Biogeosciences Discussions

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Reply on RC2

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., https://doi.org/10.5194/bg-2021-237-AC2, 2021

Responses to the comments by the reviewer 2 on bg-2021-237

We are very grateful to your sharp analysis and criticism and thoughtful and encouraging 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.

The Ideas and Perspective article by Dong-Gill Kim et al. is well written, important, and timely. The authors propose to adopt the 'appropriate technology and approach' strategy (AT&T) in order to overcome constraints to conduct research on carbon pool and greenhouse gases in developing countries. This is especially critical -as the authors correctly point out- since there is a fundamental lack of greenhouse gas research from developing countries from which many uncertainties arise. I very much enjoyed reading this article as the authors nicely demonstrate the extreme gradient between developed and developing countries when it comes to greenhouse gas research and related disciplines. I also very much agree with their argumentation that this is oftentimes caused by limited resources and training to equip, operate, and maintain the necessary instrumentation to conduct these measurements. Their description of problems attests a wealth of experience on the ground and align with my own experiences. The recommendation to focus on low-cost and low-technology instruments, open source software and data, as well as networking-based research in these countries seems therefore as an appropriate suggestion and a first step into the right direction if proper measures are taken to overcome their respective limitations. Generally, I must say that this is a difficult subject to tackle as reasons for the lack of data can be very country-specific or even region-specific. Just the sheer lack of reliable power in many regions of the world pose a significant challenge to even conduct the most basic science. Therefore, -even though it is a delicate matter on various ends- advocating and adopting AT&A is a good start to build local capacities and sever the dependence of developing countries on outside support to conduct these important measurements.

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.

Detailed comments:

Line 17: I would refrain from using the wording 'skilled technicians' as it is a broad term and could be perceived wrongly by the readership. It somewhat implies that there are no skilled technicians available in resource constraint developing countries which is not true. However, I do understand what the authors are trying to convey and suggest rewording to 'highly specialized research technician' or simply 'specialized technicians' to give a bit more nuance.

Response: Thank you, this is an important point because it is crucial to not give the wrong impression. All the technicians have certain level of skills, and they contribute to research activities in various ways. What we meant was a highly specialized research technician who is familiar with highly advanced instrument and techniques. We will change the sentence and clarify the meaning.

Line 19: suggest adding 'often': are the same countries -> are often the same countries

Response: Thanks, we agree.

Line 78: suggest adding 'Further': Further, various global meta-analyses..

Response: Thanks, we agree.

Line 93: mention where the other 30% of studies were carried out (in between missing South America and Australia).

Response: We will add the information as below:

"Africa and Asia comprised only 5% and 11%, respectively, while studies carried out in Australia/New Zealand, Europe, North America, and South America were 15%, 21%, 33%, and 15%, respectively."

Potentially swap section 3.2 and 3.1 as Technical expertise and infrastructure is the first requirement which needs to be met.

Response: It is difficult to define what is more important or urgent (all is needed). However, we will follow the suggestion of the reviewer and swap the two sections in the new version.

Line 149: suggest to write 'reliable electric power supply' instead of simply 'electric power' since many of the instruments do not like power disruption and surge peaks.

Response: This is a good point—thank you. We will change this to *"reliable and stable electric power supply"*

Line 149: skilled technicians – see earlier comment.

Response: Yes, we agree.

Line 153: add (PIs) after Principial Investigators

Response: Yes, we agree.

Line 153: suggest adding 'often': While the PIs often define

Response: Yes, we agree.

Line 159: consider rewriting the sentence starting with 'After the project funding …'. It currently reads a bit off.

Response: We propose to revise it as below:

"After the end of the project that supported material purchase and technical support, it is often not possible to get funding or collaborations to further support the activities."

Line 166: I cannot follow the logic in the argumentation and how it is connected to the previous statement. Why do research and science managers do give less attention to C and GHG dynamics and mitigation issues because they struggle to manage locally occurring climatic events?

Response: Thanks for the comment. We propose to revise it as below:

"Developing countries often struggle to manage local climate change related emergencies such as droughts or flooding and establish adaptation strategies to the issues (IPCC, 2014). For these reasons, investment in long term research and science on C and GHG may receive less attention in developing countries even if related to better understand and quantify C and GHG balances and dynamics."

Line 184: tree -> trees

Response: Yes, we agree.

Line 191: Maybe mention here the School2School Initiative by the TAHMO.org project as a good example. https://tahmo.org/school-2-school-initiative/

Response: Thank you very much for the suggestion and reference that is very relevant and interesting. We will for sure add them in the revised version

Line 174: I appreciate the authors efforts to list various AT&A which are mentioned in the subcategories of section 4. However, somehow this 'listing' of methods lacks a bit of a clear line of what defines a technology to be qualified as an AT&T. For instance, mid- and near infrared spectroscopy methods require a rather complex post-processing and calibration with local soil libraries. Thus, there is a lot of initial investment necessary to turn this into an AT&A. Similarly, low-cost sensors are excellent innovations, and I am curious on where R&D will lead us in the future but as for now these sensors still require -at least to my knowledge- a lot of careful postprocessing as there are several interferences such as from humidity or temperature. Therefore, I suggest to the authors to consider turning all information provided in Section 4 into a large table, simply listing the various AT&T in their subcategories with a brief explanation and adding their respective references. In this way the 'Idea and Perspective' article can also substantially reduced in length and be given a more concise focus to the general concept which is put forward.

Response: Thanks for the comments. Your concerns on AT&A are valid. We already addressed the problems and potential solutions in section 5, and we will revise the texts to be sure that the message is realistic and balanced. We agree your suggestion turning information provided in Section 4 into a table. We will add a table containing lists of identified AT&A, relevant discussion (e.g., pros or cons) and their respective references in section 4.

Fig 5: Red and black can hardly be distinguished on a b/w printer. Consider alternative color.

Response: Although the journal publishes all online in color it is true that if printed the red color would be missed. We will switch to dashed red lines in order to be distinguishable.

Line 318: Suggest changing to: 'With an even higher available budget… '

Response: Yes, we agree, thanks.