Geosci. Instrum. Method. Data Syst. Discuss.,
https://doi.org/10.5194/gi-2019-6-RC1, 2019

Geoscientific Instrumentation Methods and Data Systems Discussions

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Interactive comment on "In-situ measurements of the ice flow motion at Eqip Sermia Glacier using a remotely controlled UAV" *by* Guillaume Jouvet et al.

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Received and published: 22 June 2019

The manuscript by Jouvet et al. presents in situ UAV derived observations of ice flow using a remotely operated quadcopter while also using an autonomous fixed-wing UAV to map the glacier surface in advance. The authors describe the techniques of both methods before presenting their key findings, i.e. the in situ measurement of displacement with a GNSS receiver mounted on the quadcopter. The authors discuss the potential of using this method to make direct measurements.

The main finding is a proof of concept: that remotely operated UAVs can be used not only as means of aerial surveying, but as a strategy to deploy GNSS instruments on

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Discussion paper

the surface of inaccessible terrain such as the highly crevassed glacier in this case. The work is clearly described and the figures support the text well. I enjoyed reading this manuscript, and have mostly minor comments:

Page 1, abstract, I would recommend not mentioning the loss of a UAV in the abstract.

P1, 11, short-term is relative and an imprecise descriptor in this context. I think the potential of the in-situ method is to make 'continuous' measurements over a certain period, in this case 10 hours.

P1, 16, some glaciers flow as fast as 20 m per day. Maybe add "or even faster".

P2, 7-16, paragraph needs supporting references.

P3, section 3.1, a few more details would be useful here.

P3, 15, 'large' in large-scale survey is relative and imprecise. To most, the scale here would appear small. Delete 'large'.

P3, section 3.2, a few more details would be useful here as well, e.g. total length of survey lines, area covered, camera parameters.

P3, section 3.3, it worth describing how this was accomplished in the field. Some details about what's needed to do photogrammetry on the spot, i.e. in the field would be useful (e.g. computer requirements, work flow)

P4, 1-2, ... add: "and differences in the method of calculation".

P4, section 3.4, I would label this section 'feature tracking' or 'glacier velocity derivation'. It needs to be expanded a bit. When exactly was the surveys performed? How did you deal with shading? Error?

P4, 14, LiDAR. Really! What type? The value of this seems understated. Expand.

P5, 6, how far from the base station was this test?

P5 section 4.3, this section is to some degree a part of the results. You could move it

to section 5 and label it: 5.1. Identification of . . ...

P5 section 4.4, this section is to some degree a part of the results. You could move it to section 5 and label it: 5.2. First attempt to land on . . ...

P6 section 5, if above change is made, this would become: 5.3. Successful landing on. . ... the section should start by describing how the UAV was successfully landed.

P6, 13, is 1 hour needed? If shorter would be OK, maybe mention that.

P6, section 6, here you describe the photogrammetry as preliminary. What makes it 'preliminary'? Would errors be smaller and accuracy higher, if the photogrammetry had been fully executed in the field? Could the mishap have been avoided if the photogrammetry had been done differently? Some additional information is needed to fully convey the recommendations.

P7, 5, . . . with little delay. . .. Sure, but accurate photogrammetry takes a while. Here there is room for a discussion about the pros and cons, i.e. what level of accuracy is needed? And how is that achieved as fast as possible?

P7, 11, ... 10 hours. . .. This is a nice proof of concept. There is room to speculate how this can be taken forward.

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