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Interactive comment on "Large uncertainty in ecosystem carbon dynamics resulting from ambiguous numerical coupling of carbon and nitrogen biogeochemistry: A demonstration with the ACME land model" *by* Jinyun Tang and William J. Riley

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While we have carefully and thoroughly addressed the reviewers comments in the attached pdf file and the revised manuscript with tracked changes, we have the general repose posted below.

Overall response:

While we appreciate the reviewer's time to review our study, we believe the reviewer

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Discussion paper

has mis-construed significant parts of our arguments and results. We address all the comments below, but note in particular that the reviewer's repeated contention that calibration can make a numerically inconsistent model useful for projecting carbon-climate feedbacks highlights why we think out study is important for the modeling community. We make the point in our paper that, at the most basic level, models require that the numerical encoding is consistent with their analytical formulations. The practice of ensuring this consistency has been standard in other branches of earth system modeling, including atmospheric physics (e.g. Phillips, 1956; Arakawa, 1965; Wan et al., 2016), atmospheric chemistry (Sandu, 2001; Nguyen et al., 2009; Wan et al., 2013), hydrology (Tang et al., 2015) and marine biogeochemistry (Broekhuizen et al., 2008); land biogeochemical modeling should be no exception. Consistent and robust numerical encoding can help ensure that new mechanisms and processes are added for the right reasons, and can remove the false security generated by calibration of structurally uncertain biogeochemical models. Further, our study shows that numerically inconsistent models can result in very misleading predictions of how land ecosystems respond to increasing atmospheric CO2. If the reviewer's opinions on the appropriate use of calibration are widespread in the modeling community (which we believe is the case), we contend that our paper is very relevant and important, in that it dispels those notions and proposes constructive remedies. With the spirit to raise sufficient awareness of these important issues, we carefully address the reviewer's comments point by point in the attached pdf file.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2016-233/bg-2016-233-AC1-supplement.pdf

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