

Interactive comment on “Modelling the effect of soil moisture and organic matter degradation on biogenic NO emissions from soils in Sahel rangeland (Mali)” by C. Delon et al.

Anonymous Referee #1

Received and published: 31 August 2014

The MS BG-2014-291 addresses the impact of soil moisture and organic matter degradation on biogenic NO emissions from a remote Sahel rangeland (Mali). Due to a poor NO flux validation of the modelled NO flux by field measurements (Fig. 6) and poor/erroneous methodology the MS should not be published without major revision.

1) NO flux methodology: - Is there any proof of evidence, that the emission of NO is of biotic origin? Due to a Mc Calley and Sparks (2009) abiotic processes seem to dominate the emission of NO. - The use of the terms NO emission, NO release, and NO production is misleading. Furthermore, the role of NO consumption and NO compensation point (see works from Conrad et al.) is not explained. - p. 1, line 65 recent review about pulsing (Kim et al., 2012 BG) is missing - the importance of

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canopy reduction factor (CRF) is missing - improvement of Yienger and Levy algorithm by Steinkamp and Lawrence (2013) is missing - p.3, line 180: 'NO flux data sampling' correct to: 'Calculation of NO flux' and include equations!!! - p.3, line 182 and p.3, line 184 contradiction: Did you use a static or dynamic chamber? Please include equations as well as additional parameters (dimension of chamber, conversion factors, limit of detection, etc.). Additionally, it would be great to demonstrate in a proof of evidence, that the setup was not impacted by temperature and pressure. A lot of static chamber setups the temperature and pressure within the chamber differ significantly from the ambient conditions which leads to artefacts. Overall it would be helpful to present mixing ratios as the first order results measured by the analyzer and a later conversion to the NO flux. It would be easier to follow if the authors would spend as much time and lines for section 2.2 as they did for the model description.

2) vegetation data: - p.2, line 164: why you use just the data from 2004 to 2008 which equals just about 50% of the overall data?

3) modelling section: In general without any public available code or equations used in the model, it is not possible for other scientists to reproduce your results and apply the model for other studies. - p.3, line 227: why did you use this version and not the previous one? What is the improvement? - p.3, line 268: again, why did you exclude data? - p.4, line 264: The simulation of soil temperature from air temperature is highly critical for different soil types. What kind of soil properties did you use? I am wondering how well your simulation will perform in comparison to a q-10 value of approx. 2? - p. 4, line 318: [...] which aim is to examine the interactions between litter, decomposer microorganisms, [...]. It is highly surprising that you apply a model for decomposer microorganisms to study the release of NO. According to my knowledge out of the heterotrophic microorganisms which are involved in decomposition of C are only denitrifiers. Due to the lack of organic carbon and soil moisture these microorganisms should be of low abundance in this soils. Nitrifiers are usually autotrophic and use CO₂ instead of organic carbon. - p. 4, line 372: Please include equations/ de-

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scription of emission algorithm. - p. 5, line: 394: “Furthermore, the Water Filled Pore Space (WFPS) remains below 20% (soil moisture below 10%), [...]. Please clarify gravimetric or volumetric soil moisture. How fits the assumption about predominant nitrification to aerobic denitrification and N₂O production under low soil moisture? - p. 5, line 409: What is the reason that the output of mineral N equals 0? I recommend rather to indicate the modelled data points which are based on a mineral N of 0 then applying 0.01 as a first guess. - p. 5, line 439: gravimetric or volumetric? - For a future validation, the field measurements for NO should not just cover two short periods and instead performed every month over the whole period.

4) Figures: - Fig. 2: It is not appropriate to compare the absolute value of 5 cm depth with an average of 0-2 cm. Furthermore, the goodness of fit criteria of the comparison are missing. - Fig. 3: See previous comment.

5) Minor corrections: - Please spend some time to go over the general submission section in BG before re-submission!!! E.g. the citation in BG should be (Author et al., Year) and not Author et al. (Year). - p. 1, line 40: These compounds come from the mineralization [...] correct to: In natural soils these compounds come from the mineralization [...] to indicate that in agricultural soils the major source of these compounds is due to fertilization. - p. 5, line 447: “[...] fluxes of emission.”: I don’t understand this English. - p. 2, line 111: emission of NO fluxes (NO emission)? I don’t understand this English.

Interactive comment on Biogeosciences Discuss., 11, 11785, 2014.

BGD

11, C4829–C4831, 2014

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