Zhu *et al.* (2015) did an excellent job at developing the N-COM model. I enjoyed reading their manuscript starting with their motivation on why current ESMs do not represent the competition between different microbial groups, plants and soil matrix for nutrients realistically. Their innovative ECA approach (Equilibrium Chemistry Approach) is very well suited for dealing with the multiple interactions between nutrients, plants, microbial groups and soil minerals. Overall, the manuscripts is well structured and a delight to read. It will be exciting to see N-COM implemented in a microbe-mediated SOM decomposition model.

Although I am quite enthusiastic about the N-COM model, I would like to ask the authors for a couple of clarifications and improvements:

Bayesian calibration

1. From the description in section 2.3 you cannot tell, if the Bayesian calibration of N-COM is entirely proper. It seems that you ran one Monte Carlo Markov Chain for 50000 iterations. You claim that you reached convergence, but you could provide the readers with a trace plot of the MCMC (e.g. in the Appendix) and maybe the Gelman convergence criterion (if you ran multiple chains, which is recommended, see Gelman and Shirley (2011)).
2. In section 3.1, you state that the posterior parameters were irregularly distributed. Nevertheless, you fitted a normal distribution to the posterior sample (n = 1000) of parameters. You can, however, directly use your sample from the posterior to make inferences about the mean and standard deviation (or maybe better median and interquartile range). I would recommend to use the second halves (your last 25000 iterations) of your chains to directly calculate your $\sigma_{posterior}$ for the estimation of the uncertainty reduction.
3. In Figure 2, your binning of the posterior sample is quite broad. Could you use smaller bins and maybe use a larger sample from your MCMC (e.g. second halves of the chains) to construct this plot?

Competition between consumers

I would welcome some additional discussion, if a dynamic simulation of enzyme abundances for the different consumers could result in a time-varying apparent relative competitiveness. For the purpose of the present study, you assumed that all consumers have the same enzyme abundances (P4068,L15). Does this assumption simply eliminate the time-component from competition between the different consumers? Does this mean that with your approach you are able to represent the long-term competition between consumers?

Description of N-COM

1. You could try to improve how you introduce the structure of the five SOC pools. In Equation 4 you introduce $F_{C,i,j}^{\mathrm{move}}$, but the link to $f_{i,j}$ and g_i (Table 2) could be presented more clearly to the reader.
2. In Figure 1, you use the terms "MIC NH_4 uptake" and "MIC NO_3 uptake"; in the text, however, you mostly use the term "immobilization". It would be great if you updated Figure 1 to match the terminology used throughout the paper.
3. In line 21, p 4064, you state that carbon has the units "g C m^{-3}", while in Table 2 it is "g C m^{-2}". Please clarify.

Further suggestions and technical corrections

P4064,L19: You use the term "median SOC". I think this should read "slow SOC pool".

P4068,L7: "where the ECA defines relative competitiveness KM are half-saturation constants for different consumer-resource pairs". The sentence structure is unclear; a comma might be missing between "competitiveness" and "KM". Please rephrase, so that it becomes clear to what the "relative" competitiveness refers.

Table 3: I think you mean soil heterotrophic respiration, not soil CO_2 efflux. To my mind, soil CO_2 efflux would include root respiration.

P4071,L25: Should read sorption instead of "sorbtion".

P4071,L22: What is "soil free NH_4^+"?

Appendix B, Equation B2: In the numerator, it should read k_1^- instead of k_1^{-1}.

Appendix B: References to equations are incorrect: E.g. before Eqn. B4 you refer to Eqn. (9) and (8), but you mean Eqn (B3) and Eqn (B2). Same for Eqn (B7).

References

Gelman A, Shirley K. 2011. Inference from simulations and monitoring convergence. *Handbook of Markov Chain Monte Carlo*: 163-174.

Zhu Q, Riley WJ, Tang J, Koven CD. 2015. Multiple soil nutrient competition between plants, microbes, and mineral surfaces: model development, parameterization, and example applications in several tropical forests. *Biogeosciences Discuss.* **12**: 4057-4106.