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Biogeosciences Discussions

Interactive comment on "Nitrate and dissolved nitrous oxide in groundwater within cropped fields and riparian buffers" *by* D.-G. Kim et al.

Anonymous Referee #2

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General comments:

In general this is a well written paper in which the EF5g emission factor used by the IPCC is evaluated for two riparian buffers and a cropland. The authors conclude that the IPCC methodology overestimates the flux of dissolved nitrous oxide for their study sites. However as the authors already indicate more sites from different environments have to be checked to get a full evaluation and a base to change the current emission factor. The calculations used are described in much detail and both fluxes and concentrations are studied on substantial datasets which are worth publishing.

Specific comments and questions:

Groundwater nitrate concentrations were found to be significantly higher in piezome-

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ters near the cropland compared to concentrations near the creek. Since chloride concentrations stay constant it is reasonable to assume that nitrate removal is taking place and dilution is negligible. However I do have some doubts on denitrification being the main process causing the nitrate removal in these studied zones since nitrous oxide concentrations are not changed after passage through the riparian zone while dissolved oxygen concentrations are low. As indicated by the authors in the discussion it might be denitrification but plant uptake can also contribute to the nitrate removal. Furthermore no change in pH can be observed along the flowpath. If substantial denitrification occurs often pH values increase (dependent ofcourse on the buffercapacity of the soil)

Maybe I overlooked the information but it would be nice to get some insight in the watertable elevations relative to the soil surface. The authors only give water table elevations in meters above sealevel which are used to determine the flow direction and possinle intrusion of creek water into the buffer zone. I would be nice to know if the soil in the riparian zones was saturated. Give more information on the depths of the piezometer filters. At what depth is the groundwater extracted? Is there enough organic matter in the studied aquifer to facilitate denitrification (at the depth of groundwater extraction).

The data presented in the paper consist of two series; a series from Spear 2003 with groundwater monitoring data from 1997-199 and one recent series from 2005-2008. There are some differences between the series for the multi-species riparian buffer which are not explained by the authors except for the age of the riparian buffer zone. It would be nice if the authors could indicate the mechanism behind this.

Detailed comments:

Page 654 line 19 explain here what is meant by initial nitrate concentration in the adapted EF5g concept.

Page 656 line 11 only use the USDA soil classification line 15 what is the depth of

BGD

6, S327–S329, 2009

the filter in the piezometers. Are groundwater samples taken from the aquifer or the saturated zone in teh topsoil?

line 15 I would not describe the three piezometers at the border of the cropland and the three peizometers at the creek site as three transects. It is not clear if the piezometers are connected as indicated by the dotted line. In the paper you only use the average data from the ;piezometer groups; near the cropland and near the creek.

Page 657 line 20. give more information on shaking as an equilibrium has to establish between water and headspace.

Page 660 line 9 same data?

Page 665 line 9. Is this not what you would expect based on the solubility of gasses in water?

Page 665 line 9 is this due to the same temperature effect? What direction is the relationship?

Interactive comment on Biogeosciences Discuss., 6, 651, 2009.