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Interactive comment on "Three decades of simulated global terrestrial carbon fluxes from a data assimilation system confronted to different periods of observations" *by* Karel Castro-Morales et al.

Anonymous Referee #2

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This is an interesting and useful paper, albeit of more technical than scientific interest. There are a number of factors that reduce the scientific impact of the paper, while focusing more on the interaction of observations with a model of this type when used in assimilation mode. The reanalysis is limited by a number of factors, the very low spatial resolution dictated (I suppose) by the resolution of the atmospheric inverse model, the limited data fields assimilated (just carbon fluxes and FAPAR) and the lack of potentially important processes, such as fire. The author's assessment of model skill is ambivalent, they point to low errors in some places, while noting that the EI

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Discussion paper

Nino cycle is not well-captured, a time scale that others have argued provides a critical clue to climate sensitivity (eg Cox et al). By contrast, the advanced methods used and the useful assessment of the impact of the duration of the assimilation experiment, as well as other technical innovations provides a useful update to their prior paper, as the scientific conclusions are overlapping. As assimilation becomes more prevalent, and as data records lengthen (for this study, of a 30-year time scale these really are the most relevant global fields) with SIF, radar-constrained biomass, and water variables such as vegetation optical depth becoming available for > 10 years, this paper provides encouraging news about the utility and impact of records of decadal length. I'd suggest rewriting the paper modestly to emphasize the lessons learned about the impact of assimilation, and the time horizons, and placing less emphasis on the carbon cycle results, especially as the authors note (and correctly) the conclusions broadly overlap their earlier paper. I note that papets of the paper are awkwardly written and could use a careful edit, and there are a lot of figuresâĂŤI found them helpful in reviewing the paper but several of the figures could clearly be moved to supplemental material.

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