

## ***Interactive comment on “Influence of hydrological fluxes on bio-geochemical processes in a peatland” by N. Bougon et al.***

**Anonymous Referee #2**

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### General Comment

This paper concerns a field study of the effect of hydrology and chemistry on microbial activity leading to nitrate and sulphate reduction. The authors characterize two sites along a river-wetland (peat land) system with respect to transversal gradients in chemistry and hydrology. A two-year monitoring program was set up. At site G there were only short periods during which the water table in the river was higher than in the peat land, whereas at site S there was a more or less continuous flow from the river to the wetland. This difference is believed to explain the higher nitrate removal at site S than at site G. Peat from site G also had a lower initial sulphate content and lower release rates than site S. The differences in chloride concentration with distance from the river were significant for both rivers and indicates chemical differences along flow

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paths. The authors conclude from the batch experiments that the release of sulphates cannot be attributed to a single process.

An overall comment to the study is that the flow along a river is not dominantly transversal in the adjacent land and that important gradients in hydrology and geochemistry may exist longitudinally in adjacent wetland parallel to the river. The nature of the problem is likely to be at least two-dimensional. The field sampling does not cover this aspect and this limits interpretation of the results in terms of linking water flow with geochemistry. In fact, the study would have benefited from a more formal identification of two-dimensional flow directions and sampling along flow paths. It is not clear to this reviewer to what extent the geochemical results along transects presents typical gradients in the concentrations of nitrate, sulphate and chloride.

Despite the above potential shortcoming of the study, the claims of the paper are moderate and acceptable. Possibly, one may question the news value of the main findings that biological mediation is important for nitrogen removal in water and the considerable effect of hydrological conditions on biological activity in peat.

### Specific comments

1. The author should explain why the two-dimensional nature of the flow in adjacent wetland can be neglected in the field sampling program and why the sampling transects are internally representative the geochemical gradients.
2. The author should more clearly describe the news value and contribution of this study.
3. The estimation of evapotranspiration is a dominating part of the water balance and seems to be estimated only roughly. Please, provide more comments on the accuracy and potential variability of the estimate.
4. Explain more clearly the significance of biological activity in peat on nitrogen removal. For instance, it is stated that “biotic and abiotic conditions indicates the impor-

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tance of biological mediation in nitrate removal". This is well known and it is not clear exactly what is found in this study in quantitative terms.

5. I find Table 5 dubious because I'm not convinced that the numbers are representative to the spatial and temporal variability along flow paths. It is also not clear how intermittent changes can be and if the sampling frequency is sufficient. Please, explain.

6. Would soil characteristics be important to differences in chemical processes. For instance, it is well-known that denitrification can be limited by the carbon source in many cases.

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Interactive comment on Biogeosciences Discuss., 6, 4829, 2009.