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## ***Interactive comment on “Nitrogen balance and fate in a heavily impacted watershed (Oglio River, Northern Italy): in quest of the missing sources and sinks” by M. Bartoli et al.***

**Anonymous Referee #2**

Received and published: 7 November 2011

Dear Professor Billen,

Thank you very much for the opportunity to review the paper by Bartoli et al. entitled “Nitrogen balance and fate in a heavily impacted watershed (Oglio River, Northern Italy): in quest of the missing sources and sinks”.

Authors have presented a very nice and comprehensive work which main objective is to have a complete picture of the N dynamics in an intensively managed agricultural catchment placed in Italy. The information presented is valuable due to the following reasons: i) Authors present a wide study including several years, many sample points, techniques and different N forms; ii) Authors combine the information resulting of dif-

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ferent approaches to properly construct an integrative picture of the N dynamics in this catchment; iii) The catchment herein studied, belonging to the Po river basin, is a highly channelized and impacted catchment where an N export record has been observed. The N loads of Po river to the sea area are producing problems of coastal waters eutrophication. The information compiled here is therefore very useful to understand and solve this problem at its origin.

I therefore undoubtedly recommend its publication in BGS.

I have, however, some suggestions, questions and minor specific comments for the authors.

Since a part of the paper is focused on point sources, I would recommend including in the introduction a sentence summarizing the contribution of point sources to N cycle alteration.

Howarth et al. (2011) have demonstrated how N fluxes are partially controlled by climate. Climate characteristics of the Oglio catchment should be provided by the authors in the catchment description paragraphs.

Howarth et al. (2011) are well cited in P9218 L14. However citation in P9204 L2 is not the most proper.

P9204L4-5. I recommend citing here one of the most classic works dealing with these aspects (Van Breemen et al., 2002 Biogeochemistry 57/58).

P 9204 (L21-27) Study objectives: This paper is not presented in the traditional way but in many sections, with their own M&M, results and discussion sections. I agree with authors and I consider that a paper of this nature is more understandable in this manner. I consider, however, that authors should clearly and separately present the aim of each one of the sections.

Section 2.1 should be presented in an individual section (Study area) apart from section 2

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Section 2.1 Proportion of arable land should be provided. Information on the type of crops should also be provided. Are there maize crops only?

P9205 L12 “consequence,water” Please include the space

P9205 L16. What do you mean with “unregulated exploitation”?

P9206 L1 Please indicate the period (2007-2010)

P9206 L5 Please include a space in rivercourse

P9206 L7 How many sites (aprox.) for tributaries?

P9206 An “increasing spatial” trend

Section 2.2 and figure 2. Authors should maintain a unit coherence throughout the paper. In P 9215 they express concentrations as mg/L. Since the results of the paper have a policy dimension, I would recommend using mg/L.

P 9207 L3. Please do not present this as an “only-one-sentence paragraph”, and include it as the first sentence in the next paragraph. Please apply the same criteria in other parts of the paper.

P9208 L9 “N mass balance between 2000 and 2008 shows that the situation did not improve over the eight years”. Not only the situation is not improving, it is clearly getting worse.

P9208 L 5-10 Has this area been declared as Nitrate Vulnerable Zone?

Section 3.3 Please re-write M&M of this section, like this it is very difficult to understand.

Fig 4. Authors comment in 3.2 section that industrial and human pollution can account for about 6% and +- 8% of the total inputs. According to point 3.3, however, the contribution of these sources can be higher, mainly in the winter. Please connect these two approaches in a new sentence.

P9210 Section 4. To which period finally corresponds the estimated annual flux?

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P9210 L18 Why do you express export as N-NO<sub>3</sub>-?

P9210 L18 A comparison of these results (I mean river export) with the values for European rivers recently summarized in the ENA report will be enlightening.

P 9210 L 25-27 “basin represents about 34% of the N surplus calculated into the watershed, which means that some 26 000 tN are somehow retained within the basin, by processes still to be identified.” These calculations are for 2008 balance, please indicate.

P 9212 L 4. Please indicate that LOI is “loss-on-ignition”

Fig 6. (Legend) “2 - Mineralized synthetic fertilizer” Do you mean nitrification + urea hydrolysis?

P9214 L 9 Are all “low-order ditches” irrigation channels?

P9214 “We extended the maximum theoretical denitrification rate all over the surface actually occupied by the ditch network (about 6250 ha) in this geographical area.” Please explain better.

P9214 L25 Do you mean again for 2008 calculations?

P9215 L 18 According to section 2.1 irrigation period is May-September

P9216 L22. Since authors entitled the section as a question form, a final summarizing sentence is needed.

P9217 L 1. As I said before, all the units should be the same, please transform to mg/L.

P9217 L 21 I recommend citing here a recent paper by Bouraoui and Grizzetti (2011; Sci Total Environ, 409)

P 9218 “even if at present no informations are available on when such N was added to the basin” Please re-phrase.

P 9218. L19-22 Please also consider here: ammonia volatilization and its effect on

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air pollution and also when it is deposited. Consider also N<sub>2</sub>O emissions and consequences on climate change.

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Interactive comment on Biogeosciences Discuss., 8, 9201, 2011.

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