Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2020-259-AC1, 2021

Geoscientific Model Development Discussions
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EGU

Interactive comment on "Definitions and methods to estimate regional land carbon fluxes for the second phase of the REgional Carbon Cycle Assessment and Processes Project (RECCAP-2)" *by* Philippe Ciais et al.

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Received and published: 13 June 2021

Response to referees comments on "Definitions and methods to estimate regional land carbon fluxes for the second phase of the REgional Carbon Cycle Assessment and Processes Project (RECCAP-2)" by Philippe Ciais et al.

Richard Houghton (Referee) Ironically, it has always been easier to construct a global carbon budget than for any other unit of land, whether a region or a hectare. The reason is because of lateral transport of carbon by animals moving between land units, car-

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bon transported by rivers (and not only the atmosphere), and crop and wood products transported by trade. Another troublesome issue for terrestrial carbon budgets relates to the various forms carbon may take, including BVOCs, methane, carbon monoxide. And, in addition to these real-world fluxes, there are the usual scientific issues related to different methods of measurement. This paper by Ciais et al. looks at the definitions and methods needed to construct regional carbon budgets. An initial REgional Carbon Cycle Assessment and Processes Project (RECCAP) was carried out by the Global Carbon Project for the period 2000-2009. This paper sets the ground for a second: RECCAP-2. The paper discusses a series of issues and provides recommendations for use of transparent, if not identical, methods. One goal is to have the information necessary for reconciling top-down (inverse analyses) with bottom-up (inventory and modeling) approaches for measuring terrestrial carbon fluxes. No question, both the field of terrestrial carbon and the methods available for measuring and inferring fluxes are becoming more and more sophisticated and detailed. This paper seeks to define processes and reconcile different methods of measurement. It is a valuable contribution, not just to terrestrial carbon science, but to preparing for RECCAP-2. There may be nothing new here, but there is a careful review and consolidation of what's needed going forward for transparency and consistency. The paper is comprehensive, well organized and clearly written. I have no criticisms of the work, no suggestions for revision. I would note, however, that although one of the goals of terrestrial carbon research has always been to separate fluxes driven by anthropogenic, as opposed to non-anthropogenic (environmental) processes, that goal has arguably been "dumbed-down" (subverted?) by the IPCC's introduction of the "Managed Land" proxy. National greenhouse gas inventories are included briefly near the end of this paper, but they are likely to require considerable future work to be reconciled with the results from regional carbon budgets as proposed here. That's work for future analyses.

Response: We thank the reviewer R Houghton for the summary and appraisal of the manuscript. We agree that the use of 'managed land' as a proxy of 'direct human effect' is a source of confusion, as noted by Grassi et al. 2017 and added a short section on

this issue of attribution. Our manuscript is focused on CO2 budgets of RECCAP-2 regions and separate work is ongoing to reconcile DGVM, Bookkeeping models, with National inventories

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