

Interactive comment on “Influence of short-term transfers on nitrogen fluxes, budgets and indirect N₂O emissions in rural landscapes” by S. Duret et al.

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Response to Anonymous Referee #2

Dear Referee#2, We acknowledge you for your comments on our manuscript. We have prepared a revised version of the manuscript which takes into account all your comments. Our answers to your comments are detailed in the following.

Specific comments

Referee’s Comment: The Methods section is clearly set out, although it would be useful to include “N₂O” in the heading “2.2 The methodology to estimate indirect emissions”,

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as this part is devoted solely to indirect emissions of N₂O.

Authors' response: We thank the Referee. We have changed the end of this section since the methodology described for N₂O was also applied to calculate indirect NH₃ and NO₃ emissions. We have replaced N₂O by Nr (NH₃, NO₃, N₂O) which is more generic and makes it possible to describe the methodology for the three Nr species. Consequently, the heading of the section 2.2 has not been modified.

Referee's Comment: On p7601, lines 21-23, there is no mention of the form of N applied, although this would affect the NH₃ and NO_x emission calculations (see p 7603). Also the Discussion, on p7606, begins as follows: "NH₃ emissions from soils were 11% of the Nr inputs. This value was lower than the expected value of 37% of fertilizers applied (ECETOC, 1994)." One would hope for a more penetrating analysis here, as this old estimate of NH₃ emissions from fertilizers has been superseded by more recent studies (e.g. Sheppard et al, 2010), that take into account the differences in such emissions between nitrate-based forms of N and ammonium compounds or urea.

Authors' response: The form of N applied is described in section 2.3. We have replaced the old reference (ECETOC, 1994) by more recent references (see response to Referee #1).

Referee's Comment: The discussion of other simulated quantities, e.g. NO_x emissions and nitrate leaching, concentrates on the highest values found, but doesn't discuss the average values or how they relate to measured values either in this particular soil or other soils with similar properties; this ought to be rectified. For reasons that are not made clear, Table 1 only cites values for N₂O emissions obtained by use of IPCC methodology, instead of listing the average values obtained by the model simulation. Here, too, one would have liked to see comparisons with experimental observations in comparable conditions – or, if such information does not exist, at least a statement to that effect.

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Authors' response: The paper presents not only the maximum values but also the average values. It was not clear in the paper since we talked about total fluxes in section 3.1, whereas we present average values in kg N ha⁻¹ yr⁻¹. Referee #1 also pointed this out. This section has been reformulated according to suggestions by both Referees. We have also indicated "average" values in the caption of Table 1. Table 1 shows the average values obtained by model simulations. Table 1 was not clear since the Referee interpreted the * as a calculation of N₂O emissions by the IPCC methodology. It is right but only for N₂O emitted by farms. N₂O emitted by soils are calculated from NitroScape, especially the agro-ecosystem model. As suggested by Referee #1, the * is related to the Materials and Methods" section in which we have described the methodology for N₂O emissions (soils and farms). We agree with the Referee that it would be interesting to show comparisons with experimental observations in comparable conditions. In one hand, we have not found such observations. In the other hand, we chose to focus the paper on the ability of NitroScape to simulate Nr lateral transfers at the landscape scale and give ranges for the contribution of atmospheric and hydrological pathways to Nr indirect emissions. Comparisons between Nr measurements and simulation results are in progress for a next paper.

Referee's Comment: The two different sets of IPCC emission factors – from 1996 (discussed in Mosier et al 1998) and from IPCC 2006 – are used in an inconsistent way for the purpose of making comparisons with the outputs of the model; it would be better to indicate where these factors differ and how the simulations compare with the alternative versions.

Authors' response: The results-discussion section has been reformulated and extended as suggested by both Referees (see also response to Referee #1).

Referee's Comment: One further general point regarding style: such phrases as "The highest losses were simulated" (p 7608) are used several times. Phraseology such as "the model predicted that the highest losses would be in the east of the landscape...." would be more appropriate, and would avoid giving the impression that there were

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actual measured losses that could be compared with the simulations.

Authors' response: Phraseology has been changed as suggested by the Referee.

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