

# ***Interactive comment on “In-situ measurements of the ice flow motion at Equip Sermia Glacier using a remotely controlled UAV” by Guillaume Jouvét et al.***

## **Anonymous Referee #2**

Received and published: 26 June 2019

The manuscript is written in acceptable English but some minor edits are needed which I am sure the authors can figure out after careful rereads. I have several questions and suggestions:

1. “We used a multicopter UAV. . .”: I see that it is a quadcopter. Use “quadcopter” in place of “multicopter”.
2. “Despite the unfortunate loss of the UAV”: Not needed.
3. The literature survey given in the introduction is inadequate and must include recently published literature (e.g., <https://www.earth-syst-sci-data.net/11/579/2019/>, <https://www.the-cryosphere.net/9/1/2015/tc-9-1-2015.pdf>,

<https://pdfs.semanticscholar.org/cba6/8931794a9f697934bee7566d6baca36916f5.pdf>,  
[https://dspace.library.uu.nl/bitstream/handle/1874/319997/Thesis\\_Heuff.pdf?sequence=2&isAllowed=y](https://dspace.library.uu.nl/bitstream/handle/1874/319997/Thesis_Heuff.pdf?sequence=2&isAllowed=y),  
(etc.).

4. I would suggest to include description of UAV and flight planning parameters in tabulated form.
5. "...resolution by a factor of  $\sim 4$ ": Give the exact GSD.
6. "...we found an horizontal error between 23 and 45 cm...": 23-45 cm of error while comparing with 70 cm of in situ displacement can be a huge uncertainty!
7. The text "The UAV was left in this inclined position and the battery voltage ... become impossible to salvage. Shortly before this happened" is unnecessary and should be removed. The first paragraph of "Recommendations" section related with this detailing should also be omitted. This is a case-specific issue and as such, does not arise due to methodological failures.
8. I have several issues with the entire methodology, the purpose of this research, and the results. First, what was the actual error in your in situ measurement? Second, why is this study needed? Making a point measurement on glacier surface for 4 hours or less is not going to give any relevant information. Either deploy 10 UAVs simultaneously (which of course is logistically and economically not possible) to get area-wide measurements or simply use stake-based classic approaches if we really want in situ measurements. The whole purpose of UAVs is to use them as an aerial remote sensing platform which can bridge the gap between spaceborne and in situ measurements. Third, I am sure that you must be knowing how different glacier velocities can be in different hours of a day. This variation can further enhance across seasons. And on yearly scales, we can observe even more variability. It will really be a blunder to extrapolate 70 cm in 4.36 hours to  $3.7 \pm 0.06 \text{ m d}^{-1}$  and compare it with daily photogrammetric measurements! Moreover, if you report that the two methods show only less than 5% of difference, then what is the need of the in situ measurement

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when it in any case is not feasible for a monitoring at relevant spatiotemporal scale! However, in this 5% difference, you are not considering (adding/subtracting?) the 23-45 cm of error in photogrammetric method and the error in the in situ method. Next you write: "The key advantage of in-situ GNSS receivers is that they can determine the ice flow motion in much higher temporal resolution and with greater accuracy than any remote sensing method." Why? If the difference is within 5%, I would on any given day prefer a remote sensing measurement covering wide area in lesser time! What is the use of high temporal resolution measurements if they are only for 4 hours and just for a single point?! The different facies of glacier show widely varying flows even during a day and such an in situ measurement is not going to give us any relevant information unless we are investigating a known particular case.

Although I acknowledge the efforts of the authors, owing to the methodological and conceptual issues with this work which I mentioned above, I really find majority of the recommendations and conclusions repetitive/case-specific and lacking in novelty. In short, I do not see this work as a conceptual advancement in UAV-based glaciological research simply because the reasoning for justifying the need and relevance of this work is not strong enough in my view.

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<https://doi.org/10.5194/gi-2019-6>, 2019.

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