration (or skipping one of the three solutes or five catchments). However, the improvement in the writing enabled by this review should make this part of the manuscript easier to read, especially the long sentences that we have split.

Please find again some more specific remarks in the attached pdf (and please ignore the comments that were already addressed after the initial review). Response 47: Our responses to the detailed comments are attached.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-82/bg-2017-82-AC1-supplement.pdf>

Interactive comment on *Biogeosciences Discuss.*, <https://doi.org/10.5194/bg-2017-82>, 2017.