

Interactive comment on “Modelling land atmosphere daily exchanges of NO, NH₃, and CO₂ in a semi-arid grazed ecosystem in Senegal” by Claire Delon et al.

Anonymous Referee #2

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The study on nitrogen and carbon fluxes under grazing in a semi-arid region in Senegal aims to better understand their driver contributions in wet and dry seasons. The authors use field data from the years 2012 and 2013 and apply three models to derive daily time series which are evaluated against the field data. Thus, the work contributes a valuable piece of knowledge in a not-well studied system with measurements under difficult field conditions and the corresponding simulation results to evaluate the representation of processes controlling NO, NH₃ and CO₂ fluxes under these conditions.

The manuscript represents a concise and well-designed piece of knowledge on N and C fluxes in a semi-arid region, is within the scope of BG and is surely worth being

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published. Before recommending this, a major effort is needed to clarify 1) the structure of the text, 2) the methodological description and 3) the modelling concept. Therefore, I recommend major revisions. My main concerns are:

1) So far, methods, results and discussion are partly mixed and contain a large number of back and forth references. Please keep the structure more clear. E.g. in section 3.2, the role of the spatial heterogeneity represented in sampling is discussed in relation to the simulations which would better fit in the methods. The results sections contain parts in which the simulations are already discussed which could be moved to the existing discussion sections. Figure 10 is introduced in the discussion and belongs clearly to the results.

2) The methods section would benefit from an overview of measurements including the temporal resolution of the variables and a correspondence table to the simulations. Here, you could specify which simulations are compared to which measurements and why.

3) Firstly, it is clear that a model which is already published does not have to be given in detail in a new manuscript. Here, the outcome strongly depends on the details of the models applied and you give a lot of information in the appendix. Please give this information at the beginning of section 2.3 before the details of single processes are described. Here, also try to separate the basic principles from input data and variables calculated within the models. Clarify why there is the double description of resistencies (Ra, Rb, Rc) in 2.4.1 and 2.4.2. Do not mix 'parameters' with 'variables'. Parameters are fixed values in equations whereas variables stand for state variables in the models and measured values. Also here, a better overview of input data (with temporal resolution) and simulated variables is needed.

General remarks:

1) There are a lot of missing or misleading information on units, scales, subscripts. Unfortunately, typesetting needs more effort.

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2) The analysis of drivers needs more substance. Relating simulated respiration to simulated soil moisture, this shows that there is a linkage in the model, but not more. In the study region, the variation of soil moisture dominates over the variation in temperature so that this variable is more important for the processes studied. The interesting part would be to see this linkage in measured values as well.

3) The text is mostly well-written but please consider to get rid of most of the brackets. These insets can better be integrated into the sentences.

Specific remarks:

- In section 3.4, please give all the values in a table.
- Section 4.1.1 begins with a reasoning that involves something not shown. Please avoid this or give a different reasoning.
- P8L19: Typo in 'Surface-Atmosphere'
- P9L19: sentence, verb missing
- all figures: please use better colors. Blue and black lines and symbols cannot be distinguished well and having two grey lines as in figure 10 also does not help. Use red color or dashed lines.
- Fig. 1: This scheme would be a very valuable orientation. Please be more informative here. Include the input data and the variables which are exchanged. It would be good to have such an overview of the other 2 models as well.
- Fig. 3: this shows a consistent underestimation of the latent heat fluxes. This does not fit to the text stating that this is 'giving confidence'.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-366>, 2018.