

Interactive comment on “Nutrient dynamics, transfer and retention along the aquatic continuum from land to ocean: towards integration of ecological and biogeochemical models” by A. F. Bouwman et al.

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The authors thank the two anonymous reviewers for their constructive comments. We gratefully accept all suggestions, and the these changes in the revision will be real improvements, especially the issues addressed in the reviews that were not adequately represented in the earlier text.

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Below we address the specific comments.

Reviewer 1.

- Reviewer 1 observes that section 2 has no references. We inserted the references as included in Table 2 in the corresponding paragraphs. The references to the ecology concepts are now both in the summary table 1 and the text. - Section 4: we will revise the text and removed references to “our model framework”. We present a plan that requires an enormous effort to become reality. - Reviewer 1 observes that a number of important processes need to be addressed in more detail. We will therefore extend the discussion in section 4 on processes and modelling of the following processes: -weathering (see 4.2.3 first paragraph, second sentence; and the last paragraph); -biogeochemistry in riparian zones (see section 4.2.5, first paragraph); -retention in dams and reservoirs (see new section 4.3.2). Table 2 now explicitly includes dams and reservoirs.

Reviewer 2.

Reviewer 2 asks for a better balance between the various issues raised in the paper. Specifically, reviewer 2 argues that a major missing element in the description of the concepts in section 2 are hydrogeomorphic frameworks; furthermore, in section 4 carbon and particulates are underrepresented, and that the recognition of large-scale and significant landscapes is weak or inconsistent (particularly large floodplains, mountain watersheds, and high-latitude processes). Then reviewer 2 also provides detailed suggestions, including some references, to repair this imbalance. We will address all these suggestions as follows:

-Add a paragraph on hydrogeomorphic concepts (section 2.8).

-Regarding the floodplain processes we will extend the text on the hydrology (4.1) highlighting floodplain inundation, and will add a section 4.3.4 on Floodplain sediment and POC deposition, next to 4.3.3 Bank erosion and sediment transport. We will also

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clarify our definition of riparian zones in relation to floodplains in the introduction.

-The importance of mountains will be stressed in the hydrology section (4.1, second paragraph in the middle), and the delivery of sediment and nutrients to streams (4.2.1).

-In the revision, carbon will be discussed with much more detail, focusing on the delivery (4.2.1), in-stream biogeochemistry (4.3.1); the discussions will also focus on the transformations that take place between the particulate, dissolved and gaseous phases, and both particulate carbon and particulate nutrient forms will be given more attention.

Finally, Reviewer 2 thinks that the paper is too ambitious for a single manuscript; the suggestion is to split the paper in two: one on the ecological concepts, and the other on the integrated model approach.

One of the intentions of this paper was to link the existing ecological concepts with current approaches for river biogeochemistry modelling, and unite them in the plan for the development of a new integrated approach. Although with all the suggested additions the text has become even longer than it was, we are still content to have all the concepts and information together in one paper and feel that the paper will be useful to many researchers from multiple disciplines.

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