

Interactive comment on “Audit of the global carbon budget: estimate errors and their impact on uptake uncertainty” by A. P. Ballantyne et al.

Anonymous Referee #2

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This was a really clear and well written paper. It is really handy to have all the carbon budget terms laid out in all their glory alongside all their uncertainty in this manner. I know I will often refer back to the paper. I did think the paper could improve by having a clever figure showing the magnitude of the errors side by side as well as a figure/table showing the error contributions – or perhaps a schematic of the study. But none of this is critical, as on second read I understood what the authors did. However, should the authors wish make to make their paper accessible right off the bat an explanatory figure or two would increase the usefulness of your paper. Below are a couple small points and a question.

The only place where I got lost was in the explanation of the suite of simulations run P 14946 1. Equation 9, why is the matrix shown as products of EF and EL when it seems

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to me it should be sum? 2. “we include 500” 500 what, permutations? 500 samples of the error space? Wouldn’t this then lead to $9 \times (500 \times 500)$ simulations? What is the 52? 3. Again lost with the number of simulations in the last sentence . . . “randomly drew from our 100 simulations of dC/dt to perform 4500 calculations of $\text{sum}N$ and AF ”

Aren’t you artificially enlarging the error by taking random simulations from across 1959 to 2010? This means 2006 flux estimates contribute to the same pool as 1964 estimates and yet the trend contributes? You comment on the different 2 sigma error in dC/dt for 1959–1980 versus 1980–present day, would such a breakdown of decades have a different error budget for dC/dt and dNL/dt ?

It would be really useful if you would tabulate N per year with errors. In fact, I expect many of the figures could be tabulated which may expand the usefulness of your paper.

You seem to have avoided comparison with other estimates of AF in literature (e.g. le Quere et al vs Knorr in 2009)

Twice (in the abstract and in the discussion) you make statements about carbon sequestration/climate change possible being the greatest ecosystem service /challenge. Rather than making a claim like this I would advise saying it is one of the greatest ecosystem services, or one of the greatest challenges. For although it is a huge important challenge there are many other issues which would contend for primacy. For instance, air production is an even greater ecosystem service than CO_2 sequestration and not driving the 6th mass extinction or avoiding large scale genocide via hunger, disease or war I would consider as greater challenges . . .

I would adjust the statement that stabilizing the growth rate must be achieved before stabilizing concentrations can be achieved – this could be misleading. For although stabilizing the growth rate is a mathematical imperative on the path to stabilizing concentrations stabilizing the growth is not a target I would advise we strive towards, rather strive towards the goal of reducing concentrations. . .

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