

Interactive comment on “Modelling the demand for new nitrogen fixation by terrestrial ecosystems” by Xu-Ri and I.Colin Prentice

Responses to Anonymous Referee #2

RC – Reviewer's Comments, AC – Authors' Comments.

AC: We greatly thank Anonymous Referee #2 for providing constructive comments, which are important for improving our manuscript. The comments were carefully evaluated. Based on the comments, we have revised the manuscript. The detailed responses to the comments are shown as below (reviewer's comments in black, authors' responses in blue).

RC: Overall I think this paper is well written, and that the content of the paper is of interest to the readers of biogeosciences. I do have some questions and remarks that I will address below:

In the paper, the authors use a-1 rather than yr-1. This may be confusing?

AC: Yes, in the revised paper the a-1 has been changed to yr-1 thoroughly.

RC: On page 2, line 24-28, the authors give numbers of N deposition, but the numbers are different while it is unclear what the difference is. E.g. Ndep over land of 50 Tg N a-1 is rather different from the 17,5 gT N a-1 (oxidized and reduced species combined).

AC: The 17,5 gT N a-1 is the preindustrial numbers, while the 50 Tg N a-1 is the number of 1990s. In the revised paper these have been clarified.

RC: Page 3, line 21-22, this sentence is unclear.

AC: Yes, this sentence has been revised to be clear.

RC: I think the methods could be worked out further. At times it is unclear what the authors mean, and they go quite quickly through the material. A table with abbreviations, range of values, units, etc would be very helpful. Also, it was unclear to me what exactly the initial litter chemical composition was, where is the equation that uses this? It is also unclear what r_s is, since it is only explained in table 1 and not in the text.

AC: Ok, we will enrich the method part and a table about all the abbreviations will be

added in the revised MS. The initial litter chemical composition is the initial C to N ratio of litter fall, The C and N in the litter fall are the C and N that were transferred from leaves and roots to litter in the model according the specific turnover rate as shown in (Xu-Ri and Prentice, 2008). R_s is the C to N ratio of soil organic matter. It has been added in its first arise in the text.

RC: Page 5, line 27-28 are unclear to me.

AC: NNF are ultimately determined by the following equation (as shown in Appendix S1):

$$\text{NNF} = \text{NPP} (1 - f_a)(1/R_s - 1/R_{CR})$$

the lower soil C:N ratios (R_s) would resulted modeled larger NNF, while higher R_s might resulted less NNF. This sentence has been rewrote in the revised MS.

RC: Page 7, line 2. How do the authors get to 30%?

AC: The fraction of NPP supported by new fixed N, was given by the product of NNF with the ratio R_P/P_n , accounts for a global averge of ~30% of current NPP.

RC: I especially like the discussion. The relevant literature is cited, and the paper really comes together at this point. Some additional small points:

Page 2, line 13. BNF is defined at line 15

Page 3, line 13: dot after))

Page 4, line 7: take out s from decompositions

Page 4, line 8: input rather than inputs

Page 5, line 1. Where is r_s defined?

Page 7, line 14: Table 2 should be Table 3?

AC: All revised.