Reply to Interactive Comment by Mathias Koschorreck

RESPONSE: Thank you for your interest and for commenting on our manuscript.

In my study about nitrogen turnover in the Amazon floodplain I observed a peak of N2O (Koschorreck, 2005)and CH4 (Koschorreck, 2000) emission shortly after drying of sediments which explained more than 90% of the N2O emission during the dry phase. I did not observe an effect of rain during the dry period. I wonder if the temporal and spatial resolution of the Pantanal study was sufficient to account for such short term emission bursts.

RESPONSE: At the beginning of each field campaign in 2008 and 2009 we placed 5 flux chambers in still water-logged soil (Level 1, as described in the manuscript) at site A, site B and site C. Over the course of these two field campaigns this adds up to 20 flux chambers initially placed in still water-logged soil, which should give at least adequate spatial resolution.
We regularly measured the flux of N2O from the soil as it drained and found only low fluxes in the early drying period (corresponding to the early drying described in your paper (Koschorreck, 2005). I could not find an exact description of how often you sampled in your paper (it looks like once a day on Figure 3), and the pulse emission you describe lasted 4-5 days? Depending on the accesibility of the sites in the Pantanal we measured on the average every 2-3 days, which should have enabled us to observe such a pulse emission.

I did not find direct evidence for the influence of temporary vegetation on microbial nitrogen cycling in the soils. In the Amazon floodplain ammonium removal by coupled nitrification-denitrification after drying of sediments was much faster than plant growth.

RESPONSE: That sounds very reasonable! We found that the draining sediments were very often covered with aquatic macrophytes (as described in the manuscript), and even bare sediment had no visible plant growth (seedlings) for at least 2-3 weeks. You found that most of the inorganic nitrogen had been removed by microbial nitrification-denitrification in a matter of a few weeks, which could also have been the case in the Pantanal wetland soil had the inorganic nitrogen pool not been replenished. We observed high soil nitrate content even 170 days into the drained season and therefore suggest that ongoing mineralization of organic matter managed to replenish the inorganic nitrogen pool in the soil throughout the drained season. As much of the soil was covered with decaying plant litter early plant growth was delayed, postponing major plant-microbe competion for inorganic nitrogen and thus allowing nitrification-denitrification to consume ammonium and nitrate.

I also observed an impact of soil cover on nitrogen dynamics (Koschorreck and Darwich, 2003). The litter layer of decaying macrophytes prevented dessication and oxidation of the soil during the exposed period. In the paper of Liengaard et al it is not stated, if the litter layer was removed prior to measurements or if only sites without litter layer were chosen. Since I do not know the Pantanal very well, I am not sure how typical litter covered sites are. Some information about this issue in the paper would be interesting.

RESPONSE: This could be one of the key differences between the two systems! We believe that the aquatic macrophytes play two important roles. 1. They delay the plant growth by stranding on the soil surface as the water retreats allowing nitrification-denitrification to access the inorganic nitrogen without the competition from plant growth. 2. They supply the soil with organic matter on a seasonal cycle as the decay on the draining soil.
During the flooded season most water bodies are covered with Eichhornia crassipes and the waterways are often clogged with mats of several hundred square meters (personal observations). To the best of our knowledge litter-covered sites are very common.
Thank you for pointing out that we did not describe our procedure regarding litter in the mansucript. We have now included this in the Methods section. When the flux chambers were inserted on the first visit to each field site we removed the litter, inserted the chamber and replaced the litter in the original position. The litter layer was left undisturbed in the chambers during the field campaigns.

Koschorreck, M., 2000. Methane turnover in exposed sediments of an Amazon floodplain lake. Biogeochemistry, 50, 195-206.

Koschorreck, M., 2005. Nitrogen turnover in drying sediments of an Amazon floodplain lake. Microbial Ecology, 49, 567-577.

Koschorreck, M., Darwich, A., 2003. Nitrogen dynamics in seasonally flooded soils in the Amazon floodplain. Wetlands Ecol. Manage., 11, 317-330.