

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Dong-Gill Kim et al.

Author comment on "Ideas and perspectives: Enhancing research and monitoring of carbon pools and land-to-atmosphere greenhouse gases exchange in developing countries" by Dong-Gill Kim et al., Biogeosciences Discuss.,
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Responses to the comments by the reviewer 1 on bg-2021-237

We first want to express our appreciation for your sharp analysis and thoughtful and inspiring comments. Here we provide our responses and suggestions for possible modifications that we will do if we are invited to submit a revised version of our manuscript.

Overall I think the paper is well written and is within the scope of a Biogeosciences's "Ideas and Perspectives" paper. The abstract, title and figures are all appropriate. It raises important issues of inequalities in science and carbon stock and flux data scarcity across certain regions of the globe, which are mostly a result of these inequalities. I particularly liked figures 1 to 3, as they very clearly illustrate the issue.

Response: Thank you very much for encouraging comments. We are very excited to know that the reviewer found the paper interesting and inspired to improve the manuscript furthermore.

The paper focuses on the use of what is termed "appropriate technology and approach" and how it can be used to overcome primarily financial and technological barriers to the acquisition of data on carbon stocks and fluxes. However, I feel the authors could be a bit more cautious about not overselling the ability of AT&A to overcome these barriers and solve the issue of carbon stock/flux data scarcity. It is not always the cost or the technological complexity of the method that is the prohibiting factor in data acquisition. I do not disagree with what the authors have written, but I would like to see a more balanced discussion, which gives perhaps a more realistic consideration of the role that AT&A can play.

Response: Thanks, this was also a point that we discussed and tried to clarify all the limits in the manuscript. However, if the reviewer's impression was still too

unbalanced and overselling, we will revise the texts to be sure that the message is realistic and balanced.

Some specific points for discussion, which the authors do to a degree mention, but I feel do not give enough consideration to or acknowledgement of, are the following:

-Fieldwork: Fieldwork, even when using low tech methods, is expensive, but especially so when operating in a low-income country which lacks public transport infrastructure, meaning that private transport is often required, or working in large, remote forested areas where accessing the field site is difficult and time consuming and therefore expensive. Filling in the blanks on the map at a sufficient temporal and spatial scale with in situ measurements is unavoidably going to require a lot of funding.

Response: Thanks for the comment. We agree that this is an important point which was not addressed in the paper. Distances, accessibility, and transport are important aspects that we will add and discuss in the section 3.2 Technical expertise and infrastructure.

-Sometimes there is no alternative technology/approach: It would be nice for balance if in section 4 the authors acknowledged that sometimes there is no cheaper or low-tech alternative. For example the authors mention the lack of flux towers early on in the text. Whilst there are lower cost alternatives for measuring GHG fluxes on a very localised spatial scale and remote sensing products give you a regional scale estimate, is there a low cost, low-tech for measuring fluxes at an ecosystem level?

Response: It is true that for some technologies there are not equivalent low cost alternatives, however our point is that starting with what is available and possible is a crucial first step. We will add the concept suggested by the reviewer of methods that have no alternatives.

-The way science funding is awarded and how that impacts long term monitoring and participation equality in collaborations: In section 3.2 and in line 155 & 391 the authors mention the lack of equality in relationships between high-income and low-income country collaborations and a lack of long-term investment in these relationships. This to me is one of the most important issues. Whilst I believe that high-income country collaborators could go much further in their efforts to address these issues, one thing not really mentioned and which helps drive this outcome is the way that science is funded. Even if there is a genuine will on the side of the high-income country partner, the short-term basis on which funds are awarded prohibits long term monitoring, or long-term technological support or training for low-income country partners. And often funding bodies stipulate how project money can be spent, limiting what can be spent on partners at other institutions in other countries. Therefore perhaps a brief comment on the how the structure of science funding helps to inhibit the capacity building of low income countries to monitor carbon fluxes/stocks.

Response: This is a valid point but also a very complex issue that involves political and financial aspects that often follow decision procedures not fully connected to the scientific suggestions. In addition, observatories in developing countries can be supported in the first phases but then it would be important to ensure local support. This is what we tried to give as a message and for sure we

can add a sentence on the fact that political and financial decisions on the high-income countries investment in developing countries should be also based on the long-term perspective.

More minor comments are as follows:

-L167-168/286-287- is it really that likely that funders/policy makers are not aware of the importance of research into carbon stocks/fluxes? I would say it is well recognised at this level that C and GHG data is important.

Response: Considering increasing attention of developing countries to international events on climate change (e.g., COP), it seems science managers and policy makers in developing countries are getting aware of the importance of C and GHG since these are very critical issues in international relationship and negotiation. However, it doesn't mean that they are also interested in research on C and GHG and are willing to allocate finance and establish appropriate policy for them in their education and research systems. We will revise the sentences to avoid misunderstandings.

-L299-300: "Fourth, AT&A may mitigate, but does not solve, the problem of technical capacity in less-developed countries." More discussion and consideration of this point is what I am referring to above in the general comments.

Response: Yes, as stated above we will revise to ensure that the limits are also clearly explained.

Minor typos:

-L139 – should read "However"

-L160- should read "support"

-L369-should read "country"

-L385- should read "citizens"

-L390-should read "AT-A"

Response: Thanks for pointing these out.

-L374- are some words missing here?

Response: We are not sure where the sentence is not clear but we would rephrase in this way

"For developed countries, AT&A will provide new measurements to fill the gap of data, which is needed for applications, modeling, and estimations using advanced techniques."

-L376-are some words missing or the sentence needs restructuring?

Response: We would rephrase the sentence in this way:

“In addition, AT&A diffusion will bring new research and development opportunities for science industry working on low-cost instruments, since it will promote their development.”

-Figure 5. White 4 and 5 are not referred to in the caption, so I wonder why they are there.

Response: White 4 and 5 are referred in the texts (Line 313) and we will add them also in the caption