

## ***Interactive comment on “Present-day high-resolution ice velocity map of the Antarctic ice sheet” by Qiang Shen et al.***

### **Anonymous Referee #1**

Received and published: 9 April 2019

Shen et al. present a nearly complete ice velocity map of the Antarctic Ice sheet obtained by mosaicking individual velocity measurements over a period of 3 summers. The velocity measurements are validated against sparse in situ measurements and also compared to a similar ice velocity map derived using the INSAR technique.

The degree of novelty of this article is low. The same group of authors already published a paper last year using and presenting this velocity data, the validation is not really convincing because they compare to in situ measurements made several decades ago and they totally ignored in their comparison a published Antarctic-wide velocity map derived using the same images (Landsat8).

General comments

C1

1/ The same authors already published a paper using these data in Scientific Reports (<https://www.nature.com/articles/s41598-018-22765-0>) so the degree of novelty is, at best, incremental. I have much more expectation for an ESSD data in term of originality. More worrisome is the fact that some sections of the submitted manuscript are "copy and paste" from the supplementary text from this earlier publication. I suggest that the editor asks the EGU Copernicus office to produce, if possible, a similarity index between the present article and the supplement of that published study to back up and quantify my comment. The fact that the authors did not cite their earlier work (was it deliberate?) also raises an ethical problem.

2/ I find it problematic to have a dataset provided in the format of a commercial software (ENVI). Not the SPIRIT of ESSD I feel. Geotiff raster file should be preferred as they can be read by mean different software open source and commercial.

3/ Error assessment. Authors start with a formal error description identifying all sources of errors and then change strategy and just assess the error as the spread in their different velocity fields. But all their velocity fields have priorly been adjusted to the same reference, the slow moving ice in the INSAR velocity mosaic from Mouginot/Rignot, so the spread is, by construction, reduced. If the INSAR mosaic is wrong in these slow moving areas (it includes some artefacts), then all L8 velocity fields will also be wrong. The spread between them will remain small but it does not mean they are accurate.

4/ Velocity maps based on Landsat 8 imagery have also been published by another group of authors (Gardner et al., TC, 2018) and a thorough comparison to their results is mandatory. <https://www.the-cryosphere.net/12/521/2018/>

Specific comments

Title : "present day" is too general. Provide dates Time stamp. Problematic to average over 3 summers. Is not it possible to have 3 maps (one per summer) instead (or as an additional product). Would be more useful to user even if they are not complete. Robust internal and external validation is too vague. Be more specific L25 "ice glacier"

C2

is not an appropriate terminology Many space missing before the references in the text L41. The 1986 reference is outdated and probably not the best on the topic. L54. It is not "difficult". It is simply impossible... L56. Missing references about velocity mapping in Antarctica : Bindshadler & Scambos, Science, 1991 ; Scambos et al. RSE 1992 [I see one of them is cited later] L61-67. The flow of the introduction is not OK. At these lines authors come back to the reasons why the velocity data are needed. Improve the structure/logics. L70-71. Cite only reference in Antarctica here. L76. "most recent" not that "new" now... L80. Heid and Kaab did not really work on Antarctica. Cite rather Gardner et al. TC 2018 here L109-111. Already stated. Avoid such repetition and go to the point. L120. "Electronic distance" is a strange method for velocity measurements. L133. Images with time span of 16 days to 3 years are used. What about the seasonal velocity variations? Can they be neglected? L139. Coregistration and correlation are not synonym. They are are two successive steps to generate accurate displacements. L152. This is a complete mis-understanding of what cosi corr is doing. The coregistration is the step to obtain two images without any shift on the stable terrain (if stable terrain exist in the images). This is not the result of the first, coarse correlation. It gives the impression that the authors did not understand the tool that they have been using. Worrysome. L159. 32 pixels means 480 m for the smaller correlation window. With such a window, does it make sense to generate a final map with a sampling distance of 100m? Authors should quantify what is the actual/true resolution of their dataset and use a relevant final grid size. Ground sampling distance and horizontal resolution are two different concepts. L179. Unclear how the QA band has been generated. The info needs to be provided. L188. This is too vague. Which value are exactly excluded? L201. This is this geolocation error that the coregistration aim at reducing. I understand it is difficult (or impossible) in Antarctica due to a lack of stable terrain (few nunataks). But I write this to make sure the authors understand what the coregistration step is. L211. How can the authors be sure that the INSAR dataset provide a good reference for slow moving areas? I noted many artefacts in the low velocity zone of Antarctica in the INSAR dataset. L232.

C3

Does it mean that more weight is given to the velocity measurements over longer time periods? Authors should be more explicit about that. L247. Your ground sampling distance is finer. Authors did not demonstrate that the actual resolution of their product is finer. To be demonstrated. Authors need to show side by side their dataset with the Rignot & Gardner dataset to really illustrate their high resolution. L255. Clarify that "fast ice" is on sea ice. Not obvious to all readers. L297. What does "predominant" mean? No really scientific Table 1. Why providing the "year" if it is always 2015... L315. Why is the validation called "technical"? L317-321 example of sentences with redundant (or incoherent information). L332. Here the initial definition of co-registration is correct. Not earlier in the text. However, decorrelation is not leading to bad coregistration. Again the authors seem to not understand the meaning of this word. L342. Authors are quoting a correlation error here, not a coregistration error L350. This is true only if the velocity is not changing with time. How can the authors be sure? L362. Constancy of the coregistration error with space and time need to be demonstrated or backed up using a formula. L383. This variability of glacier flow is exactly why their mosaicking strategy (three summer) is not appropriate. L385. Is there a year for the Raup & Scambos reference? L399. What about the Gardner et al. product? How does it compare to the same data points? L420. Why not a direct 1:1 comparison between the INSAR and L8 dataset (also in area flowing between 10 and 100 m/yr)? L426. Validation on fast flowing glaciers, using data acquired 30 years ago in areas which are known to potentially experience profound change in velocity is not appropriate. I think it would be more convincing to construct two or three annual velocity maps and compare them. Over one year the assumption of little velocity change has more chance to hold. It would be a useful check of internal consistency.

---

Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2018-149>, 2018.

C4