

Biogeosciences Discuss., referee comment RC2  
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## Comment on bg-2021-237

Anonymous Referee #2

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Referee 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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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.

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.

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

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

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

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

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.

Line 149: skilled technicians – see earlier comment.

Line 153: add (PIs) after Principial Investigators

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

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

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?

Line 184: tree  trees

Line 191: Maybe mention here the School2School Initiative by the TAHMO.org project as a good example.

<https://tahmo.org/school-2-school-initiative/>

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.

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

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

Please also note the supplement to this comment:

<https://bg.copernicus.org/preprints/bg-2021-237/bg-2021-237-RC2-supplement.pdf>