

Geosci. Instrum. Method. Data Syst. Discuss., referee comment RC2  
<https://doi.org/10.5194/gi-2021-22-RC2>, 2021  
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## Comment on gi-2021-22

Anonymous Referee #2

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Referee comment on "Evaluating low-cost topographic surveys for computations of conveyance" by Hubert T. Samboko et al., Geosci. Instrum. Method. Data Syst. Discuss., <https://doi.org/10.5194/gi-2021-22-RC2>, 2021

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This paper aims to investigate how well low-cost UAV and RTK-GNSS software and systems can perform for developing topographic surfaces in river environments, potentially for hydraulic modeling purposes. This is an important topic, as UAVs are being increasingly used to collect high-resolution topography, and as pointed out in the paper, their low cost has the potential to greatly benefit managers in developing countries. I believe there are good data presented here, and the results will be of interest to many; however, the paper's organization and presentation could be improved to more clearly describe what was done, why it was done, and what the important take away points are. I have some general comments and questions that, if addressed, may help make the paper more effective in presenting the most important findings.

My main comment is that it seems the paper needs to be reframed around the apparently novel contributions of the paper, which are not addressed in the current version of the introduction. Many of the most interesting and potentially important results presented in the paper are not related to the objectives set up in the paper's Introduction. The paper is framed as a study focused on how remote sensing data from UAVs can be optimized, particularly with regard to the number and spatial distribution of ground control points. However, the topographic data collected with the RTK system is as critical or perhaps even more critical for the analyses they present than the UAV data and SfM processing. Indeed, one of the main findings in the paper is that there are diminishing returns as additional GCPs are included in the SfM processing – this is a good outcome to report and readers will want to know that, but many of the results rely substantially on the dense RTK-GNSS bathymetry collected from the canoe, and/or the RTK-GNSS profile of the water edge collected with the rolling cart. So much of the data which are important for the analyses are not collected with UAVs, but the introduction is almost entirely focused on UAVs.

It seems to me that if the paper intends to focus on low-cost but high-resolution characterization of river channel geometry, the novel contributions of this paper would include: 1) the low-cost RTK-GNSS system itself – how accurate is it, how is it put together, how much does it actually cost? (this is not really discussed in the paper). 2) The commercial vs. open source UAV software comparison (this is done in the paper). 3) Assessment of how many and what distribution of GCPs is best for UAV SfM data (this is also done in the paper). 4) The gridding approach for the RTK bathymetry data (discussed but not emphasized in the paper). 5) How to deal with the 'doming' effect in SfM datasets (discussed almost entirely in the Results section, but since this is a focus there should be some background on the issue in the introduction).

Additional comments (by line number):

18: clarify in the abstract that GNSS data are used to characterize the subaqueous bathymetry, and UAVs are only used to map the dry surfaces.

165: The description of the UAV flight path is not clear. Was the UAV flown in one direction back and forth ("lawnmower" style) or in two direction back and forth ("checkerboard" style)?

190: The flowchart in Fig 5 needs to be described better. For instance, what is "MVS"?

252: clarify how the slope was extracted – was a plane fit to the DEM? Is the slope computed from the average of dry points?

312: I believe this is the first mention of "Fixed Camera Parameter". This needs to be described earlier and in more detail. The method is partly described later (line 345) but that is out of place.

354: Figure 13 makes it appear there is a lateral slope of the water surface. Was there? Can we be sure the RTK system is working properly?

479: Figures B4 and B5 do not have legends.