Biogeosciences Discuss., 3, S455–S457, 2006
www.biogeosciences-discuss.net/3/S455/2006/

Biogeosciences Discussions

Interactive comment on "Nitrogen assimilation and short term retention in a nutrient-rich tidal freshwater marsh – a whole ecosystem ^{15}N enrichment study" *by* B. Gribsholt et al.

Anonymous Referee #2

Received and published: 30 August 2006

General comments This paper describes an interesting study of the nitrogen dynamics of a freshwater tidal marsh. The novel character is mostly the approach to use in situ stable isotope spiking at the scale of a whole ecosystem. The authors added 15NH4 at the time a flood entered the marsh and measured this isotope in the outflowing flood-water and in a number of ecosystem compartments (sediment, litter, plant roots, plant leaves). The study had its limitations in space and time: only one marsh was studied, whereas the stable isotope additions took place twice, in May and September. Further, the spatial heterogeneity was tackled with a stratified design in which different habitat types were sampled with a 3-fold replication (N=3). The small number of replicates together with the strong degree of within-habitat spatial variability resulted in means

with large variances, reflected in SE values close to the mean. The data presented, therefore, should be interpreted with care and should be seen as mainly indicating the order of magnitude of the values measured. Particularly the balance calculations, where several data each having their source of error are combined or added, may suffer from 'error propagation'. This said, the results did reveal some important aspects of the nitrogen dynamics in these wetlands. The fact that only a minor proportion of the N through-flow is transferred in the wetland, the major role of the sediment and litter in assimilating N, the small importance of uptake by reed in comparison to ruderal species, the sequence of adsorption followed by microbial immobilization, are all shown by the data in a convincing way.

Specific comments The Introduction does set the stage for the paper but the writing style needs some attention. The last part of the first paragraph contains unnecessary repetitions. The second paragraph could be stated better: the sentence: "Net marshĚ " is not sufficiently clear on the meaning of 'retention' and 'balance'. Further, it is confusing that detailed outcomes of part of the study (written up in other papers) are given at the end of the introduction. It is better to state these results more in general terms (without exact figures) here. There is no mention of the importance of macrofauna in the N dynamics, and no clue is given why this component was also sampled. The introduction should end in a totally different way. It now ends with an indication of the most important results treated in the paper. It should end with the most important research questions addressed. The Methods section should be clearer in some respects. The final part of 2.1. is confusing: 12 stations, 3 vegetation types but 4 habitats, 3 replicates per type. Later, in 2.3.2., there is also mention of 3 replicates per station. Describe this sampling lay-out more precisely. In 2.3.1., explain more clearly the meaning of the subscript of T. Also, indicate why the sampling intervals differed in May and September. The second paragraph on page 1087: what does 'three specimens' mean? Is it three individual plants? Reed top shoots: do you mean reed shoot tops? In these vegetation types, the use of only three replicate quadrats with small size (30x30 cm) will result in large variances in plant biomass values. The final section on Calculations does not

BGD
3, S455–S457, 2006

EGU

contain any information on statistical designs or techniques to assess variances and the significance of results regarding the 15N data. The beginning of the Results section contains information that is more appropriate for the methods, e.g., section 2.2. It is better to mention the various details on the label application there. The interpretation of Fig. 5, i.e., the enrichment of organic versus inorganic N pools, is totally based on visual inspection, which is most convincing for only a few data points. The authors should use regression techniques to test whether this is really a significant effect. The figures and tables are generally clear. Fig. 6 needs the indication of May (left diagrams) and September (right). The discussion is generally clear and well-written. A few points of attention are the repetition of the issue of the differences in labeling and hydrology between May and September (also said in the results and partly in the methods). In terms of interpretation, the authors could emphasize a little more the vertical build-up of the sediment-vegetation system as an explanation of differences in retention of the label. The litter is mostly on top, below that the roots of the annuals (ruderals) and finally the roots of the perennials (reed, willow). That probably explains the order of the degree of retention of the label. The fact that the reed roots and rhizomes retain much less than the roots of the ruderal species is understandable, because the latter have to build up their total root system from the sediment surface down during the growing season, while reed has a large, permanent rhizome-root system with internal nutrient recycling and uptake during a much larger part of the year from much deeper sediment layers. The discussion should address the issue of spatial heterogeneity and the possible propagation of errors more explicitly. In particular, it should be indicated to what degree the conclusions of the study are 'hard' quantitatively and/or qualitatively.

Interactive comment on Biogeosciences Discuss., 3, 1081, 2006.