

This study presents the ambitious accounting of the Australian terrestrial carbon budget for contribution to the RECCAP project. It is a difficult undertaking in its necessary all-inclusiveness, but at the same time no new measurements were expected—only a careful analysis of the reported values in the literature was needed. Indeed, the authors present the compilation of a large number of datasets; however, the analysis and presentation were problematic. There were two serious problems with the carbon budget: first, it is imperative that the authors address uncertainty much more rigorously (or at all, really) than was done for the carbon budget to be meaningful; and, second, the mixing of time periods, though the focus was on 1990-2011, is highly confusing and may be a flaw in the analysis. Further, there seemed to be heavy reliance on a single model for ecosystem CO₂ fluxes, which, as the authors state, dominate IAV. Given that this study should be incorporating all relevant data, there was noticeable lack of incorporation eddy flux measurements as well as other models.

The overall writing is succinct and clear, which is important because the study is very long. The presentation of results is unfocused, however, oftentimes seemingly there just because data or model output were available, not because results contributed meaningfully to the analysis or budget. In the end, the paper presents itself more as a collection of different datasets than a quality summary and analysis.

Abstract

- “in the context of estimates over two centuries” does not make sense, and should probably be deleted.
- Include a sentence that outlines the basic methods used in the study (and don’t forget the uncertainty estimation too).
- It would be good to have a statement on what the biggest source(s) of uncertainty were and why.

Introduction

- Say why 1990-2011 was selected. Compare with the time period for the other RECCAP studies (i.e., are the regional studies comparable?)

Methods

- **NPP, NEP:** needs uncertainty estimation.
- How was OzFlux integrated into the NPP/NEP estimates? It would seem odd to ignore these valuable data, and rely only on a single model.
- **Fire:** needs uncertainty estimation. There are known biases with these datasets that were not mentioned or accounted for.
- **LUC:** what’s the spatial resolution? Clarify if this is the LUC from 2011 minus 1990. Include some discussion as to why the assumed uncertainties are valid or representative.
- **DOC:** uncertainty estimation.
- **Dust:** Representativeness of studies used for Australia as a whole?
- **Fossil fuel:** Include some discussion as to why the assumed uncertainties are valid or representative.

Net C budget

- Mixing and matching of different time periods, as shown in Table 1. This shouldn't add up correctly. Discuss why various non-1990-2011 numbers were not extrapolated to the full time period.
- Why do Figs. 4, 6, 9 go beyond the 1990-2011 period? This is out of the context set up by the authors.
- Having a (sub-) figure on Precip is maybe a bit out of scope of the Carbon budget focused paper. Maybe the intention is how the Carbon budget might change with changing Precip? Seems like it was included just because the data were available, not because it contributed to the argument, which is the construction of a carbon budget. Correlation of Precip to NPP is not interesting, as the NPP is model-driven from that precip forcing.
- Fig. 3: how does this map compare to satellite observations of NDVI? Are the spatial patterns consistent? Speaking of which, perhaps more remote sensing data could have been used in this study, especially given the narrow modern time window focus, which is good for remote sensing.

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